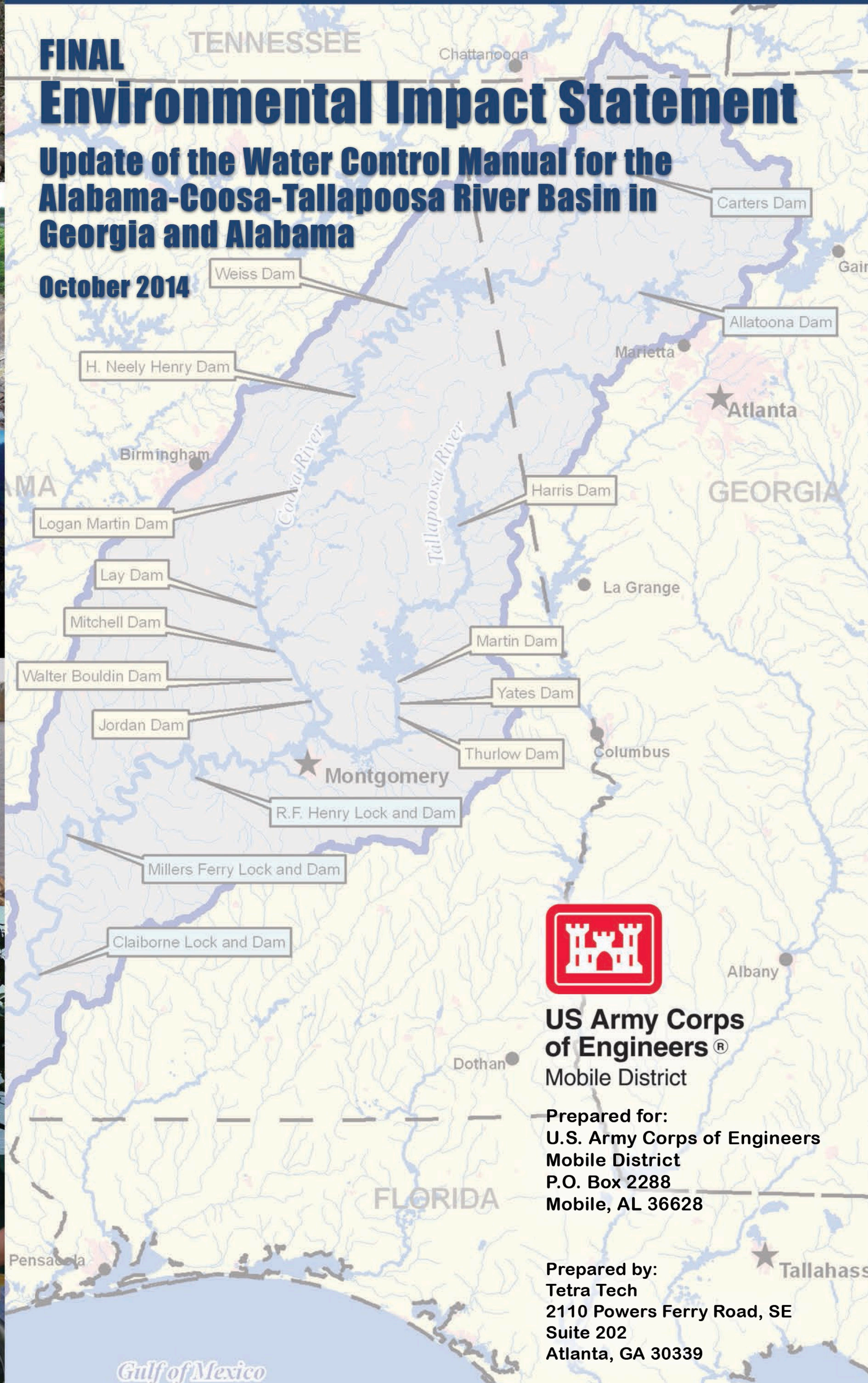
FINAL
Environmental Impact Statement

Update of the Water Control Manual for the Alabama-Coosa-Tallapoosa River Basin in Georgia and Alabama

October 2014





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ALABAMA-COOSA-TALLAPOOSA RIVER BASIN WATER CONTROL MANUAL

APPENDIX E

MILLERS FERRY LOCK AND DAM AND WILLIAM "BILL" DANNELLY LAKE

ALABAMA RIVER, ALABAMA

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

SEPTEMBER 1974
REVISED DECEMBER 2014 (scheduled)

(Looking upstream)

Millers Ferry Lock and Dam
Alabama River, Alabama

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 Millers Ferry Powerhouse can be reached at (334)-682-9124. The Lock Foreman can be reached at (334) 872-9525.

METRIC CONVERSION

Although values presented in the text are shown in English units only, a conversion table is listed in Exhibit B for your convenience.

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). It is the U.S. Army Corps of Engineers (herein referred to as USACE or Corps) policy that the designed, constructed, and maintained elevation grades of projects be reliably and accurately referenced to a consistent nationwide framework, or vertical datum - i.e., the National Spatial Reference System (NSRS) or the National Water Level Observation Network (NWLON) maintained by the U.S. Department of Commerce, National Oceanic and Atmospheric Administration. The current orthometric vertical reference datum within the NSRS in the continental United States is the North American Vertical Datum of 1988 (NAVD88). The current NWLON National Tidal Datum Epoch is 1983 - 2001. The relationships among existing, constructed, or maintained project grades that are referenced to local or superseded datums (e.g., NGVD29, MSL), the current NSRS, and/or hydraulic/tidal datums, have been established per the requirements of Engineering Regulation 1110-2-8160 and in accordance with the standards and procedures as outlined in Engineering Manual 1110-2-6056. A Primary Project Control Point has been established at this project and linked to the NSRS. Information on the Primary Project Control Point, designated 7A-3E, and the relationship between current and legacy datums are in Exhibit B.

MILLERS FERRY LOCK AND DAM

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

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PERTINENT DATA

(see Exhibit A, page E-A-1 for Supplementary Pertinent Data)

GENERAL

Location – Dallas and Wilcox Counties, Alabama; Alabama River, river mile 133.0

Drainage area R. F. Henry to Millers Ferry – sq. mi.	4,404
Total drainage area above dam site – sq. mi.	20,637

RESERVOIR

Maximum operating pool elevation - feet NGVD29	80.8
Length at elevation 80.8 feet NGVD29 – miles	105
Area at pool elevation 80.8 – acres	18,528
Total conservation volume between elev. 78.0 - 80.8 – acre-ft	46,704

GATED SPILLWAY

Total length, including end piers – feet	994
Number of piers, including end piers	18
Elevation of crest – NGVD29	46.0
Type of gates	Tainter
Size of gates – feet	50x35
Elevation of top of gates in closed position – NGVD29	81.0
Number of gates	17

EARTH OVERFLOW DIKES

Right Bank Dike (overtopped at about 240,000 cfs)	
Total length – feet	3,360
Top elevation – NGVD29	85.0
Top width – feet	25
Side slopes	1v on 2.5h
Left Bank Dike (overtopped at about 525,000 cfs)	
Total length including lock mound – feet	5,500
Top elevation – NGVD29	97.0
Top width – feet	32
Side slopes	1v on 2.5h

LOCK

Maximum lift – feet	48.8
Chamber width – feet	84
Chamber length – feet	600

POWER PLANT

Number of Units	3
Generator rating, 3 units @ 30,000 each – kW	90,000
Maximum Static Head (feet)	48

I - INTRODUCTION

1-01. Authorization. Section 7 of the Flood Control Act of 1944 instructed the Secretary of the Army to prescribe regulations for the use of storage allocated for flood control (now termed flood risk management) or navigation at all Corps reservoirs. This water control manual has been prepared as directed in the Corps' Engineering Regulation (ER) 1110-2-240, *Water Control Management, dated 8 October 1982*. This regulation prescribes the policies and procedures to be followed in carrying out water management activities, including establishment and updating of water control plans for Corps and non-Corps projects. This manual is also prepared under the format and recommendations described in ER 1110-2-8156, *Preparation of Water Control Manuals, dated 31 August 1995*; and ER 1110-2-1941, *Drought Contingency Plans, dated 15 September 1981*.

1-02. Purpose and Scope. The primary purpose of this manual is to document the reservoir regulation plan for the Millers Ferry Lock and Dam Project. Included are descriptions of physical components of the lock and dam, operating procedures, historical facts and other pertinent data. Also, presented are general characteristics of the area including: flood frequencies, meteorology, examples of reservoir regulation and a discussion on river forecasting. Details of the coordinated reservoir regulation plan for Millers Ferry Lock and Dam within the multiple project system of the Alabama River Basin are presented which insure optimum benefits consistent with the physical characteristics and 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 Millers Ferry 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. The *Alabama-Coosa-Tallapoosa River Basin Master Water Control Manual*, of which this is Appendix E, contains general information for the entire basin. Appendices to the basin master water control manual are prepared for all reservoir projects within the basin when one or more project functions are the responsibility of the Corps. Other manuals published for use by project personnel include Millers Ferry Lock and Dam Operation and Maintenance Manual, and CESAM Plan 500-1-4, Emergency Notification Procedures. A list of all the appendices for the ACT Basin and the master water control manual are listed below.

Alabama-Coosa-Tallapoosa River Basin Master Water Control 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)

1-04. Project Owner. The Millers Ferry Lock and Dam Project is a federally-owned project entrusted to the Corps, South Atlantic Division (SAD), Mobile District.

1-05. Operating Agency. The Corps' Mobile District operates the Millers Ferry Lock and Dam Project. Reservoir operation and maintenance are under the supervision of Operations Division. The project falls under the direction of the Operations Project Manager located at Tuscaloosa, Alabama. The powerhouse can be operated remotely from the R. F. Henry Lock and Dam Project. A powerhouse operator is on duty at one of these two locations 24 hours a day. Maintenance personnel at both powerhouses are on duty Monday – Thursday from 6:00 AM to 4:30 PM. The phone number for the powerhouse is (334) 682-9124 during duty hours. The phone number for the Jones Bluff Powerhouse (R. F. Henry) is (334) 875-4400. The lock is tended seasonally from 6:00 AM to 4:00 PM on Friday thru Monday during March-September and from Monday thru Thursday during October-February by operators under the direct supervision of a lock supervisor. The lock is closed on all Federal holidays. All commercial traffic must schedule an appointment for lockage. The lock will be made available 24 hours per day, seven days per week for appointments by commercial traffic. Non-commercial traffic may be accommodated during the hours the lock is manned, subject to the availability of lock operators and in conjunction with maintenance activities and as those activities allow. The office phone number of the lock is (334) 682-4877.

1-06. Regulating Agencies. Authority for the water control regulation of the Millers Ferry Project has been delegated to the SAD Commander. Water control regulation activities are the responsibility of the Mobile District, Engineering Division, Water Management Section. When necessary, the Water Management Section instructs the powerhouse operators and lockmaster regarding normal procedures and emergencies for unusual circumstances.

II - DESCRIPTION OF PROJECT

2-01. Location. Millers Ferry Lock and Dam is located 133.0 miles above the mouth of the Alabama River in the southwestern part of the State of Alabama about 10 miles northwest of the city of Camden, Alabama, and 30 miles southwest of the city of Selma, Alabama. The dam and the lower 25 miles of the reservoir are in Wilcox County and the upper 80 miles of the reservoir is in Dallas County. The project site is shown on Plate 2-1, and on Figure 2-1.

Figure 2-1. Millers Ferry Lock and Dam (looking upstream)

2-02. Purpose. Millers Ferry Project purposes include hydropower and navigation. Other generally authorized project purposes are public recreation, water quality, and fish and wildlife conservation and mitigation. Recreation facilities and access to the reservoir are provided, but recreation is typically not considered in water control decisions. There is no flood risk management storage for this project.

2-03. Physical Components. The Millers Ferry Project consists of a concrete gravity-type dam with a gated spillway, supplemented by earth dikes, a navigation lock and control station, a 90 megawatt (mw) power plant and a reservoir extending 105 miles upstream with a maximum operating pool at elevation 80.8 feet NGVD29. Upgrading of the generators from 75 mw to 90 mw was completed in 1998. Principal features of the project are described in detail in subsequent paragraphs. Sections, plan, and elevations of the dam and other features are shown on Plate 2-2.

a. Spillway. The spillway is a concrete gravity structure equipped with 17 tainter gates, 50 feet long and 35 feet high on a spillway crest at elevation 46 feet NGVD29. It has an overall length of 994 feet and a net length of 850 feet. The top of gates in closed position is at elevation 81 feet NGVD29 to allow a 0.2-foot freeboard above the normal reservoir level. The gates mounted between eight-foot wide piers are operated by individual electric hoists located on top of the piers. An access bridge for pedestrian traffic connects the top of the piers. Looking downstream, the spillway joins the lock on the left bank and the earth dike on the right bank. The spillway stilling basin consists of a horizontal concrete apron with a sloping end sill. The spillway will pass about 240,000 cfs before the right bank dike is overtopped.

b. Reservoir. The Millers Ferry Dam forms “William "Bill" Dannelly Lake” which has a full operating pool at elevation 80.8 feet NGVD29 covering an area of 18,528 acres. At pool elevation 80.8 feet NGVD29, the reservoir has a total volume of 346,254 acre-feet. At full pool it extends upstream a distance of 105 miles up the Alabama River and has a shoreline distance of about 556 miles. Area capacity curves are shown on Plate 2-3 and selected area and capacity values are tabulated on Table 2-1.

Table 2-1. William "Bill" Dannelly Lake Area and Capacity Values for Selected Elevations

POOL ELEV. (FEET NGVD29)	TOTAL AREA (ACRES)	TOTAL STORAGE (ACRE-FEET)		POOL ELEV. (FEET NGVD29)	TOTAL AREA (ACRES)	TOTAL STORAGE (ACRE-FEET)
17	0	0		80[7]	17,201	331,830
20	340	500		80.8[4]	18,528	346,254
25	930	3,660		81[5]	18,860	349,860
30	1,554	9,850		82	20,700	369,640
35	2,190	19,170		83	22,420	391,200
40	2,894	31,860		84	24,400	414,610
45	3,720	48,330		85[6]	26,243	439,930
[1]46	3,905	52,140		86	29,300	467,700
50	4,626	69,200		87	32,100	498,400
55	5,590	94,760		88	35,000	531,950
60	6,656	125,300		89	37,800	568,350
65	7,954	161,660		90	40,378	607,440
70	9,542	205,210		91	43,500	649,380
71	9,930	214,950		92	47,000	694,630
72	10,385	225,110		93	50,600	743,330
73	10,900	235,750		94	54,400	795,930
74	11,530	246,960		95	58,200	852,230
75	12,205	258,830		96	62,000	912,330
76	13,080	271,470		97	65,700	976,180
77[2]	14,030	285,030		98	69,500	1,043,780
78[3]	15,020	299,550		99	73,700	1,115,380
79	16,160	315,140		100	78,111	1,191,290

[1] Spillway crest
[2] Emergency drawdown elevation
[3] Minimum operating pool elevation
[4] Maximum operating pool elevation
[5] Top-of-gates - closed position
[6] Crest of free overflow dike
[7] Normal operating pool elevation

c. Earth Dikes. The earth dike on the left bank is in two sections. One of the sections consists of the lock mound which is parallel to the land side of the lock and extends downstream to the powerhouse. An upstream extension of the lock mound forms a training dike for the lock approach. The top of the mound is at elevation 97 feet NGVD29 and varies in width from 32 feet at the powerhouse to a maximum of 300 feet beside the lock. A service road runs along the mound from the powerhouse to the lock. The second section of the left bank dike begins on the east side of the powerhouse and extends to high ground. The top of the dike is at elevation 97 feet NGVD29, has a width of 32 feet and is traversed by an 18-foot roadway. The total length of the dike, including the lock mound, is 5,500 feet. The left bank dike would overtop at flows of about 525,000 cfs, which is 29,000 cfs above the Standard Project Flood. The dike on the right bank, which is designed for overtopping, extends from the end of the spillway westwardly to high ground, a distance of 3,360 feet. The top is at elevation 85 feet NGVD29, has a width of 25 feet and is traversed by an 18-foot roadway. Dumped riprap has been placed on both slopes of this dike for protection during periods of overtopping. Based on the 1971 - 2009 records it is estimated that there will be a 0.5% chance of overtopping in any one year, as shown on Plate 8-7. The general layout and typical- sections of the earth dikes are shown on Plate 2-2.

d. Lock. The lock is located between the gated spillway and the island separating the powerhouse from the lock. The lock chamber is 84 feet wide and has a usable length of about 600 feet. The length from center to center of the gate pintles is 655 feet. The top of the upper stoplog sill is at elevation 64 feet NGVD29 and the top of the lower sill is at elevation 19 feet NGVD29, 13 feet below the minimum tailwater at elevation 32 feet NGVD29. The tops of the lock walls are at elevation 87 feet NGVD29and the lower approach walls are at elevation 82.0 feet NGVD29. The lock filling and emptying system consists of two rectangular intake ports located on the river side of the upper gate block, which merge into a 10-foot square culvert in each of the chamber walls, a system of floor culverts located within the lock chamber, and an outlet structure on the riverside of the lock below the lower gate sill. The filling and emptying operation is controlled by reverse tainter valves located in the culverts. The volume of water discharged in acre-feet for each time the lock is emptied can be determined by multiplying the gross head by 1.264. The layout and a section of the lock are shown on Plate 2-2.

e. Lock Control Station. The Control Station is a three-story reinforced concrete building 41 feet long and 32 feet wide located on the lock monolith abutting the gated spillway. Control equipment for the operation of both the spillway and lock is located on the second floor of the station where an unobstructed view of the lock is provided. The third floor is at the same level as, and provides an exit to, the spillway access bridge.

f. Powerhouse. The powerhouse is situated on the left bank of the Alabama River between two earth dike sections of the dam, about 0.6 miles downstream from the axis of the spillway. The intake structure which is an integral part of the powerhouse has a deck over which the access road to the lock mound crosses. A 24 feet wide debris spillway is constructed adjacent to the powerhouse to facilitate the passing of trash that accumulates at the powerhouse. A 24 feet long by 18 feet high tainter gate controls the flow of water entering the debris spillway. The entire structure including the intake section is 320 feet long and 168.5 feet wide. The powerhouse itself is a reinforced concrete building containing three generation bays and one erection bay, each 80 feet wide. The generation units consist of fixed-blade propeller turbines, rated at 34,000 horsepower (hp) each with a net head of 35.5 feet, connected to vertical shaft generators rated at 30,000 kilowatts (kw). The layout and a typical section of the powerhouse are shown on Plate 2-2. Discharge curves based on generator output are shown on Plate 7-3. Rewinding of the generators was completed in 1998 which resulted in a capacity increase from 75 to 90 mw.

g. Switchyard. The switchyard is located on the east side of the powerhouse which is the left bank of the river. It is located on a mound at elevation 97 feet NGVD29. The principal structure in the switchyard is the main take-off structure for the outgoing lines. There are other structures for busses, disconnecting switches and potential transformers.

2-04. Related Control Facility. The Millers Ferry Powerhouse can be operated remotely from the Jones Bluff Powerhouse and Jones Bluff from Millers Ferry.

2-05. Real Estate Acquisition. Land acquisition authorization for the Millers Ferry Project was enacted under the River and Harbor Act of 2 March 1945, P.L. 79-14. The total acreage acquired for project purposes is 26, 788.020 acres. Of that total acreage, 4,007.30 acres were acquired in fee and 22,780.720 acres are currently held under perpetual easement. There are a total of 24 Real Estate Segment Maps traversing Autauga, Dallas, Lowndes, and Wilcox Counties, which depict the 831 tracts acquired and the final acquisition limits based on hydrological elevations. The area acquired in fee and easement for all project purposes is shown on Plates 2-4 and 2-5.

2-06. Public Facilities. William "Bill" Dannelly Lake, impounded by the Millers Ferry Dam, greatly enhances the opportunities for water-oriented recreation. The lake offers such activities as fishing, boating, water skiing, picnicking, camping, swimming, and hiking. The project features 15 recreation facilities operated by the Corps that are rustic but well facilitated for visitors. All public use areas are shown on Plates 2-4 and 2-5. Public facilities at Dannelly Lake are listed in Table 2-2 below.

Table 2-2. William "Bill" Dannelly Lake Public Facilities

Dannelly Lake	Visitor Center	Boat Launch	Fishing Deck	Wash House	Camping	Play Ground	Picnic Area	Picnic Shelter	Swimming Beach	Overlook	Hiking Trails
Millers Ferry Campground				y	y						
Steeles Landing		y					y				
Six Mile Creek		y		y	y	y	y	y			
Elm Bluff		y			y		y				
Bogue Chitto Cr.		y									
Chilatchee Creek		y		y	y		y			y	
Gees Bend		y				y	y	y			
Ellis Landing		y					y				
Bridgeport Beach				y		y	y	y	y		y
Training Dike						y	y	y			
Shell Creek		y					y				
East Bank Beach			y			y	y	y	y		
Resource Office	y										
East Bank											
West Bank							y				

III - HISTORY OF PROJECT

3-01. Authorization. The original project for the improvement of the Alabama River was authorized by Congress on 18 June 1878 to provide for a navigation channel four feet deep and 200 feet wide from the mouth to Wetumpka and was modified on 13 July 1892 to provide a 6-feet channel. Subsequent acts approved in 1905 and 1910 provided for a channel 4-foot deep at low water from the mouth to Wetumpka by the use of contracting dikes and dredging. This project was 62 percent complete in 1942, the last year that any new work was performed. The 9-foot navigation channel was authorized by the River and Harbor Act of March 2, 1945 (P. L. 79-14). The authorization refers to House Document 77-414. The House Document recommended the authorization of a general plan for the basin "...in accordance with plans being prepared by the Chief of Engineers." The basin plan at that time contemplated a 9-foot deep navigable channel from the mouth of the Alabama River to Rome, Georgia, to be achieved by open river works and locks and dams.

3-02. Planning and Design.

The first comprehensive report on the optimum use of the water resources of the basin was prepared by the Corps in 1934, and was printed as House Document No. 66, 74th Congress, 1st session (308 Report). The plan contemplated five navigation dams on the Alabama River.

A resolution of the Committee on Rivers and Harbors, House of Representatives, passed on 28 April 1936, requested that a review be made to determine if changes in economic conditions might warrant modification of the recommendations in House Document No. 66, 74th Congress, with regard to the Alabama River. A resolution of the Committee on Commerce, U. S. Senate, adopted 18 January 1939, requested a review to determine the advisability of constructing reservoirs on the Alabama-Coosa Rivers and tributaries for development of hydroelectric power and improvement for navigation.

The Chief of Engineers in a report submitted on 15 October 1941 and printed as House Document No. 414, 77th Congress, 1st Session, recommended a general plan for the development of the basin. Congress authorized in the River and Harbor Act of 2 March 1945 (P.L. 79-14) the initial and partial accomplishment of this plan. Planning studies for the initially authorized projects on the Alabama River to provide navigation facilities with the maximum hydroelectric power feasible began in 1945.

A site selection report for the entire Alabama River was submitted on 10 December 1945, which determined that the overall project for the Alabama River should consist of dredging in the lower river, and navigation dams and locks at Claiborne, Millers Ferry and Jones Bluff upstream with power plants added to the latter two projects. The first design memorandum for Millers Ferry presenting “Basic Hydrology” was submitted on 26 January 1962. It was followed by the “General Design” on 2 February 1962, and then by 11 design memoranda for particular features of the project during the next two years.

3-03. Construction.

A contract for the construction of the dam and lock at Millers Ferry site was awarded to the Morrison-Knudsen and Bates & Rogers Companies, as a joint venture, on 16 October 1964, for the sum of $18,692,541. The lock and a portion of the spillway were completed in June 1968 to the extent that the reservoir could be filled to elevation 72 feet NGVD29 and the lock placed in temporary operation. In March 1969, the pool was lowered to elevation 67 feet NGVD29 because of complications with the cofferdam protecting the powerhouse construction and use of the lock was suspended. Construction progressed by late fall of 1969 including the completion of the spillway, so that the pool could be raised sufficiently to resume navigation.

The powerhouse construction was awarded under a separate contract on 19 July 1966 to Blount Brothers Company for the sum of $16,373,000. The first generating unit was placed in operation on 15 April 1970 and the second unit one week later. The third unit was placed in operation on 27 May 1970. When the third power unit was placed in operation the project was considered to be essentially complete at a total cost of approximately $58,900,000.

A trash gate was installed in 2004 to assist in passing drift that gets stuck behind the spillway and powerhouse. It is located directly adjacent to the powerhouse and is shown in Figure 3-1.

In December 1970, P.L. 91-583 named the lake formed by the Millers Ferry Lock and Dam the William "Bill" Dannelly Lake.

