US Army Corps of Engineers ®
Mobile District

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN WATER CONTROL MANUAL

Final Draft
APPENDIX D

H. NEELY HENRY DAM AND LAKE
(ALABAMA POWER COMPANY)

COOSA RIVER, ALABAMA

U.S. ARMY CORPS OF ENGINEERS
SOUTH ATLANTIC DIVISION
MOBILE DISTRICT
MOBILE, ALABAMA

JANUARY 1979
REVISED XXX 2013

H. Neely Henry Dam and Lake

NOTICE TO USERS OF THIS MANUAL

Regulations specify that this Water Control Manual be published in a hard copy binder with loose-leaf form, and only those sections, or parts thereof; requiring changes will be revised and printed. Therefore, this copy should be preserved in good condition so that inserts can be made to keep the manual current. Changes to individual pages must carry the date of revision, which is the South Atlantic Division's approval date.

REGULATION ASSISTANCE PROCEDURES

If unusual conditions arise, contact can be made with the Water Management Section, Mobile District Office by phoning (251) 690-2730 during regular duty hours and (251) 509-5368 during non-duty hours. The Alabama Power Company Alabama Control Center Hydro Desk can be reached at (205) 257-4010 during regular duty hours.

METRIC CONVERSION

The values presented in the text are shown in English units only. Exhibit B contains a conversion table that can be used for metric units.

VERTICAL DATUM

All vertical data presented in this manual are referenced to the project's historical vertical datum, National Geodetic Vertical Datum of 1929 (NGVD29).

MEMORANDUM OF UNDERSTANDING

The H. Neely Henry Dam and Lake Project will be operated during floods and in support of navigation downstream in accordance with regulations prescribed by the Secretary of the Army and published in the Code of Federal Regulations, Title 33, Chapter II, Part 208, Section 208. A Memorandum of Understanding (MOU) concerning the operation of the H. Neely Henry development has been adopted by the Alabama Power Company (APC) and the U.S. Army Corps of Engineers (Corps). The purpose of the MOU is to primarily clarify the responsibilities of the two agencies with regard to the operation of the project for flood control and to provide direction for the orderly exchange of hydrologic data. An additional MOU with the purpose to delineate and affirm the regulation plan developed by the Corps and the APC for the APC Projects on the Coosa and Tallapoosa Rivers to support navigation on the Alabama River including periods of low flow or drought when navigation support may not be reduced was adopted XXX (date). A copy of the original MOU and the MOU for navigation operations are included in this manual as Exhibit C.

H. NEELY HENRY DAM AND LAKE

WATER CONTROL MANUAL
COOSA RIVER, ALABAMA
U.S. Army Corps of Engineers, Mobile District, South Atlantic Division

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PERTINENT DATA

GENERAL

Other names of project	Lock 3 Dam
Dam site location	
River	Coosa
Miles above mouth of Coosa River	146.8
Miles above mouth of Mobile River	506.2

RESERVOIR

Top of power pool (May through Oct) – feet NGVD29	508
Top of power pool (Dec through Mar) – feet NGVD29	507
Storage volume – acre feet	120,851
Power storage, elevation 505-508 – acre feet	30,383
Inactive storage, below elevation 480 – acre feet	1,547
Full power pool (May through Oct), elev 508 – acres	11,236
Full power pool (Dec through Mar), elev 507 – acres	10,478
Shoreline (elev 508) – miles	339

STREAMFLOW (at damsite)

Average discharge for Period of Record (1967 – 2009) - cfs	9,979
Maximum daily discharge (Nov. 2004) - cfs	89,129
Minimum daily discharge - cfs	0
Spillway design flood peak discharge - cfs	310,700

TAILWATER

Maximum spillway design flood - feet NGVD29	518.8
Full gate turbine discharge (Logan Martin elev. 460)	
1 Unit Operating (10,200 cfs) – feet NGVD29	464.2
2 units operating (20,000 cfs) - feet NGVD29	468.0
3 units operating (29,700 cfs) – feet NGVD29	471.3

DAM

Total length including dikes - feet	4,875
Total length of non-overflow section – feet	321
Maximum height from roadway to foundation – feet	100
Elevation, top of dam - feet NGVD29	539
Elevation, top of parapet - feet NGVD29	541

SPILLWAY

Type	concrete-gravity
Net length – feet	240
Elevation of crest - feet NGVD29	480

Type of gates	Tainter
Number of gates (29’x 40’)	6
Elevation of top of gates in closed position - feet NGVD29	509
Maximum discharge capacity (pool elev. 534.4) – cfs	310,700

POWER PLANT

Three units each consisting of a 27,000 kva generator driven by a fixed blade vertical turbine rated 33,500 hp at design head of 35 ft

OPERATING DATA

Gross static head at full power pool (elev. 508 ft NGVD29) – feet	46.0
Minimum head (full-gate discharge – 29,700 cfs) – feet	34.0

I - INTRODUCTION

1-01. Authorization. Public Law 436-83 provides for the private development of the Coosa River, Alabama and Georgia, and directs the Secretary of the Army to prescribe rules and regulations for project operation in the interest of flood risk management and navigation. Therefore, this water control manual has been prepared as directed and in accordance with U.S. Army Corps of Engineers (Corps) Water Management Regulations, specifically Engineering Regulation (ER) 1110-2-241, *Use of Storage Allocated for Flood Control and Navigation at Non-Corps Projects*. Also, ER 1110-2-240, *Water Control Management* prescribes the policies and procedures to be followed in carrying out water management activities, including establishment and updating of water control plans for non-Corps projects, as required by federal laws and directives. This manual is also prepared in accordance with pertinent sections of the Corps' Engineering Manual (EM) 1110-2-3600, *Management of Water Control Systems*; under the format and recommendations described in ER 1110-2-8156, *Preparation of Water Control Manuals*; and ER 1110-2-1941, *Drought Contingency Plans*. This manual is subject to review and revision at any time upon request of Alabama Power Company (APC) or the District Commander. Revisions to this manual are processed in accordance with ER 1110-2-240.

Below is a complete list of pertinent regulations and guidance and the date enacted:

ER 1110-2-240	Water Control Management	8 October 1982
ER 1110-2-241	Use of Storage Allocated for Flood Control and Navigation at Non-Corps Projects	24 May 1990
ER 1110-2-8156	Preparation of Water Control Manuals	31 August 1995
ER 1110-2-1941	Drought Contingency Plans	15 September 1981
EM-1110-2-3600	Management of Water Control Systems	30 November 1987

1-02. Purpose and Scope. This individual project manual primarily describes the flood risk management water control plan for the APC H. Neely Henry Dam and Lake Project. In addition, the manual includes descriptions of the plans for navigation support and drought contingency operations. The description of the project's physical components, history of development, normal water control activities, and coordination with others are provided as supplemental information to enhance the knowledge and understanding of the water control plan. H. Neely Henry Dam water control regulations must be coordinated with the multiple APC Coosa River projects in the Alabama-Coosa-Tallapoosa (ACT) Basin to ensure consistency with the purposes for which the system was authorized. In conjunction with the ACT Basin Master Water Control Manual, this manual provides a general reference source for H. Neely Henry water control regulation. It is intended for use in day-to-day, real-time water management decision making and for training new personnel.

1-03. Related Manuals and Reports

Other manuals related to the H. Neely Henry project water control regulation activities include the ACT Master Manual for the entire basin and nine appendices that compose the complete set of water control manuals for the ACT Basin.

Alabama-Coosa-Tallapoosa River Basin Master Manual

Appendix A	Allatoona Dam and Lake
Appendix B	Weiss Dam and Lake (Alabama Power Company)
Appendix C	Logan Martin Dam and Lake (Alabama Power Company)
Appendix D	H. Neely Henry Dam and Lake (Alabama Power Company)
Appendix E	Millers Ferry Lock and Dam and William “Bill” Dannelly Lake
Appendix F	Claiborne Lock and Dam and Lake
Appendix G	Robert F. Henry Lock and Dam and R. E. “Bob” Woodruff Lake
Appendix H	Carters Dam and Lake and Carters Reregulation Dam
Appendix I	Harris Dam and Lake (Alabama Power Company)

Other pertinent information regarding the H. Neely Henry Project and other APC Coosa River projects are contained within the Federal Energy Regulatory Commission (FERC) license for the Coosa projects. Historical river system development reports, definite project reports and design memoranda also have useful information.

1-04. Project Owner. The H. Neely Henry Dam and Lake Project is owned and operated by APC under provisions of the license issued by FERC for Project Number 2146.

1-05. Operating Agency. The H. Neely Henry Project is operated for flood control and navigation support in accordance with regulations prescribed by the Secretary of the Army which are published in the Code of Federal Regulations, Title 33, Chapter II, Part 208, Section 208.65. Day-to-day operation of the facility is assigned to the APC’s Alabama Control Center (ACC) in Birmingham, Alabama, which is part of the Power Delivery System under the direction of the Reservoir Operations Coordinator. Long-range water planning and flood control operation is assigned to the APC Reservoir Management in Birmingham, Alabama, which is part of Southern Company Services GEM-Hydro, under the direction of the System Operations Supervisor. Operation of the project is in accordance with the FERC license and this water control manual.

1-06. Regulating Agencies. Regulating authority is shared between the Corps, the FERC, and the APC. Memorandums of Understandings (MOUs) have been adopted by the APC and the Corps concerning the operation of the project. The purpose of the MOUs was to clarify the responsibilities of the two agencies with regard to the operation of the project for flood control, navigation, and other purposes and to provide direction for the orderly exchange of hydrologic data. Those modifications agreed upon by both parties are contained in the regulation plan as presented in this manual. The MOUs and this manual will be used to provide direction to implement the prescribed flood control and low flow regulations. A copy of the MOUs are included in this manual as Exhibit C.

II - DESCRIPTION OF PROJECT

2-01. Location. The H. Neely Henry Dam is located on the Coosa River at river mile 146.82, approximately 26 miles downstream from the City of Gadsden, Alabama. H. Neely Henry Lake extends upstream 78 miles to the Weiss Dam, and is located in Etowah, Cherokee, St. Clair and Calhoun Counties. The powerhouse is located on the east side, or left bank, of the Coosa River. The area of the watershed above the project is approximately 6,600 square miles. The location of the dam is shown on Plates 2-1 and 2-2. The dam is also shown in Figure 2.1.

Figure 2-1. H. Neely Henry Dam

2-02. Purpose. H. Neely Henry Dam is a multiple-purpose project which constitutes one unit in the proposed total development of the power potential and other water resources of the Coosa River below Rome, Georgia. The dam was built by APC principally for the production of hydroelectric power but was designed and constructed with a provision for the future installation of locks and appurtenances to facilitate development of the Coosa River for navigation, when such development becomes economically feasible. The dam also provides flood risk management benefits. Although not affected by Corps water supply regulations, the H. Neely Henry Lake is a source of water supply for domestic, agricultural, and municipal and industrial users. The lake also creates a large recreational area providing opportunities for fishing, boating, and other water-based recreational activities.

2-03. Physical Components. The H. Neely Henry development consists of a dam having a concrete gated spillway section with compacted earth abutment dikes; a reservoir having a surface area of 11,236 acres and extending 78 miles upstream to Weiss Dam at full summer pool of 508 feet NGVD29; a 72,900 kilowatt (kW) power plant, which is part of the main dam, located on the east side of the river between the spillway and the left bank earth abutment; a substation; and, appurtenant electrical and mechanical facilities. The principal features of the project are described in detail in subsequent paragraphs. Sections and plan of the dam, powerhouse and appurtenant works are shown on Plates 2-3 and 2-4.

a. Dam. The dam is a concrete gravity-type structure having a top elevation of 539 feet NGVD29 and a length of 858 feet. The maximum height above the existing river bed is 100 feet. Sections and plan of the dam and appurtenant works are shown on Plate 2-4. The dam is located at river mile 146.82 on the Coosa River approximately 26 miles downstream from the City of Gadsden, Alabama.

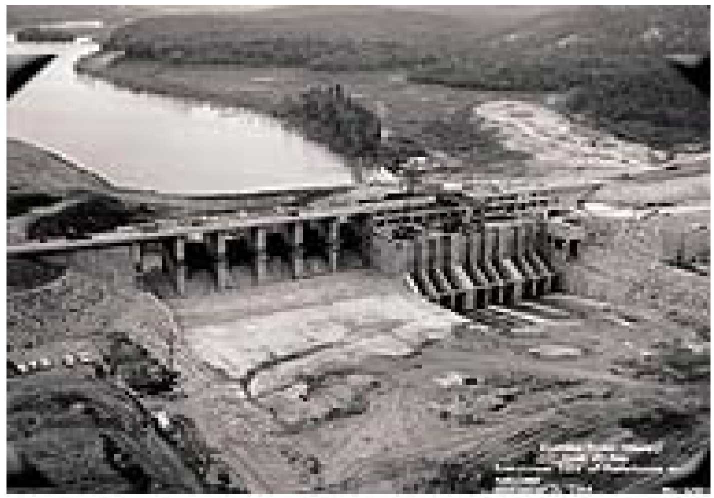

Figure 2-2. H. Neely Henry Project under Construction

b. Earth Dikes. Earth-filled, non-overflow dikes extend from the powerhouse and spillway to high ground on both sides of the concrete dam. These dikes have a top elevation of 539 feet NGVD29. The left, or east bank section is about 850 feet long by 60 feet high and ties into the powerhouse section. The right, or west bank section is about 3,200 feet long by 60 feet high and ties into the spillway section. Both sections are 36 feet wide at the top and are traversed by a paved roadway which continues across the powerhouse and spillway sections serving as an excess road to the powerhouse.

c. Reservoir. From the Weiss Dam to the H. Neely Henry Dam, H. Neely Henry Lake has a full pool summer-time level of 508 feet NGVD29 and a full pool winter-time level of 507 feet NGVD29. At elevation 508 feet NGVD29, the lake has a surface area of 11,236 acres and a total storage capacity of 120,851 acre-feet. At elevation 507 feet NGVD29, the lake has a surface area of 10,478 acres and a storage volume of 109,999 acre-feet. Usable storage of 10,860 acre-feet is available between elevations 508 and 507 feet NGVD29. The lake has 339 miles of shoreline and a maximum depth of 52 feet. The lake is relatively shallow with an average depth of 10.8 feet. The lake drainage area is 6,610 square miles, of which 1,327 square miles comprises the local lakeshed. The hydraulic retention time is approximately 7.25 days. Area-capacity curves and associated data points are shown on Plate 2-8. Flood rights and easements were acquired between elevations 508 to 527 feet NGVD29 and are shown on Plates 2-9 and 2-11

d. Spillway. The spillway section of the dam with a total length of 305 feet has a net length of 240 feet. The spillway has six radial gates, 29 feet high by 40 feet wide, with an overflow crest of elevation 480 feet NGVD29. The piers between the spillway gates support a roadway bridge across the top of the dam at elevation 539 feet NGVD29. The top of the six radial gates in closed position is elevation 509 feet NGVD29. The radial gates are operated by individual hoists. Free overflow spillway discharge under various operating conditions is shown on Plate 2-5 by a series of curves. The high tailwater, which causes a submergence effect, occurs when the powerhouse is operating in conjunction with a full spillway discharge and/or the Logan Martin reservoir is at full summer-level pool (elevation 465 feet NGVD29).

A partial-opening gate rating table for six-gate discharge in 0.5-foot increments is shown on Plate 2-6. This table gives discharge with no submergence effect. To indicate when submergence will affect the discharge, lines were put on the table to denote that the discharge lying above the line will be affected by submergence if the tailwater rises above the elevation shown in parenthesis at each end and just above each line. The spillway has a discharge capacity of 310,700 cfs at elevation 534.4 feet NGVD29, the peak pool elevation of the spillway design flood.

Discharges from the powerhouse are the upper reaches of APC's Logan Martin Lake, which has a normal full pool elevation of 465 feet NGVD29. The normal static tailwater elevation varies from 465 to 460 feet NGVD29, providing a fluctuating gross head of 40 to 48 feet. Tailwater rating curves at H. Neely Henry Dam for both summer and winter top-of-power-pool levels in Logan Martin Lake are shown on Plate 2-7.

e. <u>Powerhouse and Penstocks</u>. The powerhouse is situated on the east, or left bank of the Coosa River and with its intake section forms part of the dam. It is joined on the west side by the spillway section and on the east side by a non-overflow, earth dike section. The powerhouse is 105 feet high, 300 feet long, and 170 feet wide including the service bay. It is equipped with three vertical type generators, each rated at 24.3 megawatts (MW) (27,000 kVA at 0.9 power factor), and each operated by a vertical shaft, propeller type, hydraulic turbine rated at 33,500 horsepower for a net head of 35 feet. The total generating capacity is 72.9 MW. Performance curves for the turbines are shown on Plate 2-13. Immediately upstream from the powerhouse, running from the spillway to the east bank, a sheet piling skimming weir has been constructed with top elevation at 480 feet NGVD29. The purpose of this weir is to insure that water entering the turbine intakes is drawn from the upper levels of the reservoir where dissolved oxygen concentrations are higher during summer-time periods.

2-04. Related Control Facilities. Operation of the H. Neely Henry powerhouse and spillway gates can be operated either locally or remotely controlled from the Alabama Control Center in Birmingham, Alabama. Operation is closely coordinated with the operation of the other developments in the Coosa Basin, including the Allatoona, Carters, and Weiss Projects upstream and Lay, Mitchell, Jordan, and Bouldin Projects downstream.

2-05. Public Facilities. Many recreational advantages are inherent in an impoundment of this nature, and special attention has been given to the encouragement of recreational aspects where they do not conflict with major purposes. The project FERC license was amended to further emphasize recreational development. This amendment is included as Article 51 of Form L-6. It is a company policy to allow the public free access, to a reasonable extent, to project lands and waters for navigation and recreational purposes, including fishing and hunting. Provision for free access is also included in the project license in Article 7 of Form L-6. A map which denotes recreational facilities in operation at various points around the H. Neely Henry Lake is included as Plate 2-12.

III - HISTORY OF PROJECT

3-01. Authorization. Because of abundant streamflow and numerous excellent power sites, the Alabama-Coosa River System has long been recognized as having vast hydroelectric power potential. The system has been studied for the development of hydropower by both private interests and the Federal Government. During 1925, the APC conducted a study of the storage possibilities of the Coosa River above their existing Lay Dam with a view of developing five additional hydropower dams. In 1928, the APC prepared a report on complete canalization of the Coosa River. That report included the study of a hydropower and navigation dam at the site of the existing Federal Lock No. 2. The report identified this as the Patlay Site.

In 1934, the Corps, under the provisions of House Document No. 308, 69th Congress, First Session, developed a general plan for the overall development of the Alabama-Coosa River System. That plan, submitted to Congress and published as House Document No. 66, 74th Congress, First Session, included a hydropower and navigation dam on the Coosa River at the Patlay site, the same site previously studied by the APC. The Patlay Site (Federal Lock No. 2) is about 1.5 miles upstream from the site of H. Neely Henry Dam.

Additional studies were directed by Congress in resolutions adopted by the Committee on Rivers and Harbors, House of Representatives, on 1 April 1936 and 28 April 1936, and by the Committee on Commerce, United States Senate, on 18 January 1939. In response to those resolutions, an interim report was submitted to Congress in October 1941. That report, published as House Document No. 414, 77th Congress, First Session, recommended development of the Alabama-Coosa River and tributaries for navigation, flood control, power generation and other purposes in accordance with plans being proposed by the Chief of Engineers. The improvement outlined in House Document No. 414 included a dam with a powerhouse at the Patlay Site. Development of the Alabama-Coosa River System as recommended in House Document No. 414 was authorized by Congress in Section 2 of the River and Harbor Act of March 1945, Public Law 14, 79th Congress, First Session.

On 28 June 1954, the 83rd Congress, Second Session, enacted Public Law 436 which suspended the authorization under the River and Harbor Act of 2 March 1945, insofar as it concerned federal development of the Coosa River for the generation of electric power, in order to permit development by private interests under a license to be issued by the Federal Power Commission (FPC). The law stipulates that the license shall require provisions for flood control storage and for future navigation. It further states that the projects shall be operated for flood control and navigation in accordance with reasonable rules and regulations of the Secretary of the Army. The complete text of Public Law 436 is contained in Exhibit D.

On 2 December 1955, the APC submitted an application to the FPC for a license for development of the Coosa River in accordance with the provisions of Public Law 436. The development proposed by the APC, designated in the application as FPC Project No. 2146, included plans for a dam at the site of old Lock 3 about 2.0 miles downstream from the Patlay Site. Later the site was shifted about 0.5 miles upstream to its present location, 48.5 miles above Logan Martin Dam. During construction the name of the project was changed from Lock 3 Dam to H. Neely Henry Dam. Logan Martin and H. Neely Henry Dams form reservoirs which extend up to Weiss Dam so that the series of three dams is essentially the same as the Corps earlier plans for dams at Howell Mill Shoals, Patlay and Leesburg Sites.

3-02. Planning and Design. The FPC issued a license to the APC on 4 September 1957, for the construction, operation and maintenance of Project 2146. The license directed that construction of the H. Neely Henry (Lock 3) development commence within five years from 4 September 1957, and be completed within eight years from the date of commencement of construction of Weiss Dam. The license called for the normal pool at H. Neely Henry Dam to be at elevation 505 feet NGVD29 with controlled surcharge storage of 83,000 acre feet above that level. An amendment to the license dated 22 July 1964 established a seasonally varying maximum normal pool at elevation 505 feet NGVD29 from 5 November to 15 April and at elevation 508 feet NGVD29 from 1 May to 31 October each year. The amendment also eliminated the surcharge storage and provided for temporary lowering of the reservoir below maximum normal levels in the interest of flood control and navigation, in accordance with rules and regulations to be prescribed by the Secretary of the Army. Portions of the license pertinent to flood control, navigation, water use and reservoir regulation are contained in Exhibit E.

The rules and regulations to be prescribed by the Secretary of the Army were documented in Reservoir Regulation Manuals (RRM). The Corps approved the RRMs for the Weiss, Neely Henry, and Logan Martin APC projects in October 1965, January 1979, and January 1968, respectively. The purpose of the RRMs was to define a plan of operation during the occurrence or threatened occurrence of damaging flood conditions at downstream locations. Along with their RRMs, the Corps and APC developed a MOU to clarify the responsibilities of the two entities with regard to operation of the developments for flood control and other purposes and to provide for the orderly exchange of hydrologic data.

The Neely Henry project is primarily operated in a peaking mode, with seasonal variation in storage and generation. Operation is closely coordinated with Weiss Dam upstream and downstream APC reservoirs.

Under previous operations and agreements, APC provided a minimum flow at Montgomery, Alabama, of 4,640 cubic feet per second (cfs) (7-day average) based on the combined flows from the Tallapoosa and Coosa Rivers. The minimum flow target of 4,640 cfs was originally derived from the7Q10 flow at Claiborne Lake of 6,600 cfs. Those flows were established with the understanding that if APC provided 4,640 cfs, the Corps and intervening basin inflow would be able to provide the remaining water to meet 6,600 cfs at Claiborne Lake. However, as dry conditions continued in 2007, water managers realized that, if the basin inflows from rainfall were insufficient, the minimum flow target would not likely be achievable.

In response to the 2006 - 2009 drought, APC worked closely with the State of Alabama to develop the APC draft *Alabama Drought Operations Plan* that specified operations at APC projects on the Coosa and Tallapoosa Rivers (referred to as the APC Drought Operations Plan or ADROP). That plan included the use of composite system storage, state line flows, and basin inflow as triggers to drive drought response actions. Similarly, in response to the 2006 - 2009 drought, the Corps recognized that a basin-wide drought plan must incorporate variable hydropower generation requirements from its headwater projects in Georgia (Lake Allatoona and Carters Lake), a reduction in the level of navigation service provided on the Alabama River as storage across the basin declines, and that environmental flow requirements must still be met to the maximum extent practicable. Therefore, APC and the Corps coordinated to develop the ACT Basin Drought Contingency Plan, which includes drought operations for the Coosa River projects.

3-03. Construction. Construction started 1 August 1962, and the dam was completed in June 1966. Filling of the reservoir to operating level commenced 23 February 1966. The pool reached elevation 500.6 feet NGVD29 on 30 March 1966, the date initial testing of the turbines began. Two generating units were placed in commercial operation on 2 June 1966, and the third unit on 29 June 1966.

3-04. Related Projects. The Logan Martin Project is one of six APC projects on the Coosa River. The dam is located at mile 98.5 above the mouth at the Alabama River. Downstream of Logan Martin Dam is the Lay Dam and Powerhouse at mile 51.0, 47.5 miles downstream, followed by the Mitchell Dam and Powerhouse at mile 36.8, and the Jordan Dam at mile 18.9. The sites are shown on Plate 2-1 and associated drainage areas shown on Table 4-7.

3-05. Modifications to Regulations. On 26 February 2001, FERC approved a plan that allowed APC to evaluate an alternative operating rule curve that would better accommodate recreational access. This “evaluation” period began in 2001 and continued to the end of the existing license term (i.e., 2007) for the H. Neely Henry development. The “evaluation” period was extended along with the FERC license during the license renewal process. Under this alternative operating plan, the lake is operated from the full pool elevation of 508 feet NGVD29 from 1 May through 30 September during normal inflows and system generating requirements. A drawdown of the lake begins 1 October and ends 30 November when the level is lowered to 507 feet NGVD29. This elevation is maintained until April when lake refilling begins and continues through 30 April when full pool is reached. Previously, the wintertime drawdown level was 505 feet NGVD29 from 5 November to 15 April.

3-06. Principal Regulation Problems. There have been no significant regulation problems, such as erosion, boils, severe leakage, etc., at the H. Neely Henry Project.

IV - WATERSHED CHARACTERISTICS

4-01. General Characteristics.

a. ACT Basin. The head of the Coosa River is at Rome, Georgia at the confluence of the Etowah and Oostanaula Rivers. It flows east to the Alabama State line, then in a southwesterly then southerly direction for about 286 miles to join the Tallapoosa River near Wetumpka, Alabama, to form the Alabama River. The Alabama River flows in a southwesterly direction about 310 miles where it joins the Tombigbee River to form the Mobile River. The Mobile River flows southerly about 45 miles where it empties into Mobile Bay at Mobile, Alabama, an estuary of the Gulf of Mexico. The entire ACT Basin is shown on Plate 2-1.

b. Coosa Basin. The Coosa Basin drains a total of 14,836 square miles of which 4,362 square miles are in Georgia and 10,474 square miles are in Alabama. The main river width varies from about 250 to over 1,000 feet with banks generally about 20 feet above the river bed. The total fall of the river is 450 feet in 286 miles, giving an average fall of about 1.6 feet per mile.

c. Coosa Basin above H. Neely Henry. The basin above H. Neely Henry drains approximately 6,600 square miles and has a fall of approximately 0.8 feet per mile. The area is divided into three principal sub-areas. One is the Coosa River area which extends 138 miles upstream to Rome, Georgia, and contains 2,590 square miles. This sub-area is itself divided into two parts: the upper portion consists of 1,260 square miles and lies above the APC's Weiss Dam; the lower portion consists of 1,330 square miles and lies between Weiss Dam and H. Neely Henry Dam. The other two principal sub-areas are the basins of the Etowah and Oostanaula Rivers. These two rivers converge at Rome, Georgia, to form the Coosa River. The Etowah River has a drainage area of 1,860 square miles of which 1,110 square miles is above the Allatoona Dam and Lake Allatoona Project, located 48 miles upstream from Rome, Georgia. The Oostanaula River total drainage area is 2,150 square miles. The Carters Dam and Lake Project on the Coosawattee River, a main tributary of the Oostanaula River, has a drainage area of 376 square miles. The drainage area and river miles for important locations of interest within the basin are shown in Table 4-1.

4-02. Topography. The H. Neely Henry Project is located in the Valley and Ridge physiographic province of the southern Appalachian Mountains (see Figure 4-1). The Valley and Ridge ecoregion has a high relief, with altitudes ranging from 400 feet in valleys to 1,600 feet at ridge tops. The bedrock geology of this area is comprised dominantly of Paleozoic era sedimentary formations (primarily shales, with some other sedimentary rock such as sandstones) that have been extensively folded, faulted and thrusted. The geology results in ridges that are typically northeast-southwest oriented, and the stream patterns that are typically trellis-like or rectangular and their movement is controlled by the ridge features and weathering of the rocks. The Coosa River occupies a broad, flat, shale valley above the H. Neely Henry Dam. The bedrock consists dominantly of shale inter-bedded with localized layers of limestone and dolomite. The shale, which is of Mississippian age, is soft and tends to weather relatively rapidly where exposed. Portions of the region, particularly in the lowlands adjacent to the Coosa River, have floodplain alluvium and residuum (unconsolidated weathered material that accumulates over disintegrating rock) over the bedrock. Limestone deposits are mined in the region.

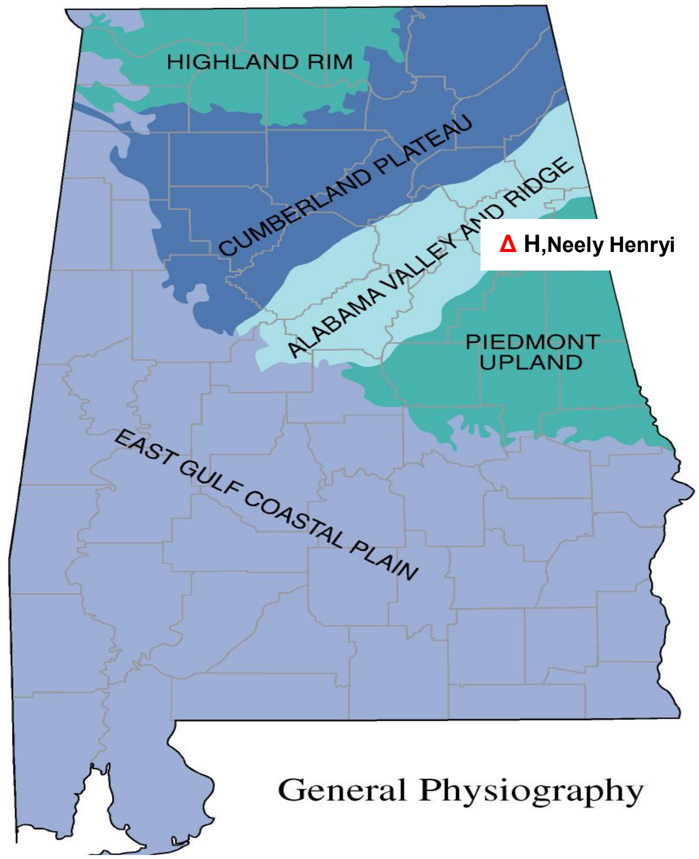

Figure 4-1. Topographic Regions in Alabama

Table 4-1. River Mile and Drainage Area for Selected Sites in Coosa River Basin above Childersburg, Alabama

COOSA RIVER				
River Miles above Mouth	**Point on River**	**Tributary**	**Drainage Area in square miles**	
			Tributary	**Coosa**
86.29	USGS gage, Childersburg, AL			8,390
99.50	Logan Martin Dam			7,700
148.00	Henry Dam			6,600
174.76	USGS gage, Gadsden, AL			5,800
206.25	Weiss Powerhouse			5,610
220.20	Below junction, Terrapin Creek	Terrapin Creek	286	5,571
	(USGS gage at Ellisville, AL)	Terrapin Creek	258	
225.65	Weiss Dam			5,273
232.98	Below junction, Chattooga River	Chattooga River	675	5,208
	(USGS gage above Gaylesville, AL)	Chattooga River	368	
278.65	Mayo's Bar			4,040
285.78	Confluence Etowah & Oostanaula , Rome, GA			4,010

ETOWAH RIVER		
River Miles above Mouth	**Point on River**	**Drainage Area in square miles**
0.00	Junction, Oostanaula River, Rome, GA	1,860
47.86	Allatoona Dam	1,122

OOSTANAULA RIVER		
River Miles above Mouth	**Point on River**	**Drainage Area in square miles**
0.00	Junction, Etowah River, Rome, GA	2,150
0.35	USGS gage, Rome 5th Ave, GA	2,150
43.16	USGS gage, Resaca, GA	1,610
46.95	Confluence Conasauga & Coosawattee Rivers	1,596

COOSAWATEE RIVER		
River Miles above Mouth	Point on River	Drainage Area in square miles
0.00	Junction, Conasauga River	859
24.90	USGS gage, Carters, GA	531
26.80	Carters Dam	374

4-03. Geology and Soils. Valley and Ridge soils are typically shallow and well drained, and water moves rapidly toward streams during precipitation events. The H. Neely Henry Project area soils are dominantly Ultisols. This soil order, which covers the majority of the State of Alabama, has developed in forested, humid/high rainfall, subtropical conditions on old landscapes (*e.g*., not glaciated or recently flooded). These soils are characterized by a surface soil that is often acidic and low in plant nutrients. The surface has a low base status (a measure of fertility) due to high rainfall weathering that has occurred over long time periods and parent materials low in base forming minerals. Although Ultisols are not as fertile as many other soil orders they do support abundant forest growth and respond well to management for agriculture.

4-04. Sediment. Significant sources of sediment within the basin are agricultural land erosion, unpaved roads, and sliviculture, and variation in land uses that result in conversion of forests to lawns or pastures. In general, the quantity and size of sediment transported by rivers is influenced by the presence of dams. Impoundments behind dams serve as sediment traps where particles settle in the lake headwaters because of slower flows. Large impoundments typically trap coarser particles plus some of the silt and clay. Often releases from dams scour or erode the streambed downstream. Ultisols dominate the Valley and Ridge ecoregion. They generally lack the original topsoil because of erosion during intensive cotton farming beginning in the 18th century.

Siltation studies by APC have been limited to evaluating the recreational impact of siltation at the mouths of tributaries. Studies indicate that shoaling over the years is reduced because of increased vegetation in the basin. Erosion studies indicate that sheet and rill erosion on cropland in Alabama was approximately 7.2 tons/acre/year in 1982 and approximately 6.0 tons/acre/year in 1997.

There are known cross sections of the reservoir available which can be used to establish ranges for sedimentation and retrogression surveys as the need arises. The cross sections were furnished by the Corps to APC in the 1980s and were eventually incorporated into an unsteady HEC-RAS model by the APC. The location of sections is shown on a number of USGS quad sheets available at the APC.

4-05. Climate. Chief factors that control the climate of the ACT Basin are its geographical position in the southern end of the temperate zone and its proximity to the Gulf of Mexico and South Atlantic Ocean. Another factor is the range in altitude from almost sea level at the southern end to higher than 3,000 feet in the Blue Ridge Mountains to the north. Frontal systems influence conditions throughout the year. During the warmer months, thunderstorms are a major producer of rainfall. Tropical disturbances and hurricanes also affect the region.

a. Temperature. The average annual temperature in the H. Neely Henry watershed for the time period 1981 - 2010 is 61.4º F. Table 4-2 provides average maximum and minimum monthly normal temperature data for six locations in or around the project. Climatologists define a climatic normal as the arithmetic average of a climate element, such as temperature, over a prescribed 30-year time interval. The National Climatic Data Center (NCDC) uses a homogenous and complete dataset with no changes to the collection site or missing values to determine the 30-year normal values. When developing this 30-year normal dataset, the NCDC has standard methods available to them to make adjustments to the dataset for any inhomogeneities or missing data before computing normal values. Extreme temperatures recorded in the mid-ACT Basin range from 108º to - 18º F. Both extremes occurred at Valley Head, Alabama. An interactive map showing the location of these stations and others is shown at: http://www.sercc.com/climateinfo/historical/historical.html.

Table 4-2. Monthly Temperatures for Various Locations in Middle ACT Basin

NORMAL MONTHLY TEMPERATURE (ºF) FOR MIDDLE ACT BASIN (MAX & MIN), 1981-2010														
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ALEXANDER CITY, AL	MAX	55.2	59.3	67.6	74.8	81.7	87.7	90.7	89.9	84.8	76.0	66.8	57.3	74.4
USC00010160	MIN	31.6	34.6	41.2	47.9	57.4	65.6	69.5	68.4	62.0	50.0	41.1	33.9	50.3
	AVE	43.4	47.0	54.4	61.3	69.6	76.7	80.1	79.2	73.4	63.0	54.0	45.6	62.4
GADSDEN, AL	MAX	51.8	56.4	65.6	74.1	81.3	87.6	90.8	90.4	84.5	74.8	64.5	54.5	73.1
USC00013154	MIN	30.8	34.4	41.1	48.9	58.2	66.6	70.6	69.7	63.0	51.1	40.5	33.6	50.8
	AVE	41.3	45.4	53.4	61.5	69.8	77.1	80.7	80.0	73.8	62.9	52.5	44.0	61.9
ROCK MILLS, AL	MAX	54.3	58.7	67.8	75.4	82.2	87.8	90.0	89.0	83.9	75.1	65.2	56.3	73.9
USC00017025	MIN	30.8	34.8	41.1	46.9	55.3	63.6	67.1	66.1	59.4	47.6	39.2	33.7	48.9
	AVE	42.5	46.7	54.4	61.2	68.7	75.7	78.6	77.6	71.6	61.4	52.2	45.0	61.4
LAFAYETTE 2W, AL	MAX	55.5	59.9	67.9	75.4	82.2	87.9	90.7	89.6	84.7	75.6	66.4	57.1	74.5
USC00014502	MIN	29.5	33.1	39.2	45.9	55.1	63.2	66.9	66.6	59.7	48.4	39.0	31.6	48.3
	AVE	42.5	46.5	53.6	60.6	68.6	75.6	78.8	78.1	72.2	62.0	52.7	44.4	61.4
HEFLIN, AL	MAX	52.4	56.6	65.3	72.9	79.5	85.9	88.8	88.4	83.1	74.0	64.2	54.5	72.2
USC00013775	MIN	29.5	32.6	39.1	45.7	55.4	63.4	67.4	66.7	59.8	47.7	38.8	31.7	48.2
	AVE	40.9	44.6	52.2	59.3	67.4	74.7	78.1	77.6	71.4	60.9	51.5	43.1	60.2
TALLADEGA, AL	MAX	53.7	58.3	66.7	74.8	81.7	88.0	90.8	90.4	85.1	75.6	65.7	56.0	74.0
USC00018024	MIN	29.7	33.0	38.8	46.2	55.3	63.3	67.9	66.9	60.2	47.8	39.3	32.3	48.5
	AVE	41.7	45.6	52.7	60.5	68.5	75.6	79.3	78.6	72.7	61.7	52.5	44.1	61.2
BASIN AVG	MAX	53.8	58.2	66.8	74.6	81.4	87.5	90.3	89.6	84.4	75.2	65.5	56.0	73.7
BASIN AVG	MIN	30.3	33.8	40.1	46.9	56.1	64.3	68.2	67.4	60.7	48.8	39.7	32.8	49.2
BASIN AVG	AVE	42.1	46.0	53.5	60.7	68.8	75.9	79.3	78.5	72.5	62.0	52.6	44.4	61.4

Table 4-3 shows the extreme temperatures for four stations within the middle ACT Basin. The maximum and minimum recorded temperatures for each month are shown. These stations are Gadsden, Childersburg, and Valley Head in Alabama, and Calhoun Experiment Station in Georgia. All the middle Coosa Basin temperature stations are shown on Plate 4-1.

Table 4-3. Extreme Temperatures within the ACT

Extreme Temperatures (ºF) Within Middle ACT Basin												
Month	Station:(013151) GADSDEN			Station:(011620) CHILDERSBURG WATER PLAN			Station:(018469) VALLEY HEAD			Station:(091474) CALHOUN EXPERIMENT STN	
	High	Low		High	Low		High	Low		High	Low
Period	1893 To 1968			1957 To 2009			1893 To 2009			1953 To 1997	
January	80	-4		81	-4		79	-15		76	-10
February	91	-13		85	4		80	-18		80	-7
March	93	6		89	7		90	2		86	4
April	94	24		93	23		92	19		91	22
May	101	34		97	33		100	29		97	33
June	108	44		102	41		104	35		103	40
July	108	50		105	51		106	45		105	50
August	106	49		104	49		105	45		104	47
September	108	34		100	34		104	29		102	32
October	99	25		93	22		98	19		95	20
November	87	4		88	14		90	-2		85	12
December	82	5		83	2		85	-8		77	-2

b. Precipitation. Due to the topographic lift of the Blue Ridge Mountains, the upland slopes are subject to intense local storms and to general storms of heavy rainfall lasting days. Heavy rains may occur at any time during the year, but are most frequent between late fall and mid-spring, when the majority of the large floods in the basin have been recorded. The large flood of March 1990 occurred when a storm front extended from Mobile, Alabama, to Montgomery, Alabama, to Rome, Georgia, and subtropical moisture was continuously drawn along the line producing an extended period of heavy rain. The normal monthly and annual precipitation in and around the H. Neely Henry watershed is shown on Table 4-4. This is based on the arithmetical mean of the normals at six stations. These stations are the same as the temperature stations and are shown on Plate 4-1. About 40 percent of the normal annual precipitation occurs from January through April, while only about 30 percent occurs during the dry period August through November. The average annual snowfall is three to five inches, usually in January and February, but is of minor importance in producing runoff.

Flood-producing storms can occur over the basin at any time, but they are much more frequent in the winter and early spring. Major storms in the winter are usually of the frontal type. Summer storms consist mainly of convective thundershowers with occasional tropical storms affecting the basin.

Table 4-4. Normal Rainfall (inches) Based on 30-Year Period – 1981 Through 2010

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ALEXANDER CITY, AL USC00010160	5.21	5.35	5.49	4.11	4.33	4.45	5.31	4.50	4.10	3.08	4.79	4.90	55.62
GADSDEN, AL USC00013154	5.27	4.99	5.15	4.64	4.64	4.37	4.72	3.88	3.96	3.65	4.96	4.36	54.59
ROCK MILLS, AL USC00017025	4.02	5.04	5.15	4.03	3.46	5.46	5.65	3.85	3.79	2.86	4.51	5.14	52.96
LAFAYETTE, AL USC00014502	5.02	5.07	5.72	4.55	4.27	4.18	5.12	4.20	3.71	3.28	4.58	4.85	54.55
HEFLIN, AL USC00013775	5.09	5.76	5.32	4.42	4.95	4.31	5.50	3.55	3.27	3.45	4.71	4.72	55.05
TALLEDEGA, AL USC00018024	5.16	5.77	6.43	4.33	4.71	4.70	4.87	3.86	3.51	3.63	5.03	4.55	55.55
BASIN AVG	5.19	5.15	6.10	4.90	4.18	4.16	5.28	3.95	3.63	2.84	4.07	4.93	54.72

Extreme rainfall events for three stations within the middle ACT Basin are shown on Table 4-5. Gadsden and Valley Head, Alabama, and Rome, Georgia, are shown with the monthly maximum and minimum values. Also shown is the one-day maximum rainfall for each location.

Table 4-5. Extreme Rainfall Events (inches), Period of Record

	Station:(013151)				Station:(018469)				Station:(097600)		
	GADSDEN				VALLEY HEAD				ROME		
	Monthly Maximum	Monthly Minimum	1 Day Maximum		Monthly Maximum	Monthly Minimum	1 Day Maximum		Monthly Maximum	Monthly Minimum	1 Day Maximum
Period	1893 To 1968				1893 To 2009				1893 To 2009		
January	13.95	1.40	5.60		12.05	1.70	5.00		12.42	0.85	4.65
February	14.10	0.71	4.86		14.73	0.74	7.39		13.45	0.74	5.30
March	12.87	1.26	6.65		15.87	0.89	4.78		17.98	1.07	6.22
April	11.84	0.06	4.57		11.40	0.58	5.15		13.60	0.30	4.30
May	8.59	0.00	4.69		11.27	0.12	4.19		11.33	0.22	2.99
June	9.09	0.43	2.75		12.47	0.54	3.60		10.85	0.23	3.31
July	17.57	0.69	4.88		12.50	0.66	4.52		14.76	0.87	4.05
August	10.44	0.56	3.12		13.80	0.00	8.05		14.54	0.49	4.92
September	10.30	0.00	3.36		11.02	0.00	8.06		11.33	0.00	4.95
October	13.43	0.00	4.98		9.91	0.00	6.02		10.37	0.00	6.67
November	20.03	0.03	4.60		11.72	0.51	4.72		16.26	0.36	5.58
December	14.13	0.57	8.38		13.67	0.77	4.28		16.47	0.58	5.96

4-06. Storms and Floods. Flood producing storms may occur over the Coosa Basin at anytime but are more frequent during the winter and spring. Major storms in the winter are usually of the frontal type, which persist for several days and cover large areas. Summer storms are usually tropical in origin and are normally short and intense, and usually cover small areas. Gage records at U.S. Geological Survey (USGS) gage 02400500 at Gadsden, Alabama, 27 miles upstream of the dam, are available from October 1926 to the present. Discharge records from January 1967 to the present at H. Neely Henry Dam are available from the APC. Both datasets through December 2012 are shown on Plate 4-2. Inflow and discharge records from January 1967 to December 2012 are shown on Plates 4-3 to 4-9.

The largest storms recorded at Gadsden, Alabama, prior to dam construction were the floods of April 1936 (76,900 cfs), February 1961 (74,100 cfs) and January 1933 (72,500). The largest post-construction discharges recorded at H. Neely Henry, 27 miles downstream of the Gadsden gage, were the floods of November 2004 (89,130 cfs), April 1979 (88,620 cfs) and April 1977 (84,350 cfs).

4-07. Runoff Characteristics. In the ACT Basin, rainfall occurs throughout the year but is less abundant from August through November. Only a portion of rainfall actually runs into local streams to form the major rivers. Factors that determine the percent of rainfall that runs into the streams include the intensity of the rain, antecedent conditions, ground cover and time of year (plants growing or dormant). Intense storms will have high runoff potential regardless of other conditions while a slow rain can produce little measurable runoff. Rating curves for the Coosa River at Gadsden, Alabama and Rome, Georgia are shown on Plates 4-10 and 4-11.

4-08. Water Quality. Alabama Department of Environmental Management (ADEM) has designated various portions of the H. Neely Henry Lake with 'use classifications' of public water supply, swimming, and fish and wildlife. The Coosa River below H. Neely Henry Dam has designated 'use classifications' as swimming and fish and wildlife, in accordance with Alabama Water Quality Control laws. The state of Alabama has promulgated water quality criteria related to the use classifications.

A total maximum daily load (TMDL) was finalized for H. Neely Henry Lake in 2008 and identified the lake as impaired for organic enrichment/dissolved oxygen, nutrients, and pH. The impaired criteria are discussed below.

a. <u>Dissolved Oxygen</u>. Alabama's water quality criteria regulations (ADEM Admin. Code R. 335-6-10-.09) states the following for segments designated with use classifications of swimming, fish and wildlife and public water supply:

> *For a diversified warm water biota, including game fish, daily dissolved oxygen concentrations shall not be less than 5.0 mg/l at all times; except under extreme conditions due to natural causes, it may range between 5.0 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 5.0 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 dissolved oxygen criterion is established at a depth of 5 feet in water 10 feet or greater in depth; for those waters less than 10 feet in depth, the dissolved oxygen criterion is applied at mid-depth. Levels of organic materials may not deplete the daily dissolved oxygen concentration below this level, nor may nutrient loads result in algal growth and decay that violates the dissolved oxygen criterion

In-lake thermal stratification is not a regular occurrence in H. Neely Henry Lake. Data collected by the Alabama Department of Environmental Management (ADEM) indicate that dissolved oxygen levels declined only slightly from the top of the water column to the bottom and water temperatures were essentially the same. The run-of-the-river nature of H. Neely Henry Lake and its shallow depths help to minimize stratification. A skimming weir has been installed near the dam to improve dissolved oxygen levels in the releases from the dam when necessary, by pulling water from the top of the water column.

b. Nutrients. H. Neely Henry Lake is classified as eutrophic, which indicates having waters rich in mineral and organic nutrients that promote a proliferation of plant life, especially algae, which can reduce the dissolved oxygen content throughout the lake. ADEM's decision to list H. Neely Henry Lake as being impaired for nutrients was authorized under ADEM's Water Quality Standards Program, which employs both numeric and narrative criteria to ensure adequate protection of designated uses for surface waters of the State. Numeric criteria typically have quantifiable endpoints for a given parameter such as pH, dissolved oxygen, or a toxic pollutant, whereas narrative criteria are qualitative statements that establish a set of desired conditions for all State waters. These narrative criteria are more commonly referred to as "free from" criteria that enable States a regulatory avenue to address pollutants or problems that may be causing or contributing to a use impairment that otherwise cannot be evaluated against any numeric criteria. Typical pollutants that fall under this category are nutrients and sediment. ADEM's narrative criteria are shown in ADEM's Administrative Code 335-6-10-.06 are as follows:

The following minimum conditions are applicable to all State waters, at all places and at all times, regardless of their uses:

(a) State waters shall be free from substances attributable to sewage, industrial wastes or other wastes that settle in forming bottom deposits which are unsightly, putrescent or interfere directly or indirectly with any classified water use.

(b) State waters shall be free from floating debris, oil, scum, and other floating materials attributable to sewage, industrial wastes or other wastes in amounts sufficient to be unsightly, or which interfere directly or indirectly with any classified water use.

(c) State waters shall be free from substances attributable to sewage, industrial wastes or other wastes in concentrations or combinations, which are toxic or harmful to human, animal, or aquatic life to the extent commensurate with the designated usage of such waters.

The major and minor point sources that discharge directly into H. Neely Henry Lake are presented in Table 4-6 below. The major point sources will have a total phosphorus limit of 1 mg/L applied as a monthly average limit for the months of April through October. The minor point sources will have a total phosphorus limit of 8.34 pounds per day (lbs/day), which will be applied as a monthly average for the months of April through October. However, ADEM may impose a concentration based total phosphorus limit for a particular minor point source(s) based on site-specific conditions.

The State of Alabama has not established a lake nutrient standard for H. Neely Henry Lake. Therefore, for TMDL development, a standard of 18 micrograms per liter (µg/L) of chlorophyll a in the upper reservoir and dam forebay was set as the target.

Table 4-6. Point Sources Discharging Directly into H. Neely Henry Lake

NPDES PERMIT #	Facility Name	Facility Type	Design Flow (MGD)
AL0055867	Southside Lagoon	Minor Municipal	0.26
AL0021334	Glencoe Lagoon	Minor Municipal	0.45
AL0077976	Willow Point Marina	Minor Municipal	0.02
AL0022659	Gadsden East WWTP	Major Municipal	6.18
AL0053201	Gadsden West WWTP	Major Municipal	11.32
AL0056839	Rainbow City Lagoon	Major Municipal	3.00
AL0057657	Attalla Lagoon	Major Municipal	4.00
AL0002119	Tyson Foods	Major Municipal	1.60

Historically, high nutrient loadings which impact the water quality in H. Neely Henry Lake have been attributed to upstream industrial activities. Therefore, as part of the TMDL process, allocations of nutrients were given to the point sources to achieve the chlorophyll a standard set in the TMDL. Pollutant loads from point sources are expected to decrease in the future based on the TMDL reductions.

c. pH. H. Neely Henry Lake is the only lake listed in Alabama as being impaired due to pH. According to ADEM's Water Quality Criteria (Administrative Code 335-6-10), the pH shall not "be less than 6.0, nor greater than 8.5" in a stream classified as Public Water Supply, Fish and Wildlife and Swimming. Elevated pH levels in lakes are typically a direct reflection of nutrient over-enrichment. One of the biggest influences of pH in water can be plant and animal respiration and plant photosynthesis. During daylight hours, aquatic plants can remove carbon dioxide from water faster than it can be replaced by respiration, thus causing pH to increase. The magnitude of the fluctuation in pH depends on the buffering capacity of the water and the rates of photosynthesis and respiration. By lowering the nutrient loads to the lake, the pH levels are expected to fall within the acceptable range. Thus the reduction of nutrient loads through the TMDL process should also reduce the pH levels to within water quality criteria requirements.

4-09. Channel and Floodway Characteristics. There are no major damage centers between H. Neely Henry and Logan Martin Dam downstream. Flood damage reduction operations downstream are described in Section 7-04, Exception 3. Flooding during a potential dam failure is addressed in Chapter 9.

4-10. Upstream Structures. The APC Weiss Dam and Lake Project is located immediately upstream of H. Neely Henry Project on the Coosa River. The Corps' Allatoona Dam and Lake Allatoona Project and the Carters Dam and Lake and Reregulation Dam are located on the Etowah and Coosawattee Rivers, respectively, in Georgia.

4-11. Downstream Structures. The APC projects downstream of the H. Neely Henry Project include Logan Martin, Lay, Mitchell, Bouldin and Jordan on the Coosa River and R. L. Harris, Martin, Yates, and Thurlow Dams on the Tallapoosa River. Corps projects downstream of the H. Neely Henry Project include Robert F. Henry, Millers Ferry, and Claiborne Locks and Dams. The Alabama River is navigable to Montgomery, Alabama, near river mile 342.0. Locations of these projects are shown on Plates 2-1 and 2-2. The existing upstream and downstream federal and APC projects and the drainage areas above them are shown on Table 4-7.

Table 4-7. Federal and APC Projects on the ACT

Agency	Alabama River Projects	Drainage Area (sq mi)
CORPS	Claiborne	21,473
CORPS	Millers Ferry	20,637
CORPS	RF Henry	16,233
	Coosa River Projects	
APC	Jordan/Bouldin*	10,165
APC	Mitchell	9,830
APC	Lay	9,087
APC	Logan Martin	7,700
APC	Henry	6,600
APC	Weiss	5,273
CORPS	Allatoona	1,122
CORPS	Carters	374
	Tallapoosa Projects	
APC	Thurlow	3,325
APC	Yates	3,250
APC	Martin	3,000
APC	Harris	1,453

* Jordan and Bouldin Dams share the same drainage area and reservoir

V - DATA COLLECTION AND COMMUNICATION NETWORKS

5-01. Hydrometeorological Stations. Management of water resources requires continuous, real-time knowledge of hydrologic conditions. Both the APC and the Corps collect and maintain records of hydrologic data and other information in connection with the operation of projects in the Coosa River Basin. Since the data collected by the APC are needed by the Corps in carrying out its responsibility of monitoring the flood control operations of the H. Neely Henry Project, and the data collected by the Corps supplements that being collected by the APC and is of value to them in planning their project operations, it is important that each agency furnish the other with such of its hydrologic and operating data as may be needed or found beneficial in its operation. This requires that communications facilities be available between the Mobile District Office of the Corps of Engineers and Reservoir Management. The USGS and National Weather Service (NWS), in cooperation with the APC, the Corps, and other federal and state agencies, maintain a network of real-time gaging stations throughout the ACT Basin.

a. Facilities. APC's Hydro Data Acquisition System (HDAS) is a combination of over 100 rain, stage, and evaporation gages located in the river basins where APC dams and reservoirs are located. The largest majority of these gages are owned and operated by APC. APC also utilizes data from relevant USGS gages. The rainfall gages and river gages are equipped with Data Collecting Platforms (DCPs) that store data on site and transmit to orbiting satellites. The stations continuously collect various types of data including stage, flow, and precipitation. The data are stored at the gage location and are transmitted to orbiting satellites. All the rainfall, reservoir, and river stage reporting gages regularly used by the Corps and APC in the ACT Basin, including the Coosa River Basin above H. Neely Henry Dam, are shown on Plates 5-1 and 5-2. Figure 5-1 shows a typical encoder with wheel tape housed in a stilling well used for measuring river stage or lake elevation. Figure 5-2 shows a typical precipitation station, with rain gage, solar panel, and Geostationary Operational Environmental Satellite (GOES) antenna for transmission of data.

Figure 5-1. Typical encoder with wheel tape for measuring the river stage or lake elevation in the stilling well

Figure 5-2. Typical field installation of a precipitation gage

All rainfall gages equipped as DCPs are capable of being part of the reporting network. Data are available from many stations in and adjacent to the ACT Basin. For operation of the H. Neely Henry Project, APC operates the HDAS that delivers real time rainfall and river stage data through SouthernLINC packet data radios and dedicated network connections. The rainfall stations APC uses to operate the facility are listed in Table 5-1. The sites in the vicinity of H. Neely Henry are shown on Plate 5-1, along with other gage locations.

Table 5-1. Rainfall Reporting Network for the Coosa Basin above H. Neely Henry Dam

Basin	Station
Etowah River Below Allatoona Dam	Dallas, GA
Oostanaula River	Dalton, GA
	Adairsville, GA
Coosa River Above Weiss Dam	LaFayette, GA
	Mt. Alto, GA
	Cedartown, GA
	Menlo, Al
	Gaylesville, AL
	Fort Payne, AL
	Blue Pond, AL
	Weiss Dam, AL
Coosa River Weiss Dam to Henry	Collinsville, AL
	Rock Run, AL
	Ellisville, AL
	Colvin Gap, AL
	Gadsden, AL
	Gadsden SP., AL
	Crudup, AL
	Ashville, AL
	Anniston, AL
	Steele, AL
	H. Neely Henry Dam, AL

All river stage gages equipped as DCPs are also capable of being part of the reporting network. Data are available from many stations in and adjacent to the ACT Basin. The river stage reporting network gages used for operation of the H. Neely Henry Dam are shown in the Table 5-2 below. The locations of river stage stations are shown on Plates 5-1 and 5-2.

Data are collected at sites throughout the ACT Basin through a variety of sources and integrated into one verified and validated central database. The basis for automated data collection at a gage location is the data collection platform. The DCP is a computer microprocessor at the gage site. A DCP has the capability to interrogate sensors at regular intervals to obtain real-time information (e.g., river stage, reservoir elevation, water and air temperature, precipitation). The DCP then saves the information, performs simple analysis of it, and then transmits the information to a fixed geostationary satellite. DCPs transmit real-time data at regular intervals to the GOES System operated by the National Oceanic and Atmospheric Administration (NOAA). The GOES Satellite's Data Collection System sends the data directly down to the NOAA Satellite and Information Service in Wallops Island, Virginia.

Table 5-2. River Stage Reporting Network for H. Neely Henry Dam

Stream	Station	USGS Station ID	River Miles Above Mouth	Drainage Area (sq mi)
	Etowah River Basin Below Allatoona Dam			
Etowah River	Allatoona	2394000	47.00	1,122
Etowah River	Cartersville at GA 61	2394670	38.22	1,330
Etowah River	Kingston (Nr) (4)	2395000	21.51	1,630
Etowah River	Rome (GA Loop 1)	2395980	1.80	1,801
Etowah River	Rome (Coosa Vally F.G.)	2395996	0.90	1,816
	Oostanaula River Basin			
Talking Rock Cr	Talking Rock	2382200		119
Coosawattee R	Ellijay	2380500	1.00	90
Coosawattee R.	Carters (Tailrace)	2382500	24.91	521
Coosawattee R.	Pine Chapel	2383520	6.60	856
Conasauga R	Eton	2384500	42.67	252
Conasauga R.	Tilton	2387000	12.14	682
Oostanaula R.	Resaca	2387500	43.16	1,610
Oostanaula R	Calhoun	2387520	36.41	1,624
Oostanaula R.	Rome	2388500	4.50	2,115
Oostanaula R.	ROME (US 27)	2388525	0.35	2,149
	Coosa River Basin Above Weiss Powerhouse			
Coosa B.	Near Rome (Mayo's Bar)	2397000	278.8	4,040
Chattooga R.	Summerville	2398000	-	192
Chattooga B.	Gaylesville	2398300	20.1-	366
Little River	Blue Pond	2399200	7.5-	199
Terrapin Creek	Ellisville	2400100	6.7-	252
	Weiss to Henry			
Coosa River	Gadsden	2400500	174.6	5,800
Coosa River	Gadsden SP	2400496	174.6	5,800
Big Wills Creek	Crudup (Reece City)	2401000	171.23	182
Big Canoe Creek	Ashville	2401390	154.26	141

The data are then rebroadcast over a domestic communications satellite (DOMSAT). The Mobile District Water Management Section operates and maintains a Local Readout Ground System (LRGS) that collects the DCP-transmitted, real-time data from the DOMSAT. Figure 5-3 depicts a typical schematic of how the system operates.

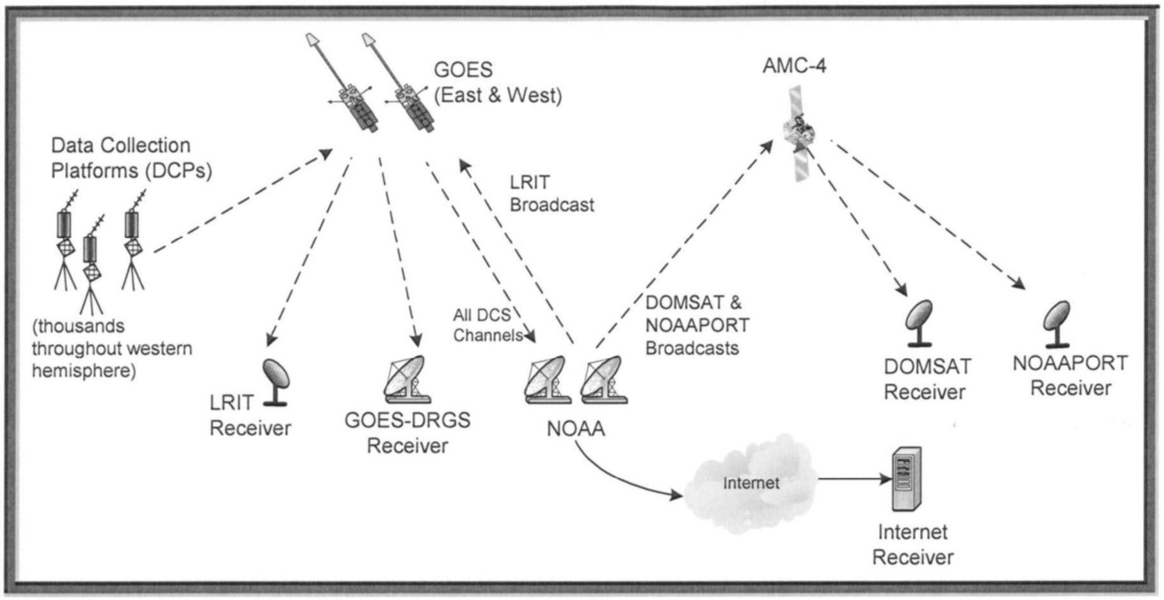

Figure 5-3. Typical Configuration of the GOES System

b. Reporting. Central to APC hydro operations, monitoring, and reporting network is the Hydro Optimization Management System (HOMS), which is a complex and dynamic system of data collection, analysis and management tools, and an arrangement of hydrologic and flow monitoring systems and tools.

The Corps operates and maintains a Water Control Data System (WCDS) for the Mobile District that integrates large volumes of hydrometeorological and project data so the basin can be regulated to meet the operational objectives of the system. The WCDS, in combination with the new Corps Water Management System (CWMS), together automate and integrate data acquisition, data management, and data dissemination.

c. Maintenance. Maintenance of data reporting equipment in the Coosa River Basin near H. Neely Henry Dam is a cooperative effort among the APC, USGS, NWS, and Corps.