Figure 3-1. Trash Gate at Millers Ferry Project

3-04. Related Projects. Millers Ferry Lock and Dam is one of three projects that provide navigation from the Port of Mobile, Alabama, to Montgomery, Alabama. Claiborne Lock and

Dam is located downstream at river mile 72.5. R. F. Henry Lock and Dam, which also has hydropower capability, is located upstream at river mile 236.3.

3-05. Modifications to Regulations. When the Millers Ferry Project first became operational, the regulation plan called for a normal operating pool at elevation 80.0 feet NGVD29 with a maximum drawdown of one foot to elevation 79.0 feet NGVD29 for power operations. To compensate for the small releases over the weekends by the Alabama Power Company (APC) projects on the Coosa and Tallapoosa Rivers, the full pool has been raised to elevation 80.8 feet NGVD29 with a maximum drawdown to elevation 78.0 feet NGVD29. The additional storage in these 2.8 feet of drawdown may be used on weekends to enhance navigation below Claiborne Lock and Dam and meet low flow requirements for downstream industries. This is discussed in more detail in the water control plan (Chapter VII).

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

IV - WATERSHED CHARACTERISTICS

4-01. General Characteristics. The Alabama-Coosa-Tallapoosa River System drains a small portion of Tennessee, northwestern Georgia, and northeastern and east-central Alabama. The Alabama River Basin has its source in the Blue Ridge Mountains of northwest Georgia. The main headwater tributaries are the Oostanaula and Etowah Rivers, which join near Rome, Georgia, to form the Coosa River. The Coosa River in turn joins the Tallapoosa River near Wetumpka, Alabama, approximately 14 miles above Montgomery, Alabama, to form the Alabama River. Plate 2-1 shows a map of the ACT River Basin.

Millers Ferry Lock and Dam is located on the Alabama River at river mile 133 (above the confluence of the Tombigbee and Alabama Rivers which form the Mobile River in southwestern Alabama). Above Millers Ferry Dam site, the Alabama River Basin has a drainage area of 20,637 square miles, a length of 612 river miles (consisting of the Alabama, Coosa, Oostanaula, and Coosawattee Rivers) and an average width of 79 miles.

4-02. Topography. The ACT River Basin is composed of an unusually wide range of topographic areas. The location of the river basin is within parts of five physiographic provinces: the Blue Ridge Province; the Valley and Ridge Province; the Piedmont Plateau; the Cumberland Plateau; and, the Coastal Plain. Each of these physiographic sub-divisions influences drainage patterns. High rounded mountains and steep narrow valleys characterize the northeastern portion of the basin in the Blue Ridge Province. Overburden is sparse except in the valley floodplains. The topography of the Valley and Ridge Province is alternating valleys and ridges with altitudes varying from approximately 600 to 1,600 feet. The dominant characteristics of the Cumberland Plateau are flat plateaus ranging in altitude from 1,500 to 1,800 feet that bound narrow, northeast southwest trending valleys. Rolling hills and occasional low mountains topographically characterize the Piedmont Province. Altitudes range from 500 to 1,500 feet. Low hills with gentle slopes and broad shallow valleys that contain slow-moving meandering streams with wide floodplains characterize the topography of the Coastal Plain. The Alabama River flows through a broad lowland valley that varies in width from 3 to 10 miles throughout the length of the Millers Ferry Lock and Dam Project. Above the Cahaba River, the south side of the river borders the Black Belt, a prairie land so named for its rich, black soil and flat to gently rolling prairie land developed over the Selma Chalk Formation, and the northern side of the river is bounded by stable formations that are more resistant to erosion. Exposed hillsides with a greater relief is characteristic of this northern side. Below the Cahaba River, the river strikes a broad, meandering, south-westerly course through the valley falling at a rate of 0.5-foot per mile. Normal river elevation is below the floodplain. There are numerous tributaries entering the river from both sides and are rather evenly distributed between the upper and lower limits of the lake. Primary tributaries are the Cahaba and Blueberry Rivers, and the Autauga, Catoma, Pintlana, Big Swamp, and Boguechitto Creeks.

4-03. Geology and Soils. The ACT River Basin covers an unusually wide range of geologic conditions. The location of the river basin is within parts of five physiographic provinces: the Blue Ridge Province; the Valley and Ridge Province; the Piedmont Plateau; the Cumberland Plateau; and, the Coastal Plain. Each of these physiographic sub-divisions influences drainage patterns. Rugged crystalline rocks characterize the northeastern portion of the basin in the Blue Ridge Province. Folded limestone, shale, and sandstone compose the Valley and Ridge Province. The axes of the folds that trend northeast-southwest influence the course of the streams in that they tend to flow southwestward along the alignment of the geologic structure. Like the Valley and Ridge Province -- folded, faulted, and thrusted rocks form the Cumberland

Plateau -- with the deformation being less than the Valley and Ridge rocks. The east-central portions of the basin are in the Piedmont Province, characterized by sequences of metamorphic and igneous rocks. Prominent topographic features generally reflect the erosional and weathering resistance of quartzite, amphibolite, and plutonic rocks. The residual soils are predominately red sandy clays and gray silty sand derived from the weathering of the underlying crystalline rocks. The more recent sedimentary formations of the Coastal Plain underlie the entire southern portion of both river basins. The contact between the Coastal Plain on the south and the previously described physiographic provinces to the north is along a line that crosses the Cahaba River near Centreville, Alabama; the Coosa River near Wetumpka, Alabama; and the Tallapoosa River near Tallassee, Alabama. As the rivers leave the hard rocks above this line and enter the softer formations of the Coastal Plain, the erosion properties change, resulting in the formation of rapids. This line is a geological divide commonly known as the "fall line". The rocks of the Coastal Plain are typically poorly consolidated marine sediments.

Millers Ferry Dam site is in the Gulf Coastal Plain physiographic province. Within the dam and reservoir area the topography is characterized in part by rolling hills and in part by gently rolling prairie land. Sediments in the area consist of typical coastal plain deposits of variably interbedded limestones, clays, sands, and sandstones of Cretaceous and Tertiary age. Regionally, the coastal plain sediments in Alabama dip gently to the south and southwest with only local variations. The geologic structure at the dam site conforms to this regional pattern.

4-04. Sediment. Sedimentation ranges were established for the entire reservoir length and the original surveys were made in 1973. The ranges were resurveyed in 1982, 1988, and again in 2009. Key ranges are resurveyed at regular intervals for any appreciable changes in channel geometry. The latest survey was in 2009 and is retained in the Hydraulic Data and Sedimentation Unit at the Mobile District Office. Sedimentation range locations are shown on Plates 4-1 and 4-2.

Based on the survey data, the William “Bill” Dannelly Lake has consistently undergone light to medium sedimentation over the lower three-fourths of the lake. The upper one-fourth of the lake has undergone light sedimentation and bed scour. The difference between the upper and lower ends of the lake may be attributed to sediment starvation due to the upper end being immediately below R. F. Henry Lock and Dam. Because R. F. Henry Lock and Dam is essentially a run-of-the-river project, it is likely that only particles more coarse than the smallest gravels become permanently trapped above the lock and dam and are prevented from entering Dannelly Lake.

4-05. Climate

a. Temperature. The ACT Basin area has long, warm summers, and relatively short, mild winters. In the southern end of the basin, the average annual temperature is 64 °F with a mean monthly range from 45 °F in January to 80 °F in July and August. In the northern end, the average annual temperature is 62 °F with a mean monthly range from 42 °F in January to 79 °F in July. Extreme temperatures recorded in the basin range from a low of minus 17 °F at Lafayette, Georgia, in January 1940 to a high of 112 °F at Centreville, Alabama, in September 1925. The frost-free season varies from about 200 days in the northern valleys to about 260 days in the southern part of the basin. The normal monthly and annual temperatures for various stations in and nearby the Millers Ferry watershed are shown on Table 4-1. 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. Extremes and average temperature data at six representative stations throughout the basin are shown on Plate 4-3. The location of the stations is shown on Plate 4-4.

Table 4-1. Normal 30-year Air Temperature for Selected Sites in/near Millers Ferry Basin
(Based on 1981 to 2010 Normals published by National Weather Service)

Normal Temperature Based on 30-Year Period – 1981 Through 2010 (degrees Fahrenheit)														
Station		**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUNE**	**JULY**	**AUG**	**SEPT**	**OCT**	**NOV**	**DEC**	**ANNUAL**
Greenville (USC00013519)	Max	57.6	61.7	69.1	75.9	83.0	88.3	90.4	90.0	85.7	77.2	68.4	59.4	75.6
	Mean	45.5	49.2	55.7	62.5	70.6	76.8	79.3	79.0	74.4	64.7	55.6	47.5	63.4
	Min	33.4	36.7	42.3	49.1	58.2	65.3	68.2	68.1	63.1	52.2	42.8	35.6	51.3
Demopolis L&D (USC00012245)	Max	55.0	59.4	67.6	75.2	82.9	88.5	91.0	90.5	85.4	76.1	66.8	57.2	74.6
	Mean	43.5	47.3	54.7	62.1	70.6	77.1	79.9	79.5	74.0	63.5	54.0	45.7	62.7
	Min	32.1	35.3	41.8	49.1	58.3	65.7	68.8	68.6	62.6	50.9	41.2	34.2	50.7
Camden 3NW (USC00011301)	Max	56.7	61.4	69.9	77.0	84.2	89.6	91.7	91.4	87.2	77.7	68.0	59.1	76.2
	Mean	46.0	49.9	57.5	64.5	72.3	78.8	81.0	80.7	75.9	65.6	56.2	48.2	64.7
	Min	35.2	38.5	45.2	52.0	60.4	68.0	70.3	69.9	64.6	53.6	44.4	37.3	53.3
Selma (USC00017366)	Max	57.4	61.5	69.6	76.4	84.0	89.8	92.0	91.6	86.9	77.7	68.6	59.1	76.3
	Mean	46.4	50.2	57.1	63.7	72.3	79.1	81.7	81.3	76.2	65.9	56.2	48.2	64.9
	Min	35.4	38.9	44.7	51.0	60.5	68.3	71.3	70.9	65.5	54.0	43.7	37.3	53.5
Millers Ferry Basin	Max	56.7	61.0	69.1	76.1	83.5	89.1	91.3	90.9	86.3	77.2	68.0	58.7	75.7
	Mean	45.4	49.2	56.3	63.2	71.5	78.0	80.5	80.1	75.1	64.9	55.5	47.4	63.9
	Min	34.0	37.4	43.5	50.3	59.4	66.8	69.7	69.4	64.0	52.7	43.0	36.1	52.2

b. Precipitation. The ACT Basin lies in a region of heavy annual rainfall which is fairly well distributed throughout the year. The normal annual precipitation for the Millers Ferry watershed and nearby area is 54.71 inches. Fifty-eight percent of the rainfall occurs during the winter and spring months, 23 percent in the summer, and 19 percent in the fall. The normal monthly and annual precipitations for various reporting stations in or near the Millers Ferry basin are shown on Table 4-2. The maximum calendar year rainfall over the ACT Basin was 78 inches in 1929 and the minimum annual was 32 inches in 1954. The highest annual station rainfall recorded in the ACT Basin was 104.03 inches at Flat Top, Georgia, in 1949; the lowest recorded was 22.00 inches at Primrose Farm, Alabama, in 1954. The light snowfall that occasionally occurs seldom covers the ground for more than a few days and has never affected any major flood in the basin. Precipitation extremes and averages for the basin are shown on Plate 4-5.

Table 4-2. Normal 30-year Precipitation for Selected Sites in/near Millers Ferry Basin
(Based on 1981 to 2010 Normals published by National Weather Service)

Normal Precipitation Based on 30-Year Period – 1981 Through 2010 (inches)														
Station		**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUNE**	**JULY**	**AUG**	**SEPT**	**OCT**	**NOV**	**DEC**	**ANNUAL**
Greenville (USC00013519)	Mean	5.27	4.86	6.10	3.97	3.94	5.00	5.79	4.76	4.17	3.64	5.20	4.66	57.36
Demopolis L&D (USC00012245)	Mean	5.44	5.37	5.04	4.45	4.13	4.14	4.68	4.60	3.69	3.54	4.62	4.82	54.52
Camden 3NW (USC00011301)	Mean	5.54	5.09	5.93	4.12	4.32	4.25	5.56	4.15	3.57	2.86	5.32	5.14	55.85
Selma (USC00017366)	Mean	4.75	5.03	5.47	3.93	3.26	4.07	4.72	4.42	3.32	2.68	4.55	4.89	51.09
Millers Ferry Basin	Mean	5.25	5.09	5.64	4.12	4.08	4.37	5.19	4.48	3.69	3.18	4.92	4.88	54.71

4-06. Storms and Floods

a. General. Flood-producing storms may occur over the basin anytime but are more frequent during the winter and early spring. These storms are usually of the frontal variety lasting two to four days. Summer storms are the convective type thundershowers with high intensity rainfall over small areas which produce local floods. In the summer and fall, occasional heavy rains may accompany dissipating tropical cyclones.

b. Record Floods. A major storm system in the spring of 1990 produced record floods on the Alabama River. On March 16, 1990, with the river still high from previous rains, the entire basin received very heavy rainfall for two days. For the two day total R. F. Henry reported 9.0 inches, Millers Ferry reported 6.75 inches and Claiborne had 9.5 inches. The upper ACT Basin received an average of 6-7 inches during this period. Millers Ferry produced a discharge of 220,730 cfs on March 23, 1990, producing a record pool elevation of 83.22 feet NGVD29. The largest known flood at Millers Ferry is the historical flood of April 1886 with an estimated peak discharge of 286,500 cfs. . Another significant flood occurred on 11-16 March 1929, when 10 inches of rainfall over a period of three days was recorded in the vicinity of Auburn, Alabama.

c. Flood Damages. While the Millers Ferry Dam does not provide flood storage, the USGS stream gage “Alabama River Below Millers Ferry L&D Near Camden, AL”, number 02427506, located below the dam, is used as a basis for determining flood stages and damages in the tailwater below the dam. Impacts begin to occur at a tailwater elevation of 66 feet NGVD29 with lowland flooding of farms and pasturelands in the immediate area. At elevation 80 feet NGVD29, some fishing camps begin to flood as well as some secondary roads.

4-07. Runoff Characteristics. The streams which constitute the Alabama River above Millers Ferry Dam site exhibit wide variations in runoff characteristics, ranging from very flashy in the mountainous regions of the Coosa Basin above Rome, Georgia, to very slow rising and falling in the lower reaches. The mean discharge at the dam site during the time the dam has been in operation (May 1970 through December 2009) is 31,232 cfs or about 1.51 cfs per square mile. (20,637 sq mi).

Streamflow at Dam Site. A gaging station was established at Millers Ferry by the Environmental Science Services Administration (ESSA)-Weather Bureau in 1931. The site is one mile upstream from the Millers Ferry Dam site. The ESSA Weather Bureau has observed stages there continuously since 1931. In 1937, the U.S. Geological Survey (USGS) began publishing mean daily flows at the site and did so until 1954. In order to continue the flow record, a computation was made to transfer mean daily flows from the Claiborne gage, 66 miles downstream, up to the Millers Ferry Dam site by a drainage area ratio for the period from 1954 through 1970. From May 1970 through December 2009, Millers Ferry outflow records are available from the Mobile District Water Management Section. The entire mean daily flow record from 1937 through December 2009 is shown on Plates 4-6 through 4-12. The mean discharge for the May 1937 - Dec 2009 period is 29,249 cfs. Mean monthly and annual flows for the same period are shown on Plates 4-13 and 4-14.

4-08. Water Quality. Water quality in Dannelly Lake is influenced by lake dynamics and various sources of pollutant loads to the lake including tributaries and upstream contributions, point and non point sources. Loads from upstream include those from the Alabama and Cahaba Rivers. Point sources are generally municipal and industrial discharges regulated by the Alabama Department of Environmental Management (ADEM) and agricultural areas contribute the largest percentage of non point sources.

The reservoir has not been identified as impaired by ADEM for violating State water quality standards. ADEM has set a standard for chlorophyll *a* in the lake of 17 μg/L during the growing season from April through October. The average chlorophyll *a* measured in the forebay by ADEM during the 2005 wet year was 11 μg/L and in the 2000 dry year, 12 μg/L, which is less than the State standard. Dissolved oxygen in the forebay does fall below the State standard during low flow periods of the growing season. These violations do not occur to the extent the State would define the reservoir as impaired. Temperature in the surface waters of the forebay average around 77 °F in the growing season, ranges increase up to 86 °F. Shallower embayments of the reservoir have greater fluctuations in parameters. As an example, chlorophyll *a* has been measured as high as 19 μg/L and surface dissolved oxygen in violation of the State standard, but not to the extent where stations would be defined as impaired by the State.

In 2005, ADEM also established the need for a 57 percent load reduction of CBODu (Ultimate Carbonaceous Oxygen Demand) from the Millers Ferry Dam to ensure water quality standards for dissolved oxygen can be achieved downstream of the reservoir. The Corps conducted a survey of longitudinal dissolved oxygen from Millers Ferry Dam downstream to river mile 112. During a period from June through August, dissolved oxygen was measured at various locations along the river. Dissolved oxygen along this reach often falls below the State dissolved oxygen standard; in the past the Corps has made special releases of flow during periods of low dissolved oxygen when water was available for such releases. The results of this survey concluded that increased flow releases from Millers Ferry Dam would benefit downstream water quality by increasing dissolved oxygen.

4-09. Channel and Floodway Characteristics. The navigation channel from the mouth of the Alabama River to Montgomery, Alabama has an authorized depth of nine feet and a width of 200 feet. There are no major flood damage centers immediately downstream of the Millers Ferry Project.

4-10. Upstream Structures. The Corps' R. F. Henry Lock and Dam Project is located on the Alabama River immediately upstream. Further upstream are six Alabama Power projects on the Coosa and Tallapoosa Rivers, and two Corps projects, Allatoona and Carters, located on the Etowah and Coosawattee Rivers respectively. In October 2004, the Marvel Slab Dam on the Cahaba River was removed to improve the ecological integrity of the river. The dam, constructed approximately 40 years earlier, was essentially a roadbed with culverts for crossing the river. Another upstream structure, the Hickory Log Creek Project, was constructed in 2007 by the city of Canton, Georgia and Cobb County–Marietta Water Authority (CCMWA), and is located approximately 25 miles northeast of Allatoona Dam. Table 4-3 shows the upstream projects and their drainage areas as well as the only downstream project, Claiborne Lock and Dam.

4-11. Downstream Structures. Below Millers Ferry Lock and Dam is Claiborne Lock and Dam. Claiborne is a Corps project with a drainage area of 836 square miles from Millers Ferry to Claiborne.

Table 4-3. Federal and Non-Federal Projects in the ACT Basin

Agency	Alabama River Projects	Drainage Area sq. mi.
COE	**Claiborne	21,473
COE	Millers Ferry	20,637
COE	R. F. Henry	16,233
	Coosa River Projects	
APC	*Jordan/Bouldin	10,102
APC	Mitchell	9,778
APC	Lay	9,053
APC	Logan Martin	7,743
APC	Neely Henry	6,596
APC	Weiss	5,270
COE	Allatoona	1,122
COE	Carters	374
Canton/CCMWA	***Hickory Log Creek	8
	Tallapoosa Projects	
APC	Thurlow	3,308
APC	Yates	3,293
APC	Martin	2,984
APC	Harris	1,454

* Jordan Dam is located on the Coosa River at river mile 18.9. Walter Bouldin Dam is located on a by-pass of the Jordan Dam and discharges into a canal which enters the Woodruff Lake at Coosa River mile 4.2.
** Downstream projects
*** Water is pumped directly from the Etowah River to support project, thus such a small drainage area.

4-12. Economic Data. The watershed surrounding the Millers Ferry Project consists of Marengo and Wilcox Counties within Alabama. The watershed includes both developed urban and residential land uses and rural land uses within the watershed.

a. Population. The 2010 population of the two counties bordering the Millers Ferry Lock and Dam Project totaled 32,697. The income data for each county is shown in Table 4-4 below.

Table 4-4. Income Data per County

County	Population (2010)	Per Capita Income	Persons living below poverty
Marengo County	21.027	18,323	22.7%
Wilcox County	11,670	12,573	38.5%
Total	32,697		

b. Agriculture. The Millers Ferry watershed and basin below consist of approximately 814 farms totaling 349,000 acres. In 2005, the agricultural production in the area totaled $20 million in farm products sold and total farm earnings of $8 million. Agriculture in the Millers Ferry Lock and Dam watershed and basin consists primarily of livestock, which accounts for 84 percent of the value of farm products sold. Table 4-5 contains agricultural production information and farm earnings for each of the counties within the Millers Ferry Project watershed and basin below.

Table 4-5. Agricultural Production and Income per County

County	2005 Farm Earnings ($1,000)	Number of Farms	Total Farm Acres (1,000)	Acres Per Farm	Value of Farm Products Sold ($1,000)	Percent Sold From	
						Crops	Livestock
Alabama							
Marengo County	4,967	508	189	372	15,000	11.6	88.4
Wilcox County	3,067	306	160	523	5,000	20.8	79.2
Totals	8,034	814	349	428	20,000		
Source: U.S. Census Bureau, County and City Data Book: 2007							

c. Industry. The leading industrial sectors that provide non-farm employment are local and state government, retail trade, and manufacturing. In 2005, the Millers Ferry Project area counties had 37 manufacturing establishments that provided 3,454 jobs with total earnings of more than $193 million. Table 4-6 shows information on the manufacturing activity for each of the counties in the Millers Ferry Lock and Dam watershed and basin below.

Table 4-6. Manufacturing Activity per County

County	No. of Manufacturing Establishments	Total Manufacturing Employees	Total Earnings ($1,000)	Value Added by Manufactures ($1,000)
Alabama				
Marengo County	25	2,607	123,500	220,760
Wilcox County	12	847	70,068	(D)
Totals	37	3454	193,568	

(D)-Data withheld to avoid disclosure *Source: U.S. Census Bureau, County and City Data Book: 2007*

d. Flood Damages. Because the dam is considered a run-of-the-river project, with very little storage, there are no quantifiable flooding impacts from the project. A summary of water surface elevations for Millers Ferry tailwater and associated impacts downstream is shown on Table 4-7.

Table 4-7. Flooding Impacts for Alabama River below Millers Ferry

USGS Gage 02427506	Flooding Impacts
(feet NGVD29)	
19.000	Gage Datum
61	Action Stage
66	Flood Stage: Farm and pasturelands in the area will flood and cattle should be moved to higher ground.
80	Moderate Flood Stage: Flooding of some fishing camps as well as a few secondary roads will occur at these stages.
83	Major Flood Stage

V - DATA COLLECTION AND COMMUNICATION NETWORKS

5-01. Hydrometeorological Stations.

a. Facilities. Management of water resources requires continuous, real-time knowledge of hydrologic conditions. The Mobile District contracts out the majority of basin data collection and maintenance to the U.S. Geological Survey (USGS) and National Weather Service (NWS) through cooperative stream gaging and precipitation network programs. The USGS, in cooperation with other federal and state agencies, maintains a network of real-time gaging stations throughout the ACT Basin. 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. 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. The gage locations are discussed in Chapter VI related to hydrologic forecasting.

Reservoir project data are obtained through each project's Supervisory Control and Data Acquisition (SCADA) system and provided to the Water Management Section both daily and in real-time.

Figure 5-1. 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

The Water Management Section employs a staff of hydrologic field technicians and contract work to USGS to operate and maintain Corps' gages throughout the ACT Basin. Corps personnel also maintain precipitation gages at project locations over the ACT Basin.

All rainfall gages equipped as Data Collection Platforms are capable of being part of the reporting network. Data is received from 22 stations in and around the Alabama River Basin from Montgomery to Millers Ferry Lock and Dam. The data are recorded in 15-minute intervals and these data are reported hourly. The 10 stations listed in Table 5-1 are considered the rainfall reporting network for the R. F. Henry, Millers Ferry, and Claiborne Projects. The locations of these rainfall stations are shown on Plate 5-1. River conditions above Montgomery are reflected in outflows from Jordan-Bouldin Dam on the Coosa River, and the Thurlow Dam on the Tallapoosa River.

Rainfall and upstream conditions are updated regularly throughout the day. Forecast of runoff are prepared and compared to those prepared by the River Forecast Center.