If gages appear to be out of service, the following agencies can be contacted for repair:

USGS Georgia Water Science Center3039 Amwiler Road, Suite 130, Atlanta, GA 30022-5803
Phone: (770) 903-9100 Web: http://ga.water.usgs.gov

USGS Alabama Water Science Center, 75 Technacenter Drive, Montgomery, AL 36117
Phone: (334) 395-4120 Web: http://al.water.usgs.gov

NWS Southern Region, 819 Taylor Street, Room 10E09, Fort Worth, TX 76102
Phone: (817) 978-1100 Web: http://www.srh.noaa.gov/

U.S. Army Corps of Engineers, Mobile District, 109 Saint Joseph Street, Mobile, AL 36602-3630
Phone: (251) 690-2730 Web: http://www.sam.usace.army.mil/water/

5-02. Water Quality Stations. Water quality measurements are made at 14 USGS gaging stations within the Alabama River Basin. The data for these stations can be obtained from the USGS yearly publication, *Water Resources Data Alabama* and *Water Resources Data Georgia.* APC receives USGS water quality data directly from USGS instrumentation at relevant sites for the operation of APC projects within the basin.

5-03. Sediment Stations. There are known cross sections of the reservoir available which can be used to establish ranges for sedimentation and retrogression surveys as the need arises.

5-04. Recording Hydrologic Data. The Water Control Data Support System (WCDSS) is an integrated system of computer hardware and software packages readily usable by water managers and operators as an aid for making and implementing decisions. An effective decision support system requires efficient data input, storage, retrieval, and capable information processing. Corps-wide standard software and database structure are used for real-time water control. For the ACT River Basin, this database includes data from various river gage locations and rainfall locations as well as data relative to the water control operations at the H. Neely Henry Project. Time series hydrometeorological data are stored and retrieved using Hydrologic Engineering Center (HEC) Data Storage System (DSS) databases and programs.

To provide the data needed to support proper analysis, a DOMSAT Receive Station (DRS) is used to retrieve Data Collection Platform data from gages throughout the ACT Basin. The DRS equipment and software then receives the DOMSAT data stream, decodes the Data Collection Platforms of interest and reformats the data for direct ingest into a HEC-DSS database.

Most reservoir data are transmitted in hourly increments for inclusion in daily log sheets that are retained indefinitely. Gage data are transmitted in increments of 15 minutes, one hour, or other intervals. Reservoir data are examined and recorded in water control models every morning (or other times when needed). The data are automatically transferred to forecast models by the APC.

Automated timed processes also provide provisional real-time data needed for support of real-time operational decisions. Interagency data exchange has been implemented with the USGS and NWS Southeast River Forecast Center (SERFC). A direct link to SERFC is maintained to provide real-time products generated by NWS offices. Information includes weather and flood forecasts and warnings, tropical storm information, NEXRAD radar rainfall, graphical weather maps and more. Likewise, a direct link to USGS gages in the field allows for direct downloading of USGS data to Corps databases.

5-05. Communications Network.

a. <u>Regulating Office with Project Office</u>. Direct communication between the APC and H. Neely Henry Dam is provided by the company's SouthernLINC network telephone and email. The power plant at H. Neely Henry Dam is operated by remote control from the Alabama Control Center located in Birmingham, Alabama. Personnel are available but not always on duty at the dam.

b. <u>Between Project Office and Others</u>. The Corps communicates regularly with the APC's Reservoir Management Section to discuss project and basin conditions. Additionally, communication with APC and the NWS is conducted to exchange data and forecasting information. The data exchange is made by computer and is supplemented by telephone and facsimile when necessary. The Water Management Section also has a computer link with the NWS's AWIPS (Advanced Weather Interactive Processing System) communication system via the River Forecast Center in Peachtree City, Georgia. The Water Management Section uses a telephone auto-answer recorded message to provide daily information to the public. Information for the H. Neely Henry Lake is provided by APC at https://lakes.alabamapower.com. Water resources information for the H. Neely Henry Project is also available to the public at the Corps' website, http://water.sam.usace.army.mil. The sites contain real-time information, historical data and general information.

Emergency communication for the Corps and APC personnel during non-duty hours is available at the numbers found on the emergency contact information list located in Exhibit G.

5-06. Project Reporting Instructions. Communications for exchange of data between the Corps Water Management Section and APC's Reservoir Management and ACC Hydro Desk will normally be accomplished by electronic transmission to the Corps' WCDS server. In addition to automated data, project operators maintain record logs of gate position, water elevation, and other relevant hydrological information including inflow and discharge. This information is stored by the APC and the Corps Water Management Section. Unforeseen or emergency conditions at the project that require unscheduled manipulations of the reservoir should be reported to the Mobile District Water Management Section as soon as possible.

If the automatic data collection and transfer are not working, projects are required to fax or email daily or hourly project data to the Water Management Section. Water Management staff will manually input the information into the database.

5-07. Warnings. During floods, dangerous flow conditions, or other emergencies, the proper authorities and the public must be informed. In general, flood warnings are coupled with river forecasting. The NWS has the federal responsibility for issuing flood forecasts to the public, and that agency will have the lead role for disseminating the information. For emergencies involving the H. Neely Henry Project, the operator on duty should notify the Alabama Control Center who will in turn, notify the Corps' Water Management Section. A coordinated effort between APC and the Corps will insure proper notifications to local law enforcement, government officials and emergency management agencies are made in a timely manner.

5-08. Role of Regulating Office. Regulating authority for the H. Neely Henry Project is shared between APC, FERC, and the Corps in accordance with the MOU that was adopted by APC and the Corps prior to the completion of the project. The purpose of the MOU is to clarify the responsibilities of the two agencies with regard to the operation of the project for flood risk management and navigation support and to provide direction for the orderly exchange of hydrologic data. The Water Management Section of the Mobile District Office is responsible for developing operating procedures for flood conditions and to prepare water control manuals, such as this one, that describe water management regulation for flood risk management and navigation support at the project. These water control manuals are regularly reviewed and updated as needed.

VI - HYDROLOGIC FORECASTS

6-01. General. Obtaining forecasts for the operation of the H. Neely Henry Dam is the responsibility of the APC. The APC, the NWS, and the Corps exchange data daily to provide quality forecasts on inflows, headwater elevations, tailwater elevations and river stages.

a. Role of the Corps. The Corps Water Management Section obtains flow estimates for the APC projects on a daily basis. Sub-daily updates are obtained as necessary. The Water Management Section considers these inflows, local flows, current pool levels, and discharge requirements in scheduling releases from downstream federal projects on the Alabama River. The Water Management Section maintains records of precipitation, river stages, reservoir elevations and general streamflow conditions throughout the Mobile District, with special emphasis on the areas affecting or affected by reservoir operation. The Water Management Section performs the following duties in connection with the operation of the H. Neely Henry project:

1) Maintains liaison with personnel of APC Reservoir Management for the daily exchange of hydrologic data.

2) Maintains records of rainfall and river stages for the Coosa River Basin, and records of pool level and outflow at H. Neely Henry Dam and other impoundments in the basin.

3) Monitors operation of the power plant and spillway at H. Neely Henry Dam for compliance with the regulation schedule for flood control operation.

4) Transmits to APC Reservoir Management any instructions for special operations which may be required due to unusual flood conditions. (Except in emergencies where time does not permit, these instructions will first be cleared with the Chief of Engineering Division.)

The Water Management Section maintains close liaison with the NWS's River Forecast Center in Peachtree City, Georgia, and their Birmingham, Alabama, offices at all times to receive forecast and other data as needed. A mutual exchange of information increases the forecasting capability of the NWS at NWS river stations which may be affected by operations at Corps projects.

b. Role of Alabama Power Company. The flood control regulation schedule that has been adopted is based on current reservoir level and inflows or forecasts of inflow. APC has developed a computer model of the river system that utilizes rainfall and river gage stations located strategically throughout the basin. The model has the capability of forecasting inflow and the effects of discharge in accordance to flood control regulations on the reservoir as well as downstream locations. The model is used to assist in accomplishing the intent of the regulation plan and in the day-to-day operation. APC is continually evaluating the results, and as experience is gained, improvements will be incorporated into the model.

c. Role of Other Agencies. The NWS is responsible for preparing and publicly disseminating forecasts relating to precipitation, temperatures, and other meteorological elements related to weather and weather-related forecasting in the ACT Basin. For the Coosa River Basin, forecasts are prepared by the NWS's Southeast River Forecast Center (SERFC) located in Peachtree City, Georgia, and are issued through their office in Birmingham, Alabama. The Water Management Section uses the NWS as a key source of information for weather forecasts. The meteorological forecasting provided by the NWS is considered critical to the Corps' water resources management mission. The 24- and 48-hour Quantitative Precipitation

Forecasts (QPFs) are invaluable in providing guidance for basin release determinations. Using precipitation forecasts and subsequent runoff directly relates to project release decisions.

1) The NWS is the federal agency responsible for preparing and issuing streamflow and river-stage forecasts for public dissemination. The SERFC routinely prepares and distributes five-day streamflow and river-stage forecasts at key gaging stations along the Alabama, Coosa, and Tallapoosa Rivers. Streamflow forecasts are available at additional forecast points during periods above normal rainfall. In addition, SERFC provides a revised regional QPF on the basis of local expertise beyond the NWS Hydrologic Prediction Center QPF. SERFC also provides the Water Management Section with flow forecasts for selected locations on request.

2) The Corps and SERFC have a cyclical procedure for providing forecast data between federal agencies. As soon as reservoir release decisions have been planned and scheduled for the proceeding days, the release decision data are sent to SERFC. Taking release decision data, coupled with local inflow forecasts at forecast points along the ACT, SERFC can provide inflow forecasts into Corps and APC projects. Having revised inflow forecasts from SERFC, the Corps and APC have up-to-date forecast data to make the following days' release decisions.

6-02. Flood Condition Forecasts. During flood conditions, forecasts are made for two conditions; rainfall that has already fallen, and for potential rainfall (or expected rainfall). Decisions are made on the basis of both actual data and forecast scenarios. The flood evacuation schedule for H. Neely Henry Reservoir is based on current and expected flows at Gadsden, Alabama. The expected flows will be those forecast by the NWS SERFC, and furnished to the Corps and to the APC in accordance with respective agreements between the agencies.

a. Requirements. Accurate flood forecasting requires a knowledge of antecedent conditions, rainfall and runoff that has occurred, and tables or unit hydrographs to apply the runoff to existing flow conditions. Predictive QPF data are needed for what if scenarios.

b. Methods. When hydrologic conditions exist so that all or portions of the ACT Basin are considered to be flooding, existing streamflow and short and long-range forecasting runoff models are run on a more frequent, as-needed basis. Experience demonstrates that the sooner a significant flood event can be recognized and the appropriate release of flows scheduled, an improvement in overall flood control can be achieved. Stored storm water that has accumulated from significant rainfall events must be evacuated following the event and as downstream conditions permit to provide effective flood risk management. Flood risk management carries the highest priority during significant runoff events that pose a threat to public health and safety. The accumulation and evacuation of flood storage for the authorized purpose of flood risk management is accomplished in a manner that will prevent, insofar as possible, flows exceeding those which will cause flood damage downstream. During periods of significant basin flooding, the frequency of contacts between the APC, the Water Management Section and SERFC staff are increased to allow a complete interchange of available data upon which the most reliable forecasts and subsequent project regulation can be based. Table 6-1 provides SERFC forecast locations in the Alabama River Basin.

Table 6-1. SERFC Forecast Locations for the Alabama River Basin

Daily Stage/Elevation Forecasts				
	Station	**Station ID**	**Critical Stage (ft)**	**Flood Stage (ft)**
	Montgomery	MGMA1	26	35
	R. F. Henry TW	TYLA1		122
	Millers Ferry TW	MRFA1		66
	Claiborne TW	CLBA1	35	42
Daily 24-hour Inflow in 1000 SFD Forecast				
Reservoir		**Station ID**		
R. F. Henry		TYLA1		
Millers Ferry		MRFA1		
Additional Stage Forecasts Only for Significant Rises				
River/Creek	**Station**	**Station ID**	**Critical Stage (ft)**	**Flood Stage (ft)**
Coosa	Weiss Dam	CREA1		564
Coosa	Gadsden	GAPA1		511
Coosa	Logan Martin Dam	CCSA1		465
Coosa	Childersburg	CHLA1		402
Coosa	Wetumpka	WETA1	40	45
Tallapoosa	Wadley	WDLA1		13
Tallapoosa	Milstead	MILA1	15	40
Tallapoosa	Tallapoosa Wt Pit	MGYA1	15	25
Catoma Creek	Montgomery	CATA1	16	20
Alabama	Selma	SELA1	30	45
Cahaba	Cahaba Hts	CHGA1		14
Cahaba	Centreville	CKLA1	20	23
Cahaba	Suttle	SUTA1	28	32
Cahaba	Marion Junction	MNJA1	15	36

VII - WATER CONTROL PLAN

7-01. General Objectives. The H. Neely Henry Project will normally operate to produce peaking hydropower. During periods of low streamflow, the 30,383 acre-feet of storage within the 508 to 505 feet NGVD29 range of power-pool drawdown will be used to augment the flow into the Logan Martin Reservoir downstream.

7-02. Constraints. APC releases water from the H. Neely Henry Project in conjunction with other reservoirs to provide a weekly volume of flow to the Alabama River for navigation and environmental purposes.

7-03. Overall Plan for Water Control.

a. General Regulation. The water control operations of H. Neely Henry Dam are in accordance with the regulation schedule as outlined in the following paragraphs. Any deviation from the prescribed instructions during flood operations will be at the direction of the Water Management Section. Deviations during normal operations will be coordinated with the Alabama Control Center.

b. Basin above H. Neely Henry Project. Allatoona Dam controls the runoff from approximately 17 percent of the total drainage area above H. Neely Henry Dam. During flood events, the discharge from Allatoona Dam is reduced or eliminated until downstream stages have receded to within banks in the Rome, Georgia, area except in the most extreme event and the Allatoona Project is in an induced surcharge operation. Flood flows at Rome, Georgia, and on the Coosa River are further reduced by the operation of Carters Dam, which controls an additional 5.7 percent of the total area above H. Neely Henry Dam. Excess flood waters stored in these two reservoirs are released at non-damaging rates after the discharge on the Coosa River at Rome, Georgia, has dropped below bankfull stage. The runoff from 74 percent of the remaining area above H. Neely Henry Dam is controlled by Weiss Dam to the maximum extent possible within its storage capability.

c. H. Neely Henry Project. The total flood risk management storage required in the Coosa River development by Public Law 436 has been provided in two projects, Weiss and Logan Martin. No storage has been allocated for flood risk management in the H. Neely Henry Reservoir. Flood operations at H. Neely Henry Dam will consist of pre-flood evacuation of a seasonally varying amount of storage in order to lower the flood profile through the reservoir, thereby protecting Gadsden, Alabama, (approximately 26 miles upstream of dam) to some extent. The effectiveness of this operation is dependent on coordination with operations at Weiss Dam upstream and Logan Martin downstream. Pre-flood evacuation is used as a means of reducing the backwater effect of the reservoir at Gadsden, Alabama, during flood conditions. Drainage areas at principal points and tributary junctions in the area influenced by the H. Neely Henry Project are listed in Table 7-1.

1 **Table 7-1. Drainage Areas of the Coosa River above Childersburg, Alabama**

River Miles above Mouth	Location	Stream	Coosa Drainage Area (sq. mi)
86.29	USGS Gage 02407000	Coosa R at Chiildersburg, AL	8,390
99.50	Logan Martin	Coosa R	7,700
148.00	H. Neely Henry	Coosa R	6,600
172.90	USGS Gage 02400500	Coosa R at Gadsden, AL	5,805
174.80	USGS Gage 02400496	Coosa R at Gadsden Steam Plant near Gadsden, AL	5,800
206.25	Weiss Powerhouse	Coosa R at Outlet Canal	5,610
220.20	Below Junction Terrapin Cr	Coosa R	5,571
	USGS Gage 02400100	Terrapin Cr at Ellisville, AL	252
	Weiss Dam	Coosa R	5,273
232.98	Below Junction Chattooga R	Coosa R	5,208
	USGS Gage 02398300	Chattooga R above Gaylesville, AL	368
278.65	USGS Gage 02397000 (Mayo's Bar)	Coosa R near Rome, GA	4,040
285.78	Head of Coosa R	Confluence of Oostanaula R and Etowah R at Rome, GA	4,010

River Miles above Mouth	Location	Stream	Etowah Drainage Area (sq. mi)
0	Head of Coosa R	Etowah R	1,860
47.86	Allatoona Dam	Etowah R	1,122

River Miles above Mouth	Location	Stream	Oostanaula Drainage Area (sq. mi)
0	Head of Coosa R	Oostanaula R	2,150
0.35	USGS Gage 02388530	Oostanaula R at 5th Ave, at Rome, GA	2,150
43.16	USGS Gage 02387500	Oostanaula R at Resaca, GA	1,610
46.95	Head of Oostanaula R	Confluence of Conasauga R and Coosawattee R	1,596

River Miles above Mouth	Location	Stream	Oostanaula Drainage Area (sq. mi)
0	Head of Oostanaula R	Coosawattee R	859
24.90	USGS Gage 02382500	Coosawattee R at Carters, GA	531
26.80	Carters Dam	Coosawattee R	374

7-04. Flood Risk Management. In order to minimize flood damages in the Gadsden, Alabama, area of the H. Neely Henry Project, the reservoir will be drawn down below its normal operating level in advance of an impending flood. The time to begin evacuation, the rate of evacuation, and the elevation to which the lake will be lowered will be determined by the elevation at the Gadsden Steam Plant gage as described in Section 7-05 "Lake Evacuation Procedures". A series of trigger points at 0.5 foot increments between 508 feet NGVD29 and 511 feet NGVD29 correspond to the lowering (and raising) of the water at the dam in increments down to 502.5 feet NGVD29. In times of rapidly rising water at Gadsden crossing multiple trigger points raise the initial evacuation rate of 1 foot in 12 hours by multiple times. There are three adjustments or exceptions to the Evacuation Rate Schedule:

Exception 1: When the rule curve is at 508 feet NGVD29, the initial trigger point (508.5 feet NGVD29) will be skipped if the following three conditions are met:

Gadsden Steam Plant gage does not exceed 509 feet NGVD29,

Weather forecasts do no indicate significant rain potential, and

Weiss releases are not expected to go above approximately 26,000 cfs (3 unit full gate operation) in the next 24 hours

Should any of these three conditions change then the evacuation rate schedule should be initiated, or if the reservoir reaches the second trigger point (509.0 feet NGVD29) then the evacuation rate should be doubled to reach the second step of the drawdown so as to return to the schedule.

Exception 2: If after the initial stage of evacuation the Gadsden elevation begins to fall then Henry elevation may be allowed to rise so long as the following conditions are met:

Gadsden Steam Plant gage does not exceed 510 feet NGVD29,

Weather forecasts do not indicate significant rain potential,

Inflows into Henry Reservoir are not increasing, and

Weiss releases are not expected to go above 40,000 cfs in the next 24 hours. Should any of these four conditions change then the evacuation rate schedule should be re-initiated.

Exception 3: Immediately below Neely Henry Dam, APC has acquired flood rights to elevation 490 feet NGVD29 for the Logan Martin Reservoir. This corresponds to a discharge of approximately 96,000 cfs. The evacuation is to proceed according to the schedule until the release reaches approximately 96,000 cfs whereupon the rate of evacuation will be reduced all the way to zero if need be to maintain a release of approximately 96,000 cfs. At that point the release can be increased to prevent the pool from rising and the maximum rate of release will continue until the reservoir reaches 502.5 feet NGVD29 or the spillway gates are raised out of the water.

7-05. Lake Evacuation Procedures. The evacuation plan described above will lower flood profiles through the downstream portion of the reservoir, thus reducing flood peaks at Gadsden. However, the pre-flood evacuation of up to 51,500 acre-feet of storage from the H. Neely Henry Lake will increase the inflows into Logan Martin Lake at the beginning of a flood. Under certain conditions of storm rainfall distribution over the area, the evacuation releases from Neely Henry Dam could combine with local flood inflows so as to reduce the effectiveness of the Logan Martin Project in controlling flood stages downstream. All evacuation operations will be analyzed and if the overall effect shown to be detrimental to flood control operations the plan will be modified to the extent necessary. This analysis is a joint operation by the Corps and the APC. Whenever a discharge of 50,000 cfs from Logan Martin Dam results in an evacuation operation, data on pool and tail water elevation and inflows and outflows are provided to the Corps by the APC. This data is analyzed and results discussed with the APC. Instructions will then be issued to alter any operations considered detrimental to flood control.

7-06. Correlation with Other Projects. H. Neely Henry is one of a series of dams constructed by APC to take advantage of the available head of the Coosa River for power. These dams also provide a substantially continuous series of pools which will serve the needs of navigation if navigation facilities are constructed. In addition, flood control storage is provided in Weiss and Logan Martin. In any such comprehensive stream development, operations at any one project, particularly a storage reservoir, will affect, to some degree, the projects downstream. For example, operations of the Weiss Project affect the inflows to all of the other Coosa River projects. In turn, the inflows into the Weiss Project are affected by operations of the Corps' Allatoona Project, located on the Etowah River 48 miles above Rome, Georgia, and by the Corps' Carters Project, located on the Coosawattee River 73.8 miles above Rome, Georgia. However, while the flood risk management regulation plans for the Allatoona and Carters Projects are somewhat interrelated, the regulation plans for flood risk management at Weiss and Logan Martin Projects, have been developed so that operations during the rising phase of a flood are completely independent of each other. Following a flood, the emptying of flood storage at Allatoona and Carters may prolong the time required to evacuate flood storage at Weiss and Logan Martin. Insofar as practicable, releases from all these projects will be made so as to minimize any undesirable condition that might be created by the emptying operations. Also, in the event of a localized storm centered over one of the downstream reservoirs, operations at the upstream projects may be modified to reduce outflow to the maximum extent feasible to alleviate the downstream flood conditions as much as possible. The Corps and APC maintain regular and rapid exchange of data in order to provide the fullest coordination of their operations.

7-07. Spillway Gate Operating Schedule. The operation of the spillway gates will be in accordance with the gate opening schedule as shown on Plate 2-6. The operator will determine the appropriate discharge and set the gates to the step that will produce a discharge as near as practical to that rate.

7-08. Minimum Flow Agreement. Flow in the Alabama River is largely controlled by APC impoundments on the Coosa and Tallapoosa Rivers. Pursuant to articles in the Federal Energy Regulatory Commission licenses for these impoundments, a minimum discharge must be released to support navigation on the Alabama River. These flows are also significant as an environmental or water quality minimum flow. Under the terms of the previous negotiated agreement, APC projects would provide releases from the Jordan/Bouldin Project on the Coosa and Thurlow Project on the Tallapoosa Rivers equal to a continuous minimum 7-day average flow of 4,640-cfs (32,480 dsf/7 days). This minimum flow target of 4,640 cfs was originally derived from the7Q10 flow at Claiborne Lake of 6,600 cfs. Those flows were established with the understanding that if APC provided 4,640 cfs, the Corps and intervening basin inflow would be able to provide the remaining water to meet 6,600 cfs at Claiborne Lake. However, as dry conditions continued in 2007, water managers realized that, if the basin inflows from rainfall were insufficient, the minimum flow target would not likely be achievable. Therefore, in coordination with APC, drought operations for the middle reaches of the ACT Basin have been revised and are described in detail in Exhibit D, *ACT River Basin Drought Contingency Plan*. The Drought Contingency Plan is summarized in Paragraph 7-13 of this manual. The revisions to the minimum low flow requirements are described in Table 7-6, ACT Drought Management Plan.

7-09. Recreation. Recreational activities are best served by maintaining a full conservation pool. Lake levels above top of conservation pool invade the camping and park sites. When the lake recedes several feet below the top of conservation pool, access to the water and beaches becomes limited. Water management personnel are aware of recreational effects caused by reservoir fluctuations and attempt to maintain reasonable lake levels, especially during the peak recreational use periods, but there are no specific requirements relative to maintaining recreational levels. Other project functions usually determine releases from the dam and the resulting lake levels

7-10. Water Quality. H. Neely Henry Lake is shallow in depth and does not experience thermal stratification during the summer, although dissolved oxygen levels can still become depressed in the lower portions of the lake due to limited circulation within the water column. During late summer, dissolved oxygen levels are often less than 4 mg/L in the deeper portions of the lake, while the upper portions of the water column will have dissolved oxygen levels in the 7 – 8 mg/L range. A skimming weir has been constructed near the dam to pull this better oxygenated water through the turbine units. However, even with the weir, dissolved oxygen levels in the releases from the dam can result in tailwater dissolved oxygen levels which violate State dissolved oxygen criteria. The releases from H. Neely Henry discharge into Logan Martin Lake downstream which also decreases the amount of natural reaeration that can occur in the turbulent tailwater area. APC has plans to install an aeration system at the H. Neely Henry Project to improve dissolved oxygen levels in the releases from the dam to ensure that dissolved oxygen standards are met.

7-11. Hydroelectric Power. A guide curve delineating the seasonally varying, top-of-power-pool level in H. Neely Henry Lake is shown on Plate 7-1. Normally, the lake level will be maintained on or below the curve except when flood inflows exceeding the discharge capacity of the spillway cause the lake level to rise. The lake is lowered each year during the flood season to elevation 507 feet NGVD29 to provide additional flood storage capacity in the system. H. Neely Henry Dam will normally operate on a weekly cycle with the hydropower generated available for use in the daily peak-load periods on Monday through Friday. When H. Neely Henry Lake is below the top of the power pool curve, the power plant will be operated in accordance with system requirements. Whenever the lake reaches the top of the power pool elevation, the power plant will operate as necessary, up to full-gate capacity, in an attempt to discharge the amount of water required to keep the lake level from exceeding the top of the power pool curve elevation.

7-12. Navigation. Navigation is an important use of water resources in the ACT Basin. The Alabama River, from Montgomery downstream to the Mobile area, provides a navigation route for commercial barge traffic, serving as a regional economic resource. A minimum flow is required to ensure usable water depths to support navigation. APC releases water from their storage projects in conjunction with other reservoirs to provide a weekly volume of flow to the Alabama River. Congress has authorized continuous navigation on the river, when sufficient water is available. The three Corps locks and dams on the Alabama River and a combination of dredging, river training works, and flow augmentation together support navigation depths on the river. The lack of regular dredging and routine maintenance has led to inadequate depths at times in the Alabama River navigation channel.

When supported by maintenance dredging, ACT Basin reservoir storage, and hydrologic conditions, adequate flows will provide a reliable navigation channel. In so doing, the goal of the water control plan is to ensure a predictable minimum navigable channel in the Alabama River for a continuous period that is sufficient for navigation use. Figure 7-1 shows the effect of dredging on flow requirements for different navigation channel depths during normal hydrologic conditions (1992 - 1994). As shown on Figure 7-1, pre-dredging conditions exist between November and April; dredging occurs between May and August; and post-dredging conditions exist from September through October, until November rainfall causes shoaling to occur somewhere along the navigation channel.

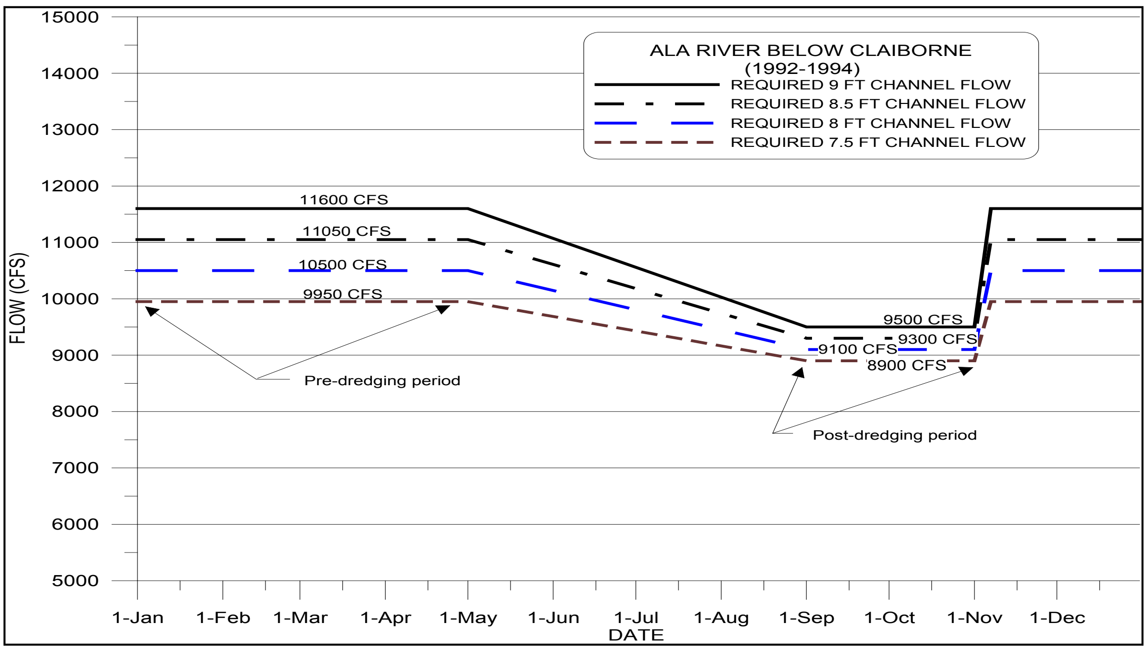

Figure 7-1. Flow-Depth Pattern (Navigation Template) During Normal Hydrologic Conditions (1992–1994)

A 9-foot-deep by 200-foot-wide navigation channel is authorized on the Alabama River to Montgomery, Alabama. When a 9.0-foot channel cannot be met, a shallower 7.5-foot channel would still allow for light loaded barges moving through the navigation system. A minimum depth of 7.5 feet can provide a limited amount of navigation. Under low flow conditions, even the 7.5-foot depth has not been available at all times.

Flow releases from upstream APC projects have a direct influence on flows needed to support navigation depths on the lower Alabama River. Flows for navigation are most needed in the unregulated part of the lower Alabama River below Claiborne Lock and Dam. When flows are available, R. F. Henry, Millers Ferry, and Claiborne are regulated to maintain stable pool levels, coupled with the necessary channel maintenance dredging, to support sustained use of the authorized navigation channel and to provide the full navigation depth of nine feet. When river conditions or funding available for dredging of the river indicates that project conditions (9-foot channel) will probably not be attainable in the low water season, the three Alabama River projects are operated to provide flows for a reduced project channel depth as determined by surveys of the river. APC operates its reservoirs on the Coosa and Tallapoosa Rivers (specifically flows from their Jordan, Bouldin, and Thurlow (JBT) Projects) to provide a minimum navigation flow target in the Alabama River at Montgomery, Alabama. The monthly minimum navigation flow targets are shown in Table 7-2. However, flows may be reduced if conditions warrant in accordance with the navigation plan memorandum of understanding between the Corps and APC. Additional intervening flow or drawdown discharge from the R. F. Henry and Millers Ferry Projects must be used to provide a usable depth for navigation and/or meet the 7Q10 flow of 6,600 cfs below Claiborne Dam. However, the limited storage afforded in both the R. E. “Bob” Woodruff and William “Bill” Dannelly Lakes can only help meet the 6,600 cfs level at Claiborne Lake for a short period. As local inflows diminish or the storage is exhausted, a lesser amount would be released depending on the amount of local inflows. Table 7-3 and Figure 7-2 show the required basin inflow for a 9.0-foot channel; Table 7-4 and Figure 7-3 show the required basin inflow for a 7.5-foot channel.

During low-flow periods, it is not always possible to provide the authorized 9-foot deep by 200-foot-wide channel dimensions. In recent years, funding for dredging has been reduced resulting in higher flows being required to provide the design navigation depth. In addition, recent droughts in 2000 and 2007 had a severe impact on the availability of navigation depths in the Alabama River.

Historically, navigation has been supported by releases from storage in the ACT Basin. Therefore, another critical component in the water control plan for navigation involves using an amount of storage from APC storage projects similar to that which has historically been used, but in a more efficient manner.