Table 5-1. Rainfall Reporting Network for the Alabama River Basin

Name	Agency	Agency ID	Latitude	Longitude
Montgomery, AL (at US 31)	USACE	15550	32.41139	-86.4083
Catoma Creek near Montgomery, AL	USACE		32.30722	-86.2994
R.F. Henry L&D near Benton, AL	USACE		32.31667	-86.7833
Selma, AL	USACE	17366	32.40556	-87.0186
Centreville, AL	USACE	11520	32.94500	-87.1392
Suttle, AL	USACE	17963	32.52917	-87.1989
Marion Junction, AL	USACE	15116	32.44389	-87.1803
Below Millers Ferry L&D near Camden, AL	USACE	11301	32.10000	-87.3981
Claiborne L&D near Monroeville, AL	USACE	11690	31.61500	-87.5506

All river stage gages equipped as Data Collection Platforms are capable of being part of the reporting network. Data is available from many stations in and adjacent to the ACT Basin. The river stage gages listed in the section of Table 5-2 titled “River Stage Gages in the Daily Hydrologic Network” are used to plan operations at the Millers Ferry Project. All of these stage gages are not required for daily operations but the information is available when desired. The locations of these and other river stage gages are shown on Plate 5-2. In addition, river stage gages listed in the section of Table 5-2 titled “Other River Stage Gages Within the Alabama River Basin” are available if necessary, but do not report daily.

In addition to the automated reporting stations, stage and flow data at APC projects are furnished to the Corps, Mobile District daily by the APC Birmingham office. The APC also receives Data Collection Platform transmissions directly from gages throughout the ACT Basin.

Data from the river-stage station at Millers Ferry can be received at any time by contacting personnel at the project. Pool and tailwater elevations as well as inflow and outflow at R. F. Henry, Millers Ferry, and Claiborne are reported each morning to the Water Management Section. Most of stations within the basin are maintained by the USGS.

Table 5-2. Reporting Stage Gages Used for Lower Alabama River Basin

USGS Gage	Name	Lat	Long	Drainage Area (sq. miles)	NGVD29 Datum	Flood Stage	Rain Gage
02420000	Alabama River Near Montgomery, AL	32.4114	-86.4083	15,087	97.90	35	No
02421000	Catoma Creek near Montgomery, AL	32.3072	-86.2994	290	151.02	20	No
02421350	Alabama River at R.F. Henry (Head Water)	32.3250	-86.7847	16,233	0.00		Yes
02421351	Alabama River at R.F. Henry (Tail Water)	32.3167	-86.7833	16,233	0.00	122	No
02423000	Alabama River at Selma, AL	32.4056	-87.0186	17,095	61.80	45	No
02424000	Cahaba River at Centreville, AL	32.9450	-87.1392	1,027	180.74	23	No
02424590	Cahaba River at Suttle, AL	32.5292	-87.1989	1,480	97.64	32	No
02425000	Cahaba River at Marion Junction	32.4439	-87.1803	1,766	86.72	36	No
02427505	Alabama River at Millers Ferry (Head Water)	32.1006	-87.3992	20,637	0.00		Yes
02427506	Alabama River at Millers Ferry (Tail Water)	32.1000	-87.3978	20,637	0.00	66	No
02428400	Alabama River at Claiborne (Head Water)	31.6150	-87.5506	21,473	0.00		No
02428401	Alabama River at Claiborne (Tail Water)	31.6134	-87.5506	21,473	0.00	42	No

b. Reporting. The Water Management Section 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 and retrieval to best meet all Corps water management activities.

Data are collected at Corps sites and 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 Data Collection Platform is a computer microprocessor at the gage site. A Data Collection Platform 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 Data Collection Platform then saves the information, performs simple analysis of it, and then transmits the information to a fixed geostationary satellite. Data Collection Platforms 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. 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 Data Collection Platform-transmitted, real-time data from the DOMSAT. Figure 5-3 depicts a typical schematic of how the system operates.

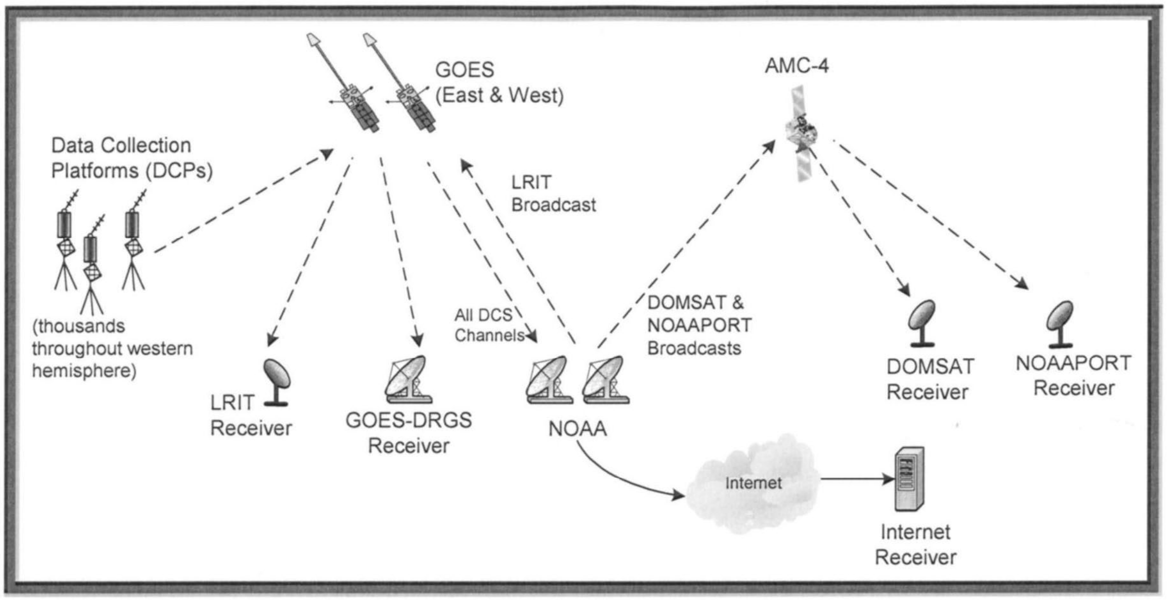


Figure 5-3. Typical configuration of the GOES System

Typically, reporting stations log 15-minute data that are transmitted every hour. A few remaining gages report every four hours, but they are being transitioned to the hourly increment. All river stage and precipitation gages equipped with a Data Collection Platform and GOES antenna are capable of being part of the reporting network.

The power plant at Millers Ferry Dam is operated locally or remotely from the control room at the R. F. Henry Dam powerhouse via a microwave link between the two projects. The remote system also produces visual observations of the project. Data from Millers Ferry Dam are automatically collected at the project and transmitted through the project's SCADA system and the Internet to R. F. Henry Dam and the Mobile District. Telephone is an option for other communications. Data for the project and the Data Collection Platforms are downloaded both daily and hourly through the Corps' server network to the Water Management Section.

c. Maintenance. The Corps, Mobile District has a cooperative program with the USGS and their office in Montgomery, Alabama for both maintenance and the exchange of data for the gages identified in the above paragraphs. Maintenance of the gages is accomplished by the USGS according to the program. If gages appear to be out of service, the following agencies can be contacted for repair:

U.S. Army Corps of Engineers, Mobile District, 109 Saint Joseph Street, Mobile, AL 36602-3630
Phone: (251) 690-2737 Web: http://water.sam.usace.army.mil

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

5-02. Water Quality Stations. There are no Corps operated or maintained water quality stations in the Millers Ferry Project area. However, there are some real-time water quality parameters collected at several of the stream gages maintained by the USGS for general water quality monitoring purposes. The data for these stations can be obtained from the USGS yearly publication, ***Water Resources Data Alabama***. The Alabama Department of Environmental Management also periodically samples water quality throughout the Alabama portion of the basin on a rotating schedule.

5-03. Sediment Stations. In order to provide an adequate surveillance of sedimentation, a network of sediment ranges were established for William "Bill" Dannelly Reservoir in 1973. Quantitative computations can be made from these ranges to determine the extent and degree of sedimentation and erosion. General conditions and changes have been measured and recorded using this network. The network of sediment stations is shown on Plate 4-1.

Sediment surveys were conducted in 1982, 1988, and 2009. Tetra Tech, Inc, was retained to conduct an analysis of the data and determine the extent and degree of sedimentation and erosion that has occurred in the lake and its tributaries over the years, and where appropriate, to speculate on the causes of those changes. This analysis and results are presented in a report entitled; "Sedimentation and Erosion Analysis for Alabama River Lakes". Sedimentation and erosion classifications were developed for each range. Based on the percentage change for the entire cross section, range cross sections were classified for sedimentation as "Heavy" (greater than 15% change), "Medium" (5 to 15% change), "Light" (0 to 5%), and "None" (0 or negative change). Erosion classifications were also developed from bank retreat and advance rates. A bank retreat or advance rate is the average change in location, measured in feet, of the shoreline. It is the area bounded between two cross section profiles at the shore erosion zone (square-feet) divided by the height of shore erosion zone (feet). The shorelines were separated into two groups, erosional and depositional. The erosional group was further divided into three classes by percentile. The 25% of shorelines showing the greatest bank retreat were classed as "Acute," the middle 50% in bank retreat were classed as "Moderate," and the 25% with the least bank retreat were classed as "Slight." Shorelines in the depositional group were classed as "Deposition."

Because sediment is delivered via several tributaries to Dannelly Lake, the sedimentation and erosion impacts may be independent between each of these tributaries. To clearly show the differences between tributaries the sedimentation ranges have been sorted by their location on the main lake body or tributary. Results are displayed in Table 5-3. Each of these tributaries and the main lake body are discussed in this section.

The historical and current survey data for the 30 ranges were compiled, plotted, and compared. The 2009 data had apparent discrepancies in the survey data sets of the ranges. Due to the nature of the 2009 data, it was not possible to make any defensible adjustments to bring it into alignment with the historical data. Therefore, the 2009 data were used for a qualitative interpretation.

Table 5-3. Sedimentation Range Results for William "Bill" Dannelly Reservoir

Rangeline	Location	Qualitative Sedimentation Classification: 1973 to 2009	Sedimentation Classification: 1973 to 1988	Shoreline Erosion Classification: 1973 to 1988	
				Left Bank	Right Bank
1A	Alabama River	Light	Light	Deposition	Deposition
2A	Alabama River	Medium	Medium	Deposition	Deposition
3A	Alabama River	None/Scour	None/Scour		Slight
4A	Alabama River	Medium	Medium	Deposition	Acute
5A	Alabama River	Light	Medium	Deposition	Deposition
9A	Alabama River	Medium	Medium	Deposition	Deposition
10A	Alabama River	Heavy	None/Scour	Slight	Deposition
13A	Alabama River	Medium	Medium	Deposition	Deposition
14A	Alabama River	Light	Light	Deposition	Slight
15A	Alabama River		Light	Deposition	Moderate
19A	Alabama River	Light	Medium	Deposition	Slight
20A	Alabama River	Medium	Medium	Deposition	Moderate
21A	Alabama River	Medium	Medium	Deposition	Moderate
22A	Alabama River	Light	Light	Deposition	Acute
23A	Alabama River	None/Scour	Light	Moderate	Moderate
24A	Alabama River	Medium	Medium	Deposition	Deposition
25A	Alabama River	Medium	None/Scour	Deposition	Acute
26A	Alabama River	Light	None/Scour	Moderate	Slight
27A	Alabama River	Medium	Light	Moderate	Deposition
28A	Alabama River	None/Scour	None/Scour	Slight	Moderate
29A	Alabama River	None/Scour	Light	Moderate	Slight
30A	Alabama River	None/Scour	None/Scour	Moderate	Acute
6A	Pine Barren Creek		Light	Deposition	Deposition
7A	Chilatchee Creek	Heavy	Light	Deposition	Deposition
8A	Chitto Creek		Heavy	Slight	Deposition
11A	Cedar Creek		Heavy	Moderate	Deposition
12A	Cedar Creek		Heavy	Deposition	Deposition
16A	Cahaba River		None/Scour	Deposition	Acute
17A	Cahaba River		Heavy	Moderate	Deposition
18A	Cahaba River				

For the period from 1973 until 2009 the main channel of the Alabama River appears to have undergone light to medium sedimentation along the lower three quarters of its length from ranges 1A to 24A. The upper reach, from 24A to 30A immediately below R.F. Henry Lock and Dam appear to have undergone no to light sedimentation and have even scoured at the upper most three ranges, 28A, 29A, and 30A. This scour may be attributed to the Alabama River being starved of sediment for the reach immediately below R. F. Henry Lock and Dam. The analysis indicates that below range 14A the river shorelines were primarily depositional from 1973 through 1988. Essentially all of the ranges classed “Acute” and “Moderate” for erosion are located in the upper half of the river, upstream from range 14A.

One sedimentation range, 6A, represents Pine Barron Creek. The analysis showed light sedimentation and depositional shorelines from 1973 through 1988. No bathymetric data were collected in 2009 at range 6A, thus no interpretation was made. Chilachee Creek is represented by sedimentation range 7A. The 1973 to 1988 analysis resulted in sedimentation class of medium, however, the 2009 data indicates that sedimentation has been ongoing and may be more accurately classified as heavy. Shorelines are classified as depositional. Chitto Creek is represented sedimentation range 08A. The analysis from 1973 to 1988 indicated the range 8A location is heavily depositional. The shorelines are essentially stable with the right classed as depositional, and the left as slight for erosion, however the rate is three feet of bank retreat over 15 years. No bathymetry was collected in 2009 so the recent sedimentation trends are not known. Two sedimentation ranges, 11A and 12A, represent Cedar Creek. Sedimentation from 1973 to 1988 was classed as heavy for both with about 10 to 13 feet of deposition in the thalweg. Bathymetric data were not collected in 2009 so the recent sedimentation trend is not known. Three of the shorelines were classed depositional. The fourth was classed moderate for erosion; however the rate appears relatively low at nine feet over 15 years. The Cahaba River is represented by three sedimentation ranges; 16A, 17A, and 18A. In general the plots of all three ranges show about five feet of mid-channel deposition, and thus 17A and 18A are classed heavy and medium for deposition respectively. Range 16A has an irregular hump in the 1973 plot which does not appear in the 1988 data. It is not known what this plot represents. However, this hump impacts the analysis by creating an overall result of scour, even with the five feet of deposition. No bathymetry was collected in 2009 at range 16A, so no further interpretation on sedimentation trends has been made. In general, all the shorelines are depositional with the exception of the right bank of 16A which shows acute erosion.

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. Time series hydrometeorological data are stored and retrieved using the CWMS Oracle database. In the event this database is unavailable, data can alternately be stored in the Hydrologic Engineering Center Data Storage System (HEC-DSS).

To provide stream gage and precipitation data needed to support proper analysis, a DOMSAT Receive Station (DRS) is used to retrieve DCP data from gages throughout the ACF Basin. The DRS equipment and software then receives the DOMSAT data stream, decodes the DCPs of interest and reformats the data for direct ingest into a HEC-DSS database. Reservoir data is received through a link with the Supervisory Control and Data Acquisition (SCADA) system which monitors and records reservoir conditions and operations in real time.

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, 1-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.

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. Communication Network.

The global network of the Corps consists of private, dedicated, leased lines between every Division and District office worldwide. Those lines are procured through a minimum of two General Services Administration-approved telephone vendors, and each office has a minimum of two connections, one for each vendor. The primary protocol of the entire Corps network is Ethernet. The reliability of the Corps' network is considered a command priority and, as such, supports a dedicated 24 hours per day Network Operations Center. The use of multiple telephone companies supplying the network connections minimizes the risk of a one cable cut causing an outage for any office. Such dual redundancy, plus the use of satellite data acquisition, makes for a very reliable water control network infrastructure.

The Water Management Section has a critical requirement to be available during emergency situations for operation of the ACT Basin and to ensure data acquisition and storage remain functional. The Water Management Section must be able to function in cases of flooding or other disasters, which typically are followed by the loss of commercial electricity. The WCDS servers and the LRGS each have individual UPS (uninterruptable power supply) and a large UPS unit specifically for the portion of Mobile District Office in which the Water Management Section resides to maintain power for operational needs.

In the event of a catastrophic incident that causes loss of communication or complete loss of access to the Mobile District Office and the WCDS and CWMS servers located on site, a Continuity of Operations Program (COOP) site is being set up as a backup to these systems. This site will have servers that mirror the WCDS and CWMS servers located at the Mobile District Office allowing Water Managers to continue operating with no interruption or loss of data. It is currently planned that the COOP site will be located at the South Atlantic Division Office in Atlanta, Georgia.

The primary communication network of the Millers Ferry Project is a SCADA system network. The SCADA network includes a microwave link between R. F. Henry and Millers Ferry Dam. The SCADA network also monitors powerhouse conditions and digitally records real-time project data hourly. The data include physical conditions at the reservoir such as pool elevations, outflow, river stages, generation, and rainfall. Special instructions or deviations are usually transmitted by e-mail, telephone, or fax.

Emergency communication is available at the following numbers:

Water Management Section	251-690-2737
Chief of Water Management	251-690-2730 or 251-509-5368 (cell)
Millers Ferry Powerhouse	334-682-9124

5-06. Communication With Project Office

a. Regulating Office with Project Office. Communication between the Water Management Section and Millers Ferry Lock and Dam is by commercial telephone and computer network. The Water Management Section can transfer current data files from the Millers Ferry computer at any time using the Local Data Server (LDS) using the File Transfer Protocol (FTP). During emergencies, a two-way voice radio in the Readiness Branch of Operations Division can be used for communication with Millers Ferry only. For powerhouse and spillway operations, communication is between Water Management Section and powerhouse operating personnel at either Jones Bluff or Millers Ferry. Millers Ferry communicates with R. F. Henry lock tenders by Private Access Exchange (PAX) or Southern Link Radio System. The equipment is located in the powerhouse at both projects. Millers Ferry Power Plant may be operated remotely from R. F. Henry. Data from Millers Ferry (including visual observations) are transmitted to R. F. Henry through an internet network. R. F. Henry Power Plant may also be operated from Millers Ferry.

b. Between Project Office and Others. The Water Management Section communicates daily with the NWS and APC 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 Advanced Weather Interactive Processing System (AWIPS) communication system via the River Forecast Center in Atlanta, Georgia. The Water Management Section, Millers Ferry, and Claiborne all use a telephone auto-answer recorded message to provide daily information to the public. Water resources information is available to the public at the Corps' website, http://water.sam.usace.army.mil. The site contains real-time information, historical data and general information that may be of interest to the public.

In order to warn the public at the start of a hydropower release downstream, a warning horn is activated by the operator from the unit controls. An audio detector verifies the horn has sounded and allows the unit start-up sequence to continue. The horn will continue to sound for two minutes before the unit starts. The Millers Ferry spillway has three horns that are initiated from the Millers Ferry/Jones Bluff Powerhouse SCADA system. The horns are activated by powerhouse operators before a gate is raised from its sill. The horns sound for two minutes, and are verified through audio detectors and electrical current detectors.

5-07. Project Reporting Instructions. R. F. Henry and Millers Ferry Powerhouse data is automatically recorded hourly. A file containing the data is sent to the LDS System every four hours. The information includes pool elevations, megawatt loading of the units, turbine and spillway discharges, gate step settings and inflows. At 6:00 A.M. every morning a water management report is sent to the LDS. It includes rainfall, 24-hour discharges and inflows, projected generation and other pertinent information.

5-08. 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 legal responsibility for issuing flood forecast to the public, and that agency will have the lead role for disseminating the information. For emergencies involving the Millers Ferry Project, the operator on duty should notify the Water Management Section, Operations Division and the Operations Project Manager at the project. A coordinated effort among those offices and the District's Emergency Management Office will develop notifications to make available to local law enforcement, government officials and emergency management agencies.

5-09. Role of Regulating Office. The Water Management Section of the Mobile District Office is responsible for developing operating procedures for both flood and non-flood conditions. Plans are developed to most fully use the water resources potential of each project with the constraints of authorized functions. Those plans are presented in water control manuals such as this one. Water control manual preparation and updating is a routine operation of the Water Management Section. In addition, the Water Management Section maintains information on current and anticipated conditions, precipitation, and river-stage data to provide the background necessary for best overall operation. The Water Management Section arranges communication channels to the Power Project Manager and other necessary personnel. Instructions pertaining to reservoir regulation are issued to the Power Project Manager; however, routine instructions are normally issued directly to the powerhouse operator on duty.

5-10. Role of Power Project Manager. The Power Project Manager should be completely familiar with the approved operating plans for the Millers Ferry and R. F. Henry Projects. The Power Project Manager is responsible for implementing actions under the approved water control plans and carrying out special instructions from the Water Management Section. The Power Project Manager is expected to maintain and furnish records requested from him by the Water Management Section. Training sessions should be held as needed to ensure that an adequate number of personnel are informed of proper operating procedures for reservoir regulation. Unforeseen or emergency conditions at the project that require unscheduled manipulation of the reservoir should be reported to the Water Management Section as soon as practicable.

VI - HYDROLOGIC FORECASTS

6-01. General. Two forecasts are available for locations along the Alabama River. The NWS's River Forecast Center prepares river forecasts for the general public and for use by the Corps. In addition, the Water Management Section prepares forecasts for internal use. All features of the forecasting procedure are subject to modification and refinement as additional data and operating experience dictate. In general, forecasts are made for Corps projects and control points along the river. Inflows and outflows are estimated for R. F. Henry, Millers Ferry, and Claiborne Projects.

a. Role of Corps. The Water Management Section maintains real-time observation of river and weather conditions in the Mobile District. The Water Management Section has capabilities to make forecasts for several areas in the ACT Basin. Those areas include all the federal projects and other locations. Observation of real-time stream conditions provides guidance of the accuracy of the forecasts. The Corps maintains contact with the River Forecast Center to receive forecast and other data as needed. Daily operation of the ACT River Basin during normal, flood risk management, and drought conservation regulation requires accurate, continual short-range and long-range elevation, streamflow, and river-stage forecasting. These short-range inflow forecasts are used as input in computer model simulations so that project release determinations can be optimized to achieve the regulation objectives stated in this manual. The Water Management Section continuously monitors the weather conditions occurring throughout the ACT Basin and the forecasts issued by the NWS. Whenever possible, the NWS weather and hydrologic forecasts are used. The Water Management Section develops forecasts that are used to meet the regulation objectives of the Corps ACT Reservoirs. In addition, the Water Management Section provides weekly hydropower generation forecasts using current power plant capacity, latest hydrological conditions, and system water availability.

b. Role of Other Agencies. The NWS is responsible for preparing and disseminating all public forecasts relating to precipitation, temperatures, and other meteorological elements related to weather and weather-related forecasting in the ACT Basin. 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. That role is the responsibility of SERFC co-located in Peachtree City, Georgia with the Peachtree City Weather Forecast Office (WFO). SERFC is responsible for the supervision and coordination of streamflow and river-stage forecasting services provided by the NWS WSFOs in Peachtree City, Georgia, and Birmingham, Alabama. SERFC routinely prepares and distributes 5-day streamflow and river-stage forecasts at key gaging stations along the Coosa, Tallapoosa, and Alabama Rivers. Streamflow forecasts are available at additional forecast points during periods above normal rainfall. In addition, SERFC provides a revised regional QPF based on local expertise beyond the NWS Hydrologic Prediction Center QPF. SERFC also provides the Water Management Section with flow forecasts for selected locations upon request. Table 6-1 lists the forecast stations in the Alabama River Basin.

(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 following days, the release decision data are sent to SERFC. Taking release decision data coupled with local inflow forecasts at forecast points along the ACT system, SERFC can provide forecasts of inflow into Corps projects. Having revised inflow forecasts from SERFC, the Corps has up-to-date forecast data to make the following days' release decisions.

(3) Alabama Power Company (APC) provides hourly discharge data from APC's Jordan, Bouldin, and Thurlow projects and provides a 7-day forecast of average daily releases from Jordan, Bouldin, and Thurlow projects.

Table 6-1. Southeast River Forecast Center Forecast Locations for Alabama River Basin

Daily Stage/Elevation Forecasts (Feet NGVD29)				
	Station	**Station ID**	**Action Stage***	**Flood Stage****
	Montgomery	MGMA1	26	35
	R. F. Henry TW	TYLA1	122	122
	Millers Ferry TW	MRFA1	61	66
	Claiborne TW	CLBA1	35	42
Daily 24-hour Inflow in Morning (10 a.m.) State Forecast Discussion				
Reservoir		**Station ID**		
R. F. Henry		TYLA1		
Millers Ferry		MRFA1		
Additional Stage Forecasts Only for Significant Rises				
River/Creek	**Station**	**Station ID**	**Action Stage**	**Flood Stage**
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

* Action Stage – The stage which some type of mitigation action in preparation for possible significant hydrologic activity occurs.
** Flood Stage – The stage for which a rise in water surface level begins to impact lives, property, or commerce.

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 can be made on the basis of known events and *what if* scenarios. The Water Management Section prepares forecasts and receives the official forecasts from SERFC.

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. For determining flood conditions at the Millers Ferry Project, the observed hourly discharges out of APC's Jordan, Bouldin, and Thurlow projects along with the APC's daily 7-day forecast for the Coosa and Tallapoosa rivers are used. Flows from the Cahaba River which is a major tributary into the Millers Ferry Project are also used for determining flood conditions.

6-03. Conservation Purpose Forecasts. The Millers Ferry Project is essentially a modified run-of-the-river project and has no practical conservation storage in the reservoir. Therefore, it is unnecessary to forecast for conservation purposes at this project.

6-04. Long-Range Forecasts.

a. Requirements. The Alabama River Projects are modified run-of-the-river projects and have no practical conservation storage in the reservoirs. Therefore, it is unnecessary to forecast for conservation purposes at these projects. However, the Corps does utilize available information from the NWS and projected release forecast from Alabama Power Company projects on the Coosa and Tallapoosa Rivers to aid in the operation of the system and for planning studies.

b. Methods. In extreme conditions, three-month and six-month forecasts can be produced based on observed hydrology and comparative percentage hydrology inflows into the ACT Basin. One-month and three-month outlooks for temperature and precipitation produced by the NWS Climate Prediction Center are used in long-range planning for prudent water management of the ACT Projects.

6-05. Drought Forecast.

a. Requirements. Engineering Regulation (ER) 1110-2-1941, Drought Contingency Plans, dated 15 September 1981, called for developing drought contingency plans for all Corps' reservoirs. Drought recognition and drought forecast information can be used in conjunction with the drought contingency plan.

b. Methods. Various products are used to detect the extent and severity of basin drought conditions. One key indicator is the U.S. Drought Monitor. The Palmer Drought Severity Index is also used as a regional drought indicator. The index is a soil moisture algorithm calibrated for relatively homogeneous regions and may lag emerging droughts by several months. The Alabama Office of State Climatologist also produces a Lawn and Garden Index which gives a basin-wide ability to determine the extent and severity of drought. The runoff forecasts developed for both short and long-range time periods reflect drought conditions when appropriate. There is also a heavy reliance on latest ENSO (El Niño/La Niña-Southern Oscillation) forecast modeling to represent the potential impacts of La Nina on drought conditions and spring inflows. Long-range models are used with greater frequency during drought conditions to forecast potential impacts to 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 on the basis of climatic conditions, 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.

c. Reference Documents. The drought contingency plan for the Millers Ferry Project is summarized in Section 7-12 below. The complete ACT Drought Contingency Plan is provided in Exhibit D.

VII - WATER CONTROL PLAN

7-01. General Objectives. The Congressionally authorized purpose for the Millers Ferry Lock and Dam as contained in its authorizing legislation was navigation and hydropower. The Millers Ferry Lock and Dam is operated as part of the Alabama River projects to provide navigation depths upstream to Montgomery, Alabama. Several other project purposes have been added through general authorizations including water quality, recreation, and fish and wildlife conservation and mitigation. A 2.8-foot drawdown from the maximum normal pool elevation of 80.8 feet NGVD29 to 78.0 feet NGVD29 is provided to facilitate operations for navigation, hydropower generation, and downstream minimum flow requirements. Fluctuations up to elevation 81.0 feet NGVD29, the top of the spillway gates, will be permitted at times to support project purposes. The regulation plan seeks to balance the needs of all project purposes at the Millers Ferry Project and at other projects in the ACT Basin and is intended for use in day-to-day, real-time water management decision making and for training new personnel.

7-02. Constraints

a. Full Discharge Capacity. The full discharge capacity of the spillway at elevation 80.8 feet NGVD29 is 192,500 cfs, the equivalent of a flood which may be expected to occur once in 10 years. Once the spillway capacity is reached a free overflow condition will prevail. There will be little difference in the water surface upstream and downstream of the dam. The river may continue to rise just as it would in the absence of any structure.

b. Head Limitation. Design criteria for stability against overturning and sliding of the Millers Ferry structures make it imperative that the head, or difference between headwater and tailwater, not exceed 48 feet at any time. All operational planning has been based on this strict limitation.

7-03. Overall Plan For Water Control. The reservoir elevation will be maintained near the normal pool of 80.0 feet NGVD29 and allowed to fluctuate between the operating range of 78.0 and 80.8 feet NGVD29 by passing the inflow through the power plant and/or the spillway gates until the powerhouse becomes inoperative. When the high flows cause the powerhouse to become inoperative, additional spillway gates will be opened to maintain the pool between elevations 78.0 and 80.8 feet NGVD29.

A large flood, which would occur about once in 10 years, will necessitate all spillway gates being fully opened. In such a case the pool may rise several more feet above the operating full level of 80.8 feet NGVD29. After the flood peak has passed, the spillway gates will be lowered to maintain the pool between elevations 78.0 and 80.8 feet NGVD29. Once the tailwater elevation recedes low enough to provide sufficient head, the turbines can be restarted. As the water continues to recede, the gates are closed according to the schedule until all the spillway gates are closed, if necessary. Any departures from this operating schedule will be made only as directed by the Water Management Section. In periods when flow is less than powerhouse capability, peaking power releases will be made as described in paragraph 7-10b. The headwater-tailwater rating curve is shown on Plate 7-1. Plate 7-2 shows total spillway and overbank discharge for pool levels above elevation 80.0 feet NGVD29. Flowage easements have been obtained encompassing all lands subjected to an increased frequency of flooding from operation of the project. The easement limits are described on Plates 2-4 and 2-5. More detailed instructions for water control operations are given in the following paragraphs.

Operation of Spillway Gates. The spillway gates will generally not be operated until the inflow exceeds the capacity of the powerhouse. When inflows exceed the powerhouse capacity the spillway gates will be operated as directed by the Power Project Manager in order to maintain the reservoir between elevations 79 and 80.8 feet NGVD29. When inflow and pool conditions require operation of the spillway, the gates will be opened in the order and increments of openings depending on inflow and pool elevation as shown on Plates 7-4 through 7-9. The 17 spillway gates are numbered in sequence beginning at the left bank or east end of the spillway, adjacent to the lock. Gate adjustments will be made as necessary and as specified by the above mentioned charts to maintain the upper pool level. For flows in excess of regulating capacity, the gates will be left in the fully open position until the pool has peaked and recedes to elevation 80.0 feet NGVD29. When this elevation is reached, the operator will begin closing gates required to maintain the pool within the target limits.

7-04. Standing Instructions to Damtender. Standing Instructions to the Operator for Water Control can be found in Exhibit C. It describes the operators' duties and responsibilities for reservoir regulation including operating procedures, data collecting, and data reporting.

7-05. Flood Risk Management. There is no flood risk management storage in the Millers Ferry Project. Flowage easements have been obtained encompassing all lands subjected to an increased frequency of flooding from the operation of the project. Paragraph 2-05 describes the real estate acquisition lines.

7-06. Recreation. Most recreational activities at the Millers Ferry Project occur during the summer months. Because Millers Ferry operates to maintain a generally stable pool, access to recreational areas such as swimming beaches and boat ramps are generally not limited. Other recreational opportunities are hiking trails, picnic areas, a fishing deck, and camping.

The Operations Project Manager will be responsible for contacting various lakeshore interests and keeping the public informed of lake conditions during drawdown periods. The Operations Project Manager will close beaches and boat ramps as necessary, patrol the lake, mark hazards, and perform other necessary tasks to mitigate the effects of low lake levels. Paragraph 2-06 describes the public facilities available at the project. Occasionally, releases may be scheduled for special recreational events such as river float trips.

7-07. Water Quality. Flows from Millers Ferry are used downstream to provide the 7Q10 flow of 6,600 cfs below Claiborne (determined from observed flow between 1929 – 1981 at the USGS gage # 02429500, Alabama River at Claiborne, Alabama). Several industries on the Alabama River have designed effluent discharges and have State discharge permits based on this dilution flow. Whenever flows recede to this level, conditions will be closely monitored so adequate warning can be given if it is necessary to reduce the flows even further. Paragraph 7-10 explains the procedures to be followed should the outflow drop to a level which is not sufficient enough to provide enough flow downstream.

7-08. Fish and Wildlife. The impoundment is favorable for the establishment of a sports fishery. The pool will be maintained at a fairly constant level except during floods when high inflows cause a rise in the reservoir level. This relatively stable pool during the spring spawning season is beneficial to the production of crappie, largemouth and smallmouth bass, shellcracker, warmouth, and sunfishes. However, because of the regulation of the project for navigation and hydropower, it will generally not be possible to maintain a fairly constant pool level to support optimum fish spawning conditions.

When Alabama River flow and project conditions allow, the Corps operates the lock from February through May to facilitate downstream/upstream passage of migratory fishes. While there can be slight differences in the locking technique each year, generally two fish locking cycles are performed each day between 8 AM and 4 PM, depending on facility staffing; one in the morning and one in the afternoon.

7-09. Water Supply. Based upon information provided by the Alabama Office of Water Resource in 2010, there are several withdrawals for irrigation between R. F. Henry and Millers Ferry Projects. They are: South Dallas Turf Farm Inc.; O. W. Till Jr.; Weyerhaeuser Company - Pine Hill Nursery; Weyerhaeuser Timberlands Inc.; International Paper/Alabama Supertree Nursery; Lane Cattle Co. LLC; and South Dallas Turf Farm Inc.. Roland Cooper State Park also withdraws water for public use in the park.

7-10. Hydroelectric Power. The Millers Ferry Powerhouse is operated as a run-of-river hydropower plant for the production of hydroelectric energy and capacity. Depending upon flow, the plant is either continuously running (high flow) or peaking (low flow) on a seven-day basis. The output from the plant is marketed by the Southeastern Power Administration (SEPA) in accordance with provisions in the Flood Control Act of 1944. The responsibility under this Act for determining the amount of power that can be produced from this project has been delegated to the Mobile District Commander. The District Commander relies on the Water Management Section to make weekly and daily determinations of hydropower that can be generated**.** The average annual energy produced at Millers Ferry from FY 2000 to 2012 was 315,878 MWH with a high of 470,727 MWH (2005) and a low of 248,136 MWH (2008).

The spillway gate operation at Claiborne Dam is related to the generation schedule and spillway releases at the Millers Ferry Project. Except in high flow conditions, spillway gate settings at Claiborne will require nearly constant monitoring to mitigate the releases from the Millers Ferry Project and maintain the Claiborne pool level between limiting elevations 32.0 and 36.0 feet NGVD29. The target discharge rate to release through the Claiborne Dam spillway gates is based on Millers Ferry Powerhouse upcoming generation schedule and the Claiborne pool elevation.

a. Normal Operation. The powerhouse at Millers Ferry Dam is operated to furnish peak energy. The energy is marketed to the Government's preference customers under terms of contracts negotiated and administered by SEPA. The generation (and water release) is based on a declaration of energy and capacity available that is prepared weekly by the Mobile District on the basis of the overall ACT water control plan. The declarations, which are designed to keep the pools within the established seasonal and pondage limits, where practicable, are prepared by the Water Management Section of the Mobile District and furnished to the South Atlantic Division (SAD) office for coordination of the hydropower projects within the Alabama-Georgia-South Carolina power marketing system. Actual daily and hourly scheduling of generation is coordinated by the Water Management Section, SEPA, and the hydropower customers. Local restraints can dictate generation during certain hours. Performance curves which indicate the discharge capacity and power output capability at various operating heads for a single turbine unit are shown on Plate 7-3.

b. High-Flow Operation. During periods when the reservoir inflow is equal to or greater than the capacity of the turbines (about 33,600 cfs), the power plant will be operated at full capacity around the clock. As the flow increases, rising tailwater elevations will reduce the head and the power output. When the head decreases to approximately 15.3 feet, the units will be shut down.

c. Low-Flow Operation. The hydropower operation during extended low flow or drought periods is slightly different from the normal operation. The maximum allowable drawdown is elevation 77.5 feet NGVD29. Provisions have been made for an emergency drawdown elevation of 77.0 feet NGVD29. During extended low-flow periods the Water Management Section will establish a target tailwater elevation at Claiborne Lock and Dam. The Water Management Section will schedule sufficient daily generation and discharge from R. F. Henry and Millers Ferry to maintain the target tailwater elevation. If the generation schedule causes the pool to drop to elevation 77.5 feet NGVD29, the Project Operator for water control will notify the Water Management Section. In no case will releases be made if the pool falls to elevation 77.0 feet NGVD29 unless specifically directed by the Water Control Manager. Because the upstream Alabama Power projects do not normally release as much water on weekends as weekdays, William "Bill" Dannelly pool can be expected to be at its lowest level on Monday and highest level on Friday during the period.

7-11. Navigation.

Navigation is an important use of water resources in the ACT Basin. The Alabama River, from Montgomery, Alabama, downstream to the Mobile, Alabama, 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. 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 using 2004 – 2010 survey data. 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.

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-feet depth has not been available at all times.

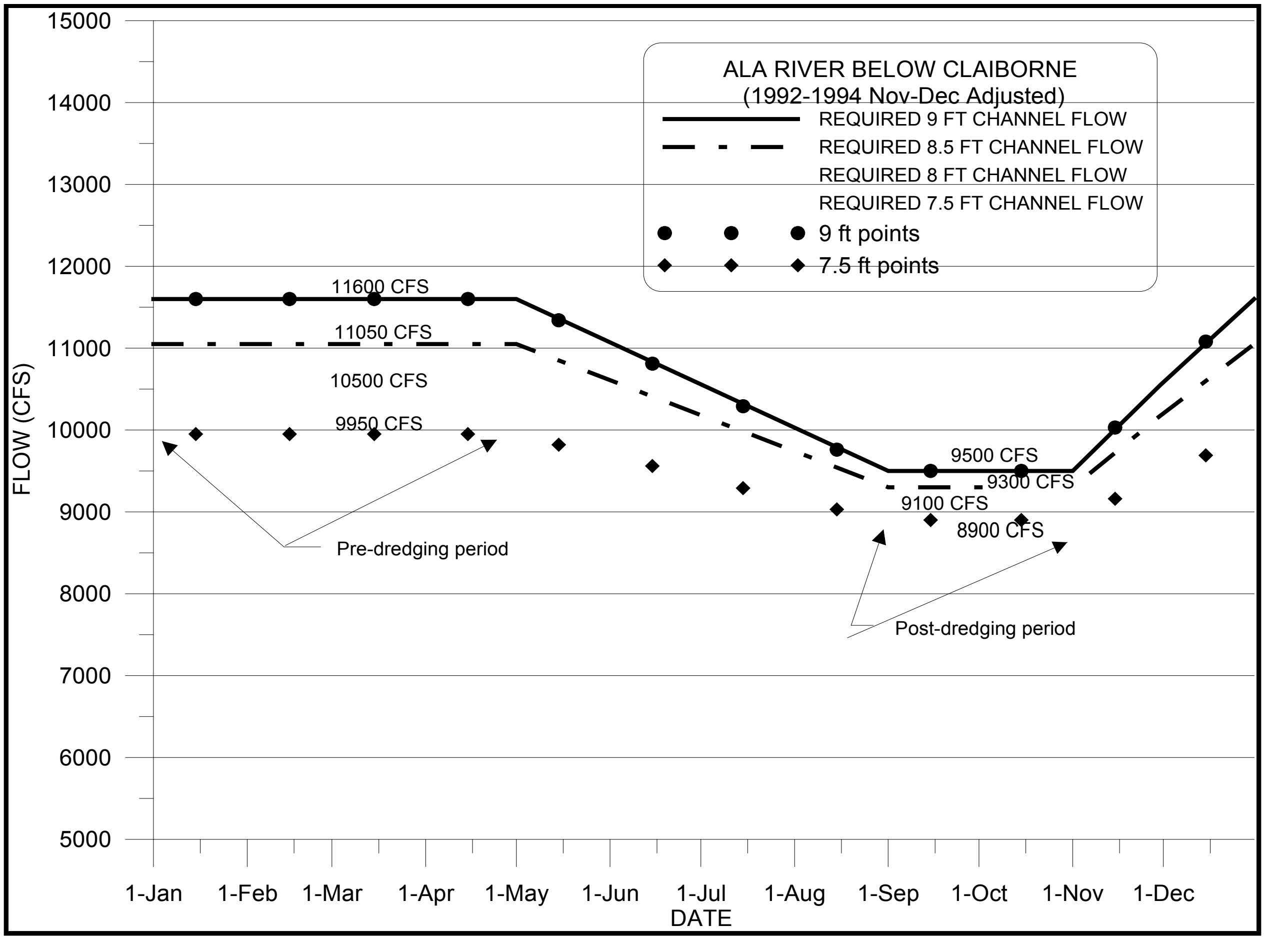


Figure 7-1. Flow-Depth Pattern (Navigation Template) Using 2004 2010 Survey Data

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 9 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 7-1. However, flows may be reduced if conditions warrant. 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 7-2 and

Figure 7-2 show the required basin inflow for a 9.0-foot channel; Table 7-3 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 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 (Exhibit D).

Table 7-1. Monthly Navigation Flow Target in CFS

Month	9.0-ft target below Claiborne Lake (from Navigation Template) (cfs)	9.0-ft Jordan, Bouldin, Thurlow goal (cfs)	7.5-ft target below Claiborne Lake (from Navigation Template) (cfs)	7.5-ft Jordan, Bouldin, Thurlow goal (cfs)
Jan	11,600	9,280	9,950	7,960
Feb	11,600	9,280	9,950	7,960
Mar	11,600	9,280	9,950	7,960
Apr	11,600	9,280	9,950	7,960
May	11,340	9,072	9.820	7,856
Jun	10,810	8,648	9,560	7,648
Jul	10,290	8,232	9,290	7,432
Aug	9,760	7,808	9,030	7,224
Sep	9,500	7,600	8,900	7,120
Oct	9,500	7,600	8,900	7,120
Nov	10,030	8,024	9,160	7,328
Dec	11,080	8,864	9,690	7,752

Table 7-2. 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	9,072	–499	9,571
Jun	8,648	412	8,236
Jul	8,232	749	7,483
Aug	7,808	1,441	6,367
Sep	7,600	1,025	6,575
Oct	7,600	2,118	5,482
Nov	8,024	2,263	5,761
Dec	8,864	1,789	7,075

Table 7-3. 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	7,856	–499	8,355
Jun	7,648	412	7,236
Jul	7,432	749	6,683
Aug	7,224	1,441	5,783
Sep	7,120	1,025	6,095
Oct	7,120	2,118	5,002
Nov	7,328	2,263	5,065
Dec	7,752	1,789	5,963

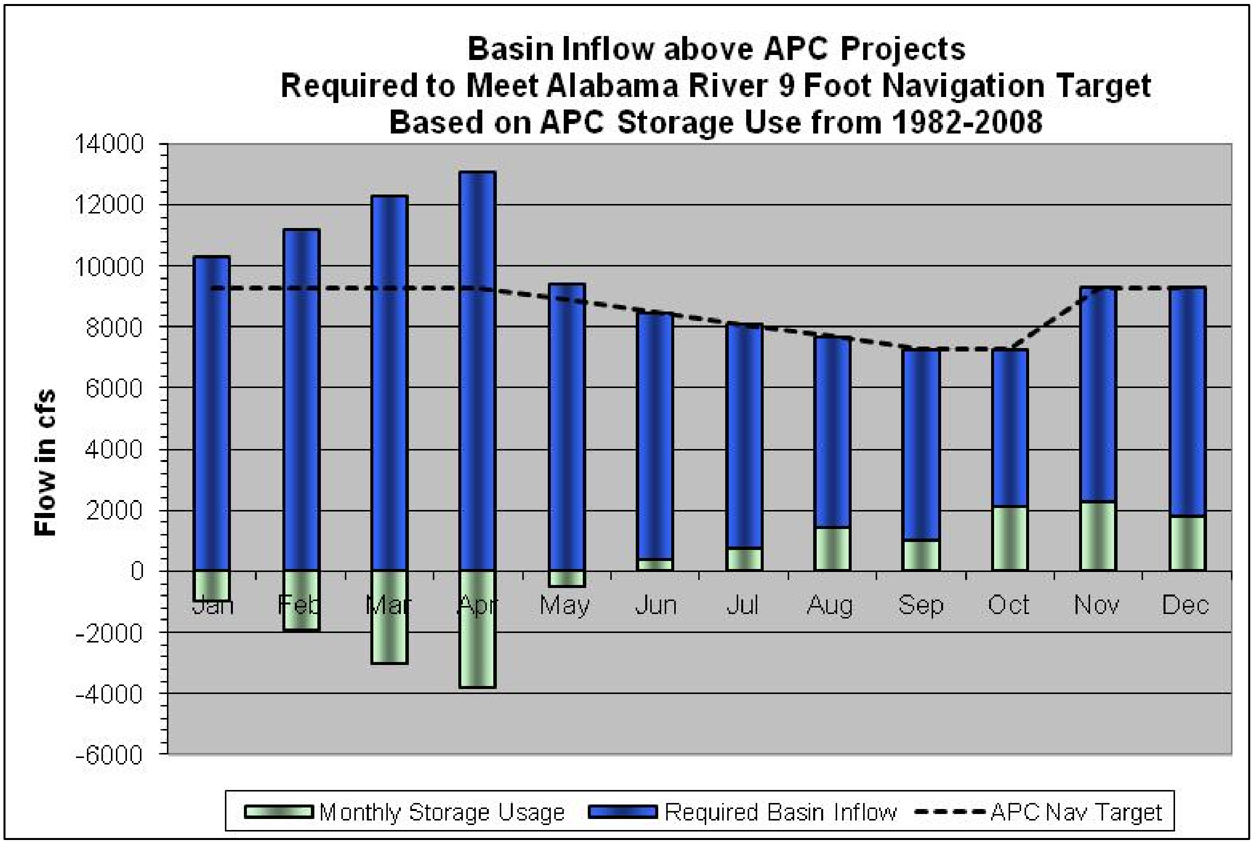


Figure 7-2. Flow Requirements From Rainfall (or Natural Sources) and Reservoir Storage to Achieve the JBT Goal for Navigation Flows for a 9-Foot Channel

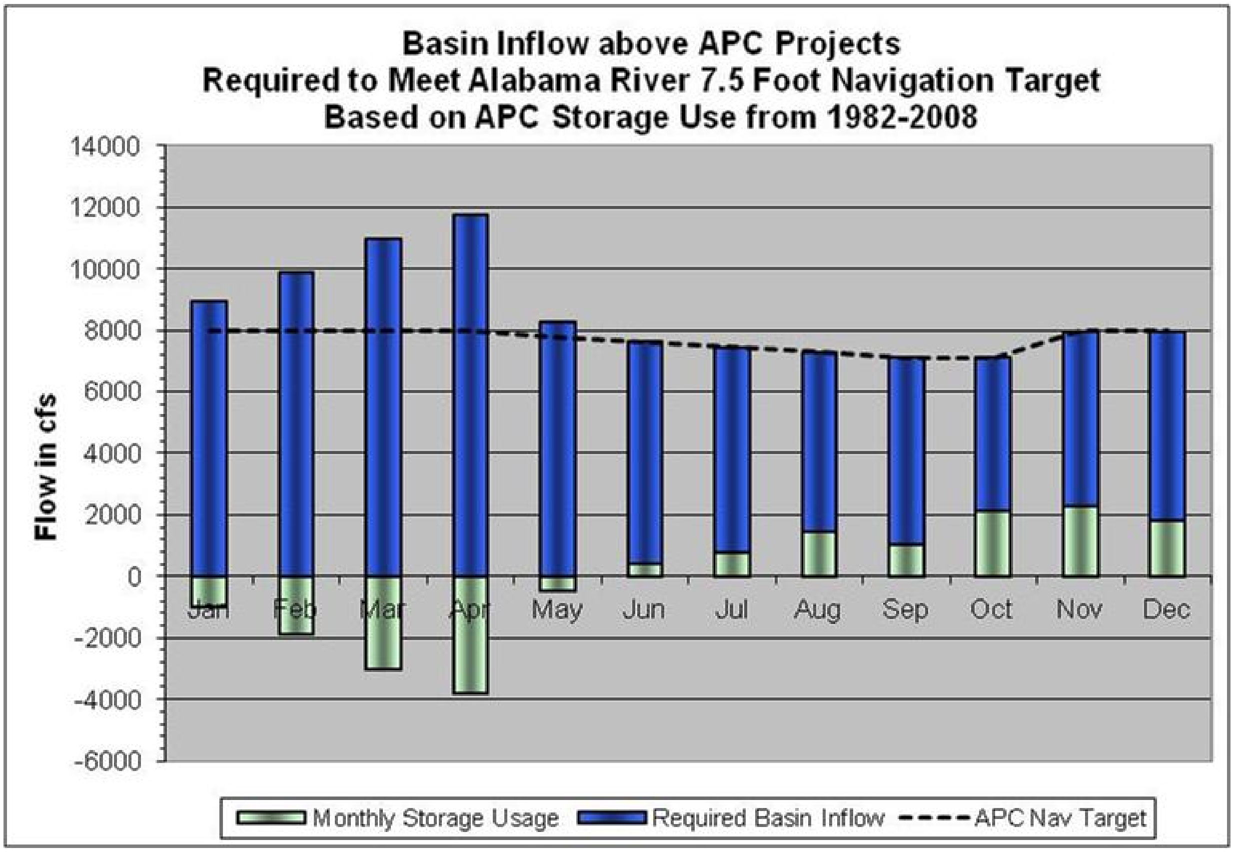


Figure 7-3. Flow Requirements From Rainfall (or Natural Sources) and Reservoir Storage to Achieve the JBT Goal for Navigation Flows for a 7.5-Foot Channel

During normal flow periods, no special water control procedures are required for navigation at the Millers Ferry Project other than maintaining the proper pool level. The normal maximum allowable drawdown at elevation 78.0 feet NGVD29 provides a clearance of 13.0 feet over the upper lock sill and should provide minimum depths for a nine-foot navigation channel at Montgomery, Alabama, 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, Alabama, 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 Millers Ferry Lock during flood periods when the tailwater reaches elevation 81 feet NGVD29, which leaves 1.0 foot of freeboard on the lower guide wall. At this elevation the discharge will be approximately 220,000 cfs which is expected to occur on an average of once every 19 years.