The ACT Basin navigation regulation plan is based on storage and flow/stage/channel depth analyses using basin inflows and average storage usage by APC (e.g., navigation operations would not be predicated on use of additional storage) during normal hydrologic conditions. Under that concept, the Corps and APC make releases that support navigation when basin inflows meet or exceed seasonal targets for either the 9.0-foot or 7.5-foot channel templates. Triggers are also identified (e.g., when basin inflow are less than required natural flows) to change operational goals between the 9.0-foot and 7.5-foot channels. Similarly, basin inflow triggers are identified when releases for navigation are suspended and only 7Q10 (4,640 cfs) releases would occur. During drought operations, releases to support navigation are suspended until system recovery occurs as defined in the ACT Basin Drought Contingency Plan (ACT River Basin Master Water Control Manual, Exhibit F).

Table 7-2. Monthly Navigation Flow Target in CFS

Month	9.0-ft target below Claiborne Lake (cfs)	9.0-ft JBT goal (cfs)	7.5-ft target below Claiborne Lake (cfs)	7.5-ft JBT goal (cfs)
Jan	11600	9280	9950	7,960
Feb	11600	9280	9950	7,960
Mar	11600	9280	9950	7,960
Apr	11600	9280	9950	7,960
May	11100	8880	9740	7,792
Jun	10600	8480	9530	7,624
Jul	10100	8080	9320	7,456
Aug	9600	7680	9110	7,288
Sep	9100	7280	8900	7,120
Oct	9100	7280	8900	7,120
Nov	11600	9280	9950	7,960
Dec	11600	9280	9950	7,960

Table 7-3. Basin inflow above APC Projects required to meet a 9.0-Foot Navigation Channel

Month	APC navigation Target (cfs)	Monthly historic storage usage (cfs)	Required basin inflow (cfs)
Jan	9,280	–994	10,274
Feb	9,280	–1,894	11,174
Mar	9,280	–3,028	12,308
Apr	9,280	–3,786	13,066
May	8,880	–499	9,379
Jun	8,480	412	8,068
Jul	8,080	749	7,331
Aug	7,680	1,441	6,239
Sep	7,280	1,025	6,255
Oct	7,280	2,118	5,162
Nov	9,280	2,263	7,017
Dec	9,280	1,789	7,491

Table 7-4. Basin inflow above APC Projects required to meet a 7.5-Foot Navigation Channel

Month	APC navigation Target (cfs)	Monthly historic storage usage (cfs)	Required basin inflow (cfs)
Jan	7,960	–994	8,954
Feb	7,960	–1,894	9,854
Mar	7,960	–3,028	10,988
Apr	7,960	–3,786	11,746
May	7,792	–499	8,291
Jun	7,624	412	7,212
Jul	7,456	749	6,707
Aug	7,288	1,441	5,847
Sep	7,120	1,025	6,095
Oct	7,120	2,118	5,002
Nov	7,960	2,263	5,697
Dec	7,960	–994	8,954

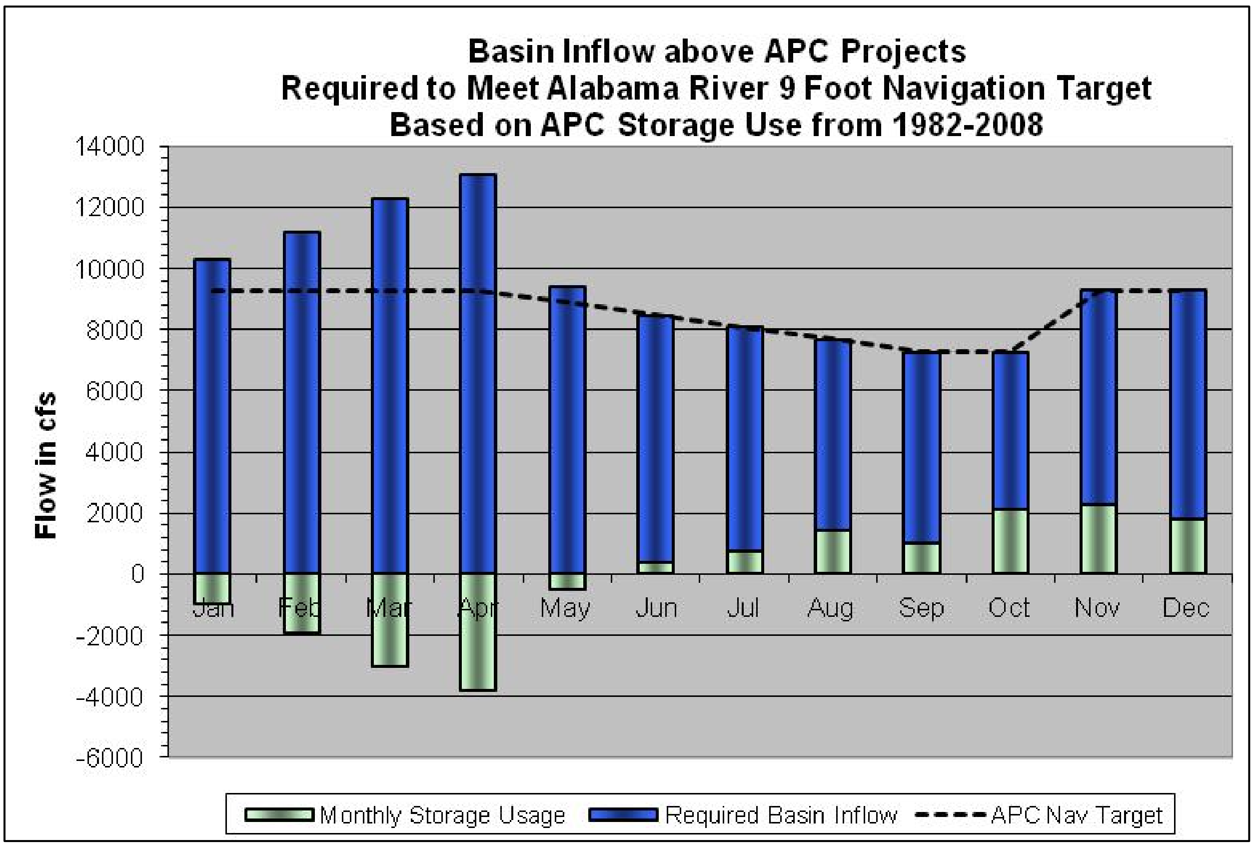

Figure 7-2. Flow requirements from rainfall (or natural sources) and reservoir storage to achieve the JBT Goal for navigation flows for a 9-foot channel

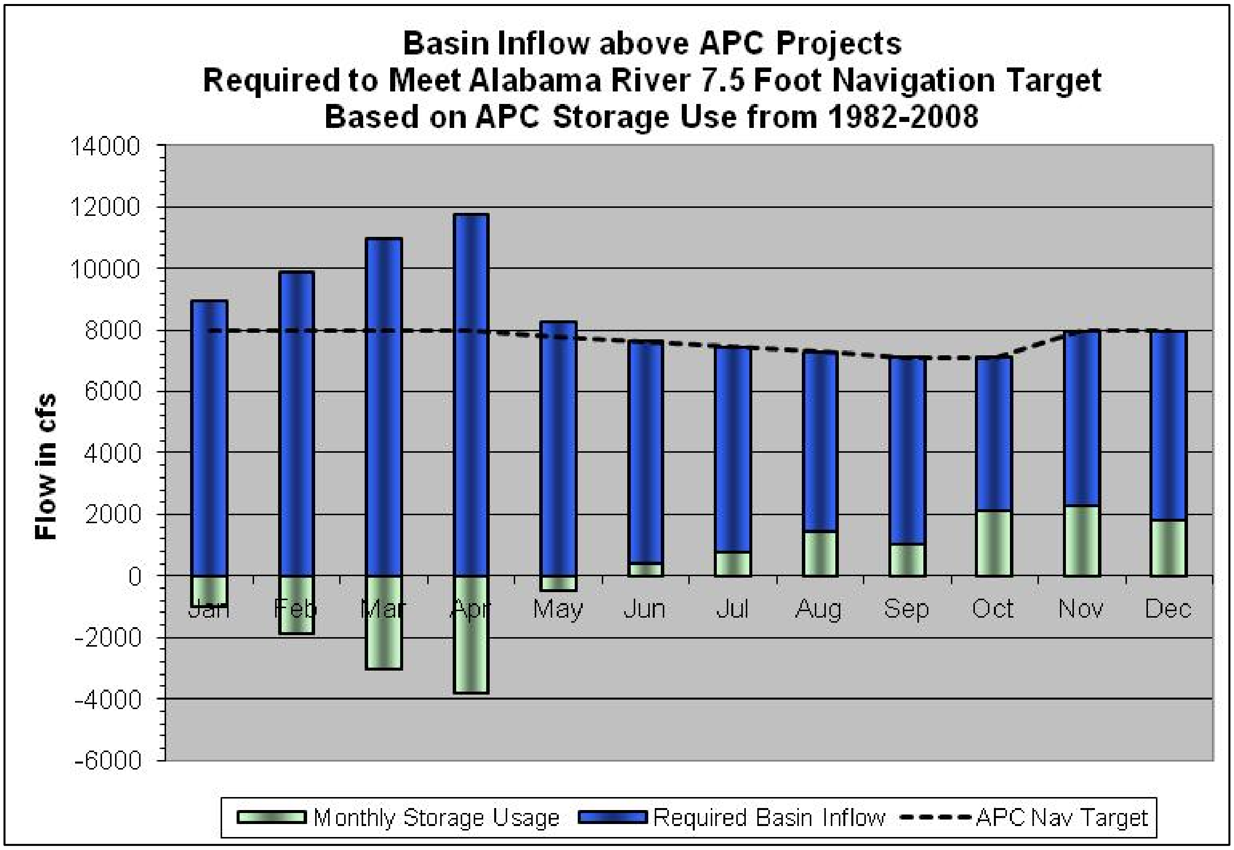

Figure 7-3. Flow requirements from rainfall (or natural sources) and reservoir storage to achieve the JBT Goal for navigation flows for a 7.5-foot channel

During normal flow periods, no special water control procedures are required for navigation at the R. F. Henry Project other than maintaining the proper pool level. The normal maximum allowable drawdown at elevation 123.0 feet NGVD29 provides a clearance of 13.0 feet over the upper lock sill and should provide minimum depths for a 9-foot navigation channel at Montgomery and up to Bouldin Dam. Navigable depth is normally available downstream of the project if Millers Ferry is within its normal operating level. However, shoaling between Selma and R. F. Henry may result in the need to make water releases to increase the depth over any shoals. This will be accomplished by regular or specially scheduled hydropower releases when possible.

During high flow periods, navigation will be discontinued through the R. F. Henry Lock during flood periods when the headwater reaches elevation 131.0 feet NGVD29. At this elevation the discharge will be 156,000 cfs which is expected to occur on an average of once every three years and the freeboard will be 1-foot on the guide and lock walls.

In the event that the Mobile District Water Management Section determines upcoming reductions in water releases may impact the available navigation channel depth, they shall contact the Black Warrior/Tombigbee - Alabama/Coosa Project Office, and the Mobile District Navigation Section, to coordinate the impact. Water Management shall provide the Claiborne tailwater gage forecast to the project office and the Navigation Section. Using this forecast and the latest available project channel surveys, the project office and the Navigation Section will evaluate the potential impact to available navigation depths. Should this evaluation determine that the available channel depth is adversely impacted, the project office and the Navigation Section will work together, providing Water Management with their determination of the controlling depth. Thereafter, the project office and the Navigation Section will coordinate the issuance of a navigation bulletin. The notices will be issued as expeditiously as possible to give barge owners, and other waterway users, sufficient time to make arrangements to light load or remove their vessels before action is taken at upstream projects to reduce flows. The bulletin will be posted to the Mobile District Navigation web site at

http://navigation.sam.usace.army.mil/docs/index.asp?type=nn

Although special releases will not be standard practice, they could occur for a short duration to assist maintenance dredging and commercial navigation for special shipments if basin hydrologic conditions are adequate. The Corps will evaluate such requests on a case by case basis, subject to applicable laws and regulations and the basin conditions.

7-13. Drought Contingency Plan.

An ACT Basin Drought Contingency Plan (DCP) has been developed to implement water control regulation drought management actions. The plan includes operating guidelines for drought conditions and normal conditions. The H. Neely Henry Project operates in concert with other APC projects to meet the provisions of the DCP related to flow requirements from the Coosa and Tallapoosa Basins. APC and the Corps will coordinate water management during drought with other federal agencies, navigation interests, the states, and other interested parties as necessary. The following information provides a summary of the DCP water control actions for the ACT Basin projects. The drought plan is described in detail in Exhibit F, Drought Contingency Plan.

The ACT Basin Drought Plan matrix defines monthly minimum flow requirements except where noted for the Coosa, Tallapoosa, and Alabama Rivers as a function of a Drought Intensity Level (DIL) and time of year. Such flow requirements are daily averages. The ACT Basin drought plan is activated when one or more of the following drought triggers is exceeded:

1. Low basin inflow
2. Low state line flow
3. Low composite conservation storage

Drought management actions would become increasingly more austere when two triggers are exceeded (Drought Level 2) or all three are exceeded (Drought Level 3). The combined occurrences of the drought triggers determine the DIL. Table 7-5 lists the three drought operation intensity levels applicable to APC projects.

Table 7-5. ACT Basin Drought Intensity Levels

Drought Intensity Level (DIL)	Drought Level	No. of Triggers Exceeded
-	Normal Regulation	0
DIL 1	Moderate Drought	1
DIL 2	Severe Drought	2
DIL 3	Exceptional Drought	3

Drought management measures for ACT Basin-wide drought regulation consists of three major components:

- Headwater regulation at Allatoona Lake and Carters Lake in Georgia
- Regulation at APC projects on the Coosa and Tallapoosa Rivers
- Regulation at Corps projects downstream of Montgomery on the Alabama River

The headwater regulation component includes water control actions in accordance with established action zones, minimum releases, and hydropower generation releases in accordance with project water control plans. Regulation of APC projects will be in accordance with Table 7-6 in which the drought response will be triggered by one or more of the three indicators - state line flows, basin inflow, or composite conservation storage. Corps operation of its Alabama River projects downstream of Montgomery will respond to drought operations of the APC projects upstream.

Table 7-6. ACT Drought Management Plan

<table>
<tr><th></th><th>Jan</th><th>Feb</th><th>Mar</th><th>Apr</th><th>May</th><th colspan="2">Jun</th><th>Jul</th><th>Aug</th><th>Sep</th><th>Oct</th><th>Nov</th><th>Dec</th></tr>
<tr><td rowspan="4">Drought Level Response[a]</td><td colspan="13">DIL 0 - Normal Operations</td></tr>
<tr><td colspan="13">DIL 1: Low Basin Inflows or Low Composite or Low State Line Flow</td></tr>
<tr><td colspan="13">DIL 2: DIL 1 criteria + (Low Basin Inflows or Low Composite or Low State Line Flow)</td></tr>
<tr><td colspan="13">DIL 3: Low Basin Inflows + Low Composite + Low State Line Flow</td></tr>
<tr><td rowspan="4">Coosa River Flow[b]</td><td colspan="3">Normal Operation: 2,000 cfs</td><td colspan="2">4,000 (8,000)</td><td colspan="2">4,000 – 2,000</td><td colspan="6">Normal Operation: 2,000 cfs</td></tr>
<tr><td colspan="3">Jordan 2,000 +/-cfs</td><td colspan="3">4,000 +/- cfs</td><td>6/15 Linear Ramp down</td><td colspan="3">Jordan 2,000 +/-cfs</td><td colspan="3">Jordan 2,000 +/-cfs</td></tr>
<tr><td colspan="3">Jordan 1,800 +/-cfs</td><td colspan="3">2,500 +/- cfs</td><td>6/15 Linear Ramp down</td><td colspan="3">Jordan 2,000 +/-cfs</td><td colspan="3">Jordan 1,800 +/-cfs</td></tr>
<tr><td colspan="3">Jordan 1,600 +/-cfs</td><td colspan="4">Jordan 1,800 +/-cfs</td><td colspan="3">Jordan 2,000 +/-cfs</td><td colspan="2">Jordan 1,800 +/-cfs</td><td>Jordan 1,600 +/- cfs</td></tr>
<tr><td rowspan="4">Tallapoosa River Flow[c]</td><td colspan="13">Normal Operations: 1200 cfs</td></tr>
<tr><td colspan="4">Greater of: 1/2 Yates Inflow or 2 x Heflin Gage(Thurlow Lake releases > 350 cfs)</td><td colspan="6">1/2 Yates Inflow</td><td colspan="3">1/2 Yates Inflow</td></tr>
<tr><td colspan="4">Thurlow Lake 350 cfs</td><td colspan="6">1/2 Yates Inflow</td><td colspan="3">Thurlow Lake 350 cfs</td></tr>
<tr><td colspan="7">Maintain 400 cfs at Montgomery WTP (Thurlow Lake release 350 cfs)</td><td colspan="3">Thurlow Lake 350 cfs</td><td colspan="3">Maintain 400 cfs at Montgomery WTP (Thurlow Lake release 350 cfs)</td></tr>
<tr><td rowspan="4">Alabama River Flow[d]</td><td colspan="13">Normal Operation: Navigation or 7Q10 flow</td></tr>
<tr><td colspan="4">4,200 cfs (10% 7Q10 Cut) - Montgomery</td><td colspan="6">7Q10 - Montgomery (4,640 cfs)</td><td colspan="3">Reduce: Full – 4,200 cfs</td></tr>
<tr><td colspan="5">3,700 cfs (20% 7Q10 Cut) - Montgomery</td><td colspan="5">4,200 cfs (10% 7Q10 Cut) - Montgomery</td><td colspan="3">Reduce: 4,200 cfs-> 3,700 cfs Montgomery (1 week ramp)</td></tr>
<tr><td colspan="4">2,000 cfs Montgomery</td><td colspan="3">3,700 cfs Montgomery</td><td colspan="3">4,200 cfs (10% 7Q10 Cut) - Montgomery</td><td colspan="3">Reduce: 4,200 cfs -> 2,000 cfs Montgomery (1 month ramp)</td></tr>
<tr><td rowspan="4">Guide Curve Elevation</td><td colspan="13">Normal Operations: Elevations follow Guide Curves as prescribed in License (Measured in Feet)</td></tr>
<tr><td colspan="13">Corps Variances: As Needed; FERC Variance for Lake Martin</td></tr>
<tr><td colspan="13">Corps Variances: As Needed; FERC Variance for Lake Martin</td></tr>
<tr><td colspan="13">Corps Variances: As Needed; FERC Variance for Lake Martin</td></tr>
</table>

a. Note these are base flows that will be exceeded when possible.
b. Jordan flows are based on a continuous +/- 5% of target flow.
c. Thurlow Lake flows are based on continuous +/- 5% of target flow: flows are reset on noon each Tuesday based on the prior day's daily average at Heflin or Yates.
d. Alabama River flows are 7-Day Average Flow.

VIII - EFFECT OF WATER CONTROL PLAN

8-01. General. In 1954, Public Law 436 suspended the authorization for federal development of the Coosa River for the generation of electric power, in order to permit development by private interests under a license to be issued by the Federal Power Commission (FPC). In December 1955, APC submitted an application to the FPC for a license for development of the Coosa River in accordance with the provisions of Public Law 436. The FPC issued a license to APC on 4 September 1957, for the construction, operation and maintenance of Project 2146, which included the H. Neely Henry site. The H. Neely Henry Project is a peaking hydropower peaking project with operating lake elevations that range from 508 to 505 feet NGVD29.

The impacts of the *ACT Master Water Control Manual* and its Appendices, including this water control plan have been fully evaluated in an Environmental Impact Statement (EIS) that was published on (date). A Record of Decision (ROD) for the action was signed on (date). During the preparation of the EIS, a review of all direct, secondary and cumulative impacts was made. As detailed in the EIS, the decision to prepare the Water Control Manual and the potential impacts was coordinated with Federal and State agencies, environmental organizations, Indian tribes, and other stakeholder groups and individuals having an interest in the basin. The ROD and EIS are public documents and references to their accessible locations are available upon request.

8-02. Flood Risk Management. H. Neely Henry Dam contains approximately two percent of the conservation storage in the ACT Basin. The discharge percent chance exceedance curve at the dam site for the period 1967 – 2009 is shown on Plate 8-1. The curve was developed from "midnight instantaneous" discharge data from the APC. The effects of reservoir evacuation on three floods of record, March - April 1944, November - December 1948, and March - April 1951, are shown on Plates 8-2 through 8-4. In computing the effect of reservoir regulation on these three floods, it was assumed that the initial pool level was at the maximum wintertime power-pool elevation of 505.0 feet NGVD29.

Regulation of the spillway design flood is shown on Plate 8-5. The initial pool for the spillway design flood was assumed to be at the maximum wintertime power-pool elevation of 505.0 feet NGVD29.

The pre-flood evacuation plan for H. Neely Henry Lake will provide some reduction in flood peaks at Gadsden, Alabama, by lowering the water surface profile throughout the reservoir. For floods with peak inflows of 80,000 to 90,000 cfs occurring in the winter with initial pool level at elevation 505 feet NGVD29, the drawdown of the lake will effect a reduction in peak stage at Gadsden, Alabama, of about 1-foot. For floods of the same magnitude occurring in the summer with initial pool level at 508 feet NGVD29, the lake drawdown will reduce the peak stage at Gadsden, Alabama, by 1 l/2 to 2 feet. However, since the initial pool is higher in the summer, the resulting peak at Gadsden, Alabama, would be slightly higher than for the same flood occurring during the winter.

Headwater and tailwater elevation-percent chance exceedance curves are shown on Plate 8-6.

8-03. Recreation. H. Neely Henry Lake is an important recreational resource, providing significant economic and social benefits for the region and the nation. The project contains 11,236 acres of water at the summer power pool elevation of 508.0 feet NGVD29. A wide variety of recreational opportunities are provided at the lake including boating, fishing, camping, picnicking, water skiing, hunting, and sightseeing. The effects of the H. Neely Henry water control operations on recreation opportunities are minimal between the maximum and minimum power pool elevations of 508 to 507 feet NGVD29.

8-04. Water Quality. The water quality conditions that are generally present in H. Neely Henry Lake are typical of water quality conditions and trends that exist in reservoirs throughout the ACT Basin that are relatively shallow with short hydraulic retention times. Water quality conditions in the main body of the lake are typically better than in the arms because of nutrient and sediment-rich, riverine inflows. Sediment and phosphorus concentrations are also highest in the upper arms and decrease toward the main pool as velocity is lowered and sediment is removed from suspension. During summertime, dissolved oxygen levels and water temperatures are typically highest near the top of the water column, with colder, less oxygenated water existing near the bottom. Additionally, chlorophyll *a* concentrations vary both seasonally and spatially and are highest from July to October during periods of low flow. Point and nonpoint sources from urban areas increase sediment and pollutant loads in the rivers immediately downstream. Reservoirs in the ACT Basin, including H. Neely Henry Lake, typically act as a sink, removing pollutant loads and sediment.

Portions of H. Neely Henry Lake are listed on the 2010 draft Integrated 305(b) and 303(d) list because of organic enrichment/dissolved oxygen, nutrients, and pH impairment. A total maximum daily load (TMDL) was finalized for H. Neely Henry Lake in 2008. The lake is classified as eutrophic caused by the high levels of nutrients within the lake. Dissolved oxygen levels in the tailwater can drop below State standards during the late summertime period. H. Neely Henry Lake is the only lake listed in the State of Alabama as being impaired due to pH.

8-05. Fish and Wildlife. The Coosa River consists of 255 river miles between its beginning at the confluence of the Etowah and Oostanaula Rivers to its confluence with the Tugaloo River forming the Alabama River. Of these 255 river miles, 238 miles are impounded through a series of six APC dams. These six impoundments have a total of 81,300 acres of water. The H. Neely Henry Lake comprises 78 of the 238 lake impounded river miles (33%) and 11,236 of the 81,300 acres of water (14%) within the Coosa River Basin. There are 147 species of fish, 53 species of freshwater mussels, and 91 species of aquatic snails within the Coosa River Basin.

Operational flow changes affect habitat for reservoir fisheries and other aquatic resources mainly through changes in water levels, changes in reservoir flushing rates (retention times), and associated changes in water quality parameters, such as primary productivity, nutrient loading, dissolved oxygen concentrations, and vertical stratification. Seasonal water level fluctuations can substantially influence littoral (shallow-water) habitats, decreasing woody debris deposition, restricting access to backwaters and wetlands, and limiting seed banks and stable water levels necessary for native aquatic vegetation. Those limitations, in turn, significantly influence the reproductive success of resident fish populations. High water levels inundating shoreline vegetation during spawning periods frequently have been associated with enhanced reproductive success and strong year class development for largemouth bass, spotted bass, bluegill, crappie, and other littoral species. Conversely, low or declining water levels can adversely affect reproductive success by reducing the area of available littoral spawning and rearing habitats.

In reservoirs like H. Neely Henry with relatively stable water levels and short hydraulic retention, longer post-winter retention is associated with greater crappie production, possibly related to reduced flushing of young-of-year fish in the discharge from the impoundment and more stable feeding conditions. Substantial daily or weekly fluctuations in lake levels associated with hydropower peaking operations can negatively affect lake fisheries by dewatering spawning and nursery habitats for littoral species, exposing nests and eggs deposited in shallow-water habitats, and reducing the availability of shoreline cover and its associated invertebrate food supply.

8-06. Hydroelectric Power. The H. Neely Henry Dam hydropower Project, along with 13 other hydroelectric facilities throughout the State of Alabama, provides six percent of the APC's power generation. The State of Alabama depends on these facilities as a source of dependable and stable electricity. Hydroelectric power is also one of the cheaper forms of electrical energy, and it can be generated and supplied quickly as needed in response to changing demand.

Hydropower is produced as peak energy at H. Neely Henry Dam, i.e., power is generated during the hours that the demand for electrical power is highest, causing significant variations in downstream flows. Daily hydropower releases from the dam vary from zero during off-peak periods to as much as 29,700 cfs, which is turbine capacity. Often, the weekend releases are lower than those during the weekdays. Lake elevations can vary on average about 0.65 feet during a 24-hour period as a result of hydropower releases. Tailwater levels can also vary significantly daily because of peaking hydropower operations at H. Neely Henry Dam, characterized by a rapid rise in downstream water levels immediately after generation is initiated and a rapid fall in stage as generation is ceased. Except during high flow conditions when hydropower may be generated for more extended periods of time, this peaking power generation scenario with daily fluctuating stages downstream is repeated nearly every week day (not generally on weekends).

Hydropower generation by the H. Neely Henry Dam Hydropower Plant, in combination with the other hydropower power projects in the ACT Basin, helps to provide direct benefits to a large segment of the basin's population in the form of dependable, stable, and relatively low-cost power. Hydropower plays an important role in meeting the electrical power demands of the region.

To illustrate the power benefit produced by the H. Neely Henry Project, Table 8-1 shows the amount of power generated by each acre-foot of water released from H. Neely Henry Dam as compared with other projects.

Table 8-1. Energy Produced Per One Acre-Foot of Water Released from Dam at Full Pool

Energy Produced from One Acre-Foot of Water Released from Dam at Full Pool	
Power Plant	**Energy, KWH**
Allatoona Dam	134
Weiss Dam	37
H. Neely Henry Dam	**31**
Logan Martin Dam	49
Lay Dam	71
Mitchell Dam	52
Bouldin/Jordan Dam	101
R.F. Henry Lock & Dam	30
Millers Ferry Lock & Dam	34

8-07. Navigation. APC releases water from H. Neely Henry Project in conjunction with their other storage projects in the ACT Basin to provide flows to support navigation in accordance with the Memorandum of Understanding for navigation support. The navigation plan provides the flexibility to support flow targets when the system experiences normal flow conditions, reduced support as basin hydrology trends to drier conditions, and suspension of navigation support during sustained low flow conditions.

8-08. Drought Contingency Plans. The importance of drought contingency plans has become increasingly obvious as more demands are placed on the water resources of the basin. During low flow conditions, the reservoirs within the basin may not be able to fully support all project purposes. Several drought periods have occurred since construction of the H. Neely Henry Project in 1966. The duration of low flows can be seasonal or they can last for several years. Some of the more extreme droughts occurred in the early and mid 1980's, and most of the time period between late-1998 to mid-2009. There were periods of high flows during these droughts but the lower than normal rainfall trend continued.

The purpose of drought planning is to minimize the effect of drought, to develop methods for identifying drought conditions, and to develop both long- and short-term measures to be used to respond to and mitigate the effects of drought conditions. During droughts, reservoir regulation techniques are planned to preserve and ensure the more critical needs. Minimum instream flows protect the area below H. Neely Henry Dam and conservation efforts strengthen the ability to supply water supply needs.

For the H. Neely Henry Project, the APC and the Corps will coordinate water management activities during the drought with other private power companies and federal agencies, navigation interests, the states, and other interested state and local parties as necessary. Drought operations will be in compliance with the plan for the entire ACT Basin.

8-09. Flood Emergency Action Plans. Normally, all flood control operations are directed by the Water Management Section. If, however, a storm of flood-producing magnitude occurs and all communications are disrupted between the Corps and the APC, flood risk management measures, as previously described in Chapter VII of this appendix, will begin. If communication is broken after some instructions have been received from the Corps, those instructions will be followed for as long as they are applicable.

The H. Neely Henry Dam is well maintained and has not experienced unusual events or problems. Discharges from the dam are released into the Logan Martin pool immediately downstream. The upper reaches of Logan Martin Lake are generally confined to the original river channel with some small backwater areas. The area is largely undeveloped rural and agricultural land. Most permanent buildings are in the lower reach of Logan Martin Lake. Dam failure at H. Neely Henry would pose little impact to roads and highways immediately downstream, with the exception of Highway 77 in the Ohatchee, Alabama area. Much of the area that would be impacted by dam failure is periodically flooded by high water and there is little development in these areas. Below Riverside, Alabama, substantial development has occurred and the impacts of flooding would be great.

An emergency contact information list is shown in Exhibit G.

IX - WATER CONTROL MANAGEMENT

9-01. Responsibilities and Organization. Many agencies in federal and state governments are responsible for developing and monitoring water resources in the ACT Basin. Some of the federal agencies are the Corps, U.S. Environmental Protection Agency, USGS, National Parks Service, U.S. Coast Guard, U.S. Department of Energy, U.S. Department of Agriculture, USFWS, and NOAA. In addition to the federal agencies, each state has agencies involved: GAEPD, The Coosa-North Georgia Regional Water Planning Council, and the Alabama Department of Environmental Management, Alabama Office of Water Resources. APC, as a non-federal hydro developer, also has major responsibilities through FERC licenses.

a. Alabama Power Company (APC). The H. Neely Henry Project was constructed and is operated by the APC. Day-to-day operation of the project is assigned to the APC's Alabama Control Center in Birmingham, Alabama, as part of the Power Delivery System under the direction of Reservoir Operations Supervisor. Long-range water planning and flood risk management operation is assigned to APC's Reservoir Management in Birmingham, Alabama, as part of Southern Company Services Hydro Services, under the direction of the System Operations Supervisor.

b. U.S. Army Corps of Engineers (Corps). Authority for water control regulation of federal projects in the ACT Basin has been delegated to the South Atlantic Division (SAD) Commander. The responsibility for water control regulation activities has been entrusted to the Mobile District, Engineering Division, Water Management Section. Water control actions for federal projects are regulated to meet the authorized project purposes in coordination with federally authorized ACT Basin-wide System purposes and public law. It is the responsibility of the Water Management Section to coordinate with APC to develop Coosa River project water control regulation procedures for flood risk management and navigation. The Water Management Section monitors the Coosa River projects for compliance with the approved water control plans and agreements. The Water Management Section will perform the following specific duties in connection with the operation of the H. Neely Henry Project:

1) Maintain liaison with personnel of Alabama Power Company's Reservoir Management for the daily exchange of hydrologic data.