In the event that the Mobile District Water Management Section (EN-HW) determines upcoming reductions in water releases may impact the available navigation channel depth, they shall contact the Black Warrior/Tombigbee - Alabama/Coosa Project Office (OP-BA), and the Mobile District Navigation Section (OP-TN), to coordinate the impact. EN-HW shall provide the Claiborne tailwater gage forecast to OP-BA and OP-TN. Using this forecast and the latest available project channel surveys, OP-BA and OP-TN will evaluate the potential impact to available navigation depths. Should this evaluation determine that the available channel depth is adversely impacted, OP-BA and OP-TN will work together, providing EN-HW with their determination of the controlling depth. Thereafter, OP-BA and OP-TN 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 website 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.

7-12. Drought Contingency Plan.

Flow in the Alabama River is largely controlled by APC impoundments on the Coosa and Tallapoosa Rivers above R. F. Henry Lock and Dam. Under normal flows the APC impoundments will provide sufficient releases from the Coosa and Tallapoosa Rivers to meet a continuous minimum seven-day average flow of 4,640-cfs (32,480 dsf/7 days). However, additional intervening flow or drawdown discharge from R. F. Henry and Millers Ferry Projects must be used to provide a usable depth for navigation or meet the 7Q10 flow of 6,600-cfs at Claiborne Lock and Dam.

In accordance with ER 1110-2-1941, Drought Contingency Plans, dated 15 September 1981, an ACT Basin Drought Contingency Plan (DCP) has been developed to implement water control regulation drought management actions. Drought operations will be in compliance with the plan for the entire ACT Basin as outlined in Exhibit D. Pertinent requirements of the DCP relative to the Millers Ferry Project are summarized below.

Based upon experience gained during previous droughts, and in particular the 2006 - 2008 drought, a basin-wide DCP was developed and is comprised of three components - headwater operations at Allatoona Lake and Carters Lake in Georgia; operations at APC projects on the Coosa and Tallapoosa Rivers; and downstream operations at Corps projects below Montgomery, Alabama. Drought operations for the APC projects were initially developed as a separate plan by the APC (APCDOP) in cooperation with the State of Alabama and the Corps as a result of the 2006 – 2008 drought. The specifics of the APCDOP, as incorporated into the overall ACT Basin DCP, are shown on Table 7-5.

Operational guidelines have been developed on the basis of a Drought Intensity Level (DIL). The DIL is a drought indicator, ranging from DIL 1 to DIL 3, determined by the combined number of drought triggers that occur. The three drought triggers are: (1) basin inflow; (2) composite conservation storage in APC reservoirs; and (3) state line flow. Additional information on the drought triggers can be found in Exhibit D. Drought management actions would become increasingly more austere when two triggers occur (Drought Level 2) or all three occur (Drought Level 3). Table 7-4 lists the three drought operation intensity levels applicable to APC projects.

Table 7-4. ACT Basin Drought Intensity Levels

Drought Intensity Level (DIL)	Drought Level	No. of Triggers Occurring
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, as described in water control manuals for Allatoona and Carters Projects (Appendices A and H), includes water control actions in accordance with established action zones, minimum releases, and hydropower generation releases. Regulation of APC projects will be in accordance with Table 7-5 in which the drought response will be triggered by one or more of 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.

No storage is provided in the William “Bill” Dannelly pool for regulating releases during periods of low inflow. When drought conditions determine that a change in the operating guidelines is necessary private industries, state agencies and federal agencies with interests in the river system will be notified. Normally the agencies will be advised of any impending reductions well in advance, and their comment will be requested regarding any adverse impacts on the respective agency or industry.

Table 7-5. ACT Basin Drought Management Matrix

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Drought Level Response[a]	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 1,600 to 2,000 +/-cfs			2,500 +/- cfs		6/15 Linear Ramp down	Jordan 2,000 +/-cfs			Jordan 1,600 to 2,000 +/-cfs		
	Jordan 1,600 +/-cfs			Jordan 1,600 to 2,000 +/-cfs			Jordan 2,000 +/-cfs			Jordan 1,600 to 2,000 +/-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 releases > 350 cfs)				1/2 Yates Inflow					1/2 Yates Inflow		
	Thurlow 350 cfs				1/2 Yates Inflow					Thurlow 350 cfs		
	Maintain 400 cfs at Montgomery WTP (Thurlow release 350 cfs)						Thurlow 350 cfs			Maintain 400 cfs at Montgomery WTP (Thurlow release 350 cfs)		
Alabama River Flow[d]	Normal Operation: Navigation or 4,640 cfs flow											
	4,200 cfs (10% Cut) - Montgomery				4,640 cfs - Montgomery					Reduce: Full – 4,200 cfs		
	3,700 cfs (20% Cut) - Montgomery					4,200 cfs (10% 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% 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 base flows that will be exceeded when possible.
b .Jordan flows are based on a continuous +/- 5% of target flow.
c. Thurlow 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.

7-13. Flood Emergency Action Plans. The Corps is responsible for developing Flood Emergency Action Plans for the ACT System. The plans are included in the Operations and Maintenance Manuals for each system project. Example data available include emergency contact information and flood inundation information.

7-14. Other

Passing Drift. In order to pass drift through the gated spillway, it may be necessary to occasionally raise a gate higher than called for by the gate operating schedule. However, if drift passing is improperly done, i.e., if large spillway gate openings are used with low tailwaters, extremely high velocities and serious scour of the channel below the spillway may occur. Accordingly, the passing of debris is not allowed with the tailwater below elevation 52.0 feet NGVD29. Further, because of existing scour holes below gates 4, 7, 8, 11 and 14, the passing of debris will not be attempted at any time through these gates. Within these restraints, the time to raise the gate to an opening large enough to pass the drift should be as short duration as practical. In any case, the variation from the gate operating schedule should not exceed 30 minutes. The lockmaster should write all drift passing procedures on the Washing Drift Log Sheet and send a copy to the Water Management Section.

A trash gate was constructed in 2004 to facilitate passing debris at the powerhouse. In order to pass at this location, it may be necessary to occasionally raise the trash gate adjacent to the powerhouse. The time to raise the trash gate to pass the drift should be as short duration as practical to prevent unnecessary scouring of the channel below the spillway. The minimum tailwater elevation for passing drift is 52.0 feet NGVD29. The lockmaster should write all drift passing procedures on the Washing Drift Log Sheet and send a copy to the Water Management Section.

7-15. Deviation From Normal Regulation*.* The District Commander is occasionally requested to deviate from normal regulation. Prior approval for a deviation is required from the Division Commander except as noted in subparagraph a below.

Deviation requests usually fall into the following categories:

a. Emergencies. Examples of some emergencies that can be expected to occur at a project are drowning and other accidents, failure of the operation facilities, chemical spills, treatment plant failures and other temporary pollution problems. Water control actions necessary to abate the problem are taken immediately unless such action would create equal or worse conditions. The Mobile District will notify the SAD office as soon as practicable.

b. Declared System Emergency. A Declared System Emergency can occur when there is a sudden loss of power within the electrical grid and there is an immediate need of additional power generation capability to meet the load on the system. In the Mobile District, a system emergency can be declared by the Southern Company or the Southeastern Power Administration's Operation Center. Once a system emergency has been declared, the requester will contact the project operator and request generation support. The project operator will then lend immediate assistance within the projects operating capabilities. Once support has been given, the project operator should inform the Mobile District Office immediately. The responsibilities and procedures for a Declared System Emergency are discussed in more detail in Division Regulation Number 1130-13-1, *Hydropower Operations and Maintenance Policies*. It is the responsibility of the District Hydropower Section and the Water Management Section to notify South Atlantic Division Operations Branch of the declared emergency. The Division Operations Branch should then coordinate with SEPA, District Water Management, and the

District Hydropower section on any further actions needed to meet the needs of the declared emergency.

c. Unplanned Deviations. Unplanned instances can create a temporary need for deviations from the normal regulation plan. Unplanned deviations may be classified as either major or minor but do not fall into the category of emergency deviations. Construction accounts for many of the minor deviations and typical examples include utility stream crossings, bridge work, and major construction contracts. Minor deviations can also be necessary to carry out maintenance and inspection of facilities. The possibility of the need for a major deviation mostly occurs during extreme flood events. Requests for changes in release rates generally involve periods ranging from a few hours to a few days, with each request being analyzed on its own merits. In evaluating the proposed deviation, consideration must be given to impacts on project and system purposes, upstream watershed conditions, potential flood threat, project condition, and alternative measures that can be taken. Approval for unplanned deviations, either major or minor, will be obtained from the Division Office by telephone or electronic mail prior to implementation.

d. Planned Deviations. Each condition should be analyzed on its merits. Sufficient data on flood potential, lake and watershed conditions, possible alternative measures, benefits to be expected, and probable effects on other authorized and useful purposes, together with the district recommendation, will be presented by letter or electronic mail to SAD for review and approval.

7-16. Rate of Release Change. There are no restrictions on releases from Millers Ferry Lock and Dam during normal operations. During high flows, it is desirable to uniformly lower discharge downstream as allowable by conditions and equipment to lessen the impacts of the erosive nature of high flows.

VIII - EFFECT OF WATER CONTROL PLAN

8-01. General. Millers Ferry Lock and Dam is a run-of-the-river project with little storage capacity and limited peaking hydropower capacity between the maximum and minimum operating pool elevations of 80.8 and 78.0 feet NGVD29. The project's minimum reservoir level, elevation 78.0 feet NGVD29, provides navigation depths up to R. F Henry Lock and Dam. Other purposes provided by the project include water quality, public recreation and fish and wildlife conservation and mitigation. While access and some facilities are available at the project for public recreation and fish and wildlife conservation, water is typically not specifically managed for these purposes.

The impacts of the ACT Water Control Manual and its appendices, including this water control manual have been fully evaluated in an Environmental Impact Statement (EIS) that was published on __________. A Record of Decision (ROD) for the action was signed on ___________. 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. Millers Ferry Lock and Dam does not contain reservoir flood risk management storage; therefore, the project has no flood damage reduction capabilities.

a. Spillway Design Flood. The duration of the spillway design flood is approximately 24 days with a peak inflow of 840,000 cfs. Peak outflow is 814,200 cfs. The peak elevation is 106.8 feet NGVD29. The effects of the spillway design flood are shown on Plate 8-1.

b. The Standard Project Flood. The standard project flood would cause a peak pool elevation of 96.6 feet NGVD29 and a maximum discharge of 490,500 cfs. Peak inflow is 496,000 cfs. The effects of the standard project flood are shown on Plate 8-2.

c. Historic Floods. The impacts of the project on the hydrograph for flood of record, February 1961, and the flood of March 1990 are shown on Plate 8-3 and Plate 8-4 respectively.

8-03. Recreation. The Millers Ferry Lock and Dam Project is an important part of the Alabama River Lakes (ARL) recreational resource, providing both economic and social benefits for the region and the Nation. The ARL is composed of the Claiborne, Millers Ferry, and R. F. Henry Projects. The ARL contains 35,632 acres of water plus an additional 12,788 acres of land, most of which are available for public use. Pool elevations of 125 feet NGVD29 at R.F. Henry, 80 feet NGVD29 at Millers Ferry, and 35 feet NGVD29 at Claiborne were used to determine total acres of water. A wide variety of recreational opportunities are provided at the lake including boating, fishing, camping, picnicking, water skiing, and sightseeing. Mobile District park rangers and other project personnel conduct numerous environmental and historical education tours and presentations, as well as water safety instructional sessions each year for the benefit of area students and project visitors. The ARL receives more than 3,400,000 recreational visitors per year. The local and regional economic benefits of recreation are significant. Annual recreational visitor spending within 30 miles of the project totals $88 million.

8-04. Water Quality. All the ACT Basin projects operate to meet the objective of maintaining water quality. The Millers Ferry Project operates essentially as a run-of-the-river project providing a continual discharge of the inflows downstream. These discharges are used downstream to help provide the 7Q10 flow of 6,600 cfs downstream of Claiborne Lock and Dam. Several industries on the Alabama River have designed effluent discharges on the basis of that dilution flow. Whenever flows recede to that level, conditions are closely monitored so that adequate warning can be given if it is necessary to reduce the flows even further in response to extremely dry conditions. Aside from the minimum flow target downstream of Claiborne Lock and Dam, no other water management activities occur to specifically address water quality objectives.

8-05. Fish and Wildlife. The relatively stable pool at Millers Ferry Lock and Dam is beneficial to certain species of fish and wildlife. However, the project also creates a physical barrier to fish and other aquatic organisms' passage. The reservoir is relatively deep and slow moving compared to pre-impounded conditions. This results in a change in physical conditions, such as velocities, temperature, and substrate, as well as feeding and spawning habitat that cannot be tolerated by many species. The dam and reservoir along with other Corps and APC dams and reservoirs in the basin have resulted in declines in many fish and mussel populations. The described lockages in Section 7-08 of this Appendix and the Claiborne Lock and Dam Appendix for fish passage are being implemented in order to provide improved opportunities for migration for many species.

8-06. Water Supply. There are no water supply contracts at the Millers Ferry Lock and Dam Project, nor are water releases made for downstream M&I water supply purposes. There are seven withdrawals for irrigation and one for public use in a park between R. F. Henry and Millers Ferry Projects (see Section 7-09).

The regulation and permitting of surface water withdrawals for M&I use is a state responsibility. No M&I water supply releases are made from Millers Ferry Dam specifically for downstream M&I water supply purposes. However, water released from Millers Ferry Dam for its authorized project purposes, particularly during dry periods, help to ensure a reasonably stable and reliable water flow in the river to the benefit of downstream water supply users.

8-07. Hydroelectric Power. The Millers Ferry Lock and Dam Project has a limited peaking hydropower capacity between elevation 78 to 80.8 feet NGVD29.

The Millers Ferry hydropower dam, along with 22 other hydropower dams in the southeastern United States, compose the SEPA service area. SEPA sells hydroelectric power generated by Corps plants to a number of cooperatives and municipal power providers, referred to as preference customers. Hydroelectric power is 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 Millers Ferry 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 33,300 cfs, which is turbine capacity. Often, the weekend releases are lower than those during the weekdays. The projects with hydropower capability provide three principal power generation benefits:

1. Hydropower helps to ensure the reliability of the electrical power system in the SEPA service area by providing dependable capacity to meet annual peak power demands. For

most plants, that condition occurs when the reservoir is at its maximum elevation. Dependable capacity at hydropower plants reduces the need for additional coal, gas, oil, or nuclear generating capacity.

2. Hydropower projects provide a substantial amount of energy at a small cost relative to thermal electric generating stations, reducing the overall cost of electricity. Hydropower facilities reduce the burning of fossil fuels, thereby reducing air pollution. Between 2001 and 2010, Millers Ferry Project produced an average of 345,193 megawatt hours per fiscal year, with a minimum of 248,136 and a maximum of 470,727 megawatt-hours (mwh), dependent upon water availability.

3. Hydropower has several valuable operating characteristics that improve the reliability and efficiency of the electric power supply system, including efficient peaking, a rapid rate of unit unloading, and rapid power availability for emergencies on the power grid.

Hydropower generation by the Millers Ferry 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 relatively low-cost power and the annual return of revenues to the Treasury of the United States. Hydropower plays an important role in meeting the electrical power demands of the region.

8-08. Navigation.

The Alabama River from Montgomery, Alabama, downstream to the Mobile, Alabama, 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. Congress has authorized continuous navigation on the river, when sufficient water is available. There are three locks and dams on the Alabama River, and a combination of dredging, river training works, and flow augmentation from upstream storage projects, which together support navigation depths on the river.

The Alabama River is a terminus on the inland waterway system. It is accessed by the Black Warrior Tombigbee Waterway and Mobile Harbor and the Gulf Intracoastal Waterway (GIWW). Its major value as a water transportation resource is its ability to carry traffic to and from inland waterway points in Mississippi, Louisiana, and Texas. Traffic on the Alabama River is linked to resources originating along the river, which makes barge transportation essential and convenient for moving these resources.

Because of river bends and shoaling at the bends, typical tow size is a four-barge tow, except during very low water conditions when tow sizes can be reduced to two barges.

Flows for navigation are most needed in the unregulated part of the lower Alabama River below Claiborne Lock and Dam. When flows are available, Claiborne Lock and Dam is operated to provide the full navigation depth of nine feet. When river conditions or funding available for dredging of the river indicates that project conditions (nine-foot channel) will probably not be attainable in the low water season, the dam is operated to provide flows for a reduced project channel depth as determined by surveys of the river. In recent years funding for dredging has been cut resulting in higher flows or minimized channel (150 feet wide) being required to provide the design navigation depth. In addition to annual seasonal low flow impacts, droughts have a severe impact on the availability of navigation depths in the Alabama River.

A 9-foot deep by 200-foot wide navigation channel is authorized on the Alabama River to Montgomery, Alabama. 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. Over the period from 1976 to 1993, based upon river stage, the 7.5-foot navigation channel was available 79 percent of the time and the 9-foot navigation channel was available 72 percent of the time. Since 1993, the percentage of time that these depths have been available has declined further. Full navigation channel availability on the Alabama River is dependent upon seasonal flow conditions and channel maintenance. The ACT Basin water control plan will provide a 9-foot channel, based upon river stage, approximately 90 percent of the time in January and over 50 percent of the time in September. A 7.5-foot channel, based upon river stage, is expected approximately 90 percent of the time in January and 56 percent of the time in September. Because of higher flows in the winter and spring, channel availability is much higher from December through May.

Figure 8-1 depicts the historic annual channel depth availabilities for the Alabama River below Claiborne Lock and Dam, based upon river stage, computed for 1970-2010.

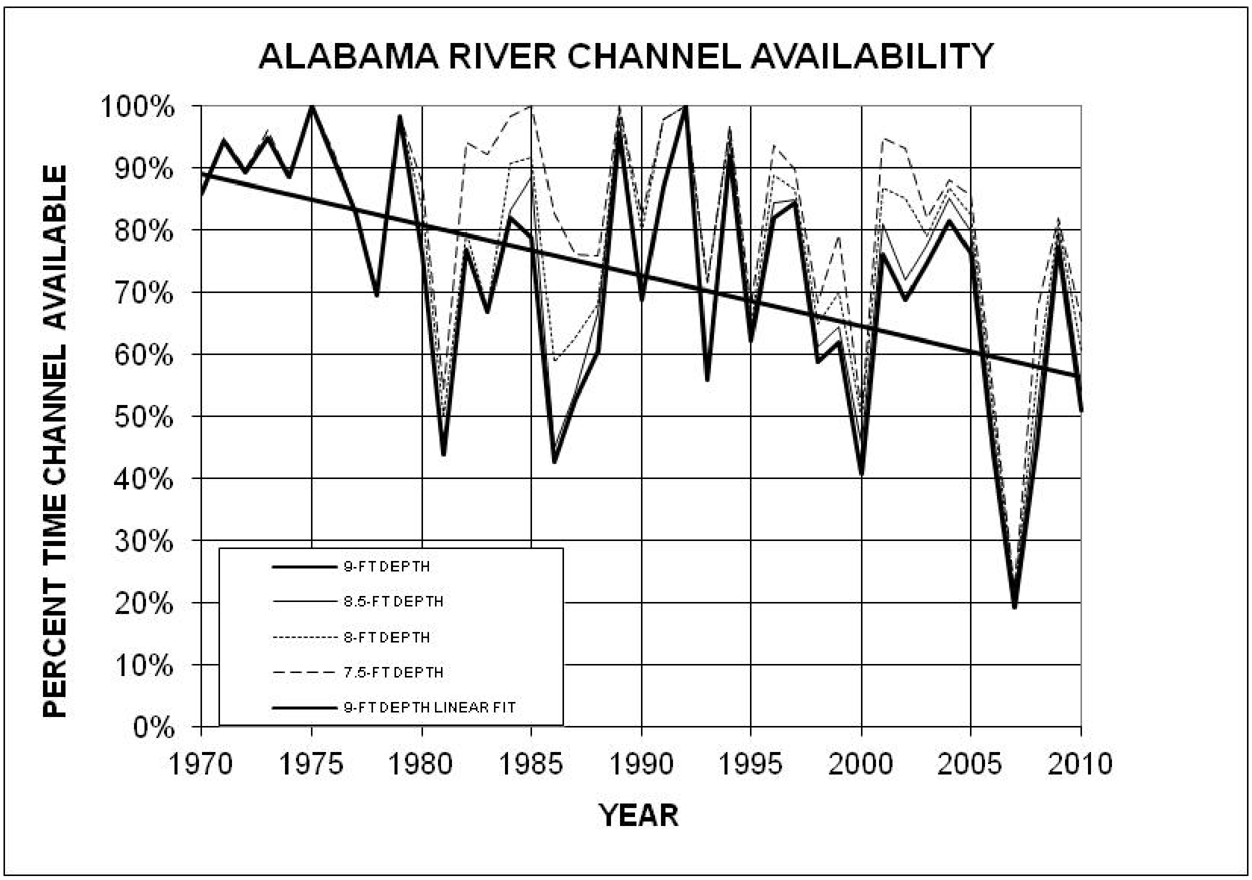


Figure 8-1. Alabama River Channel Availability Below Claiborne, 1970 to 2010

Extreme high flow conditions also limit availability of the project for commercial navigation, principally related to the ability to use the navigation locks at the three locks and dams on the Alabama River. Those conditions are temporary and far more short-term (usually lasting no more than a few days) than low-water limitations resulting from extended periods of drought and low basin inflows. At R. F. Henry Lock and Dam, use of the navigation lock is discontinued when the headwater above the dam reaches elevation 131.0 feet NGVD29. That elevation equates to a flow of about 156,000 cfs, which occurs on average about once every three years. At Millers Ferry Lock and Dam, use of the navigation lock is discontinued when the tailwater below the dam reaches elevation 81.0 feet NGVD29. That tailwater elevation equates to a flow of about 220,000 cfs, which occurs on average about once every 18 years. At Claiborne Lake, use of the navigation lock is temporarily discontinued when the tailwater below the dam reaches elevation 47.0 feet NGVD29. That tailwater elevation equates to a flow of about 130,000 cfs, which occurs on average about once every 1.8 years.

8-09. Drought Contingency Plans. The development of drought plans has become increasingly important as more demands are placed on the water resources of the basin. During low-flow conditions, the system may not be able to fully support all project purposes. 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. Response to drought conditions involves all the Corps and APC projects in the basin. Certain flow rates into the Alabama River are prescribed in the water control plan on the basis of available storage in the reservoirs, and other factors. The plan is described in Chapter VII of this appendix.

8-10. Flood Emergency Action Plans. Because the Millers Ferry Dam is not a flood risk management project, no major actions occur that are related to flood risk management. However, flowage easements have been obtained encompassing all lands subjected to an increased frequency of flooding from operation of the project. Normally, all operations are directed by the Mobile District Office (MDO). If a storm of flood-producing magnitude event occurs and all communications are disrupted between the MDO and project personnel at the Millers Ferry Lock and Dam, emergency operating procedures, as previously described in Chapter VII of this appendix, will begin. If communication is broken after some instructions have been received from the MDO, those instructions will be followed for as long as they are applicable.

8-11. Frequencies. The annual peak flow frequency curves at the Millers Ferry Project are plotted on Plate 8-5 and annual discharge duration on Plate 8-6. The headwater and tailwater stage frequency curve is shown on Plate 8-7.

IX - WATER CONTROL MANAGEMENT

9-01. **Responsibilities and Organization**. The Millers Ferry Project is a federal structure operated by the Corps. It is part of the Alabama River Navigation System. 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, National Parks Service, U.S. Coast Guard, USGS, U.S. Department of Energy, U.S. Department of Agriculture, U.S. Fish and Wildlife, NOAA. In addition to the Federal agencies, the State of Alabama is involved through the Alabama Department of Environmental Management, Alabama Office of Water Resources.

a. U.S. Army Corps of Engineers. Authority for water control regulation of the Millers Ferry Project has been delegated to the 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 Millers Ferry are regulated to meet the federally authorized project purposes in coordination with federally authorized ACT Basin-wide System purposes. It is the responsibility of the Water Management Section to develop water control regulation procedures for the Millers Ferry Project, including all foreseeable conditions. The Water Management Section monitors the project for compliance with the approved water control plan. In accordance with the water control plan, the Water Management Section performs water control regulation activities that include determination of project water releases, daily declarations of water availability for hydropower generation and other purposes; daily and weekly reservoir pool elevation and release projections; weekly river basin status reports; tracking basin composite conservation storage and projections; determining and monitoring daily and seven-day basin inflow; managing high flow operations and regulation; and coordination with other District elements and basin stakeholders. When necessary, the Water Management Section instructs the Project Operator regarding normal water control regulation procedures and emergencies, such as flood events. The project is tended by operators under direct supervision of the Power Project Manager and the Millers Ferry Site Manager. The Water Management Section communicates directly with the powerhouse operators at the Millers Ferry Powerhouse and with other project personnel as necessary. The Water Management Section is also responsible for collecting historical project data and disseminating water control information, such as historical data, lake level and flow forecasts, and weekly basin reports within the agency; to other Federal, State, and local agencies; and to the general public. The Millers Ferry Powerhouse is tended by operators who control both the power generation at Jones Bluff and the spillway gates. They can also remotely control the power generation at Millers Ferry. The Jones Bluff Powerhouse and spillway gates can also be remotely operated from the Millers Ferry Powerhouse. The Millers Ferry spillway gates can only be operated by the lock tender at Millers Ferry. The spillway gates and lock are tended by operators under direct supervision of a lock supervisor who in turn reports to the Project Manager at the Black Warrior Tombigbee/Alabama-Coosa Project Management Office in Tuscaloosa, Alabama.

b. Other Federal Agencies. Other Federal agencies work closely with the Corps to provide their agency support for the various project purposes of the Millers Ferry Project 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.

c. State 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.

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.

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.

d. Stakeholders. Many non-Federal stakeholder interest groups are active in the ACT Basin. The groups include lake associations, 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. The *ACT Master Water Control Manual* includes a list of State and Federal agencies and active stakeholders in the ACT Basin that have participated in the ACT Basin water management teleconferences and meetings.

e. Alabama Power Company. The Alabama Power Company (APC) owns and operates hydropower projects within the State, and controls most of the storage in the ACT Basin, as shown below in Table 9-1. The William "Bill" Dannelly Lake (Millers Ferry) controls less than two percent of the conservation storage in the ACT Basin.

Table 9-1. ACT Basin Conservation Storage Percent by Acre-Feet

Project	Storage (acre-feet)	Percentage
* Allatoona	284,580	10.8%
* Carters	157,402	6.0%
Weiss	263,417	10.0%
H. Neely Henry	118,210	4.5%
Logan Martin	144,383	5.5%
Lay	92,352	3.5%
Mitchell	51,577	1.9%
Jordan/Bouldin	19,057	0.7%
Harris	207,317	7.9%
Martin	1,202,340	45.7%
Yates	6,928	0.3%
* R. F. Henry (R. E. "Bob" Woodruff)	36,450	1.4%
* Millers Ferry (William "Bill" Dannelly)	46,704	1.8%

* Federal project

Millers Ferry receives outflow from the R. F. Henry Dam, which in turn receives discharges from the APC dams, Jordan-Bouldin on the Coosa River and Thurlow on the Tallapoosa River, and schedules operation based on these releases and local or intervening flow. The scheduled outflows from these dams primarily determine the operation of Millers Ferry.

9-02. Interagency Coordination

a. Local Press and Corps Bulletins. The local press includes any periodic publications in or near the Millers Ferry Watershed and the ACT Basin. The cities of Montgomery, Demopolis, Selma, Grove Hill, and Greenville, Alabama, are all in or near the Millers Ferry watershed and publish local newspapers. 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. The Corps and the Mobile District publish e-newsletters regularly which are made available to the general public via email and postings on various websites. Complete, real-time information is available at the Mobile Districts' Water Management homepage http://water.sam.usace.army.mil/.

b. National Weather Service. 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. 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 Corps-USGS Cooperative Gaging Program, the USGS maintains a comprehensive network of gages in the Millers Ferry Watershed and ACT Basin. The USGS Water Science Centers in Georgia and Florida-Tallahassee publish real-time reservoir levels, river and tributary stages, and flow data through the USGS NWIS web site. The Water Management Section uses the USGS to operate and maintain project water level gaging stations at each federal reservoir to ensure the accuracy of the reported water levels.

d. Southeastern Power Administration. SEPA was created in 1950 by the Secretary of the Interior to carry out the functions assigned to the Secretary by the Flood Control Act of 1944. In 1977 SEPA was transferred to the newly created U.S. Department of Energy. SEPA, headquartered in Elberton, Georgia, is responsible for marketing electric power and energy generated at reservoirs operated by the Corps. The power is marketed to more than 491 preference customers in Georgia, Florida, Alabama, Mississippi, southern Illinois, Virginia, Tennessee, Kentucky, North Carolina, and South Carolina.

1. SEPA's objectives are to market electricity generated by the Federal reservoir projects, while encouraging its widespread use at the lowest possible cost to consumers. Power rates are formulated using sound financial principles. Preference in the sale of power is given to public bodies and cooperatives, referred to as preference customers. SEPA does not own transmission facilities and must contract with other utilities to provide transmission, or *wheeling* services, for the Federal power.

2. SEPA's responsibilities include the negotiation, preparation, execution, and administration of contracts for the sale of electric power; preparation of repayment studies

to set wholesale rates; the provision, by construction, contract or otherwise, of transmission and related facilities to interconnect reservoir projects and to serve contractual loads; and activities pertaining to the operation of power facilities to ensure and maintain continuity of electric service to its customer.

3. SEPA schedules the hourly generation schedules for the Millers Ferry power project at the direction of the Corps on the basis of daily and weekly water volume availability declarations and water release requirements.

e. U.S. Fish and Wildlife Service. 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. The Corps, Mobile District, with support from the Water Management Section, coordinates 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 Millers Ferry 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 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 SAD 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

Dam site location	
State	Alabama
Basin	Alabama-Coosa-Tallapoosa
River	Alabama
Miles above mouth of Alabama River	133.0
Drainage area R. F. Henry to Millers Ferry - sq. mi.	4,404
Total drainage area above Millers Ferry Dam site - sq. mi.	20,637
Type of project	Dam, Reservoir and Power plant
Objectives of regulation	Navigation, Power
Project Owner	United States of America
Operating Agency/ Regulating Agency	U. S. Army Corps of Engineers

STREAM FLOW AT DAM SITE

Period of Record	1938-2009
Period of Record (Dam in place)	1970-2009
Average annual flow for period of record (1938-2009) - cfs	29,391
Minimum monthly flow in period of record(1938-2009) - cfs	3,346 (Dec 2007)
Maximum monthly flow in period of record(1938-2009) - cfs	152,195 (Mar 1961)
Minimum daily flow in period of record (1938-2009) - cfs	1,990 (1 Dec 2007)
Maximum daily flow in period of record(1938-2009) - cfs	249,895 (3 Mar 1961)
Peak flow during period of record, (Feb-Mar 1961 flood) - cfs	284,000
Peak stage for period of record, (Feb-Mar 1961 flood) - ft NGVD29	86.5
Estimated peak stage for the flood of historical record (Apr 1886) - feet NGVD29	87.0

REGULATED FLOODS

Maximum flood of record (Feb. - Mar. 1961)*	
Regulated peak outflow – cfs	271,500
Regulated peak headwater - feet NGVD29	87
Standard project flood series	
Peak inflow - cfs	496,000
Regulated peak outflow - cfs	490,500
Regulated peak headwater - feet NGVD29	96.6
Spillway design flood series	
Peak inflow - cfs	840,000
Regulated peak outflow - cfs	814,200
Regulated peak headwater - feet NGVD29	106.8

REGULATED FLOODS (CONT'D)

TAILWATER ELEVATIONS – feet NGVD29

Minimum without turbines in operation	30.36
Maximum flood of continuous record,(Feb-Mar 1961)	85.5
Standard Project Flood Series	96.1
Spillway Design Flood Series	106.5

RESERVOIR

Maximum operating pool elevation - feet NGVD29	80.8
Minimum operating pool elevation - feet NGVD29	78.0
Normal operating pool elevation – feet NGVD29	80.0
Area at pool elevation 80.8 - acres	18,528
Area acquired in fee simple - acres	4,007.3
Area acquired by easement - acres	22,780.72
Area cleared - acres	6,183
Maximum elevation of clearing - feet NGVD29	81.0
Total volume to elevation 78.0 - acre-feet	299,550
Total volume to elevation 80.8 - acre-feet	346,254
Volume from elevation 78.0 to 80.8 - acre-feet	46,704
Length at elevation 80.8 - miles	105
Shoreline distance at elevation 80.8 - miles	556

LOCK

Nominal size of chamber - feet	84 x 600
Distance center to center of gate pintles - feet	655
Maximum lift - feet	48.8
Elevation of upper stop-log sill – feet NGVD29	64.0
Elevation of upper miter sill - feet NGVD29	61.0
Elevation of lower stop-log sill - feet NGVD29	19.0
Elevation of lower miter sill - feet NGVD29	19.0
Elevation of chamber floor - feet NGVD29	18.0
Elevation of top of floor culverts – feet NGVD29	17.0
Elevation of top of upper approach walls - feet NGVD29	87.0
Elevation of top of chamber walls - feet NGVD29	87.0
Elevation of top of lower guide walls - feet NGVD29	82.0
Freeboard on guide walls when lock becomes inoperative - feet	1.0
Type of upper gate	vertically framed miter
Height of upper gate - feet	26
Type of lower gate	horizontally framed miter
Height of lower gate - feet	68
Type of culvert valves	reverse tainter

Dimensions of culverts at valves - feet	10 x 10
Dimensions of culverts at laterals - feet	10 x 15.75
Elevation of culvert ceilings between valves - feet NGVD29	26.0

LOCK (CONT'D)

Minimum submergence of culvert valves - feet	6.0
Type of filling and emptying system	Longitudinal floor culverts
Type of emergency dams	stop logs
Elevation of top of upstream emergency dam - feet NGVD29	82.0
Elevation of top of downstream emergency dam - feet NGVD29	46.0
Type of operating machinery	hydraulic oil pressure

SPILLWAY

Total length, including end piers - feet	994
Net length - feet	850
Elevation of crest - feet NGVD29	46.0
Number of piers, including end piers	18
Width of piers - feet	8
Type of gates	Tainter
Number of gates	17
Length of gates - feet	50
Height of gates - feet	35
Maximum discharge capacity (pool elev. 80.8) - cfs	192,500
Elevation of top of gates in closed position - feet NGVD29	81.0
Elevation of low steel of gates in fully open position - feet NGVD29	98.8
Elevation of trunnion - feet NGVD29	79.0
Elevation of access bridge - feet NGVD29	113.5
Elevation of stilling basin apron - feet NGVD29	17.0 to 25.0
Length of stilling basin - feet	61 to 69
Height of end sill - feet	5.0 to 7.5

EARTH OVERFLOW DIKES

RIGHT BANK DIKE

Total length - feet	3,360
Top elevation - feet NGVD29	85.0
Top width - feet	25
Side slopes	1 on 2.5
Thickness of riprap on slopes - inches	18 to 24
Thickness of filter blanket - inches	6 to 9

Recurrence interval of flood which will overtop dike - years	27
Freeboard, top of dike above maximum normal upper pool - feet	4.2

EARTH OVERFLOW DIKES

LEFT BANK DIKE

Total length including lock mound - feet	5,500
Top elevation - feet NGVD29	97.0
Top width - feet	32
Slope on upstream	1 on 2.5
Slope on downstream	1 on 3
Thickness of riprap on slopes - inches	24
Thickness of filter blanket - inches	9
Maximum swellhead when dike is overtopped - feet	0.4
Freeboard, top of dike above headwater for Standard Project flood series - feet	1.5

POWER PLANT

Maximum power pool elevation - feet NGVD29	80.8
Maximum normal drawdown elevation - feet NGVD29	78.0
Temporary/Emergency drawdown elevation – feet NGVD29	77.0
Maximum static head - feet	48.0
Average operating head without spillway discharge - feet	40
Rated net head - feet	35.5
Operating head with one unit at full gate and pool elevation at 80.8 ft	44.0 to 46.5
Minimum head for generation - feet	14
Length of powerhouse - feet	320
Width of powerhouse including intake structure - feet	168.5
Type of powerhouse construction	reinforced concrete
Type of intake gates	tractor
Number of intake gates	9
Height of intake gates - feet	34
Width of intake gates - feet	20
Type of intake gate operation	Gantry crane
Number of units	3
Unit Spacing - feet	80
Type of turbine	fixed blade
Maximum discharge per unit - cfs	11,200
Maximum power discharge at pool elevation 78.0 - cfs	33,300
Capacity of each turbine - hp	34,000
Elevation of centerline of distributor - feet NGVD29	44.0
Generator rating - kW	30,000
Total installation - kW	90,000

Dependable plant output during critical period - kW	75,000
Generator rating - kva	26,316
Generator speed - rpm	69.3
Generator, electrical characteristics	3 phase, 60 cycle, 13,000 volt

POWER PLANT (CONT'D)

Elevation of bottom of draft tube - feet NGVD29	-16.0
Length of draft tube - feet	86
Type of draft tube gates	slide
Number of draft tube gates	3
Type of draft tube gate operation	positioned by gantry
Elevation of operating deck - feet NGVD29	97.0
Location of switchyard	right bank downstream
Elevation of switchyard and parking area - feet NGVD29	97.0
Transmission voltage - kv	115
Number of transformer bays	3
Number of 3-phase type transformers	3
Capacity of each transformer - kva	30,330
Average annual energy from plant (2000-2012) - million kW-hr.	331.7

TRASH GATE

Type of gate	Tainter
Width of debris spillway – feet	24
Size of trash gate, length x height – feet	24 x 18
Elevation of trash gate crest – feet NGVD29	72
Elevation of trash gate fully opened – feet NGVD29	90
Discharge through trash gate at pool elevation 80.8 feet NGVD29 - cfs	2,640

EXHIBIT B

UNIT CONVERSIONS
AND
VERTICAL DATUM CONVERSION INFORMATION

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	0.0001	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 cfs for 24 hours
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

Millers Ferry Coordinate Comparison

Station	NAVD88 Elevation (feet)	NGVD29 Elevation (feet)	Diff NAVD88 NGVD29 (feet)	Remarks
7A-3E	87.270			Set Corps of Engineers Brass Disk (Elevation obtain from OPUS DB)
7A-3F	87.255			Set Corps of Engineers Brass Disk
US Gauge (Lock)	90.122			Shot on upstream gauge datum point. Read 80.27 on tape, digital readout 80.27 @ 9:16 AM June 7, 2010.
DS Gauge (Lock)	89.864			Shot on Downstream gauge datum point. Read 32.74 on tape, digital readout 41.80 @ 8:35 AM June 7, 2010.
US Gauge (Power House)	100.463			Shot on upstream gauge datum point. Read 80.19 on tape, digital readout 80.19 @ 11:17 AM June 7, 2010.
DS Gauge (Power House)	100.463			Shot on Downstream gauge datum point. Steel tape was unreadable, digital readout 41.42 @ 11:21 AM June 7, 2010.
RP1 (Lock)	89.671	89.347	0.324	USGS - RP 1 –Tail gage: (8/1/89) – is chiseled arrow on 3/8” aluminum plate in front of recorder near upstream edge of well. Elev., 89.347 ft, MSL
RP2 (Lock)	89.898	89.573	0.325	USGS - RP 2 – Pool gage – is penciled arrow on plywood floor in front of recorder near upstream edge of well. Elev. 89.573 ft, MSL.
RP1 (Pool) Power House	100.185	99.887	0.297	USGS - RP 1 – (2/26/88) Pool Gage. – is chiseled arrow on metal top at counter weight side of float tape. Elev., 99.887 ft, MSL.
RP1 (Tail) Power House	100.161	99.867	0.294	USGS - RP 1 – (2/26/88) Tail Gage. – is chiseled arrow on metal top right of float tape indicator. Elev., 99.867 ft, MSL.
HW&TW	97.148	96.851	0.297	USGS - Bronze tablet. – set in floor between headwater and tail water gages, stamped “HW-TW Reference Gage 1974.” Elev., 96.851 ft, MSL.
TBM A	89.655			Chiseled square on upstream left corner of concrete base for downstream lock housing.

Millers Ferry Coordinate Comparison

Station	NAVD88 Elevation (feet)	NGVD29 Elevation (feet)	Diff NAVD88 NGVD29 (feet)	Remarks
TBM B	88.277			Chiseled "x" in top left side of stationary metal cleet. First cleet on landward side of lock wall. 3.30 foot right of life ring holder case
TBM C	89.708			Chiseled square near left edge of left lock wall. Near lock upstream gauge. 2.00 foot right of steel tape on upstream gauge at lock.
TBM D	89.567			Chiseled "x: in top left side of stationary metal cleet. First cleet on landward side of lock wall. 3.30 foot right of life ring holder case.
TBM E	97.205			Top of anchor bolt holding "u" channel iron to floor of Gauge Well Room in powerhouse. Left bolt closest to headwater gauge well. 2.10 foot from center of steel tape on headwater gauge.

SURVEY DATASHEET (Version 1.0)

PID:	BBBY66
Designation:	7A-3E
Stamping:	7A-3E
Stability:	Monument will probably hold position well
Setting:	Massive structures (other than listed below)
Description:	LOCATED ON THE ALABAMA RIVER, AT THE MILLERS FERRY LOCK AND DAM, IN THE VACINITY OF THE LEFT LOCK WALL, UPSTREAM OF THE DOWNSTREAM LOCK AND DAM. MONUMENT IS 20.0 FEET NORTHEAST OF A HANDRAIL CORNER, 19.2 FEET NORTHEAST OF A LAMP POLE, 11.9 FEET NORTHWEST OF THE NORTHWEST CORNER OF THE GATE HOUSE AND 16.8 FEET SOUTHEAST OF A METAL CLEET. MONUMENT IS A STANDARD U.S. ARMY CORPS OF ENGINEERS BRASS DISK SET IN LOCK WALL.
Observed:	2010-06-07T13:06:00Z
Source:	OPUS - page5 0909.08

Close-up View

REF_FRAME: NAD_83 (CORS96)	EPOCH: 2002.0000	SOURCE: NAVD88 (Computed using GEOID09)	UNITS: m	SET PROFILE	DETAILS

LAT:	32° 5' 57.12247"	± 0.027	m
LON:	-87° 23' 52.75335"	± 0.019	m
ELL HT:	-1.333	± 0.048	m
X:	245522.822	± 0.019	m
Y:	-5402643.827	± 0.033	m
Z:	3369754.317	± 0.045	m
ORTHO HT:	26.600	± 0.048	m

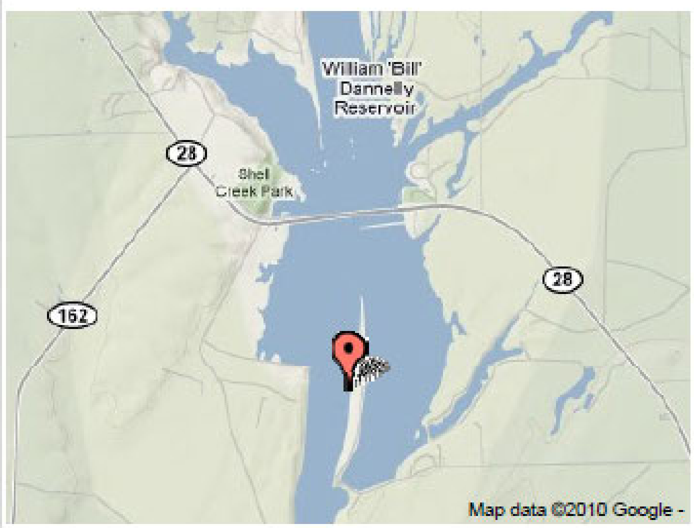
	UTM 16	SPC 102(AL W)
NORTHING:	3551500.731m	232728.209m
EASTING:	462448.395m	609628.492m
CONVERGENCE:	-0.21148752°	0.05420838°
POINT SCALE:	0.99961739	0.99993448
COMBINED FACTOR:	0.99961760	0.99993469

CONTRIBUTED BY

mchaney

Maptech Inc

Horizon View



The numerical values for this position solution have satisfied the quality control criteria of the National Geodetic Survey. The contributor has verified that the information submitted is accurate and complete.

MILLERS FERRY LOCK AND DAM

EXHIBIT C

STANDING INSTRUCTION TO THE PROJECT OPERATOR FOR WATER CONTROL

MILLERS FERRY LOCK AND DAM

STANDING INSTRUCTIONS TO THE POWERHOUSE OPERATOR FOR WATER CONTROL

MILLERS FERRY LOCK AND DAM PROJECT

1. BACKGROUND AND RESPONSIBILITIES

a. General Information. These "Standing Instructions to the Powerhouse Operator for Water Control" are written in compliance with Paragraph 9-2 of EM-1110-2-3600 (Engineering and Design, *Management of Water Control Systems*, 30 November 1987) and with ER-1110-2-240 (Engineering and Design, *Water Control Management*, 8 October 1982). A copy of these Standing Instructions must be kept on hand at the project site at all times. Any deviation from the Standing Instructions will require approval of the District Commander.

(**1) Project Purposes**. The Millers Ferry Lock and Dam Project is operated for Hydropower and Navigation.

(**2) Chain of Command**. The Powerhouse Operator is responsible to the Water Control Manager for all water control actions.

(3) Structure. The Millers Ferry is located at Alabama River mile 133.0, Wilcox County, Alabama. The dam is a concrete-gravity structure with a concrete-gravity gated spillway. The powerhouse is located on the left bank, separated from the spillway by approximately 3000 feet. The lock is located adjacent to the left side of the spillway.

(4) Operation and Maintenance (O&M). All O&M activities are the responsibility of the U. S. Army Corps of Engineers.

b. Role of the Powerhouse Operator.

(1) Normal Conditions (dependent on day-to-day instruction). The Water Control Manager will coordinate the daily water control actions with SEPA. The Powerhouse Operator will then receive instructions from SEPA. This communication will be increased to an hourly basis if the need develops.

(2) Emergency Conditions (flood, drought, or special operations). During emergency conditions, the Powerhouse Operator will be instructed by the Water Control Manager on a daily or hourly basis for all water control actions. In the event that communications with Water Management Section are cut off, the Powerhouse Operator will continue to follow the water control plan and contact the Water Management Section as soon as communication is reestablished.

2. DATA COLLECTION AND REPORTING

a. General. R. F. Henry and Millers Ferry Powerhouse data is automatically recorded hourly. A file containing the data is sent to the LDS System every four hours. The information includes pool elevations, megawatt loading of the units, turbine and spillway discharges, gate step settings and inflows.

b. Normal Conditions. At 6:00 A.M. every morning a water management report is sent to the LDS. It includes:

1. Midnight Pool Elevation (ft NGVD29)
2. 6AM Pool Elevation (ft NGVD29)
3. Midnight Tailwater Elevation (ft NGVD29)
4. 6AM Tailwater Elevation (ft NGVD29)
5. 24-Hour Average Inflow (cfs)
6. 1st 4-Hour Average Inflow (cfs)
7. 24-Hour Average Discharge (cfs)
8. 1st 4-Hour Average Discharge (cfs)
9. Gross Generation (mwh)
10. Estimated Generation (mwh)
11. Rainfall (hundredths of an inch)
12. 6AM Gatestep
13. 24-Hour Average Turbine Discharge (cfs)
14. Capacity (mw)
15. Project generation schedule.

c. Regional Hydro-meteorological Conditions. The Powerhouse operator will be informed by the Water Control Manager of any regional hydro-meteorological conditions that may impact water control actions.