2) Maintain records of rainfall and river stages for the Coosa River Basin, and records of pool level and outflow at H. Neely Henry Dam and other impoundments in the basin.

3) Monitor operations of the power plant and spillway at H. Neely Henry Dam for compliance with the regulation schedule for flood control operations, Plate 7-2.

4) Transmit to APC Reservoir Management any instructions for special operations which may be required due to unusual flood conditions (except in emergencies where time does not permit, these instructions will first be cleared with the Chief of Hydrology and Hydraulics Branch and the Chief of Engineering Division).

5) Evaluate special water control plan variance requests submitted by APC Reservoir Management and provide approval or disapproval.

c. Other Federal Agencies. Other federal agencies work closely with APC and the Corps to provide their agency support for the various project purposes of H. Neely Henry and to meet the federal requirements for which they might be responsible. The responsibilities and interagency coordination between the Corps and the federal agencies are discussed in Paragraph 9-02.

d. State and County Agencies

The Alabama Office of Water Resources (OWR) administers programs for river basin management, river assessment, water supply assistance, water conservation, flood mapping, the National Flood Insurance Program and water resources development. Further, OWR serves as the state liaison with federal agencies on major water resources related projects, conducts any special studies on instream flow needs, and administers environmental education and outreach programs to increase awareness of Alabama's water resources.

1) The Alabama Department of Environmental Management Drinking Water Branch works closely with the more than 700 water systems in Alabama that provide safe drinking water to four million citizens.

2) The Alabama Chapter of the Soil and Water Conservation Society fosters the science and the art of soil, water, and related natural resource management to achieve sustainability.

e. Stakeholders. Many non-federal stakeholder interest groups are active in the ACT Basin. The groups include lake associations, municipal and industrial (M&I) water users, navigation interests, environmental organizations, and other basin-wide interests groups. Coordinating water management activities with the interest groups, state and federal agencies, and others is accomplished as required on an ad-hoc basis and on regularly scheduled water management teleconferences when needed to share information regarding water control regulation actions and gather stakeholder feedback.

9-02. Interagency Coordination.

a. Local Press and Corps Bulletins. The local press includes any periodic publications in or near the H. Neely Henry watershed and the ACT Basin. Montgomery, Alabama has some of the largest daily papers. These papers often publish articles related to the rivers and streams. Their representatives have direct contact with the Corps and APC through their respective Public Affairs offices. In addition, the local press and the public can access current project information on the Corps and APC web pages.

b. National Weather Service (NWS). NWS is the federal agency in NOAA that is responsible for weather and weather forecasts. The NWS along with its River Forecast Center maintains a network of reporting stations throughout the nation. It continuously provides current weather conditions and forecasts. It prepares river forecasts for many locations including the ACT Basin. Often, it prepares predictions on the basis of *what if* scenarios. Those include rainfall that is possible but has not occurred. In addition, the NWS provides information on hurricane tracts and other severe weather conditions. It monitors drought conditions and provides the information. Information is available through the Internet, the news, and the Mobile District's direct access.

c. U.S. Geological Survey (USGS). The USGS is an unbiased, multidisciplinary science organization that focuses on biology, geography, geology, geospatial information, and water. The agency is responsible for the timely, relevant, and impartial study of the landscape, natural resources, and natural hazards. Through the APC-USGS partnership and the Corps-USGS Cooperative Gaging Program, the USGS maintains a comprehensive network of gages in the ACT Basin. The USGS Water Science Centers in Georgia and Alabama publish real-time reservoir levels, river and tributary stages, and flow data through the USGS National Water Information Service (NWIS) web site.

d. U.S. Fish and Wildlife Service (USFWS). The USFWS is an agency of the Department of the Interior whose mission is working with others to conserve, protect and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people. The USFWS is the responsible agency for the protection of federally listed threatened and endangered species and federally designated critical habitat in accordance with the Endangered Species Act of 1973. The USFWS also coordinates with other federal agencies under the auspices of the Fish and Wildlife Coordination Act. APC and the Corps, Mobile District, with support from the Water Management Section, coordinate water control actions and management with USFWS in accordance with both laws.

9-03. Framework for Water Management Changes. Special interest groups often request modifications of the basin water control plan or project specific water control plan. The H. Neely Henry Project and other ACT Basin projects were constructed to meet specific, authorized purposes, and major changes in the water control plans would require modifying, either the project itself or the purposes for which the projects were built. However, continued increases in the use of water resources demand constant monitoring and evaluating reservoir regulations and reservoir systems to insure their most efficient use. Within the constraints of the FERC regulating license for the H. Neely Henry Project, Congressional authorizations, and engineering regulations, the water control plan and operating techniques are often reviewed to see if improvements are possible without violating authorized project functions. When deemed appropriate, temporary variances to the water control plan approved by FERC and the Corps can be implemented to provide the most efficient regulation while balancing the multiple purposes of the ACT Basin-wide System.

EXHIBIT A

SUPPLEMENTARY PERTINENT DATA

EXHIBIT A
SUPPLEMENTARY PERTINENT DATA

GENERAL INFORMATION	
FERC License Number	2146
License Issued	September 4, 1957
License Expiration Date	July 31, 2007
Licensed Capacity, kw	72,900
Project Location	Near Town of Ohatchee; Counties of Cherokee, Etowah, Calhoun and St. Clair; Coosa River 507 river miles above Mobile
Total Area Encompassed by Existing Project Boundary (land and water), acres	12,941
Acres of Water within Existing Project Boundary	11,236
Acres of Mainland within Existing Project Boundary	1,706
Henry Dam Drainage Basin, square miles	6,600
Length of River from Henry Dam to Weiss Dam, miles	78
Length of River from Henry Dam to Logan Martin Dam, miles	48.5
DAM	
Date of Construction	August 1, 1962
In-service Date	June 2, 1966
Construction Type	Gravity concrete and earth-fill
Elevation Top of Abutments, NGVD29	539
Gross Head at Normal Pool Elevation (508 NGVD29), feet	43
Spillway Elevation (to top of gates), NGVD29	509
Total Length of Water Retaining Structures, feet	4,705
Length of non-overflow sections, feet	Right 133; Left120
Length of embankments feet	Right 3,200; Left 850
Length of Powerhouse (substructure), feet	300
Length of Spillway (total), feet	605

DAM (continued)	
Length of concrete spillway, feet	305
Length of Spillway (gated), feet	240
Gates: Spillway Gates	6 total
Width by Height, feet	40 x 29
Hazard Classification	High
Spillway Capacity at 534.4 NGVD29, cfs	310,700
RESERVOIR - HENRY LAKE	
Length of Impoundment, mile	78
Pool Elevations: Normal, feet NGVD29	508
Gross Storage:	
Normal Pool @ Elev 508 ft, acre-feet	120,851
Minimum Pool @ Elev 503.5 ft, acre-feet	77,570
Usable Storage Capacity (between 508 and 480 NGVD29), acre-feet	Approximately 112,000
Surface Area (at NGVD29), acres	11,236
Miles Shoreline (including tributaries) at 508 NGVD29	339
Number of Boat Docks	1,396
Water Residence Time, days	5.8
Water Temperature Range, °Fahrenheit:	Maximum 82 Aug; Minimum 40 Jan-Feb
Existing Classification	PWS/F/S
POWERHOUSE	
Length (Superstructure), feet	300
Width (Superstructure), feet	170
Height, feet	105
Construction Type (Superstructure)	Concrete
Draft Tube Invert Elevation, feet NGVD29	444.0
Operating Floor Elevation, feet NGVD29	494.9
Normal Tailwater Elevation, feet NGVD29	between 460.0 & 468.0
High Tailwater Elevation (three units generating), feet NGVD29	470
Discharge Capacity, cfs	26,000
Invert Elevation, feet NGVD29	- Approximately 493

POWERHOUSE (continued)	
Outdoor Gantry Crane Capacity, tons	140
TURBINES (3)	
Rated Net Head (Gross Static), feet	43
Manufacturer	Newport News
Type	Propeller
Rated Discharge Capacity: Maximum, cfs	8,900 each
Speed, rpm	81.8
Rated Output at 35 ft head, hp	33,500 each
GENERATORS (3)	
Manufacturer	General Electric
Nameplate Rating, kw	24,300 each
Rated Output, kva	27,000
Power Factor	0.9
Voltage, volts	11,500
Number of Phases	3
Frequency	60 cycle
Estimated average annual generation, kwh	210,935,000
TRANSFORMERS	
Transmission Voltage	
Low side, volts	11,500
High side, volts	115,000
Rating, kilovolt amp	90,000
FLOOD FLOWS – HENRY DAM	
Probable Maximum Flood	
Inflow, cfs	356,200
Outflow. Cfs	317,100
Maximum Elevation, feet NGVD29	532.51
Top of Embankment and Spillway, feet NGVD29	539.0

EXHIBIT B

UNIT CONVERSIONS

AREA CONVERSION

UNIT	m^2	km^2	ha	in^2	ft^2	yd^2	mi^2	ac
1 m^2	1	10^{-6}	10^{-4}	1550	10.76	1.196	3.86×10^{-7}	2.47×10^{-4}
1 km^2	10^{6}	1	100	1.55×10^{9}	1.076×10^{7}	1.196×10^{6}	0.3861	247.1
1 ha	10^{4}	0.01	1	1.55×10^{7}	1.076×10^{7}	1.196×10^{4}	3.86×10^{-3}	2,471
1 in^2	6.45×10^{-4}	6.45×10^{10}	6.45×10^{-8}	1	6.94×10^{-3}	7.7×10^{-4}	2.49×10^{-10}	1.57×10^{7}
1 ft^2	.0929	9.29×10^{-8}	9.29×10^{-6}	144	1	0.111	3.59×10^{-8}	2.3×10^{-5}
1 yd^2	0.8361	8.36×10^{-7}	8.36×10^{-5}	1296	9	1	3.23×10^{-7}	2.07×10^{-4}
1 mi^2	2.59×10^{6}	2.59	259	4.01×10^{9}	2.79×10^{7}	3.098×10^{6}	1	640
1 ac	4047	0.004047	0.4047	6.27×10^{6}	43560	4840	1.56×10^{-3}	1

LENGTH CONVERSION

UNIT	cm	m	km	in.	ft	yd	Mi
Cm	1	0.01	0.00001	0.3937	0.0328	0.0109	6.21×10^{-6}
M	100	1	0.001	39.37	3.281	1.094	6.21×10^{-4}
Km	10^{5}	1000	1	39,370	3281	1093.6	0.621
in.	2.54	0.0254	2.54×10^{-5}	1	0.0833	0.0278	1.58×10^{-5}
Ft	30.48	0.3048	3.05×10^{-4}	12	1	0.33	1.89×10^{-4}
Yd	91.44	0.9144	9.14×10^{-4}	36	3	1	5.68×10^{-4}
Mi	1.01×10^{5}	1.61×10^{3}	1.6093	63,360	5280	1760	1

FLOW CONVERSION

UNIT	m^3/s	m^3/day	l/s	ft^3/s	ft^3/day	ac-ft/day	gal/min	gal/day	Mgd
m^3/s	1	86,400	1000	35.31	3.05×10^{6}	70.05	1.58×10^{4}	2.28×10^{7}	22.824
m^3/day	1.16×10^{-5}	1	0.0116	4.09×10^{-4}	35.31	8.1×10^{-4}	0.1835	264.17	2.64×10^{-4}
l/s	0.001	86.4	1	0.0353	3051.2	0.070	15.85	2.28×10^{4}	2.28×10^{-2}
ft^3/s	0.0283	2446.6	28.32	1	8.64×10^{4}	1.984	448.8	6.46×10^{5}	0.646
ft^3/day	3.28×10^{-7}	1233.5	3.28×10^{-4}	1.16×10^{-5}	1	2.3×10^{-5}	5.19×10^{-3}	7.48	7.48×10^{-6}
ac-ft/day	0.0143	5.451	14.276	0.5042	43,560	1	226.28	3.26×10^{5}	0.3258
gal/min	6.3×10^{-5}	0.00379	0.0631	2.23×10^{-3}	192.5	4.42×10^{-3}	1	1440	1.44×10^{-3}
gal/day	4.3×10^{-8}	3785	4.38×10^{-4}	1.55×10^{-6}	11,337	3.07×10^{-6}	6.94×10^{-4}	1	10^{-6}
Mgd	0.0438		43.82	1.55	1.34×10^{5}	3.07	694	10^{6}	1

VOLUME CONVERSION

UNIT	liters	m^3	in^3	ft^3	gal	ac-ft	million gal
Liters	1	0.001	61.02	0.0353	0.264	8.1×10^{-7}	2.64×10^{-7}
m^3	1000	1	61,023	35.31	264.17	8.1×10^{-4}	2.64×10^{-4}
in^3	1.64×10^{-2}	1.64×10^{-5}	1	5.79×10^{-4}	4.33×10^{-3}	1.218×10^{-8}	4.33×10^{-9}
ft^3	28.317	0.02832	1728	1	7.48	2.296×10^{-5}	7.48×10^{6}
Gal	3.785	3.78×10^{-3}	231	0.134	1	3.07×10^{-6}	10^{6}
ac-ft	1.23×10^{6}	1233.5	75.3×10^{6}	43,560	3.26×10^{5}	1	0.3260
million gallon	3.785×10^{6}	3785	2.31×10^{8}	1.34×10^{5}	10^{6}	3.0684	1

COMMON CONVERSIONS

1 million gallons per day (MGD) = 1.55 cfs
1 day-second-ft (DSF) = 1.984 acre-ft
1 cubic foot per second of water falling 8.81 feet = 1 horsepower
1 cubic foot per second of water falling 11.0 feet at 80% efficiency = 1 horsepower
1 inch of depth over one square mile = 2,323,200 cubic feet
1 inch of depth over one square mile = 0.0737 cubic feet per second for one year.

EXHIBIT C

MEMORANDUM OF UNDERSTANDING WITH ATTACHMENT BETWEEN CORPS OF ENGINEERS AND ALABAMA POWER COMPANY

Insert SIGNED copy MOU w attachment

EXHIBIT D

PUBLIC LAW 436
83RD CONGRESS, 2ND SESSION

Public Law 436 - 83d Congress
Chapter 408 - 2d Session
H. R. 8923

AN ACT

To provide for the development of the Coosa River, Alabama and Georgia

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That in connection with the comprehensive program for the development of the water resources of the Alabama-Coosa River and tributaries, authorized by the Rivers and Harbors Act, approved March 2, 1945 (59 Stat. 10), it is hereby declared to be the policy of the Congress, where private interests are considering applying for authority to undertake the development of resources covered by such authorization, that the power from such development shall be considered primarily for the benefit of the people of the section as a whole and shall be sold to assure the widest possible use, particularly by domestic and rural consumers, and at the lowest possible cost.

Sec. 2. The authorization of the comprehensive plan for the Alabama-Coosa River and tributaries, as provided in the Rivers and Harbors Act, approved March 2, 1945, insofar as it provides for the development of the Coosa River for the development of electric power, is hereby suspended to permit the development of the Coosa River, Alabama and Georgia, by a series of dams in accordance with the conditions of a license, if issued, pursuant to the Federal Power Act and in accordance with the provisions and requirements of this Act.

Sec. 3. The series of dams, together with the existing hydroelectric power dams on the Coosa River, shall, in the judgment of the Federal Power Commission, be best adapted to the comprehensive plan for the development of the Coosa River for the use or benefit of interstate commerce, for the improvement and utilization of waterpower development, and for other beneficial public uses, including recreational purposes.

Sec 4. The dams constructed by the licensee shall provide a substantially continuous series of pools and shall include basic provisions for the future economical construction of navigation facilities.

Sec. 5. The license relating to such development shall require the maximum flood control storage which is economically feasible with respect to past floods. of record but in no event shall flood control storage be less than that required to compensate for the effects of valley storage displaced by the proposed reservoirs of the licensee, or less in quantity and effectiveness than the amount of flood control storage which could feasibly be provided by the currently authorized federal multiple purpose project at Howell Mills Shoals constructed to elevation 490, with surcharge storage to elevation 495.

Sec. 6. Before a license is issued, the applicant for the license shall submit a report on the details of its plan of development to the Federal Power Commission.

Sec 7. The Chief of Engineers shall review any plan of development submitted to the Federal Power Commission for the purpose of acquiring a license and shall make recommendations with respect to such plan to such Commission with particular regard to flood control and navigation, and its adaptability to the comprehensive plan for the entire basin development.

Sec. 8. The license may provide for the construction of the series of dams in sequence on the condition that the dam or dams providing the maximum flood control benefits shall be constructed first unless a different order of construction is approved by the Secretary of the Army.

Sec. 9. The operation and maintenance of the dams shall be subject to reasonable rules and regulations of the Secretary of the Army in the interest of flood control and navigation.

Sec. 10. An allocation of cost of flood control provided in addition to that required to compensate for displaced valley storage and of cost of navigation shall be approved by the Federal Power Commission, taking into consideration recommendations of the Chief of Engineers based upon flood control and navigation benefits estimated by the Chief of Engineers.

Sec 11. If the Federal Power Commission shall issue a license under this Act, the Commission shall simultaneously make a full report to the Public Works Committees of the Senate and House of Representatives of the Congress, setting out the major provisions and conditions inserted in such license, and a copy of the Commission's report shall forthwith be submitted to the Chief of Engineers who shall review the same and promptly submit to said committees his views as to whether the major provisions and conditions in such license are adaptable to the comprehensive plan. In the event the Congress by legislative enactment adopts a policy of compensating such licensees for navigation and flood control costs, any such allocated navigation and flood control costs are hereby authorized to be compensated through annual contributions by the United States.

Sec 12. Unless it is beyond the reasonable control of a licensee acting in good faith and exercising due diligence: (1) an application for a preliminary permit under the Federal Power Act relating to the development of the Coosa River shall be prosecuted with reasonable diligence before the Federal Power Commission; (2) an application for a license to construct such dams shall be filed with such Commission within two years after the date of the enactment of this Act; (3) construction of one such dam shall be commenced within a period of one year subsequent to the date of the issuance of a license by such Commission, (4) at least one such dam and its power plant shall be completed and in operation in accordance with the terms of the license within five years from the date of the issuance of such license by such Commission; and (5) the remaining dams included in the license issued by such Commission shall be completed within ten years from the date of the commencement of construction of the first dam, subject to the provisions of Section 13 of the Federal Power Act: "Provided," That if any such conditions are not fulfilled, or if the Commission denies the application for a license, the authorization relating to the Alabama-Coosa River provided for in the Act, approved March 2, 1945, shall have the same status as it would have had if this Act had not been enacted, so far as the uncompleted project works are concerned; in which event the outstanding license may be terminated or revoked and the uncompleted and completed project may be sold or acquired by the United States as provided in Sections 13 and 26 of the Federal Power Act.

Sec. 13. Nothing in this Act shall be deemed to affect in any way the authorization of the development of the Alabama-Coosa River and tributaries other than that portion of the development involving projects on the Coosa River or the authority of the Federal Power Commission to issue a license for the complete development of the Coosa River by States or municipalities under section 7 (a) of the Federal Power Act or to find under section 7 (b) of said Act that the development should be under taken by the United States itself.

Approved June 28, 1954

EXHIBIT E

EXTRACTS FROM PROJECT LICENSE

EXTRACTS FROM PROJECT LICENSE

Federal Power Commission License for major project No. 2146, Issued 4 September 1957, as amended, authorizes the construction, operation and maintenance by the Alabama Power Company of certain new dams and reservoirs and the modification of certain existing developments on the Coosa River. One of the new projects authorized by this license is the Lock 3 development (later named H. Neely Henry) near Gadsden, Alabama. Extracts from the project license especially pertinent to flood control, navigation, water use and reservoir regulation concerning the H. Neely Henry development are quoted below for guidance and reference purposes.

"Article 6. For the purpose of determining the stage and flow of the stream or streams. from which water is to be diverted for the operation of the project works, the amount of water held in and withdrawn from storage, and the effective head on the turbines, the Licensee shall install and thereafter maintain such gages and stream gaging stations as the Commission may deem necessary and best adapted to the requirements, and shall provide for the required readings of such gages and for the adequate rating of such stations. The Licensee shall also install and maintain standard meters adequate for the determination of the amount of electric energy generated by said project works. The number, character, and location of gages, meters, or other measuring devices, and the method of operation thereof, shall at all times be satisfactory to the Commission and may be altered from time to time if necessary to secure adequate determinations, but such alteration shall not be made except with the approval of the Commission or upon the specific direction of the Commission. The installation of gages, the ratings of said stream or streams, and the determination of the flow thereof, shall be under the supervision of, or in cooperation with, the District Engineer of the United States Geological Survey having charge of stream gaging operations in the region of said project, and the Licensee shall advance to the United States Geological Survey the amount of funds estimated to be necessary for such supervision or cooperation for such periods as may be mutually agreed upon. The Licensee shall keep accurate and sufficient record of the foregoing determinations to the satisfaction of the Commission, and shall make return of such records annually at such time and in such form as the Commission may prescribe."

"Article 7. So far as is consistent with proper operation of the said project, the Licensee shall allow the public free access, to a reasonable extent, to project waters and adjacent project lands owned by the Licensee for the purpose of full public utilization of such lands and waters for navigation and recreational purposes, including fishing and hunting, and shall allow to a reasonable extent for such purposes the construction of access roads, wharves, landings, and other facilities on its lands the Occupancy of which may, in appropriate circumstances, be subject to payment of rent to the Licensee in a reasonable amount: Provided, that the Licensee may reserve from public access, such portions of the project waters, adjacent lands, and project facilities as may be necessary for the protection of life, health, and property and provided further, that the Licensee's consent to the construction of access roads, wharves, landings, and other facilities shall not, without its express agreement, place upon the Licensee any obligation to construct or maintain such facilities."

"Article 9. Insofar as any material is dredged or excavated in the prosecution of any work authorized under the license, or in the maintenance of the project, such material shall be removed and deposited so it will not interfere with navigation, and will be to the satisfaction of the District Engineer, Department of the Army, in charge of the locality."

"Article I5. Whenever the United States shall desire to construct, complete, or improve navigation facilities in connection with the project, the Licensee shall convey to the United States, free of cost, such of its lands and its rights-of-way and such right of passage through its dams or other structures, and permit such control of pools as may be required to complete and maintain such navigation facilities."

"Article 16. The Licensee shall furnish free of cost to the United States power for the operation and maintenance of navigation facilities at the voltage and frequency required by such facilities and at a point adjacent thereto, whether said facilities are constructed by the Licensee or by the United States."

"Article 17. The operation of any navigation facilities, which may be constructed as a part of or in connection with any dam or diversion structure constituting a part of the project works, shall at all times be controlled by such reasonable rules and regulations in the interest of navigation, including the control of the level of the pool caused by such *dam* or diversion structure, as may be made from time to time by the Secretary of the Army. Such rules and regulations may include the construction, maintenance, and operation by the Licensee, at its own expense, of such lights and signals as may be directed by the Secretary of the Army."

"Article 18. The United States specifically retains and safeguards the right to use water in such amount, to be determined by the Secretary of the Army, as may be necessary for the purposes of navigation on the navigable waterway affected; and the operations of the Licensee, so far as they affect the use. Storage and discharge from storage of waters affected by the license, shall at all times be controlled by such reasonable rules and regulations as the Secretary of the Army may prescribe in the interest of navigation, and as they may prescribe for the protection of life, health, and property, and in the interest of the fullest practicable conservation and utilization of such waters for power purposes and for other beneficial public uses, including recreational purposes, and the Licensee shall release water from the project reservoir at such rate in cubic feet per second, or such volume in acre- feet per specified period of time, as the Secretary of the Army may prescribe in the interest of navigation, or as the prescribe for the other purposes herein before mentioned."

"Article 38. The Licensee shall acquire by flowage easements, or by fee title, the right to flood the lands above and below each dam deemed necessary to permit realization of the prescribed flood control regulation plans and shall hold the Government free and clear against any damage claims due to the operation by the Licensee, during the term of the license or of any extension or renewal thereof, of the project for flood control under prescribed by the Secretary of the Army."

"Article 40. The operation of the dams constituting the project in the interest of flood control, including the control of the level of the pool caused by each of the dams, and the discharge of water through the spillways or any outlet structures of such dams, shall be in accordance with such reasonable rules and regulating as may be prescribed by the Secretary of the Army."

"Article 50. The maximum normal water surface elevations for the Lock 3 development shall be at 505 feet from November 5 through April 15, and at 508 feet from May 1 through October 31 of each year, and the temporary lowering of the water surface elevation below these maximum normal water surface elevations, in the interests of flood control and navigation, shall be in accordance with such reasonable rules and regulations as may be prescribed by the Secretary of the Army."

"Article 51. The Licensee shall, within six months after the issuance of this order, submit to the Commission for approval, a proposed recreational use plan for the project. The plan shall be prepared after consultation with appropriated Federal, State and local agencies and shall include recreational improvements which may be provided by others in addition to the improvements the Licensee plans to provide."

EXHIBIT F

ALABAMA-COOSA-TALLAPOOSA (ACT) RIVER BASIN

DROUGHT CONTINGENCY PLAN

DROUGHT CONTINGENCY PLAN

FOR

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

ALLATOONA DAM AND LAKE
CARTERS DAM AND LAKE
ALABAMA POWER COMPANY COOSA RIVER PROJECTS
ALABAMA POWER COMPANY TALLAPOOSA RIVER PROJECTS
ALABAMA RIVER PROJECTS

U.S. Army Corps of Engineers
South Atlantic Division
Mobile District

June 2011

DRAFT
DROUGHT CONTINGENCY PLAN
FOR
ALABAMA-COOSA-TALLAPOOSA RIVER BASIN
ALLATOONA DAM AND LAKE
CARTERS DAM AND LAKE
ALABAMA POWER COMPANY COOSA RIVER PROJECTS
ALABAMA POWER COMPANY TALLAPOOSA RIVER PROJECTS
ALABAMA RIVER PROJECTS

I – INTRODUCTION

1-01. Purpose of Document. The purpose of this Drought Contingency Plan (DCP) is to provide a basic reference for water management decisions and responses to water shortage in the Alabama-Coosa-Tallapoosa (ACT) River Basin induced by climatological droughts. As a water management document it is limited to those drought concerns relating to water control management actions for federal U.S. Army Corps of Engineers (Corps) and Alabama Power Company (APC) dams. Because of the long-term nature of a drought and the specific problems that may result, this document details only a limited number of specific actions that can be carried out related to water control. The primary value of this DCP is in documenting the overall ACT Basin Drought Management Plan for the system of Corps and APC projects; in documenting the data needed to support water management decisions related to drought regulation; and in defining the coordination needed to manage the ACT project's water resources to ensure that they are used in a manner consistent with the needs which develop during a drought. This DCP addresses the water control regulation of the five Corps impoundments and the APC Coosa and Tallapoosa projects (Table 1) in regard to water control regulation during droughts. Details of the drought management plan as it relates to each project and its water control regulation during droughts are provided in the water control plan within the respective project appendix to the ACT Basin Master Water Control Manual.

II – AUTHORITIES

2-01. Authorities. The following list provides the policies and guidance that are pertinent to the development of drought contingency plans and actions directed therein.

A. ER 1110-2-1941, "Drought Contingency Plans", dated 15 Sep 1981. This regulation provides policy and guidance for the preparation of drought contingency plans as part of the Corps of Engineers' overall water management activities.

B. ER 1110-2-8156, "Preparation of Water Control Manuals", dated 31 Aug 1995. This document provides a guide for preparing water control manuals for individual water resource projects and for overall river basins to include drought contingency plans.

C. ER 1110-2-240, "Water Control Management", dated 8 Oct 1982. This regulation prescribes the policies and procedures to be followed in water management activities including special regulations to be conducted during droughts. It also sets the responsibility and approval authority in development of water control plans.

D. EM 1110-2-3600, "Management of Water Control Systems", dated 30 Nov 1987. This guidance memorandum requires that the drought management plan be incorporated into the project water control manuals and master water control manuals. It also provides guidance in formulating strategies for project regulation during droughts.

Table 1. Reservoir impoundments within the ACT River Basin

River/Project Name	Owner/State/ Year Initially Completed	Total storage at Top of Conservation Pool (summer) (ac-ft)	Conservation Storage (ac-ft)	Percentage of ACT Basin Conservation Storage (%)
Coosawattee River				
Carters Dam and Lake	Corps/GA/1974	383,565	141,400	6
Carters Reregulation Dam	Corps/GA/1974	19,300	17,210	1
Etowah River				
Allatoona Dam and Lake	Corps/GA/1949	670,047	284,589	12
Coosa River				
Weiss Dam and Lake	APC/AL/1961	306,651	237,448	10
H. Neely Henry Dam and Lake	APC/AL/1966	120,851	43,205	2
Logan Martin Dam and Lake	APC/AL/1964	273,500	108,262	4
Lay Dam and Lake	APC/AL/1914	262,306	77,478	3
Mitchell Dam and Lake	APC/AL/1923	170,422	28,048	1
Jordan Dam and Lake	APC/AL/1928	235,780	15,969	1
Walter Bouldin Dam	APC/AL/1967	235,780	NA	--
Tallapoosa River				
Harris Dam and Lake	APC/AL/1982	425,503	191,129	8
Martin Dam and Lake	APC/AL/1926	1,623,000	1,183,356	49
Yates Dam and Lake	APC/AL/1928	53,770	5,976	0.2
Thurlow Dam and Lake	APC/AL/1930	18,461	NA	--
Alabama River				
Robert F. Henry Lock and Dam/R.E. “Bob” Woodruff Lake	Corps/AL/1972	234,200	47,179	2
Millers Ferry Lock and Dam/William “Bill” Dannelly Lake	Corps/AL/1969	331,800	64,900	3
Claiborne Lock and Dam and Lake	Corps/AL/1969	96,360	NA	--

III – DROUGHT IDENTIFICATION

3-01. <u>Definition</u>. Drought can be defined in different ways - meteorological, hydrological, agricultural, and socioeconomic. In this DCP, the definition of drought used in the *National Study of Water Management During Drought* is used:

> "Droughts are periods of time when natural or managed water systems do not provide enough water to meet established human and environmental uses because of natural shortfalls in precipitation or streamflow."

That definition defines drought in terms of its impact on water control regulation, reservoir levels, and associated conservation storage. Water management actions during droughts are intended to balance the water use and water availability to meet water use needs. Because of hydrologic variability, there cannot be 100 percent reliability that all water demands are met. Droughts occasionally will be declared and mitigation or emergency actions initiated to lessen the stresses placed on the water resources within a river basin. Those responses are tactical measures to conserve the available water resources (USACE 2009).

3-02. <u>Drought Identification</u>. There is no known method of predicting how severe or when a drought will occur. There are, however, indicators that are useful in determining when conditions are favorable: below normal rainfall; lower than average inflows; and low reservoir levels, especially immediately after the spring season when rainfall and runoff conditions are normally the highest. When conditions indicate that a drought is imminent, the Corps Water Management Section (WMS) and APC will increase the monitoring of the conditions and evaluate the impacts on reservoir projects if drought conditions continue or become worse for 30-, 60-, or 90-day periods. Additionally, WMS and APC will determine if a change in operating criteria would aid in the total regulation of the river system and if so, what changes would provide the maximum benefits from any available water.