3. WATER CONTROL ACTION AND REPORTING

a. Normal Conditions. During normal conditions, all releases will be made through the turbine units. The Powerhouse Operator will follow the Millers Ferry Water Control Manual for normal water control actions and will report directly to the Water Control Manager.

b. Emergency Conditions. During high flows, the Lock Operator at Millers Ferry will follow the instructions for spillway gate settings given by the Powerhouse Operator and according to the Gate Operating Schedule. The generating units will be shut down when the operating head decreases to approximately 14 feet. During low flow conditions, the Powerhouse Operator will contact the Water Control Manager if the pool elevation reaches 77.5 feet NGVD29. If unable to reach Water Management Section, generating units will be shut down at elevation 77.0 feet NGVD29, and the Powerhouse Operator will notify Water Management and SEPA as soon as possible. In no case will releases be made when the pool is below elevation 77.0 feet NGVD29 unless specifically directed by the Water Management Section. The Powerhouse Operator will follow the Millers Ferry Water Control Manual for emergency water control actions and will follow the Emergency Action Plan for emergency notification procedures.

c. Inquiries. All significant inquiries received by the Powerhouse Operator from citizens, constituents, or interest groups regarding water control procedures or actions must be referred directly to the Water Control Manager.

d. Water Control Problems. The Powerhouse Operator must immediately notify the Water Control Manager, by the most rapid means available, in the event that an operational malfunction, erosion, or other incident occurs that could impact project integrity in general or water control capability in particular.

EXHIBIT D

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

US Army Corps of Engineers ®

South Atlantic Division
Mobile District

December 2014

DROUGHT CONTINGENCY PLAN
FOR THE
ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

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. This DCP does not prescribe all possible actions that might be taken in a drought situation due to the long-term nature of droughts and unique issues that may arise. 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 manual 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	Total storage at Full Pool (acre-feet)	Conservation Storage (acre-feet)	Percentage of ACT Basin Conservation
Coosawattee River				
Carters Dam and Lake	Corps/GA/19	383,565	141,402	5.9
Carters Reregulation Dam	Corps/GA/19	17,500	16,000	0.1
Etowah River				
Allatoona Dam and Lake	Corps/GA/19	367,471	284,580	10.8
Hickory Log Creek Dam	CCMWA/Cant on/2007	17,702	NA	NA
Coosa River				
Weiss Dam and Lake	APC/AL/196	306,655	263,417	10.0
H. Neely Henry Dam and	APC/AL/196	120,853	118,210	4.5
Logan Martin Dam and Lake	APC/AL/196	273,467	144,383	5.5
Lay Dam and Lake	APC/AL/191	262,887	92,352	3.5
Mitchell Dam and Lake	APC/AL/192	170,783	51,577	1.9
Jordan Dam and Lake	APC/AL/192	236,130	19,057	0.7
Walter Bouldin Dam	APC/AL/196	236,130	NA	--
Tallapoosa River				
Harris Dam and Lake	APC/AL/198	425,721	207,317	7.9
Martin Dam and Lake	APC/AL/192	1,628,303	1,202,340	45.7
Yates Dam and Lake	APC/AL/192	53,908	6,928	0.3
Thurlow Dam and Lake	APC/AL/193	17,976	NA	--
Alabama River				
Robert F. Henry Lock and Dam/R.E. "Bob" Woodruff	Corps/AL/19 72	247,210	36,450	1.4
Millers Ferry Lock and Dam/William "Bill" Dannelly	Corps/AL/19 69	346,254	46,704	1.8
Claiborne Lock and Dam and Lake	Corps/AL/19 69	102,480	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. Drought Identification. 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 Alabama Office of the State Climatologist also produces a Lawn and Garden Moisture Index for Alabama, Florida, Georgia, and South Carolina, 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 conditions, 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. For example, 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 of 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 22,739 square miles: 17,254 square miles in Alabama; 5,385 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. **<u>Project Description</u>**. 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

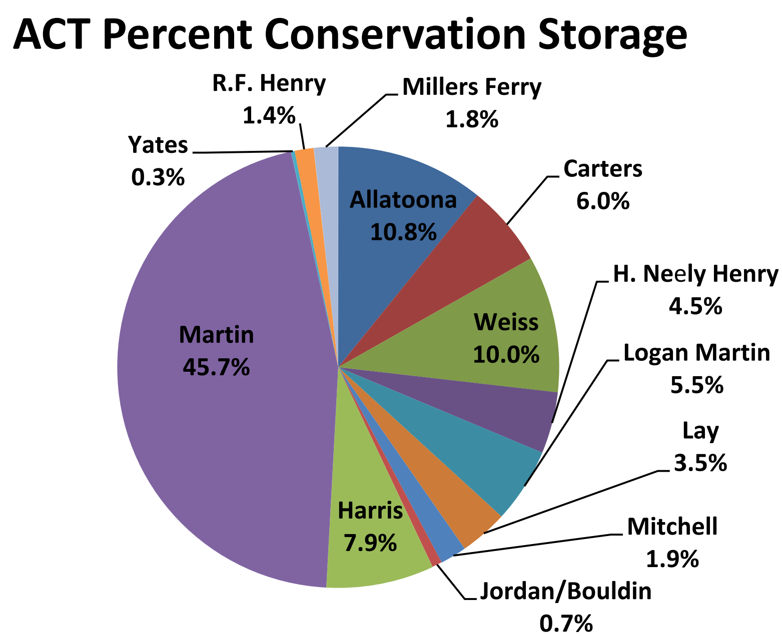


Figure 1. Alabama-Coosa-Tallapoosa River Basin Percent Conservation Storage

reservoir and Carters Lake and Carters Reregulation Dam as one reservoir), Lake Martin on the Tallapoosa River has the greatest amount of storage, containing 45.7 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 80 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 20 percent. The two most upstream Corps reservoirs, Allatoona Lake and Carters Lake, account for 16.8 percent of the total basin conservation storage.

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

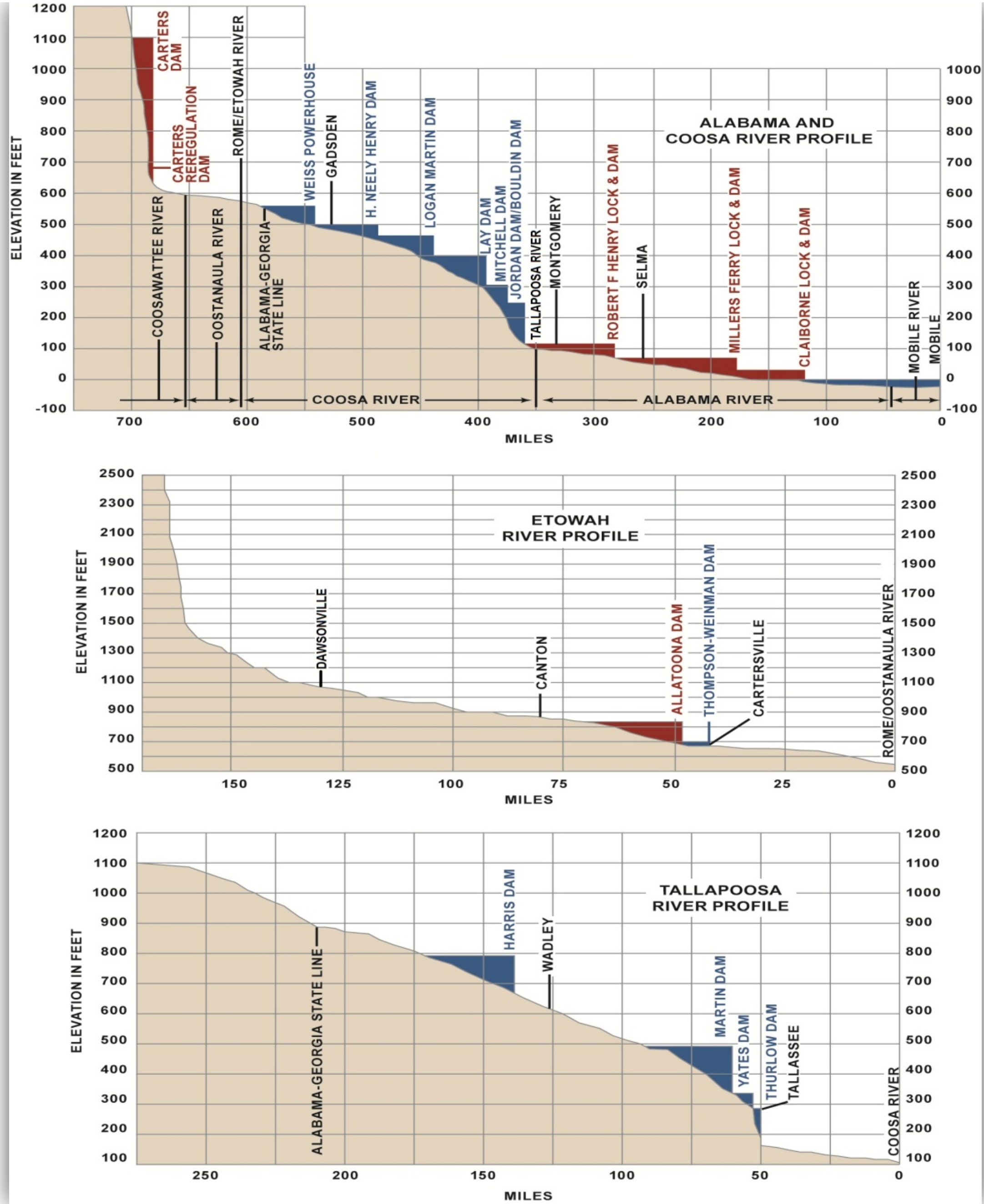


Figure 3. Alabama-Coosa-Tallapoosa River Basin Profile Map

B. **Allatoona Dam and Lake**. The Corps' Allatoona Dam on the Etowah River creates the 11,862 acres 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 NGVD29 during the late spring and summer months (May through August); transitions to elevation 835 feet NGVD29 in the fall (October through mid-November); transitions to a winter drawdown to elevation 823 feet NGVD29 (1-15 January); and refills back to elevation 840 feet NGVD29 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.

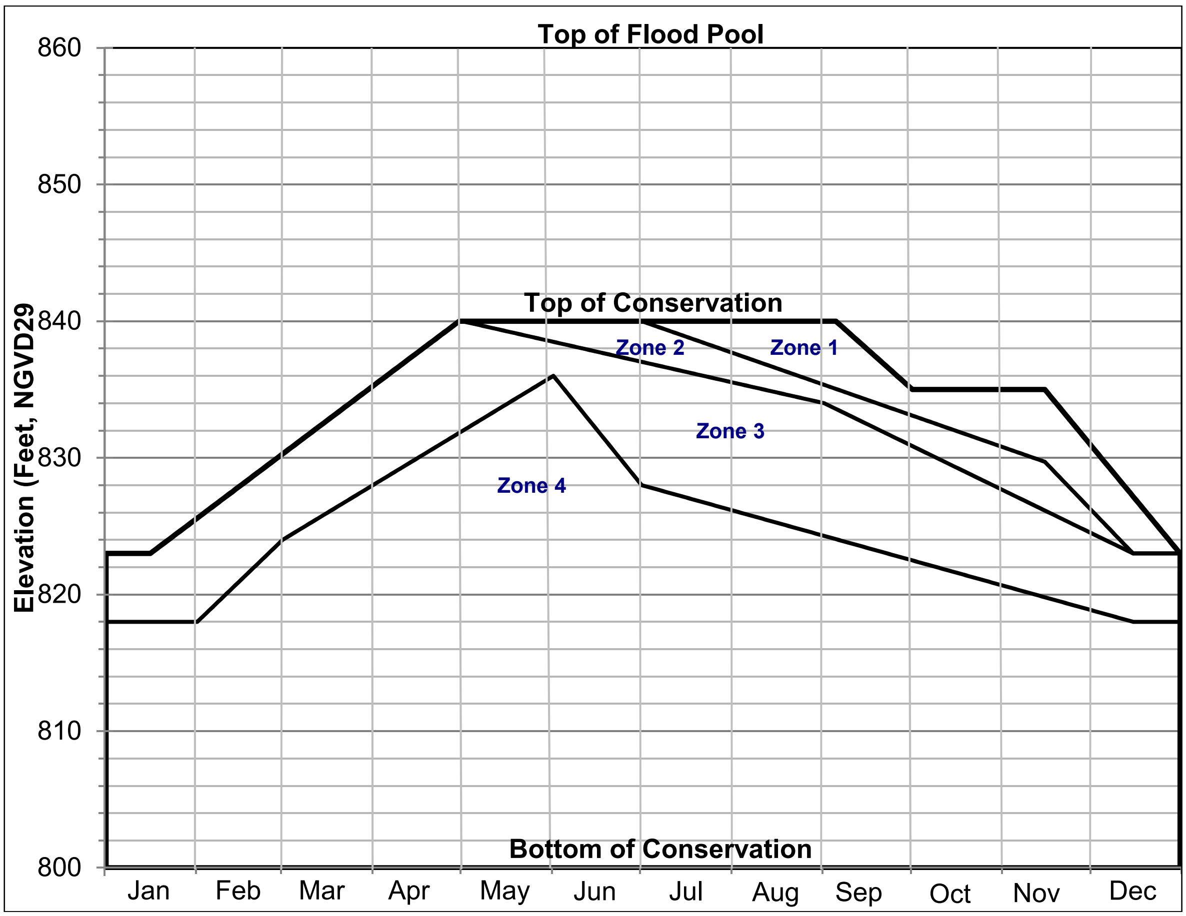


Figure 4. Allatoona Lake Guide Curve and Action Zones

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 1,074 feet NGVD29 from 1 May to 1 November; transitioning to elevation 1,072 feet NGVD29 between 1 November and 1 December; remains at elevation 1,072 feet NGVD 29 from 1 December to April; then transitioning back to 1,074 feet NGVD29 between 1 April and 1 May. This is 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 NGVD29 and minimum elevation of 677 feet NGVD29 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 conservation. 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.

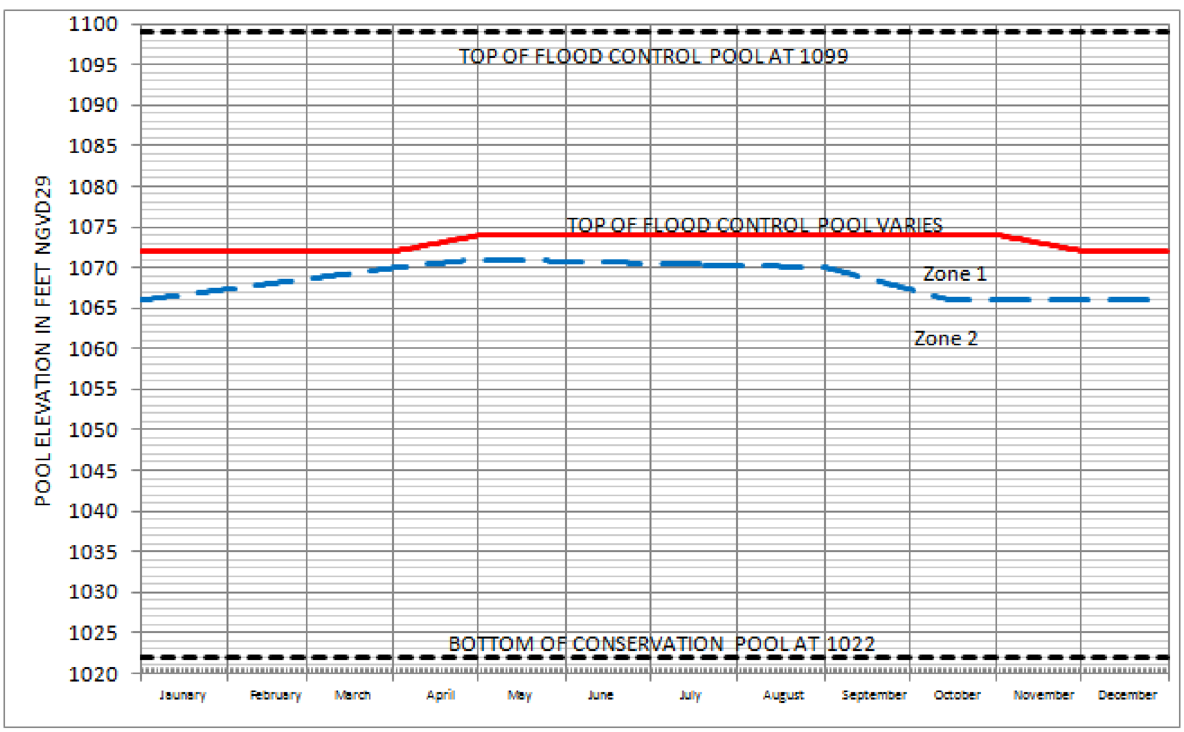


Figure 5. Carters Lake Guide Curve and Action Zones

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 three 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 understanding between the Corps and APC (Exhibit B of the *Master Water Control Manual, Alabama-Coosa-Tallapoosa (ACT) River Basin, Alabama, Georgia*), 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 mi northeast of Birmingham, Alabama, and extends into northwest Georgia for about 13 miles upstream on the Coosa River. The dam impounds a 30,027 acres reservoir (Weiss Lake) at the normal summer elevation of 564 feet NGVD29 as depicted in the regulation guide curve shown in Figure 6 (source APC). The H. Neely Henry Lake is on the Coosa River in northeast Alabama, about 60 miles northeast of Birmingham, Alabama. The dam impounds an 11,200 acres reservoir at the normal summer elevation of 508 feet NGVD29 as depicted in the regulation guide curve shown in Figure 7 (source APC). The Logan Martin Lake is in northeast Alabama on the Coosa River, about 40 miles east of Birmingham, Alabama. The dam impounds a 15,269-acre reservoir at the normal summer elevation of 465 feet NGVD29 as depicted in the regulation guide curve shown in Figure 8 (source APC). 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.