Various products are used to detect and monitor the extent and severity of basin drought conditions. One key indicator is the U.S. Drought Monitor available through the U.S. Drought Portal, www.drought.gov. The National Weather Service (NWS) Climate Prediction Center (CPC) also develops short-term (6- to 10-day and 8- to 14-day) and long-term (1-month and 3-month) precipitation and temperature outlooks and a U.S. Seasonal Drought Outlook, which are useful products for monitoring dry conditions. The Palmer Drought Severity Index is also used as a drought reference. The Palmer index assesses total moisture by using temperature and precipitation to compute water supply and demand and soil moisture. It is considered most relevant for non-irrigated cropland and primarily reflects long-term drought. However, the index requires detailed data and cannot reflect an operation of a reservoir system. The state climatologists also produce a Lawn and Garden Index, which gives a basin-wide ability to determine the extent and severity of drought conditions. The runoff forecasts developed for both short- and long-range periods reflect drought conditions when appropriate. There is also a heavy reliance on the latest El Niño Southern Oscillation (ENSO) forecast modeling to represent the potential effects of La Niña on drought conditions and spring inflows. Long-range models are used with greater frequency during drought conditions to forecast potential effects on reservoir elevations, ability to meet minimum flows, and water supply availability. A long-term, numerical model, Extended Streamflow Prediction, developed by the NWS, provides probabilistic forecasts of streamflow and reservoir stages on the basis of climatic, streamflow, and soil moisture. Extended Streamflow Prediction results are used in projecting possible future drought conditions. Other parameters and models can indicate a lack of rainfall and runoff and the degree of severity and continuance of a drought. Models using data of previous droughts or a percent of current to mean monthly flows with several operational schemes have proven helpful in forecasting reservoir levels for water management planning purposes. Other parameters considered during drought management are the ability of the various lakes to meet the demands placed on storage, the probability that lake elevations will return to normal seasonal levels, basin streamflows, basin groundwater table levels, and the total available storage to meet hydropower marketing system demands.

3-03. **Historical Droughts**. Drought events have occurred in the ACT Basin with varying degrees of severity and duration. Five of the most significant historical basin wide droughts occurred in 1940-1941, 1954-1958, 1984-1989, 1999-2003, and 2006-2009. The 1984 to 1989 drought caused water shortages across the basin in 1986. This resulted in the need for the Corps to make adjustments in the water management practices. Water shortages occurred again from 1999 through 2002 and during 2007 through 2008. The 2006 to 2009 drought was the most devastating recorded in Alabama and western Georgia. Precipitation declines began in December 2005. These shortfalls continued through winter 2006-07 and spring 2007, exhibiting the driest winter and spring in the recorded period of record. The Corps and APC had water levels that were among the lowest recorded since the impoundments were constructed. North Georgia received less than 75 percent of normal precipitation (30-year average). The drought reached peak intensity in 2007, resulting in a D-4 Exceptional Drought Intensity (the worst measured) throughout the summer, 2007.

3-04. **Severity**. Water shortage problems experienced during droughts are not uniform throughout the ACT River Basin. Even during normal, or average, hydrologic conditions, various portions of the basin experience water supply problems. The severity of the problems are primarily attributed to the pattern of human habitation within the basin; the source of water utilized (surface water vs. ground water); and the characteristics of the water resources available for use. During droughts, these problems can be intensified. A severe drought in the basin develops when a deficiency of rainfall occurs over a long time period and has a typical duration of 18 to 24 months. The number of months of below normal rainfall is more significant in determining the magnitude of a drought in the basin than the severity of the deficiency in specific months. However, the severity of the rainfall deficiency during the normal spring wet season has a significant impact on the ability to refill reservoirs after the fall/winter drawdown period. Another confounding factor which influences droughts in the basin is the variability of rainfall over the basin, both temporarily and spatially.

IV – BASIN AND PROJECT DESCRIPTION

4-01. **Basin Description**. The headwater streams of the Alabama-Coosa-Tallapoosa (ACT) River Basin rise in the Blue Ridge Mountains of Georgia and Tennessee and flow southwest, combining at Rome, Georgia, to form the Coosa River. The confluence of the Coosa and Tallapoosa Rivers in central Alabama forms the Alabama River near Wetumpka, Alabama. The Alabama River flows through Montgomery and Selma and joins with the Tombigbee River at the mouth of the ACT Basin to form the Mobile River about 45 miles above Mobile, Alabama. The Mobile River flows into Mobile Bay at an estuary of the Gulf of Mexico. The total drainage area of the ACT Basin is approximately 22,800 square miles: 17,300 square miles in Alabama; 5,400 square miles in Georgia; and 100 square miles in Tennessee. A detailed description of the ACT River Basin is provided in the ACT Master Water Control Manual, Chapter II – Basin Description and Characteristics.

4-02. **Project Description**. The Corps operates five projects in the ACT Basin: Allatoona Dam and Lake on the Etowah River; Carters Dam and Lake and Reregulation Dam on the Coosawattee River; and Robert F. Henry Lock and Dam, Millers Ferry Lock and Dam, and

Claiborne Lock and Dam on the Alabama River. Claiborne is a lock and dam without any appreciable water storage behind it. Robert F. Henry and Millers Ferry are operated as run-of-river projects and only very limited pondage is available to support hydropower peaking and other project purposes. APC owns and operates eleven hydropower dams in the ACT Basin: seven dams on the Coosa River and four dams on the Tallapoosa River. Figure 1 depicts the percentage of conservation storage of each project in the ACT Basin. Figure 2 shows the project locations within the basin. Figure 3 provides a profile of the basin and each project.

A. General. Of the 16 reservoirs (considering Jordan Dam and Lake and Bouldin Dam as one reservoir and Carters Lake and Carters Reregulation Dam as one reservoir), Lake Martin on the Tallapoosa River has the greatest amount of storage, containing over 48 percent of the conservation storage in the ACT Basin. Allatoona Lake, R.L. Harris Lake, Weiss Lake, and Carters Lake are the next four largest reservoirs in terms of storage. APC controls approximately 77 percent of the available conservation storage; Corps projects (Robert F. Henry Lock and Dam, Millers Ferry Lock and Dam, Allatoona Lake, and Carters Lake) control 23 percent. The two most upstream Corps reservoirs, Allatoona Lake and Carters Lake, account for 18 percent of the total basin conservation storage.

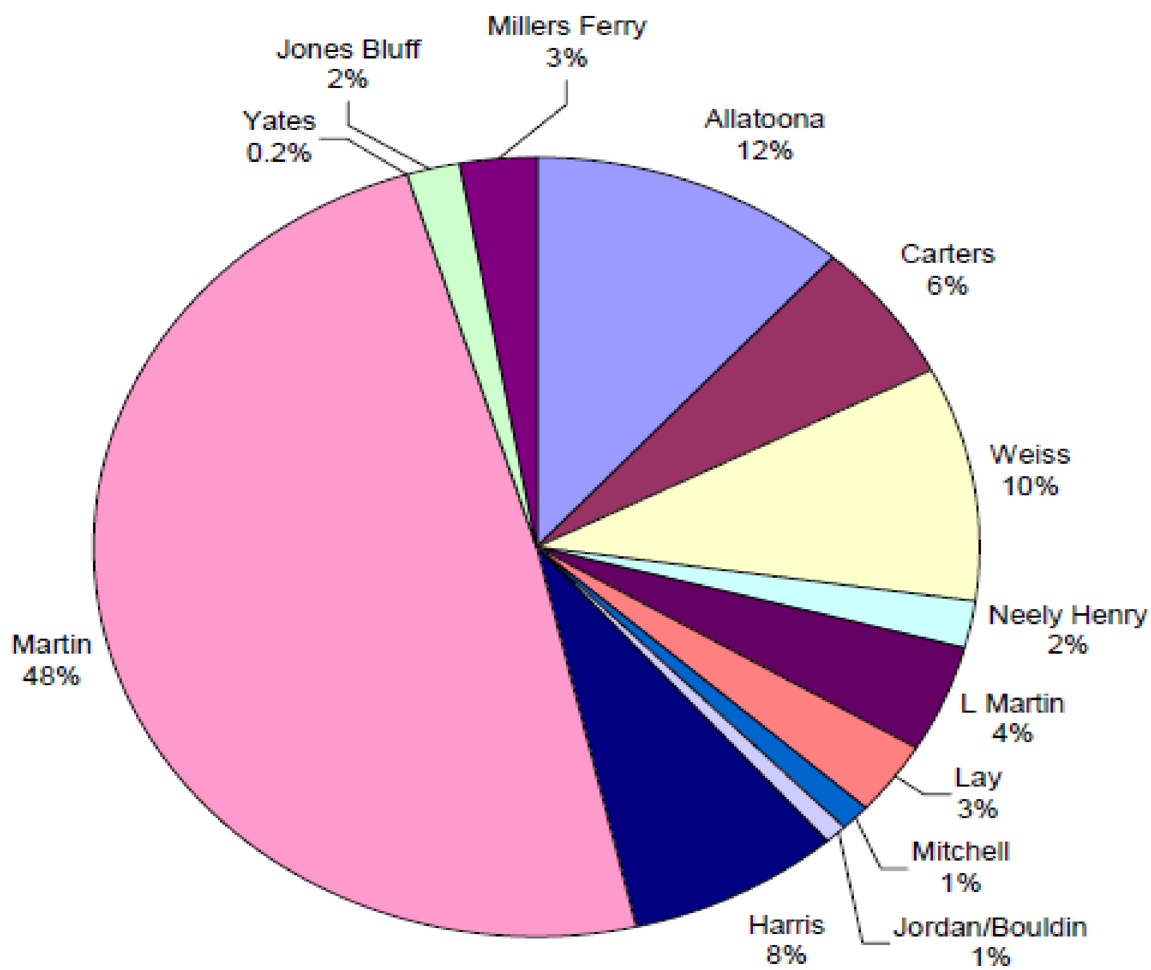

Figure 1. Percentage of conservation storage of each project in the ACT Basin

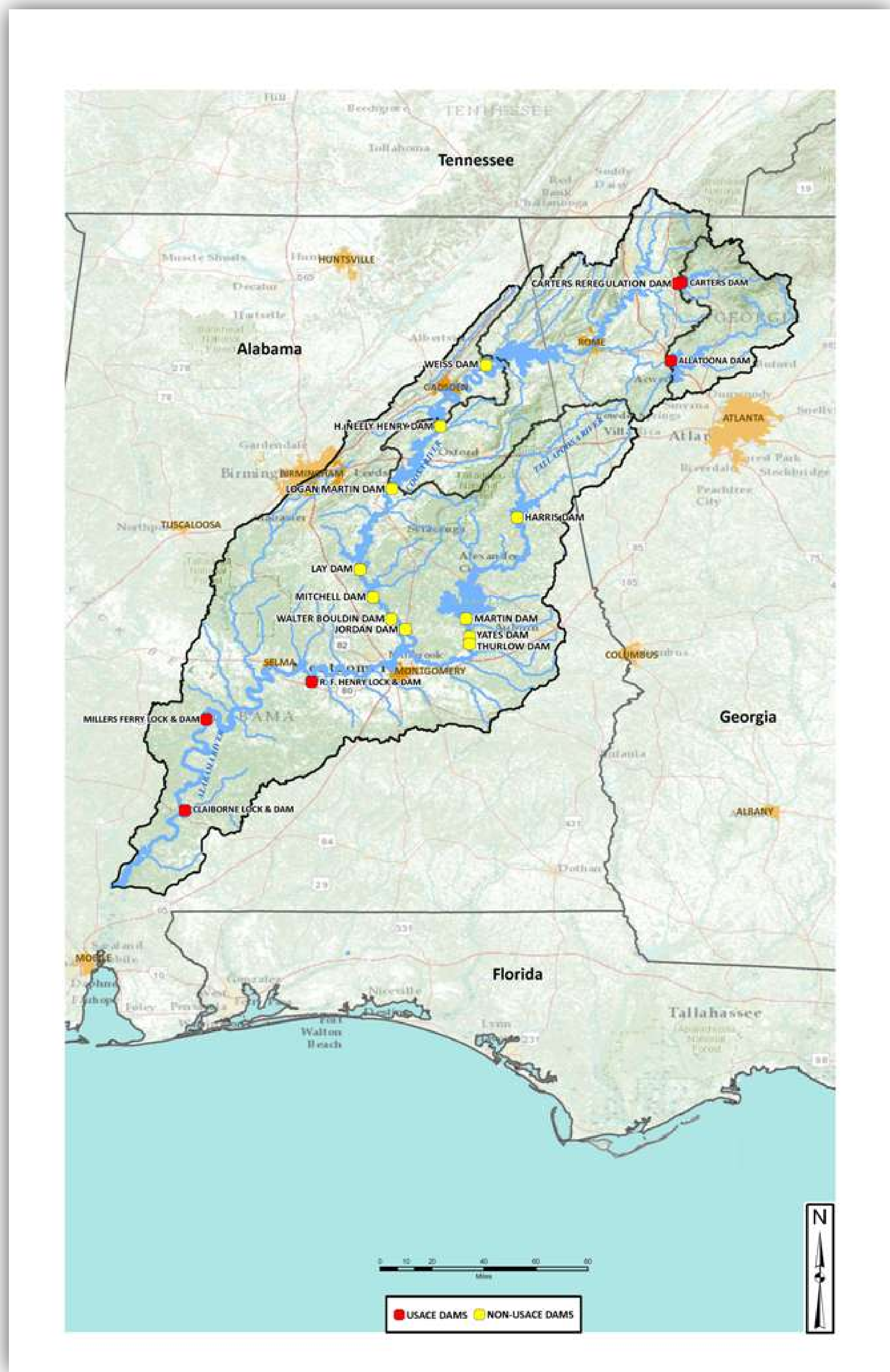

Figure 2. Alabama-Coosa-Tallapoosa River Basin Project Location Map

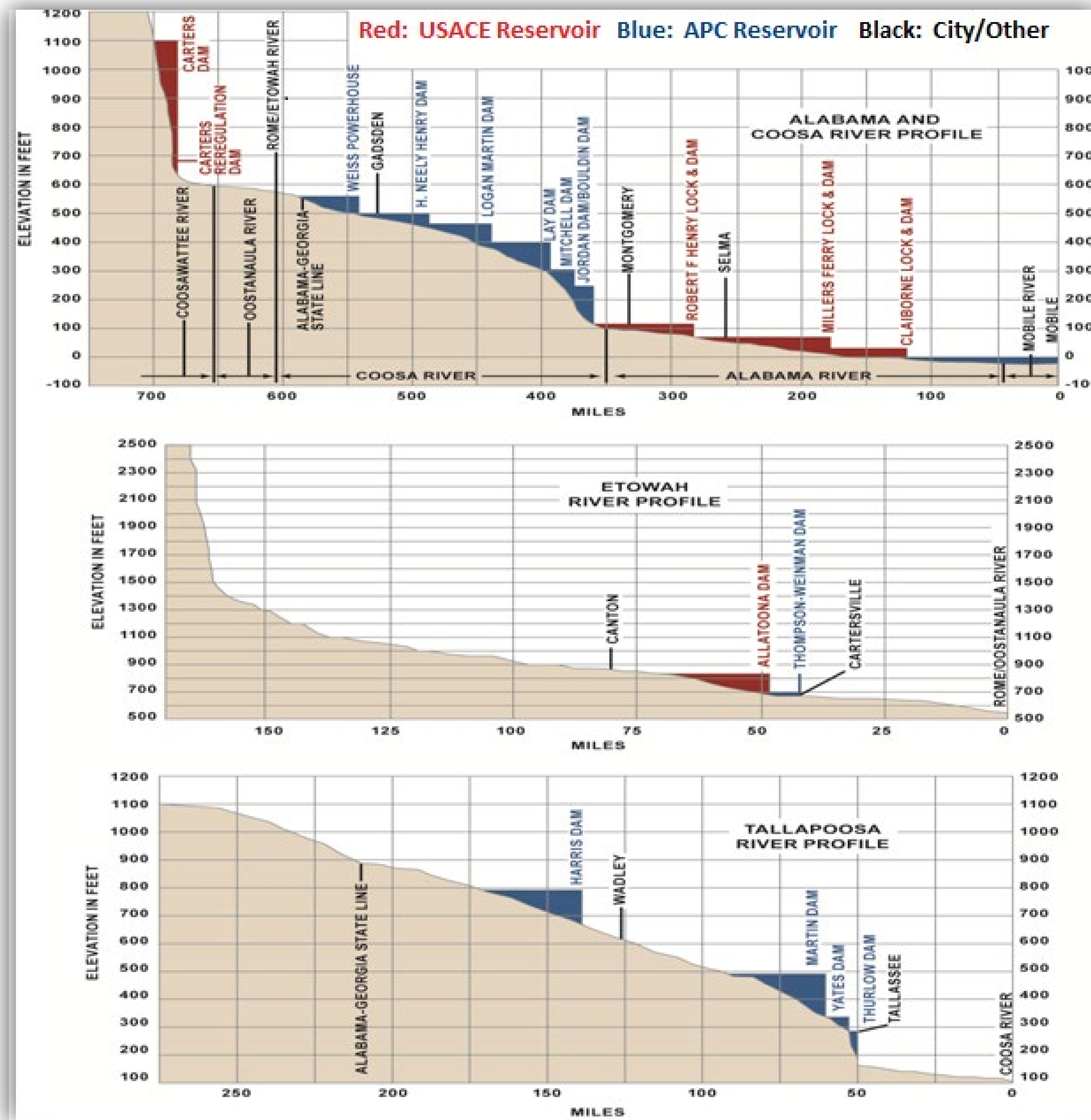

Figure 3. Alabama-Coosa-Tallapoosa River Basin Profile Map

B. Allatoona Dam and Lake. The Corps' Allatoona Dam on the Etowah River creates the 11,862-ac Allatoona Lake. The project's authorization, general features, and purposes are described in the Allatoona Dam and Lake Water Control Manual. The Allatoona Lake top of conservation pool is elevation 840 feet during the late spring and summer months (May through August); transitions to elevation 835 feet in the fall (October through mid-November); transitions to a winter drawdown to elevation 823 feet (1-15 January); and refills back to elevation 840 feet during the winter and spring wet season as shown in the water control plan guide curve (Figure 4). However, the lake level may fluctuate significantly from the guide curve over time, dependent primarily upon basin inflows but also influenced by project operations, evaporation, withdrawals, and return flows. A minimum flow of about 240 cfs is continuously released through a small unit, which generates power while providing a constant flow to the Etowah River downstream. Under drier conditions when basin inflows are reduced, project operations are adjusted to conserve storage in Allatoona Lake while continuing to meet project purposes in accordance with four action zones as shown on Figure 4.

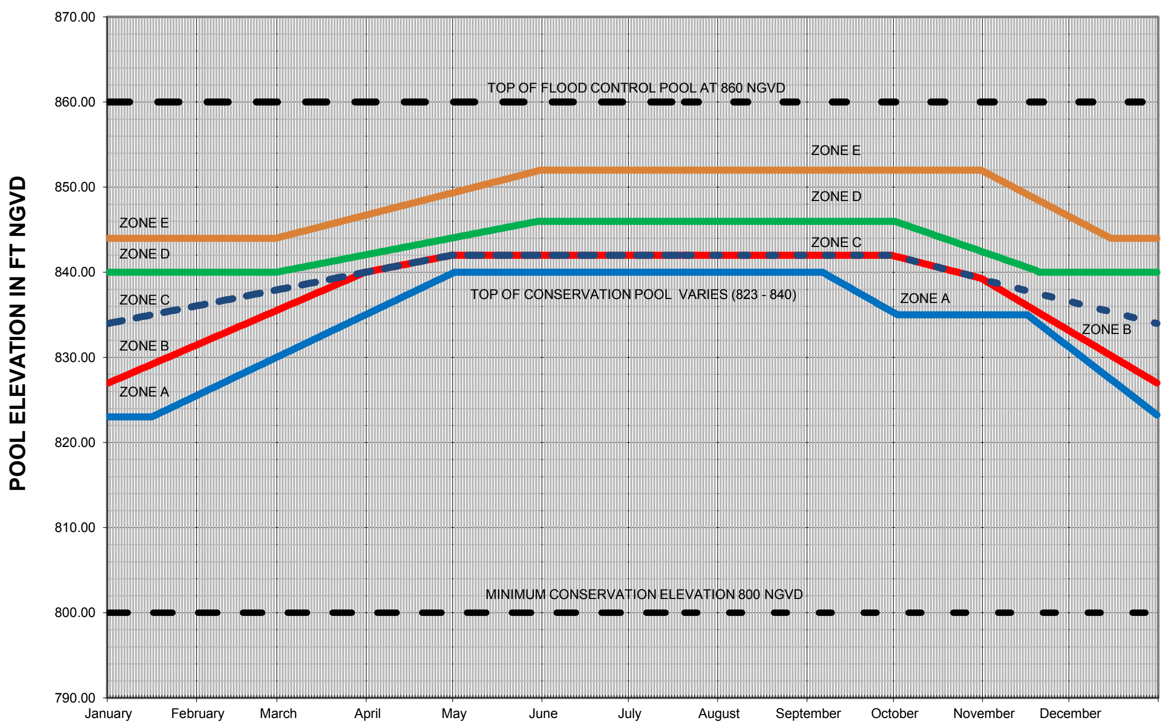

Figure 4. Allatoona Lake Guide Curve and Action Zones

C. Carters Dam and Lake and Reregulation Dam. Carters Lake is formed by Carters Dam, a Corps' reservoir on the Coosawattee River in northwest Georgia upstream of Rome, Georgia. The Carters Project is a pumped-storage peaking facility that utilizes a Reregulation Dam and storage pool in conjunction with the main dam and lake. The project's authorization, general features, and purposes are described in the Carters Dam and Lake and Regulation Dam water control manual. The Carters Lake top of conservation pool is elevation 1074 feet from May through September transitioning to elevation 1072 feet from mid October through mid April as shown in the water control plan guide curve (Figure 5). As expected with a peaking/pumped storage operation, both Carters Lake and the reregulation pool experience frequent elevation changes. Typically, water levels in Carters Lake vary no more than 1 to 2 feet per day. The reregulation pool will routinely fluctuate by several feet (variable) daily as the pool receives peak hydropower discharges from Carters Lake and serves as the source for pumpback operations into Carters Lake during non-peak hours. The reregulation pool will likely reach both its normal maximum elevation of 696 feet and minimum elevation of 677 feet at least once each week. However, the general trend of the lake level may fluctuate significantly from the guide curve over time, dependent primarily upon basin inflows but also influenced by project operations and evaporation. Carters Regulation Dam provides a seasonal varying minimum release to the Coosawattee River for downstream fish and wildlife enhancement. Under drier conditions when basin inflows are reduced, project operations are adjusted to conserve storage in Carters Lake while continuing to meet project purposes in accordance with action zones as shown on Figure 5. In Zone 2, Carters Regulations Dam releases are reduced to 240 cfs.

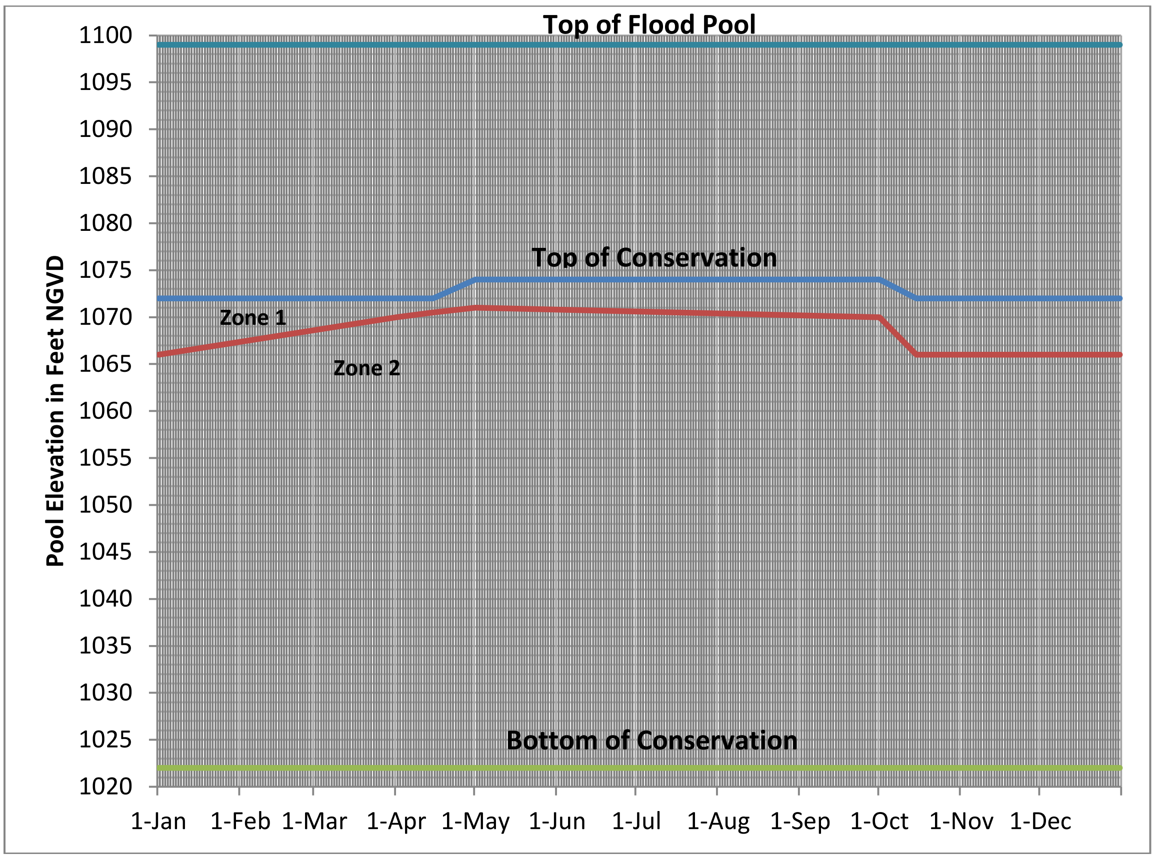

Figure 5. Carters Lake Guide Curve and Action Zones

D. APC Coosa River Projects. APC owns and operates the Coosa Hydro system of projects at Weiss Lake, H. Neely Henry Lake, Logan Martin Lake, Lay Lake, Mitchell Lake, and Jordan/Bouldin Dam and Lake on the Coosa River in the ACT Basin. APC Coosa River projects function mainly to generate electricity by hydropower. In addition, the upper 3 projects (Weiss, H. Neely Henry, and Logan Martin) operate pursuant to Public Law 83-436 regarding the requirement for the projects to be operated for flood risk management and navigation in accordance with reasonable rules and regulations of the Secretary of the Army. The rules and regulations are addressed in a memorandum of agreement between the Corps and APC, in individual water control manuals for the three projects, and in this ACT Basin DCP. The Weiss Lake is on the Coosa River in northeast Alabama, about 80 miles northeast of Birmingham, Alabama, and extends into northwest Georgia for about 13 miles upstream on the Coosa River.

The dam impounds a 30,200-ac reservoir (Weiss Lake) at the normal summer elevation of 564 feet as depicted in the regulation guide curve shown in Figure 6. The H. Neely Henry Lake is on the Coosa River in northeast Alabama, about 60 mi northeast of Birmingham, Alabama. The dam impounds an 11,200-acre reservoir at the normal summer elevation of 508 feet as depicted in the regulation guide curve shown in Figure 7. The Logan Martin Lake is in northeast Alabama on the Coosa River, about 40 miles east of Birmingham, Alabama. The dam impounds a 15,263-acre reservoir at the normal summer elevation of 465 feet as depicted in the regulation guide curve shown in Figure 8. The projects' authorizations, general features, and purposes are described in the Weiss, H. Neely Henry, and Logan Martin water control manual appendices to the ACT Basin Master Water Control Manual.

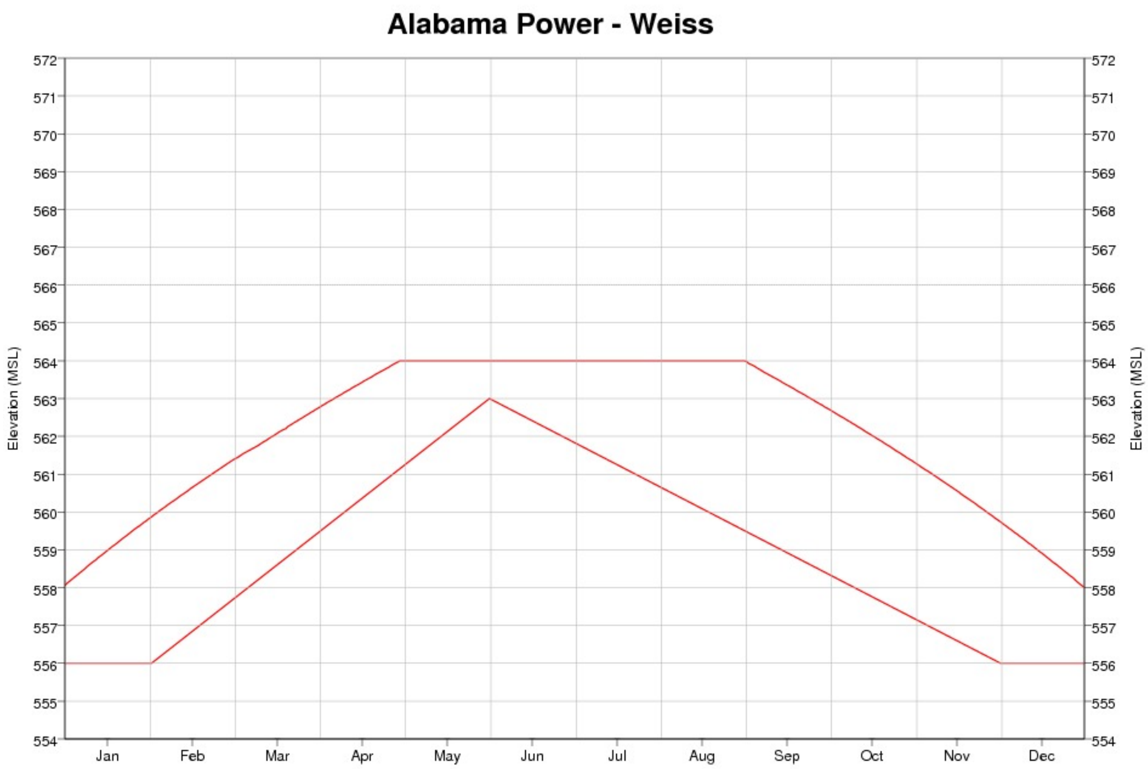

Figure 6. Weiss Lake Guide Curve

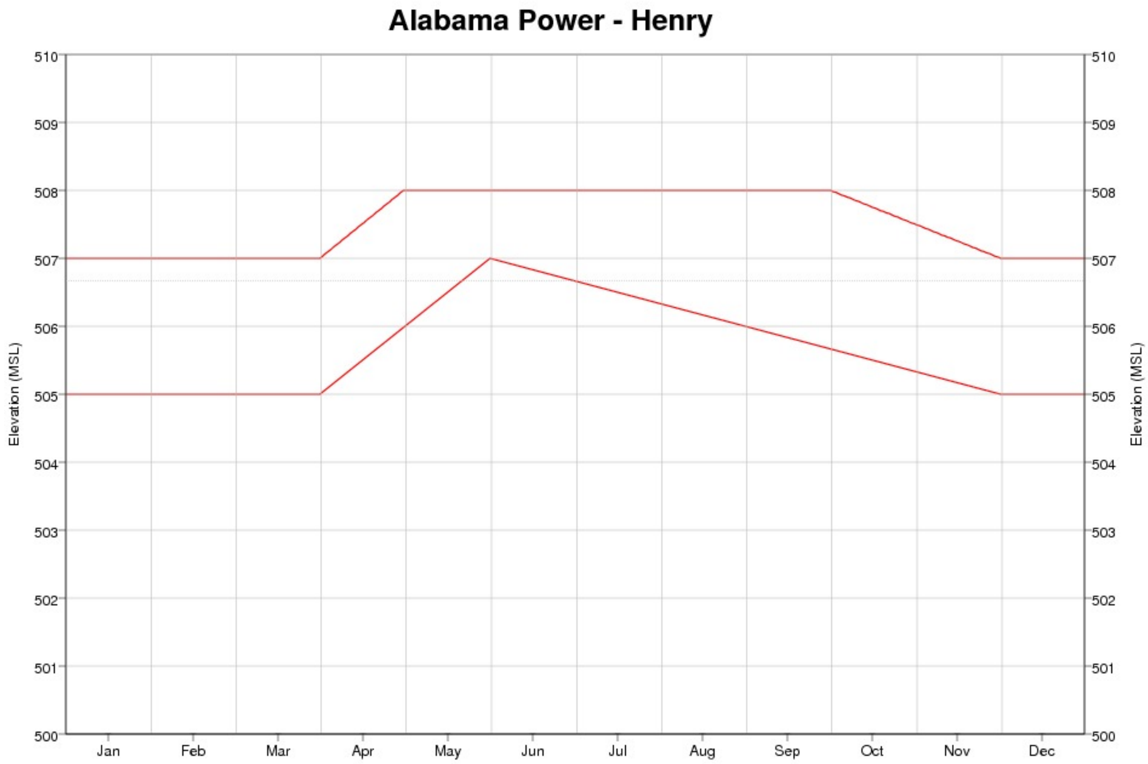

Figure 7. H. Neely Henry Lake Guide Curve

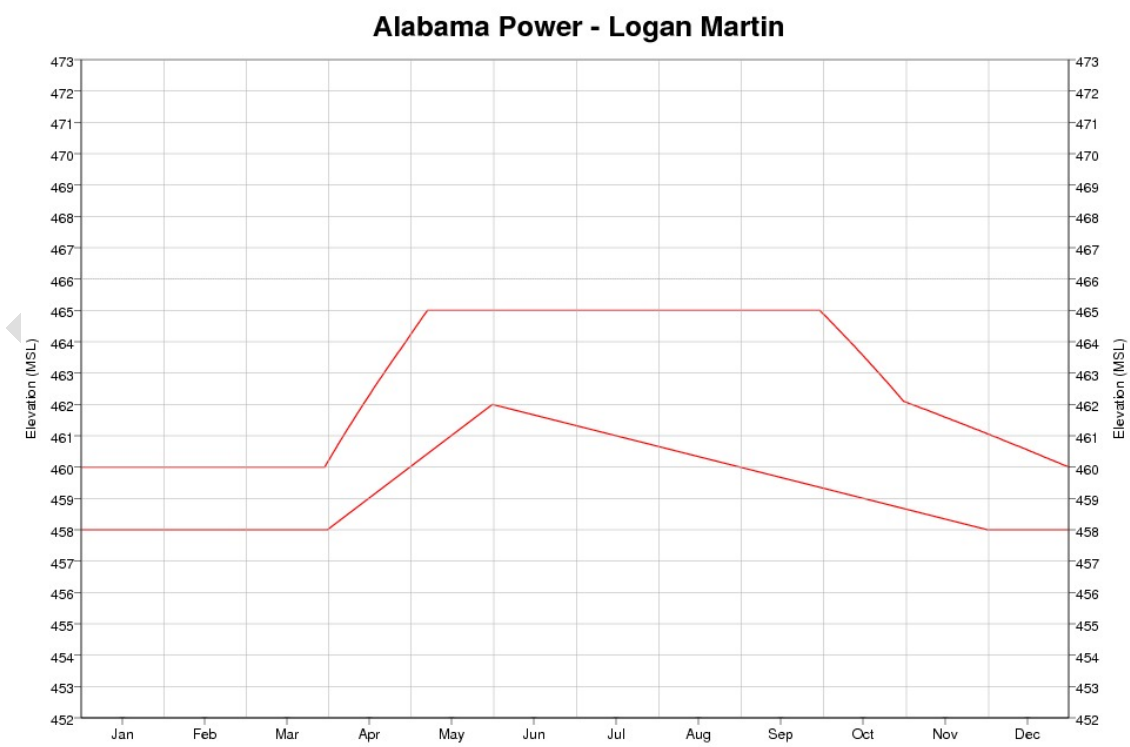

Figure 8. Weiss Lake Guide Curve

The downstream Coosa River APC run-of-river hydropower projects (Lay Dam and Lake, Mitchell Dam and Lake, and Jordan/Bouldin Dams and Lake) have no appreciable storage and are operated in conjunction with the upstream Coosa projects to meet downstream flow requirements and targets in support of the ACT Basin Drought Plan and navigation.

E. APC Tallapoosa River Projects. APC owns and operates the Tallapoosa River system of projects at Harris Dam and Lake, Martin Dam and Lake, Yates Dam, and Thurlow Dam in the ACT Basin. APC Tallapoosa River projects function mainly to generate electricity by hydropower. In addition, the Robert L. Harris Project operates pursuant to Public Law 83-436 regarding the requirement for the project to be operated for flood risk management and navigation in accordance with reasonable rules and regulations of the Secretary of the Army. The rules and regulations are addressed in a memorandum of agreement between the Corps and APC, in individual water control manual for the APC project, and in this ACT Basin DCP.

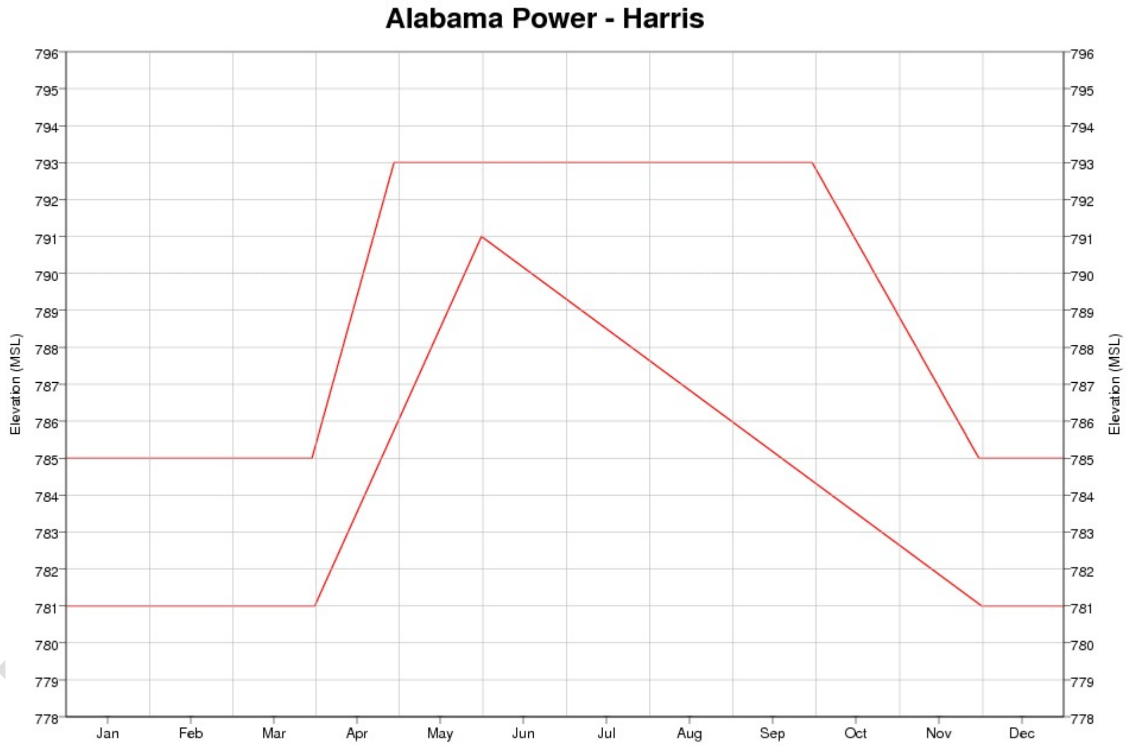

Figure 9. Robert L. Harris Lake Guide Curve

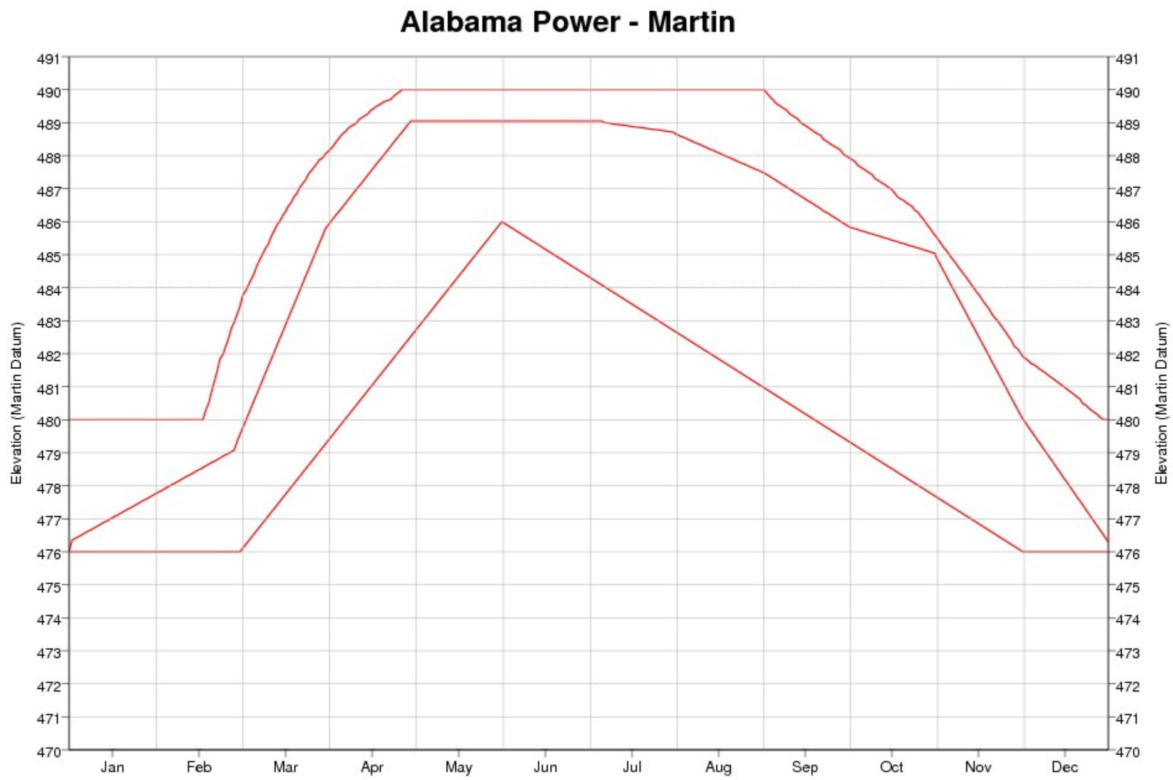

Figure 10. Martin Lake Guide Curve

F. Corps Alabama River Projects. The Corps operates three run-of-river lock and dam projects (Robert F. Henry, Millers Ferry, Claiborne) on the Alabama River in the lower ACT Basin to support commercial navigation. Claiborne Lake, together with R.E. "Bob" Woodruff Lake and William "Bill" Dannelly Lake, are collectively referred to as the Alabama River Lakes. The primary location used for communicating the available reliable navigation depth is the Claiborne Lock and Dam tailwater elevation. The water surface elevation is related to the available navigation depth based on the latest hydrographic surveys of the lower Alabama River reach downstream of Claiborne.

(1) <u>Robert F. Henry</u>. The R.E. "Bob" Woodruff Lake is created by the Robert F. Henry Lock and Dam on the Alabama River, 281 miles upstream of Mobile Bay. R.E. "Bob" Woodruff Lake extends from the Robert F. Henry Lock and Dam upstream to the Walter Bouldin Dam. In addition to hydropower and navigation, R.E. "Bob" Woodruff Lake provides recreation and fish and wildlife conservation. R.E. "Bob" Woodruff Lake is 77 miles long and averages 1,300 feet wide. It has a surface area of 12,500 ac and a storage capacity of 234,200 acre-feet (ac-ft) at a normal pool elevation of 125 feet. Lake levels are typically fairly stable with minimal fluctuation between the operating pool elevation limits, 123 feet to 126 feet. The emergency drawdown pool elevation is 122 feet. An authorized 9-foot deep by 200-foot wide navigation channel exists over the entire length of the lake. The Jones Bluff hydropower plant generating capacity is 82 MW. The lake is a popular recreation destination, receiving up to two million visitors annually.

(2) <u>Millers Ferry</u>. The William "Bill" Dannelly Lake is created by the Millers Ferry Lock and Dam on the Alabama River, 178 miles upstream of Mobile Bay. William "Bill" Dannelly Lake is 103 miles long and averages almost 1,400 feet wide. The reservoir has a surface area of

18,528 ac and a storage capacity of 346,254 ac-ft at a normal full pool elevation of 80.8 feet. Lake levels remain fairly stable on a day-to-day basis with minimal fluctuation between the operating pool elevation limits, 79 feet to 80.8 feet. An authorized 9-foot deep by 200-foot wide navigation channel extends the entire length of the reservoir. The facility is a multipurpose reservoir constructed by the Corps for both navigation and hydropower. The reservoir also provides recreational benefits and has lands managed for wildlife mitigation. The Millers Ferry hydropower plant generating capacity is 90 MW. The reservoir provides ample recreation opportunities. Recreation visitors number three million annually.

(3) <u>Claiborne</u>. Claiborne Lake is created by the Claiborne Lock and Dam on the Alabama River about 118 miles upstream of Mobile Bay. The lake is similar to a wide river, averaging about 800 feet wide, with a surface area of 5,930 acres. Claiborne Lake extends 60 miles upstream to the Millers Ferry Lock and Dam. Storage capacity in the lake is 96,360 acre-feet (ac-ft) at a normal pool elevation of 35 feet. The operating pool elevation limits are between 32 feet and 36 feet. The lake has an authorized 9-foot deep, 200-foot wide navigation channel extending its entire length. The primary purpose of the Corps project is navigation. No hydropower generating capability exists at the project. The lake also provides recreation benefits and lands managed for wildlife mitigation.

G. As other ACT water management objectives are addressed, lake levels might decline during prime recreation periods. Drought conditions will cause further drawdowns in lake levels. While lake levels will be slightly higher than what would naturally occur if no specific drought actions are taken, reservoir levels will decline thus triggering impacts associated with reaching initial recreation and water access limited levels. Large reservoir drawdowns impact recreational use: access to the water for boaters and swimmers is inhibited; submerged hazards (e.g., trees, shoals, boulders) become exposed or nearly exposed, posing safety issues; and exposed banks and lake bottoms become unsightly and diminish the recreation experience. Consequently certain levels are identified in each Corps impoundment at which recreation would be affected. The *Initial Impact level* (IIL) represents the level at which recreation impacts are first observed (i.e., some boat launching ramps are unusable, most beaches are unusable or minimally usable, and navigation hazards begin to surface). The *Recreation Impact level* (RIL) defines the level at which major impacts on concessionaires and recreation are observed (more ramps are not usable, all beaches are unusable, boats begin having problems maneuvering in and out of marina basin areas, loss of retail business occurs). The level at which severe impacts are observed in all aspects of recreational activities is called the *Water Access Limited level* (WAL). At this point, all or almost all boat ramps are out of service, all swimming beaches are unusable, major navigation hazards occur, channels to marinas are impassable and/or wet slips must be relocated, and a majority of private boat docks are unusable. The individual project water control manuals describe the specific impact levels at each project and provides information regarding the effects of the water control plans on recreation.

V – WATER USES AND USERS

5-01. <u>Water Uses and Users</u>.

A. Uses – The ACT Basin rivers and lakes are a major source of water supply by many cities, industries, and farms for wastewater dilution, municipal water supply, fish and wildlife propagation, hydropower generation, and recreational boating and fishing.

B. Users – The following tables list the surface water uses and water users within Georgia and Alabama in the ACT Basin.

Table 2. Surface water use: ACT Basin (Georgia 2005)

Water use category	Quantity (mgd)	% of total
Total Use	788.98	100%
Public Supply	154.78	19.6%
Domestic and Commercial	0.30	0.0%
Industrial and Mining	32.49	4.1%
Irrigation	11.31	1.4%
Livestock	16.18	2.1%
Thermoelectric Power Generation	573.92	72.8%

Table 3. M&I surface water withdrawal permits in the ACT Basin (Georgia)

River basin	Permit holder	Permit number	County	Source water	Permit limit max day (mgd)	Permit limit monthly average (mgd)
Coosa River Basin (Georgia)—upstream counties to downstream counties						
Coosa	Dalton Utilities - Conasauga R	155-1404-01	Whitfield	Conasauga River	49.400	40.300
Coosa	Dalton Utilities - Mill Creek	155-1404-02	Whitfield	Mill Creek	13.200	7.500
Coosa	Dalton Utilities - Coahulla Cr	155-1404-03	Whitfield	Coahulla Creek	6.000	5.000
Coosa	Dalton Utilities - Freeman Springs	155-1404-04	Whitfield	Freeman Springs	2.000	1.500
Coosa	Dalton Utilities - River Road	155-1404-05	Whitfield	Conasauga River	35.000	18.000
Coosa	Chatsworth Water Works Commission	105-1405-01	Murray	Holly Creek	1.100	1.000
Coosa	Chatsworth Water Works Commission	105-1405-02	Murray	Eton Springs	1.800	1.800
Coosa	Chatsworth Water Works Commission	105-1409-01	Murray	Carters Lake	2.550	2.300
Coosa	Chatsworth, City of	105-1493-02	Murray	Coosawattee River	2.200	2.000
Coosa	Ellijay, City of - Ellijay R	061-1407-01	Gilmer	Ellijay River	0.550	0.450
Coosa	Ellijay - Gilmer County W & S Authority	061-1408-01	Gilmer	Cartecay River	4.000	4.000
Coosa	Calhoun, City of	064-1411-03	Gordon	Big Spring	7.000	6.000
Coosa	Calhoun, City of	064-1412-01	Gordon	City Of Calhoun Spring	0.638	0.537
Coosa	Calhoun, City of	064-1492-02	Gordon	Oostanaula River	6.200	3.000

Table 3 (continued). M&I surface water withdrawal permits in the ACT Basin (Georgia)

River basin	Permit holder	Permit number	County	Source water	Permit limit max day (mgd)	Permit limit monthly average (mgd)
Coosa	Calhoun, City of	064-1493-01	Gordon	Coosawattee River	18.000	16.000
Coosa	Jasper, City of	112-1417-02	Pickens	Long Swamp Creek	1.000	1.000
Coosa	Bent Tree Community, Inc.	112-1417-03	Pickens	Chestnut Cove Creek and unnamed creek	0.250	0.230
Coosa	Bent Tree Community, Inc.	112-1417-04	Pickens	Lake Tamarack	0.250	0.230
Coosa	Big Canoe Utilities Company, Inc.	112-1417-05	Pickens	Lake Petit	1.000	1.000
Coosa	Big Canoe Utilities Company, Inc.	112-1417-06	Pickens	Blackwell Creek	2.650	2.650
Coosa	Etowah Water & Sewer Authority	042-1415-01	Dawson	Etowah River	5.500	4.400
Coosa	Cherokee County Water & Sewerage Auth	028-1416-01	Cherokee	Etowah River	43.200	36.000
Coosa	Gold Kist, Inc	028-1491-03	Cherokee	Etowah River	5.000	4.500
Coosa	Canton, City of	028-1491-04	Cherokee	Etowah River	23.000	18.700
Coosa	Canton, City of (Hickory Log Creek)	028-1491-05	Cherokee	Etowah River	39.000	39.000
Coosa	Bartow County Water Department	008-1411-02	Bartow	Bolivar Springs	0.800	0.800
Coosa	Adairsville, City of	008-1412-02	Bartow	Lewis Spring	5.100	4.100
Coosa	New Riverside Ochre Company, Inc.	008-1421-01	Bartow	Etowah River	5.000	5.000
Coosa	New Riverside Ochre Company, Inc.	008-1421-02	Bartow	Etowah River	6.000	6.000
Coosa	Emerson, City of	008-1422-02	Bartow	Moss Springs	0.630	0.500
Coosa	Gerdau AmeriSteel US, Inc. – Cartersville Steel Mill	008-1423-01	Bartow	Pettit Creek	2.000	1.500
Coosa	Baroid Drilling Fluids, Inc.	008-1423-02	Bartow	Etowah River	3.400	2.500
Coosa	Cartersville, City of	008-1423-04	Bartow	Etowah River	26.420	23.000
Coosa	Georgia Power Co. - Plant Bowen	008-1491-01	Bartow	Etowah River	520.000	85.000
Coosa	CCMWA	008-1491-05	Bartow	Lake Allatoona	86.000	78.000
Coosa	Cartersville, City of	008-1491-06	Bartow	Lake Allatoona	21.420	18.000
Coosa	La Fayette, City of - Dry Creek	146-1401-01	Walker	Dry Creek	1.000	0.900
Coosa	La Fayette, City of - Big Spring	146-1401-02	Walker	Big Spring	1.650	1.310
Coosa	Mount Vernon Mills - Riegel Apparel Div.	027-1401-03	Chattooga	Trion Spring	9.900	6.600
Coosa	Summerville, City of	027-1402-02	Chattooga	Raccoon Creek	3.000	2.500
Coosa	Summerville, City of	027-1402-04	Chattooga	Lowe Spring	0.750	0.500
Coosa	Mohawk Industries, Inc.	027-1402-05	Chattooga	Chattooga R./ Raccoon Cr.	4.500	4.000
Coosa	Oglethorpe Power Corp.	057-1402-03	Floyd	Heath Creek	3,838.000	3,030.000
Coosa	Floyd County - Brighton Plant	057-1414-02	Floyd	Woodward Creek	0.800	0.700

Table 3 (continued). M&I surface water withdrawal permits in the ACT Basin (Georgia)

River basin	Permit holder	Permit number	County	Source water	Permit limit max day (mgd)	Permit limit monthly average (mgd)
Coosa	Cave Spring, City of	057-1428-06	Floyd	Cave Spring	1.500	1.300
Coosa	Floyd County	057-1428-08	Floyd	Old Mill Spring	4.000	3.500
Coosa	Berry Schools, The (Berry College)	057-1429-01	Floyd	Berry (Possum Trot) Reservoir	1.000	0.700
Coosa	Inland-Rome Inc.	057-1490-01	Floyd	Coosa River	34.000	32.000
Coosa	Georgia Power Co. - Plant Hammond	057-1490-02	Floyd	Coosa River	655.000	655.000
Coosa	Rome, City of	057-1492-01	Floyd	Oostanaula & Etowah R	18.000	16.400
Coosa	Rockmart, City of	115-1425-01	Polk	Euharlee Creek	2.000	1.500
Coosa	Vulcan Construction Materials, L.P.	115-1425-03	Polk	Euharlee Creek	0.200	0.200
Coosa	Cedartown, City of	115-1428-04	Polk	Big Spring	3.000	2.600
Coosa	Polk County Water Authority	115-1428-05	Polk	Aragon, Morgan, Mulco Springs	1.600	1.100
Coosa	Polk County Water Authority	115-1428-07	Polk	Deaton Spring	4.000	4.000
Tallapoosa River Basin (Georgia)						
Tallapoosa	Haralson County Water Authority	071-1301-01	Haralson	Tallapoosa River	3.750	3.750
Tallapoosa	Bremen, City of	071-1301-02	Haralson	Beech Creek & Bremen Reservoir (Bush Creek)	0.800	0.580
Tallapoosa	Bowdon, City of - Indian	022-1302-01	Carroll	Indian Creek	0.400	0.360
Tallapoosa	Southwire Company	022-1302-02	Carroll	Buffalo Creek	2.000	1.000
Tallapoosa	Villa Rica, City of	022-1302-04	Carroll	Lake Paradise & Cowens Lake	1.500	1.500
Tallapoosa	Carrollton, City of	022-1302-05	Carroll	Little Tallapoosa River	12.000	12.000
Tallapoosa	Bowdon, City of - Lake Tysinger	022-1302-06	Carroll	Lake Tysinger	1.000	1.000

Source: GAEPD 2009a

Table 4. M&I surface water withdrawals in the ACT Basin (Georgia)

Basin (subbasin)	Withdrawal by	County	Withdrawal (mgd)
Coosa River Basin (Georgia)			
Coosa (Conasauga)	Dalton Utilities	Whitfield	35.38
Coosa (Conasauga)	City of Chatsworth	Murray	1.26
Coosa (Coosawattee)	Ellijay-Gilmer County Water System	Gilmer	3.12
Coosa (Coosawattee)	City of Fairmount	Gordon	0.06
Coosa (Oostanaula)	City of Calhoun	Gordon	9.10
Coosa (Etowah)	Big Canoe Corporation	Pickens	0.48
Coosa (Etowah)	City of Jasper	Pickens	1.00
Coosa (Etowah)	Bent Tree Community	Pickens	0.07
Coosa (Etowah)	Lexington Components Inc (Rubber)	Pickens	0.01
Coosa (Etowah)	Etowah Water and Sewer Authority	Dawson	1.50
Coosa (Etowah)	Town of Dawsonville	Dawson	0.10
Coosa (Etowah)	City of Canton	Cherokee	2.83
Coosa (Etowah)	Cherokee County Water System	Cherokee	15.81
Coosa (Etowah)	Gold Kist, Inc.	Cherokee	1.94
Coosa (Etowah)	City of Cartersville	Bartow	13.26
Coosa (Etowah)	New Riverside Ochre Company, Inc (Chemicals)	Bartow	1.67
Coosa (Etowah)	Gerdau AmeriSteel US, Inc. – Cartersville Steel Mill (Primary metals)	Bartow	0.16
Coosa (Etowah)	Georgia Power Co – Plant Bowen	Bartow	38.92
Coosa (Etowah)	CCMWA	Bartow	44.42
Coosa (Upper Coosa)	City of Lafayette	Walker	1.20
Coosa (Upper Coosa)	City of Summerville	Chattooga	2.05
Coosa (Upper Coosa)	Mount Vernon Mills – Riegel Apparel Division (Textiles)	Chattooga	2.74
Coosa (Oostanaula)	(Domestic/Commercial)	Floyd	0.30
Coosa (Etowah / Oostanaula)	City of Rome	Floyd	9.98
Coosa (Upper Coosa)	Floyd County Water System	Floyd	2.57
Coosa (Upper Coosa)	Inland-Rome Inc. (Paper)	Floyd	25.74
Coosa (Upper Coosa)	Georgia Power Co - Plant Hammond	Floyd	535.00
Coosa (Upper Coosa)	Polk County Water Authority	Polk	2.22
Coosa (Etowah)	Vulcan Construction Materials	Polk	0.09
Tallapoosa River Basin (Georgia)			
Tallapoosa (Upper)	City of Bremen	Haralson	0.32
Tallapoosa (Upper)	Haralson County Water Authority	Haralson	2.05
Tallapoosa (Upper)	City of Bowdon	Carroll	0.75
Tallapoosa (Upper)	Southwire Company	Carroll	0.09
Tallapoosa (Upper)	City of Carrollton	Carroll	5.37
Tallapoosa (Upper)	City of Temple	Carroll	0.26
Tallapoosa (Upper)	City of Villa Rica	Carroll	0.58
Tallapoosa (Upper)	Carroll County Water System	Carroll	4.08

Table 5. Surface water use - ACT Basin (Alabama, 2005) (mgd)

ACT subbasin	HUC	Public supply	Industrial	Irrigation	Livestock	Thermo-electric	Total, by subbasin
Upper Coosa	03150105	2.12	0	3.10	0.40	0	5.62
Middle Coosa	03150106	33.24	65.83	7.91	0.87	142.68	250.53
Lower Coosa	03150107	10.96	0.89	5.10	0.35	812.32	829.62
Upper Tallapoosa	03150108	0.90	0	0.15	0.40	0	1.45
Middle Tallapoosa	03150109	19.09	0	0.52	0.32	0	19.93
Lower Tallapoosa	03150110	38.22	2.23	4.22	0.28	0	44.95
Upper Alabama	03150201	10.40	30.63	3.84	0.84	4.14	49.85
Cahaba	03150202	52.90	0	3.49	0.25	0	56.64
Middle Alabama	03150203	0	21.04	1.73	0.48	0	23.25
Lower Alabama	03150204	0	54.61	0.64	0.02	0	55.27
Total - By Use Category		167.83	175.23	30.70	4.21	959.14	1337.11

Source: Hutson et al. 2009

Table 6. M&I surface water withdrawals in the ACT Basin (Alabama)

Basin (subbasin)	Withdrawal by	County	Withdrawal (mgd)
Coosa River Basin (Alabama)			
Coosa (Upper)	Centre Water Works & Sewer Board	Cherokee	1.19
Coosa (Upper)	Piedmont Water Works & Sewer Board	Calhoun	0.93
Coosa (Middle)	Jacksonville Water Works & Sewer Board	Calhoun	1.34
Coosa (Middle)	Anniston Water Works & Sewer Board	Calhoun	0.08
Coosa (Middle)	Fort Payne Water Works Board	DeKalb	8.10
Coosa (Middle)	Goodyear Tire and Rubber Company	Etowah	9.87
Coosa (Middle)	Gadsden Water Works & Sewer Board	Etowah	14.86
Coosa (Middle)	Alabama Power Co – Gadsden Steam Plant	Etowah	142.68
Coosa (Middle)	SIC 32 – Unnamed Stone, Glass, Clay, and/or Concrete Products	St. Clair	3.49
Coosa (Middle)	Talladega/Shelby Water Treatment Plant	Talladega	6.44
Coosa (Middle)	Talladega County Water Department	Talladega	0.81
Coosa (Middle)	Talladega Water Works & Sewer Board	Talladega	1.62
Coosa (Middle)	Bowater Newsprint, Coosa Pines Operation	Talladega	52.47
Coosa (Lower)	Sylacauga Utilities Board	Talladega	3.25
Coosa (Lower)	SIC 22 – Unnamed Textile	Talladega	0.89
Coosa (Lower)	Goodwater Water Works & Sewer Board	Coosa	0.46
Coosa (Lower)	Alabama Power Co – E.C. Gaston Plant	Shelby	812.32
Coosa (Lower)	Clanton Waterworks & Sewer Board	Chilton	1.79
Coosa (Lower)	Five Star Water Supply	Elmore	5.46
Tallapoosa River Basin (Alabama)			
Tallapoosa (Upper)	Heflin Water Works	Cleburne	0.51
Tallapoosa (Upper)	Wedowee Gas, Water, and Sewer	Randolph	0.39
Tallapoosa (Middle)	Roanoke Utilities Board	Randolph	1.29
Tallapoosa (Middle)	Clay County Water Authority	Clay	1.87
Tallapoosa (Middle)	Lafayette	Chambers	0.53
Tallapoosa (Middle)	Central Elmore Water & Sewer Authority	Elmore	4.83
Basin (subbasin)	**Withdrawal by**	**County**	**Withdrawal (mgd)**
Tallapoosa (Middle)	Alexander City Water Department	Tallapoosa	10.57
Tallapoosa (Lower)	West Point Home, Inc	Lee	2.23
Tallapoosa (Lower)	Opelika Water Works Board	Lee	2.61
Tallapoosa (Lower)	Auburn Water Works Board	Lee	5.75
Tallapoosa (Lower)	Tallassee	Tallapoosa	1.98
Tallapoosa (Lower)	Tuskegee Utilities	Macon	2.71
Tallapoosa (Lower)	Montgomery Water Works & Sewer Board	Montgomery	25.17
Alabama River Basin			
Alabama (Upper)	Montgomery Water Works & Sewer Board	Montgomery	10.40
Alabama (Upper)	International Paper	Autauga	30.63
Alabama (Upper)	Southern Power Co – Plant E. B. Harris	Autauga	4.14
Alabama (Cahaba)	Birmingham Water Works & Sewer Board	Shelby	52.90
Alabama (Middle)	International Paper – Pine Hill	Wilcox	21.04
Alabama (Lower)	Alabama River Pulp Company	Monroe	54.61

Source: Hutson et al. 2009

VII – DROUGHT MANAGEMENT PLAN

7-01. **General**. The Drought Contingency Plan (DCP) for the ACT Basin implements drought conservation actions on the basis of composite system storage, state line flows, and basin inflow as triggers to drive drought response actions. The DCP also recognizes that a basin-wide drought plan must incorporate variable hydropower generation requirements from its headwater projects in Georgia (Allatoona Dam and Carters Dam), a reduction in the level of navigation service provided on the Alabama River as storage across the basin declines, and that environmental flow requirements must still be met to the maximum extent practicable. The Act basin-wide drought plan is composed of three components - Headwater regulation at Allatoona Lake and Carters Lake in Georgia; Regulation at APC projects on the Coosa and Tallapoosa Rivers; and Downstream Alabama River regulation at Corps projects downstream of Montgomery, Alabama.

A. Headwater Regulation for Drought at Allatoona Lake and Carters Lake. Drought regulation at Allatoona Lake and Carters Lake consists of progressively reduced hydropower generation as pool levels decline in accordance with the conservation storage action zones established in the projects' water control plans. For instance, when Allatoona Lake is operating in normal conditions (Conservation storage Zone 1); hydropower generation typically ranges from 0 to 4 hours per day. However, as the pool drops to lower action zones during drought conditions, generation could be reduced to 0 to 2 hours per day. As Carters Lake pool level might drop into a conservation storage Zone 2, seasonal varying minimum target flows would be reduced to 240 cfs. The water control plan for each project describes the drought water control regulation plan in more detail.

B. Drought Regulation at APC Projects on the Coosa, Tallapoosa, and Alabama River. Regulation guidelines for the Coosa, Tallapoosa, and Alabama Rivers have been defined in a drought regulation matrix (Table 7) on the basis of a Drought Intensity Level (DIL). The DIL is a drought indicator, ranging from zero to three. The DIL is determined on the basis of three basin drought criteria (or triggers). A DIL 0 indicates normal regulation, while a DIL from 1 to 3 indicates some level of drought conditions. The DIL increases as more of the drought indicator thresholds (or triggers) are exceeded. The drought regulation matrix defines minimum average daily flow requirements on a monthly basis for the Coosa, Tallapoosa, and Alabama Rivers as a function of the DIL and time of year. The combined occurrences of the drought triggers determine the DIL. Three intensity levels for drought operations are applicable to APC projects.

- DIL 0 — (normal operation) no triggers exceeded
- DIL 1 — (moderate drought) 1 of 3 triggers exceeded
- DIL 2 — (severe drought) 2 of 3 triggers exceeded
- DIL 3 — (exceptional drought) all 3 triggers exceeded

(1) <u>Drought Indicators</u>. The indicators used to determine drought intensity include the following:

1. **Low basin inflow**. The total basin inflow needed for navigation is the sum of the total filling volume plus 7Q10 flow (4,640 cfs). Table 8 lists the monthly low basin inflow criteria. All numbers are in cfs-days. The basin inflow value is computed daily and checked on the 1st and 15th of the month. If computed basin inflow is less than the value required, the low basin inflow indicator is triggered. The basin inflow is total flow above the APC projects excluding Lake Allatoona and Carters Lake. It is the sum of local flows, minus lake evaporation and diversions. Figure 11 illustrates the local inflows to the Coosa and Tallapoosa Basins. The basin inflow computation differs from the navigation basin inflow, because it does not include releases from Lake Allatoona and Carters Lake. The intent is to capture the hydrologic condition across APC projects in the Coosa and Tallapoosa Basins.

Table 7. ACT Basin Drought Regulation Plan Matrix

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Drought Level Response[a]	DIL 0 - Normal Operations											
	DIL 1: Low Basin Inflows or Low Composite or Low State Line Flow											
	DIL 2: DIL 1 criteria + (Low Basin Inflows or Low Composite or Low State Line Flow)											
	DIL 3: Low Basin Inflows + Low Composite + Low State Line Flow											
Coosa River Flow[b]	Normal Operation: 2,000 cfs			4,000 (8,000)		4,000 – 2,000	Normal Operation: 2,000 cfs					
	Jordan 2,000 +/-cfs			4,000 +/- cfs		6/15 Linear Ramp down	Jordan 2,000 +/-cfs			Jordan 2,000 +/-cfs		
	Jordan 1,800 +/-cfs			2,500 +/- cfs		6/15 Linear Ramp down	Jordan 2,000 +/-cfs			Jordan 1,800 +/-cfs		
	Jordan 1,600 +/-cfs			Jordan 1,800 +/-cfs			Jordan 2,000 +/-cfs			Jordan 1,800 +/-cfs		Jordan 1,600 +/- cfs
Tallapoosa River Flow[c]	Normal Operations: 1200 cfs											
	Greater of: 1/2 Yates Inflow or 2 x Heflin Gage(Thurlow Lake releases > 350 cfs)				1/2 Yates Inflow					1/2 Yates Inflow		
	Thurlow Lake 350 cfs				1/2 Yates Inflow					Thurlow Lake 350 cfs		
	Maintain 400 cfs at Montgomery WTP (Thurlow Lake release 350 cfs)						Thurlow Lake 350 cfs			Maintain 400 cfs at Montgomery WTP (Thurlow Lake release 350 cfs)		
Alabama River Flow[d]	Normal Operation: Navigation or 7Q10 flow											
	4,200 cfs (10% 7Q10 Cut) - Montgomery				7Q10 - Montgomery (4,640 cfs)					Reduce: Full – 4,200 cfs		
	3,700 cfs (20% 7Q10 Cut) - Montgomery					4,200 cfs (10% 7Q10 Cut) - Montgomery				Reduce: 4,200 cfs-> 3,700 cfs Montgomery (1 week ramp)		
	2,000 cfs Montgomery				3,700 cfs Montgomery		4,200 cfs (10% 7Q10 Cut) - Montgomery			Reduce: 4,200 cfs -> 2,000 cfs Montgomery (1 month ramp)		
Guide Curve Elevation	Normal Operations: Elevations follow Guide Curves as prescribed in License (Measured in Feet)											
	Corps Variances: As Needed; FERC Variance for Lake Martin											
	Corps Variances: As Needed; FERC Variance for Lake Martin											
	Corps Variances: As Needed; FERC Variance for Lake Martin											

a. Note these are based flows that will be exceeded when possible.
b .Jordan flows are based on a continuous +/- 5% of target flow.
c. Thurlow Lake flows are based on continuous +/- 5% of target flow: flows are reset on noon each Tuesday based on the prior day's daily average at Heflin or Yates. d. Alabama River flows are 7-Day Average Flow.

Table 8. Low Basin Inflow Guide (in cfs-days)

Month	Coosa Filling Volume	Tallapoosa Filling Volume	Total Filling Volume	7Q10 flow	Required Basin Inflow
Jan	629	0	629	4,640	5,269
Feb	647	1,968	2,615	4,640	7,255
Mar	603	2,900	3,503	4,640	8,143
Apr	1,683	2,585	4,268	4,640	8,908
May	242	0	242	4,640	4,882
Jun			0	4,640	4,640
Jul			0	4,640	4,640
Aug			0	4,640	4,640
Sep	–602	–1,304	–1,906	4,640	2,734
Oct	–1,331	–2,073	–3,404	4,640	1,236
Nov	–888	–2,659	–3,547	4,640	1,093
Dec	–810	–1,053	–1,863	4,640	2,777

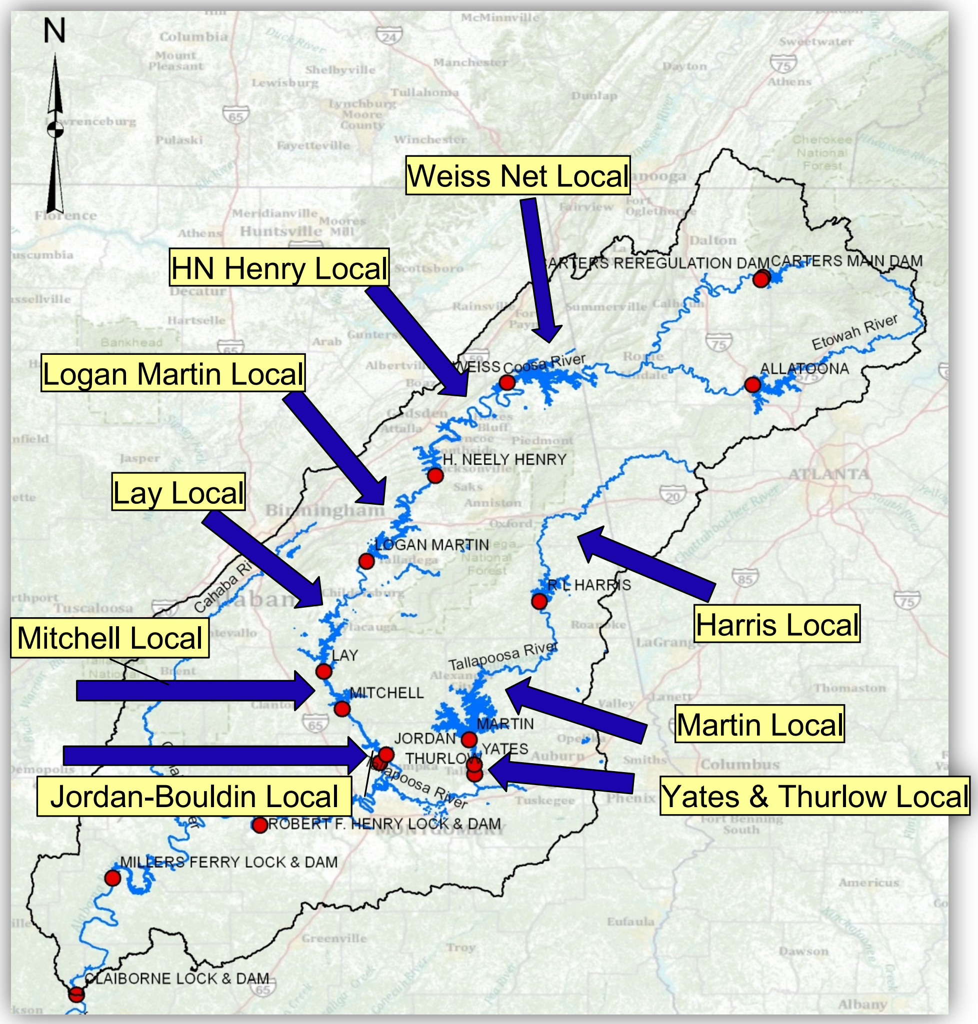

Figure 11. ACT Basin Inflows

2. **Low composite conservation storage**. Low composite conservation storage occurs when the APC projects' composite conservation storage is less than or equal to the storage available within the drought contingency curves for the APC reservoirs. Composite conservation storage is the sum of the amounts of storage available at the current elevation for each reservoir down to the drought contingency curve at each APC major storage project. The reservoirs considered for the trigger are R.L. Harris Lake, H. Neely Henry Lake, Logan Martin Lake, Lake Martin, and Weiss Lake. Figure 12 plots the APC composite zones. Figure 13 plots the APC low composite conservation storage trigger. If the actual active composite conservation storage is less than or equal to the active composite drought zone storage, the low composite conservation storage indicator is triggered. That computation is performed on the 1st and 15th of each month, and is considered along with the low state line flow trigger and basin inflow trigger.

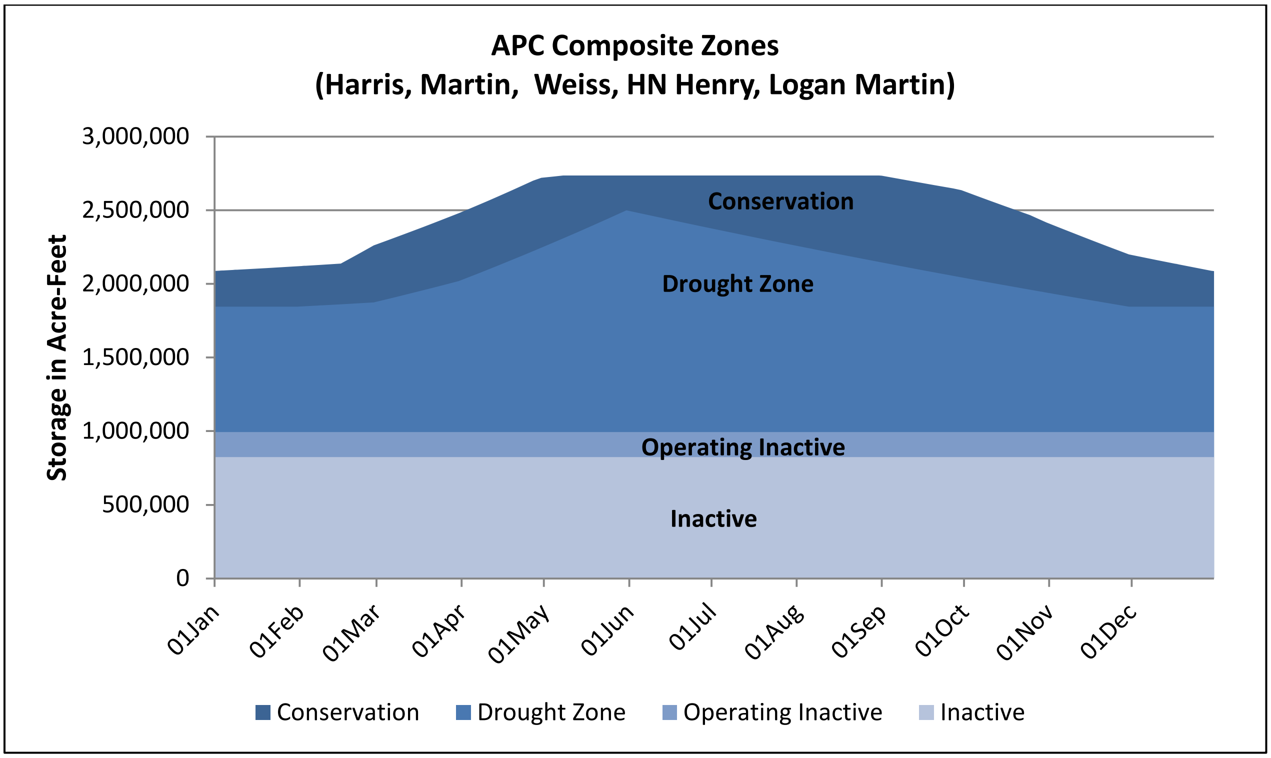

Figure 12. APC Composite Zones

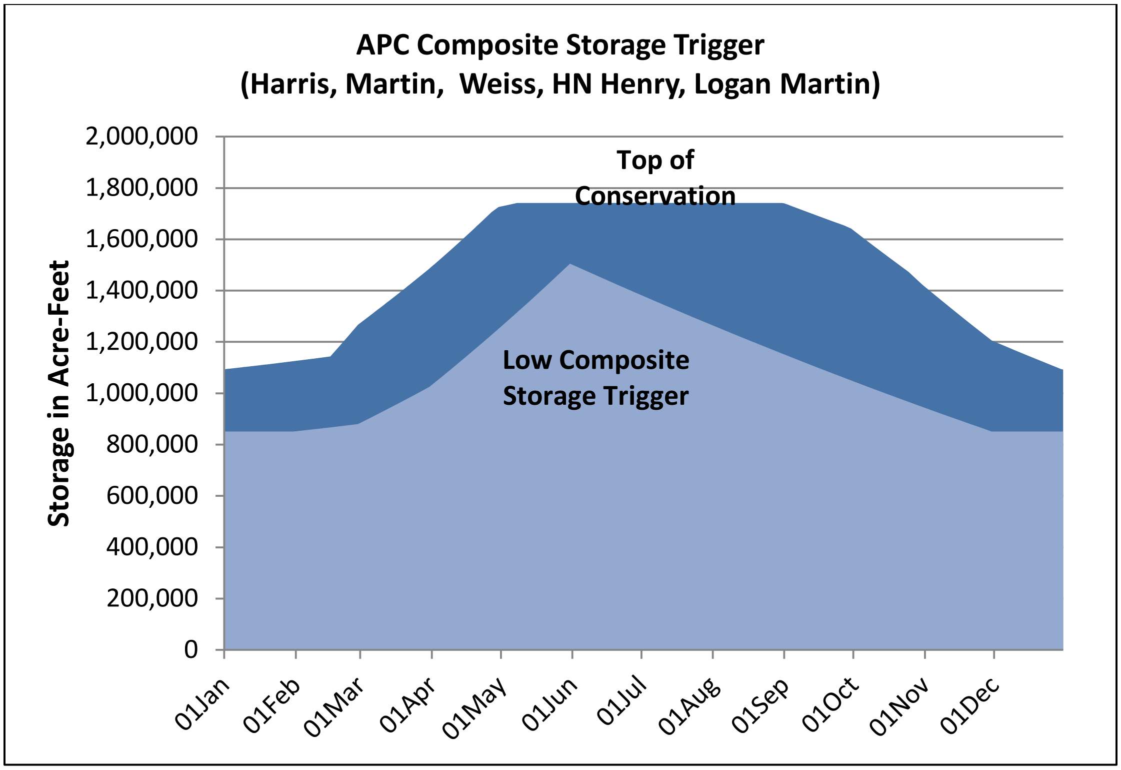

Figure 13. APC Low Composite Conservation Storage Drought Trigger

3. **Low state line flow**. A low state line flow trigger occurs when the Mayo's Bar USGS gage measures a flow below the monthly historical 7Q10 flow. The 7Q10 flow is defined as the lowest flow over a 7-day period that would occur once in 10 years. Table 9 lists the Mayo's Bar 7Q10 value for each month. The lowest 7-day average flow over the past 14 days is computed and checked at the 1st and 15th of the month. If the lowest 7-day average value is less than the Mayo's Bar 7Q10 value, the low state line flow indicator is triggered. If the result is greater than or equal to the trigger value from Table 9, the flow is considered normal, and the state line flow indicator is not triggered. The term state line flow is used in developing the drought management plan because of the proximity of the Mayo's Bar gage to the Alabama-Georgia state line and because it relates to flow data upstream of the Alabama-based APC reservoirs. State line flow is used only as a source of observed data for one of the three triggers and does not imply that targets exist at that geographic location. The ACT Basin drought matrix does not include or imply any Corps regulation that would result in water management decisions at Carters Lake or Lake Allatoona.

Table 9. State Line Flow Trigger

Month	Mayo's Bar (7Q10 in cfs)
Jan	2,544
Feb	2,982
Mar	3,258
Apr	2,911
May	2,497
Jun	2,153
Jul	1,693
Aug	1,601
Sep	1,406
Oct	1,325
Nov	1,608
Dec	2,043

Note: Based on USGS Coosa River at Rome Gage (Mayo's Bar, USGS 02397000) observed flow from 1949 to 2006

(2) Drought Regulation. The DIL is computed on the 1st and 15th of each month. Once a drought operation is triggered, the DIL can only recover from drought condition at a rate of one level per period. For example, as the system begins to recover from an exceptional drought with DIL 3, the DIL must be stepped incrementally back to zero to resume normal operations. In that case, even if the system triggers return to normal quickly, it will still take at least a month before normal operations can resume — conditions can improve only to DIL 2 for the next 15 days, then DIL 1 for the next 15 days, before finally returning to DIL 0.

For DIL 0, the matrix shows a Coosa River flow between 2,000 cfs and 4,000 cfs with peaking periods up to 8,000 cfs occurring. The required flow on the Tallapoosa River is a constant 1,200 cfs throughout the year. The navigation flows on the Alabama River are applied to the APC projects. The required navigation depth on the Alabama River is subject to the basin inflow.

For DIL 1, the Coosa River flow varies from 2,000 cfs to 4,000 cfs. On the Tallapoosa River, part of the year, the required flow is the greater of one-half of the inflow into Yates Lake and twice the Heflin USGS gage. For the remainder of the year, the required flow is one-half of Yates Lake inflow. The required flows on the Alabama River are reduced from the amounts when DIL 0.

For DIL 2, the Coosa River flow varies from 1,800 cfs to 2,500 cfs. On the Tallapoosa River, the minimum is 350 cfs for part of the year and one-half of Yates Lake inflow for the remainder of the year. The requirement on the Alabama River is between 3,700 cfs and 4,200 cfs.

For DIL 3, the flows on the Coosa River range from 1,600 cfs to 2,000 cfs. A constant flow of 350 cfs on the Tallapoosa River is required. It is assumed an additional 50 cfs will occur between Thurlow Lake, the City of Montgomery water supply intake. Required flows on the Alabama River range from 2,000 cfs to 4,200 cfs

In addition to the flow regulation for drought conditions, the DIL affects the flow regulation to support navigation operations. When the DIL is equal to zero, APC projects are operated to meet the needed navigation flow target or the 7Q10 flow as defined in the navigation measure section. Once DIL is greater than zero, drought operations will occur, and flow regulation to support navigation operations is suspended.

7-02. Extreme Drought Conditions. An extreme drought condition exists when the remaining composite conservation storage is depleted, and additional emergency actions may be necessary. When conditions have worsened to this extent, utilization of the inactive storage must be considered. Such an occurrence would typically be contemplated in the second or third year of a drought. Inactive storage capacities have been identified for the two federal projects with significant storage (Figures 14 and 15). The operational concept established for the extreme drought impact level and to be implemented when instituting the use of inactive storage is based on the following actions:

(1) Inactive storage availability is identified to meet specific critical water use needs within existing project authorizations.

(2) Emergency uses and users will be identified in accordance with emergency authorizations and through stakeholder coordination. Typical critical water use needs within the basin are associated with public health and safety.

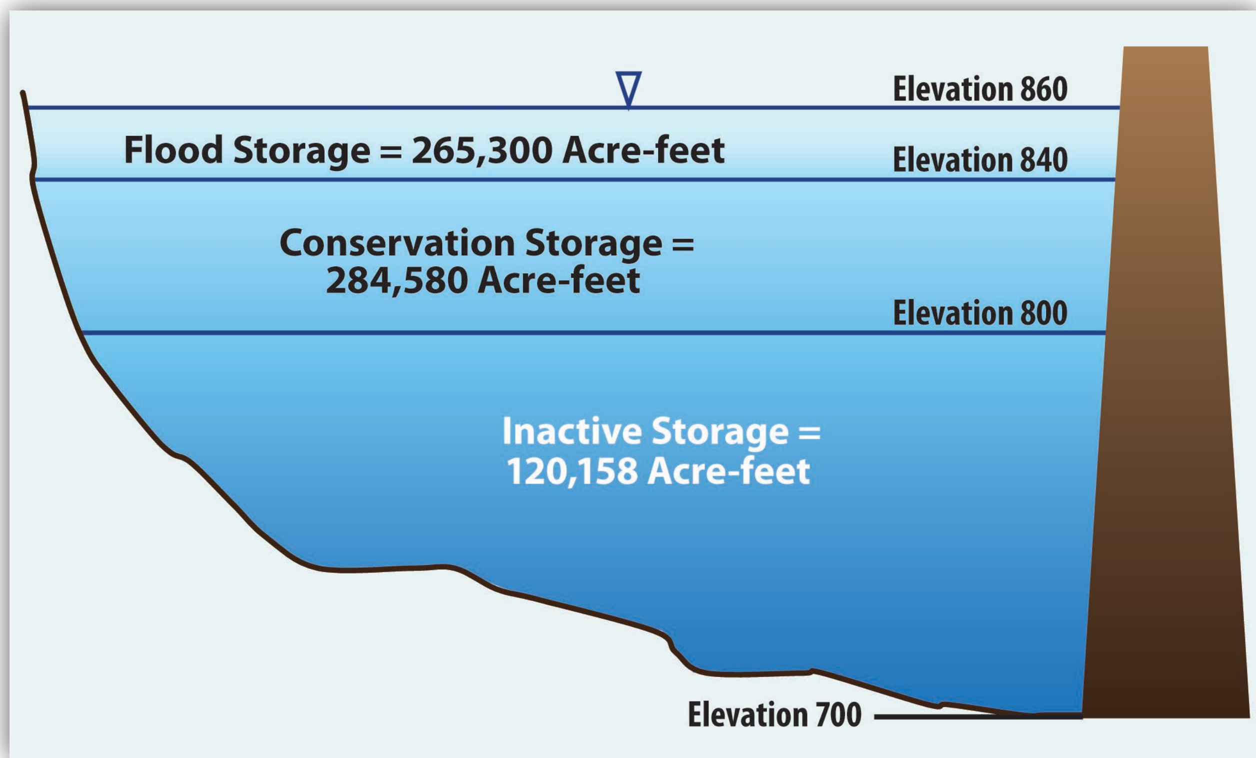

Figure 14. Storage in Lake Allatoona

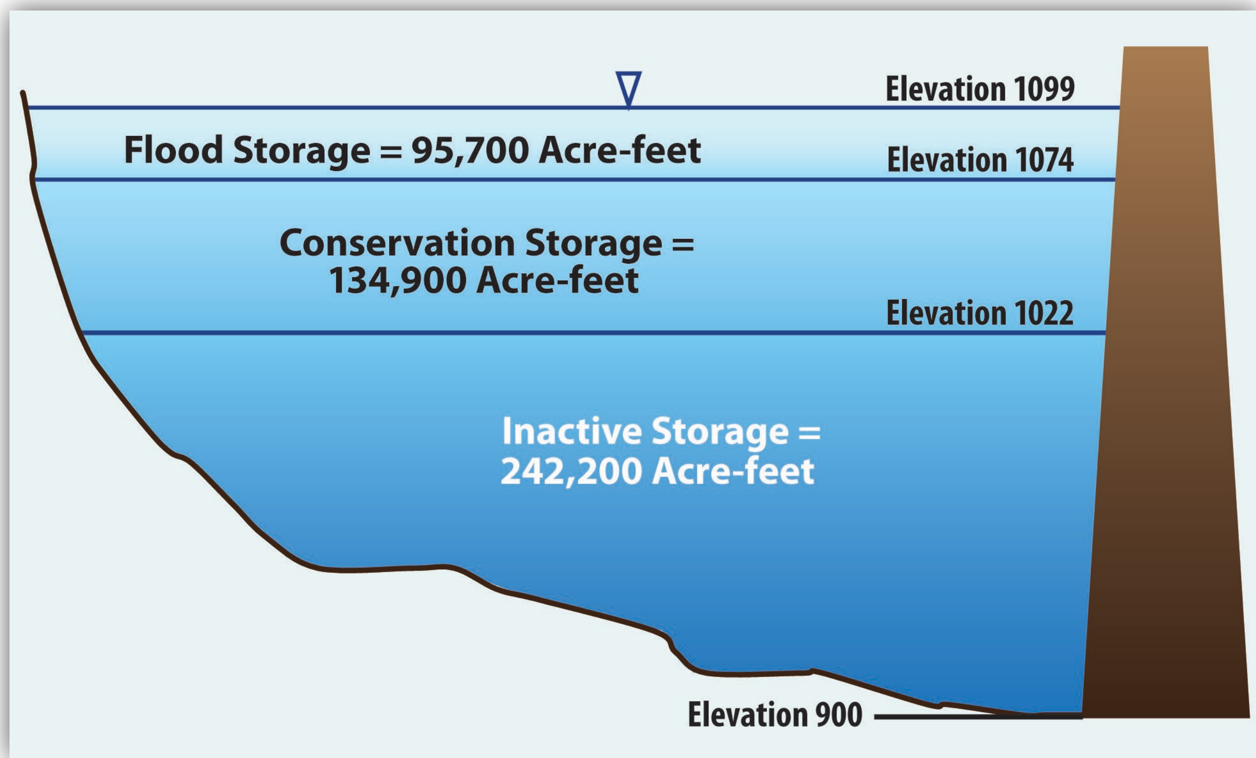

Figure 15. Storage in Carters Lake

(3) Weekly projections of the inactive storage water availability to meet the critical water uses in the ACT Basin will be utilized when making water control decisions regarding withdrawals and water releases from the federal reservoirs.

(4) The inactive storage action zones will be developed and instituted as triggers to meet the identified priority water uses (releases will be restricted as storage decreases).

(5) Dam safety considerations will always remain the highest priority. The structural integrity of the dams due to static head limitations will be maintained.

VIII – DROUGHT MANAGEMENT COORDINATION AND PROCEDURES

8-01. USACE Coordination. It is the responsibility of the Mobile District Water Management Section and APC to monitor climatological and hydrometeorological conditions at all times to make prudent water management decisions with water conservation as a priority. The Water Management Section makes daily decisions and coordinates regularly with APC and with other district representatives from the various areas for which the river systems are operated -- hydropower, recreation, navigation, environmental, and others to exchange information concerning the operation of the river system. This coordination includes conducting weekly meetings with these other district elements. Daily water management decisions regarding water availability, lake level forecasts, and storage forecasts are determined using the information obtained along with current project and basin hydrometeorological data. A weekly District River System Status report is prepared that summarizes the conditions in each of the river basins. When conditions become evident that normal low flow conditions are worsening, the Water Management Section will elevate the district coordination to a heightened awareness. When drought conditions are imminent, Emergency Management representatives will be notified of the conditions and will be included in the regular coordination activities.

8-02. <u>Interagency Coordination</u>. The Water Management Section will support the environmental team regarding actions that require coordination with the U.S. Fish and Wildlife Service (USFWS) for monitoring threatened and endangered species and with the Environmental Protection Agency (EPA), Georgia Environmental Protection Division (GAEPD), and Alabama Department of Environmental Management (ADEM) regarding requests to lower water quality minimum flow targets below Claiborne Dam.

8-03. <u>Public Information and Coordination</u>. When conditions determine that a change in the water control actions from normal regulation to drought regulation is imminent, it is important that various users of the system are notified so that any environmental or operational preparations can be completed prior to any impending reduction in reservoir discharges, river levels, and reservoir pool levels. In periods of severe drought within the ACT Basin it will be within the discretion of the Division Commander to approve the enactment of ACT Basin Water Management conference calls. The purposes of the calls are to share ongoing water management decisions with basin stakeholders and to receive stakeholder input regarding needs and potential impacts to users within the basin. Depending upon the severity of the drought conditions, the calls will be conducted at regular monthly or bi-weekly intervals. Should issues arise, more frequent calls would be implemented.

a. Local Press and Corps Bulletins. The local press consists of periodic publications in or near the ACF Basin. Montgomery, Columbus, and Atlanta have some of the larger daily papers. The papers often publish articles related to the rivers and streams. Their representatives have direct contact with the Corps through the Public Affairs Office. In addition, they can access the Corps Web pages for the latest project information. The Corps and the Mobile District also publish e-newsletters regularly, but they are not widely distributed to the general public. Complete, real-time information is available at the Mobile District's Water Management homepage http://www.sam.usace.army.mil/water/. The Mobile District Public Affairs Office issues press releases as necessary to provide the public with information regarding Water Management issues and activities and also provides information via the Mobile District web site.

IX – REFERENCES

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U. S. Geological Survey (USGS). 2000. *Droughts in Georgia*. Open-file report 00-380. U.S. Geological Survey, Atlanta, Georgia.

EXHIBIT G

EMERGENCY CONTACT INFORMATION

Emergency Contact Information

<u>Alabama Power Company:</u>

Reservoir Operations Supervisor	(205) 257-1401
Reservoir Operations Supervisor Alternate Daytime	(205) 257-4010
Reservoir Operations Supervisor After-Hours	(205) 257-4010

<u>US Army Corps of Engineers:</u>

Water Management Section	(251) 690-2737
Chief of Water Management	(251) 690-2730 or (251) 509-5368
H. Neely Henry Powerhouse	(256) 892-3172