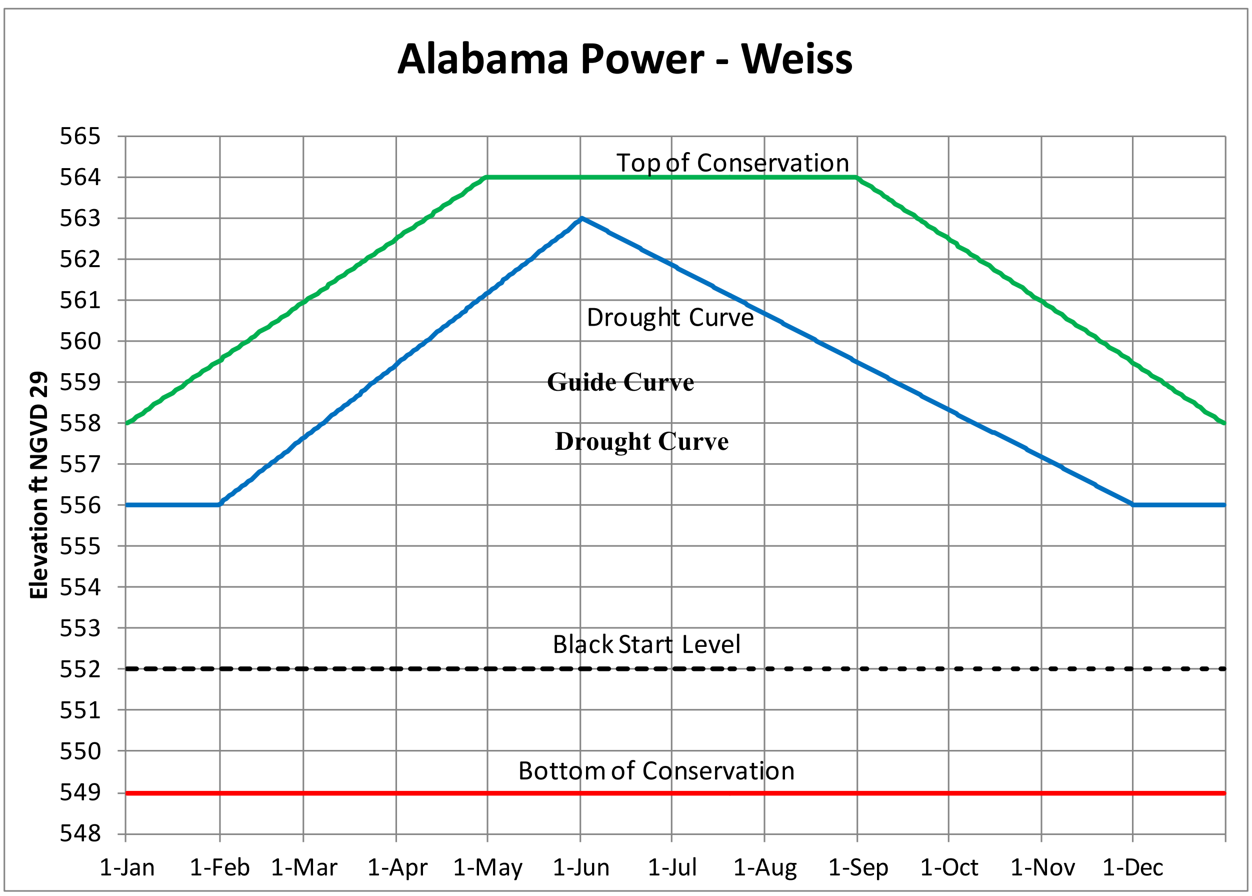


Figure 6. Weiss Lake Guide Curve

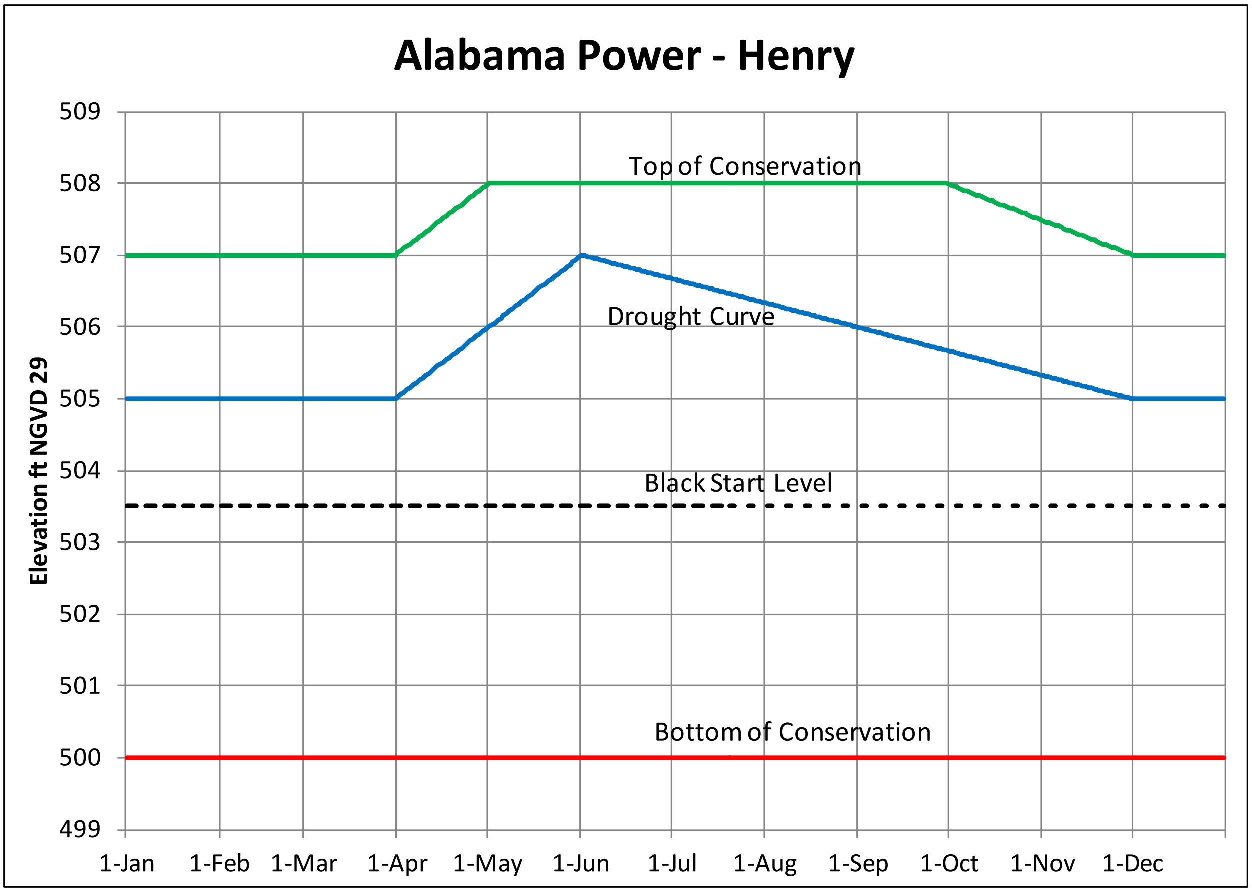


Figure 7. H. Neely Henry Lake Guide Curve

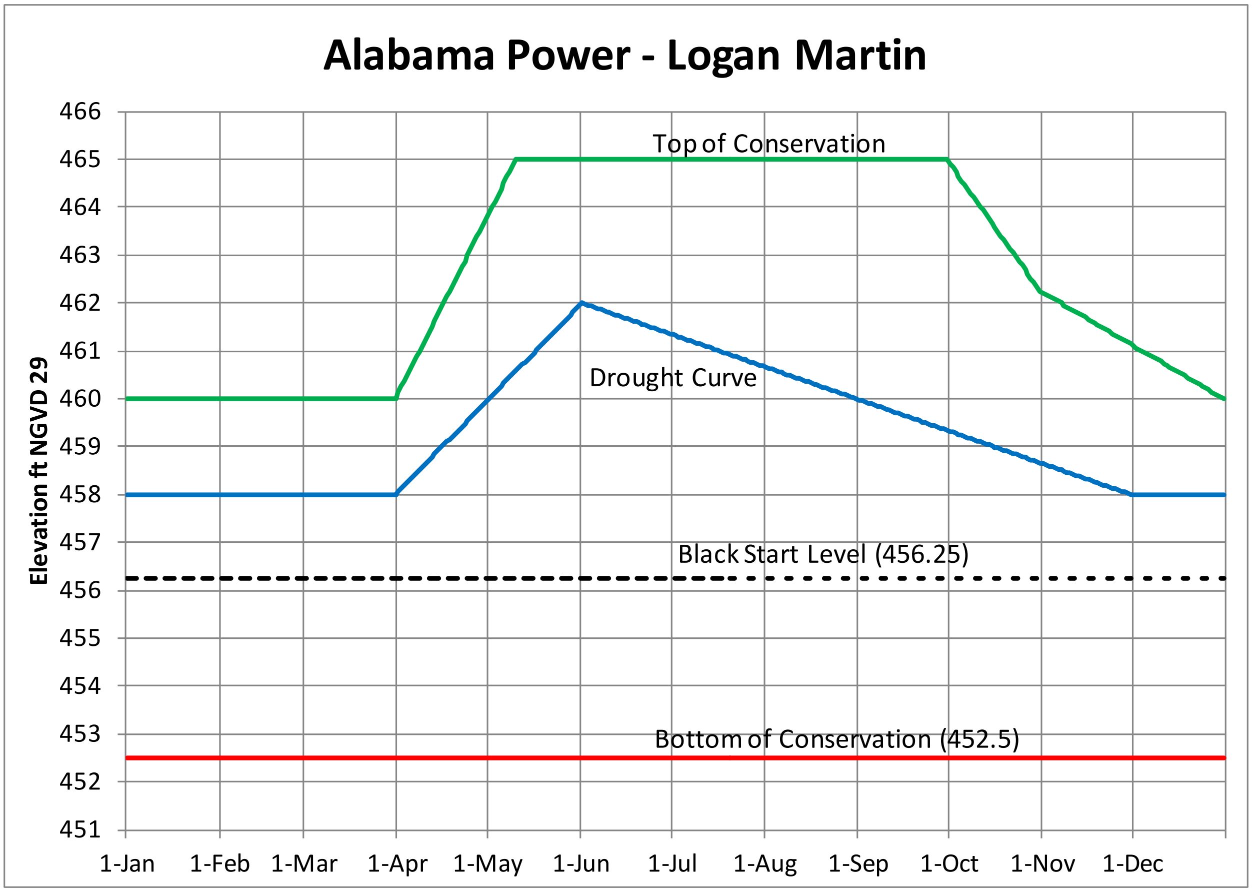


Figure 8. Logan Martin Lake Guide Curve

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 33 CFR, Chapter II, Part 208, Section 208.65 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 prescribed are described in a memorandum of understanding between the Corps and APC, individual water control manuals for the APC projects, and this DCP.

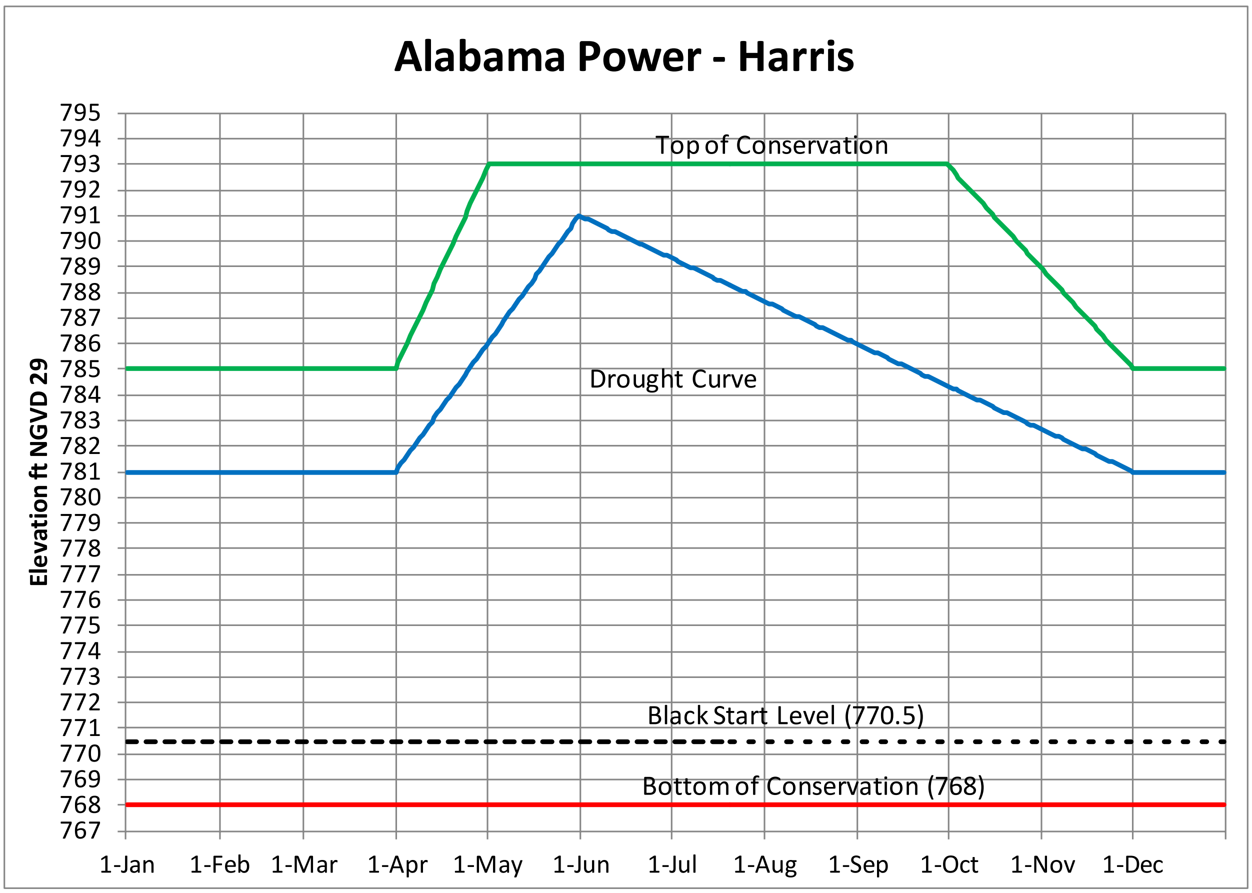


Figure 9. Robert L. Harris Lake Guide Curve

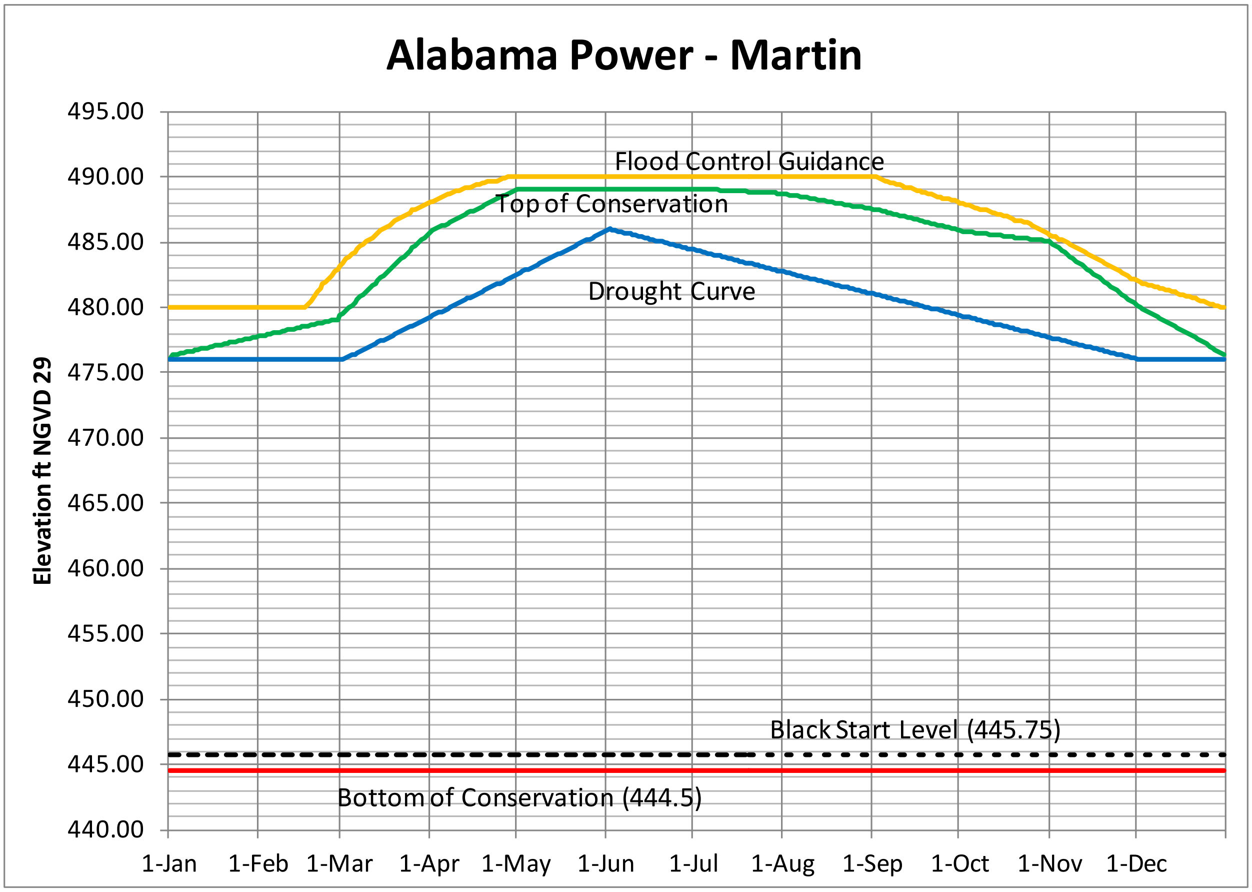


Figure 10. Martin Lake Guide Curve

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) Robert F. Henry. The R.E. “Bob” Woodruff Lake is created by the Robert F. Henry Lock and Dam on the Alabama River at river mile 236.3. 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 12,510 acres and a storage capacity of 234,200 acre-feet at a normal pool elevation of 126 feet NGVD29. Lake levels are typically fairly stable with minimal fluctuation between the operating pool elevation limits, 123 feet NGVD29 to 126 feet NGVD29. The emergency drawdown pool elevation is 122 feet NGVD29. 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 (declared value). The lake is a popular recreation destination, receiving up to two million visitors annually.

(2) Millers Ferry. The William "Bill" Dannelly Lake is created by the Millers Ferry Lock and Dam on the Alabama River at river mile 133. William "Bill" Dannelly Lake is 103 miles long and averages almost 1,400 feet wide. The reservoir has a surface area of 18,528 acres and a storage capacity of 346,254 acre-feet at a normal full pool elevation of 80 feet NGVD29. Lake levels remain fairly stable on a day-to-day basis with minimal fluctuation between the operating pool elevation limits, 79 feet NGVD29 to 80 feet NGVD29. It has an authorized 9-foot-deep by 200-foot-wide navigation channel which 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 (declared value). The reservoir provides ample recreation opportunities. Recreation visitors number three million annually.

(3) Claiborne. Claiborne Lake is created by the Claiborne Lock and Dam on the Alabama River at river mile 72.5. 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 at a normal pool elevation of 35 feet NGVD29. The operating pool elevation limits are between 32 feet NGVD29 and 36 feet NGVD29. 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 provide information regarding the effects of the water control plans on recreation.

V – WATER USES AND USERS

5-01. Water Uses and Users.

A. Uses – The ACT Basin rivers and lakes provide for wastewater dilution, M&I 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 Sprngs	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 WW Commission	105-1405-01	Murray	Holly Creek	1.100	1.000
Coosa	Chatsworth WW Commission	105-1405-02	Murray	Eton Springs	1.800	1.800
Coosa	Chatsworth WW 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

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

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

River basin	River basin	River basin	River basin	River basin	River basin	River basin
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	Allatoona Lake	86.000	78.000
Coosa	Cartersville, City of	008-1491-06	Bartow	Allatoona Lake	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
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

Table 3 (continued). M&I surface water withdrawal permits in the ACT Basin (Georgia)						
River basin	**River basin**	**River basin**	**River basin**	**River basin**	**River basin**	**River basin**
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)						
Tallapoo sa	Haralson County Water Authority	071-1301-01	Haralson	Tallapoosa River	3.750	3.750
Tallapoo sa	Bremen, City of	071-1301-02	Haralson	Beech Creek & Bremen Reservoir (Bush Creek)	0.800	0.580
Tallapoo sa	Bowdon, City of Indian	022-1302-01	Carroll	Indian Creek	0.400	0.360
Tallapoo sa	Southwire Company	022-1302-02	Carroll	Buffalo Creek	2.000	1.000
Tallapoo sa	Villa Rica, City of	022-1302-04	Carroll	Lake Paradise & Cowens Lake	1.500	1.500
Tallapoo sa	Carrollton, City of	022-1302-05	Carroll	Little Tallapoosa River	12.000	12.000
Tallapoo sa	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

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

Basin (subbasin)	Withdrawal by	County	Withdrawal (mgd)
Coosa (Etowah)	Cherokee Co. Water System	Cherokee	15.81
Coosa (Etowah)a	Gold Kist, Inc.	Cherokee	1.94
Coosa (Etowah)	City of Cartersville	Bartow	13.26
Coosa (Etowah)	New Riverside Ochre Compan y, 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)	City of Cave Spring (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

VI. – CONSTRAINTS

6-01. General. The availability of water resources in the ACT Basin is constrained by existing water supply storage contracts, Corps water control manuals, minimum flow requirements from Allatoona and Carters Dams, APC FERC licenses, Corps-APC Memorandum of Understanding, and industrial water quality flow needs. Existing water supply storage contracts do not include the use of the inactive storage pool and would require developing and implementing an emergency storage contract in order to access this water resource. Each Corps project has a water control manual that specifies operational requirements for varying basin conditions and requires a deviation approval to operate outside the parameters established by the manual. The Allatoona Project has a minimum flow release requirement of 240 cfs for downstream purposes. The Carters Project has a seasonally varying minimum flow release requirement that ranges from 250 – 865 cfs during normal conditions and a minimum of 240 cfs during low flow conditions. The APC projects are operated under FERC licenses which define specific operational requirements for each project and require approval from FERC and possibly the Corps and State agencies before any revised operations could be implemented. The Corps and APC projects are also operated under the rules and regulations found in the Corps-APC Memorandum of Understanding, which describes operational requirements for flood conditions and navigation within the ACT Basin. Some industrial NPDES permits within the ACT Basin have water quality discharge limitations which are impacted by the volume of water flow in the river.

VII – DROUGHT MANAGEMENT PLAN

7-01. <u>General</u>. 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 manual 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 one to three. The DIL is determined on the basis of three basin drought criteria (or triggers). A DIL from 1 to 3 indicates some level of drought conditions. The DIL increases as more of the drought indicator thresholds (or triggers) occur. 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 1 — (moderate drought) 1 of 3 triggers occur
DIL 2 — (severe drought) 2 of 3 triggers occur
DIL 3 — (exceptional drought) all 3 triggers occur

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

1. **Low basin inflow**. The total basin inflow needed is the sum of the total filling volume plus 4,640 cfs. The total filling volume is defined as the volume of water required to return the pool to the top of the conservation guide curve and is calculated using the area-capacity tables for each project. Table 8 lists the monthly low basin inflow criteria. The basin inflow value is computed daily and checked on the first and third Tuesday 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 Allatoona Lake 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 Allatoona Lake 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]	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 1,600 to 2,000 +/-cfs			2,500 +/- cfs		6/15 Linear Ramp down	Jordan 2,000 +/-cfs			Jordan 1,600 to 2,000 +/-cfs		
	Jordan 1,600 +/-cfs			Jordan 1,600 to 2,000 +/-cfs			Jordan 2,000 +/-cfs			Jordan 1,600 to 2,000 +/-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 4,640 cfs flow											
	4,200 cfs (10% Cut) - Montgomery				4,640 cfs - Montgomery					Reduce: Full – 4,200 cfs		
	3,700 cfs (20% Cut) - Montgomery					4,200 cfs (10% 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% 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 on 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	Minimum JBT Target Flow	Required Basin Inflow
Jan	628	0	628	4,640	5,268
Feb	626	1,968	2,594	4,640	7,234
Mar	603	2,900	3,503	4,640	8,143
Apr	1,683	2,585	4,269	4,640	8,909
May	248	0	248	4,640	4,888
Jun			0	4,640	4,640
Jul			0	4,640	4,640
Aug			0	4,640	4,640
Sep	–612	–1,304	–1,916	4,640	2,724
Oct	–1,371	–2,132	–3,503	4,640	1,137
Nov	–920	–2,748	–3,667	4,640	973
Dec	–821	–1,126	–1,946	4,640	2,694

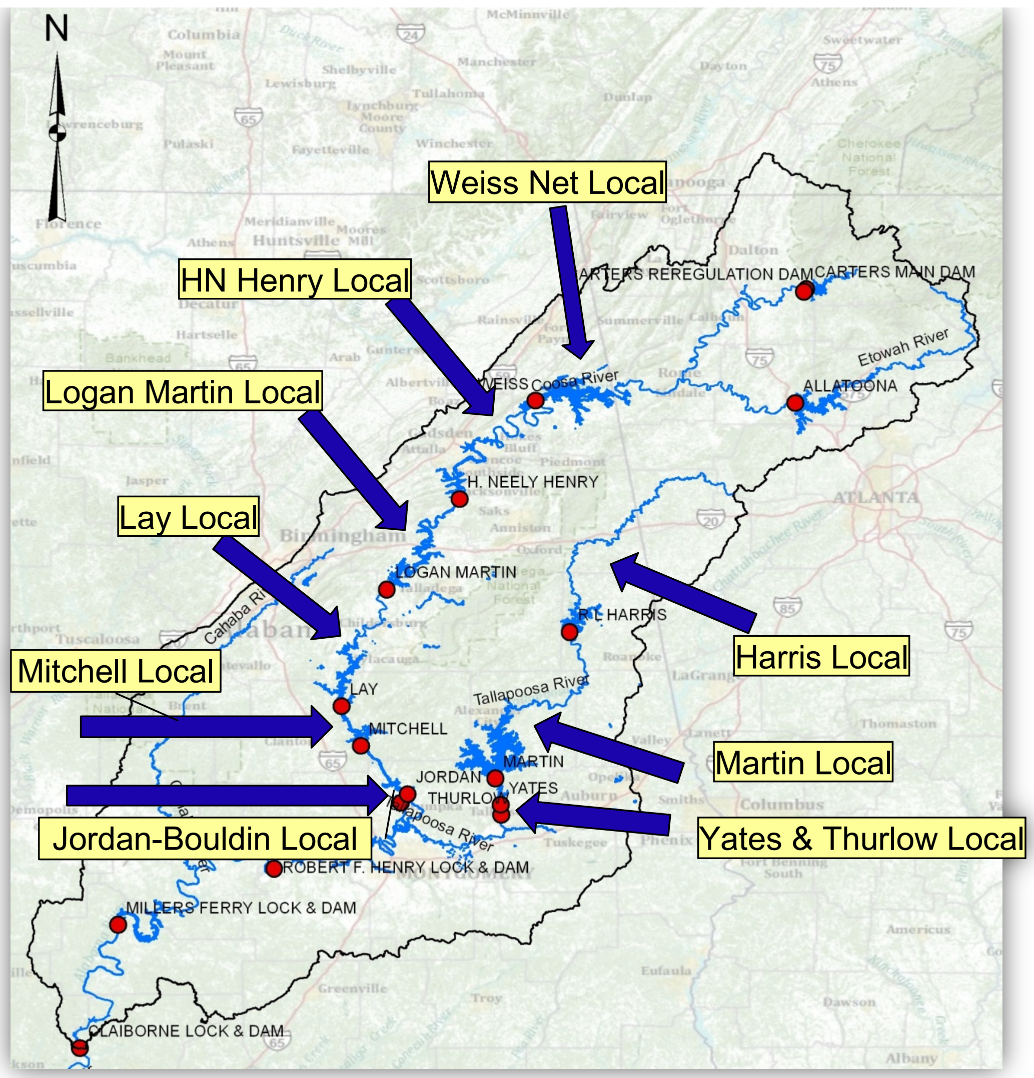


Figure 11. ACT Basin Inflows

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 first and third Tuesday of each month, and is considered along with the low state line flow trigger and basin inflow trigger.

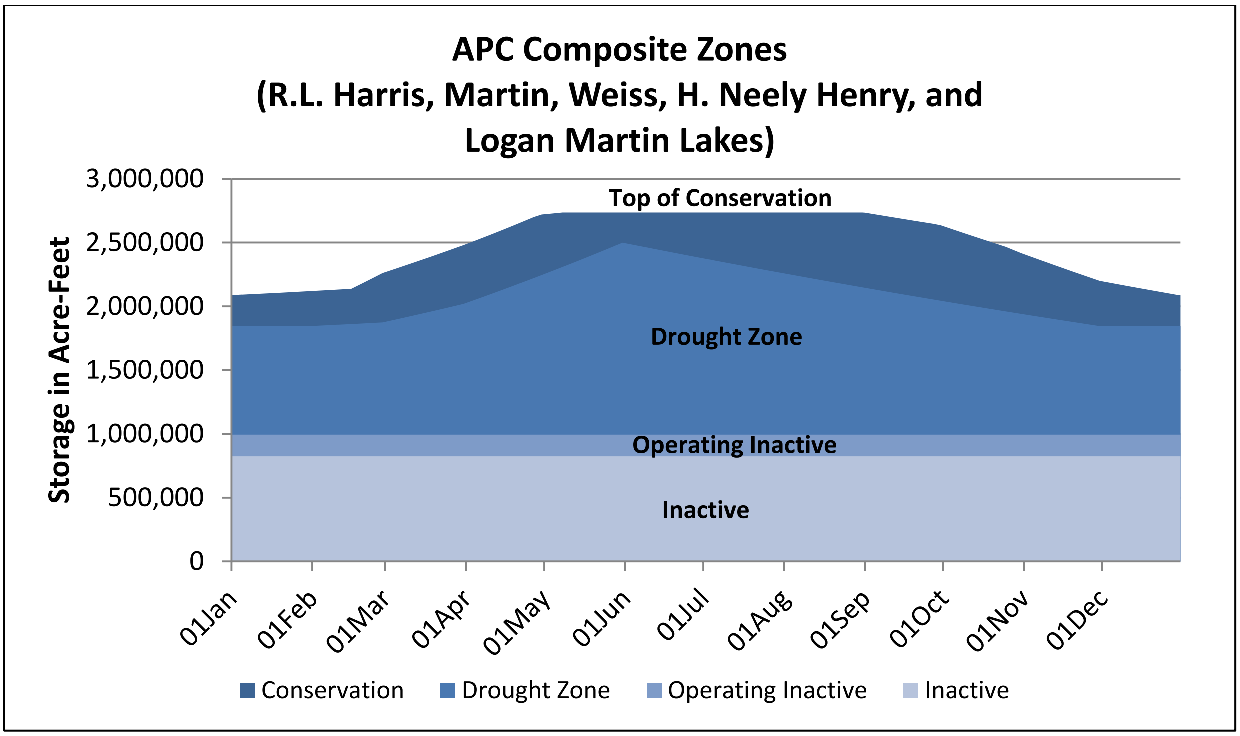


Figure 12. APC Composite Zones

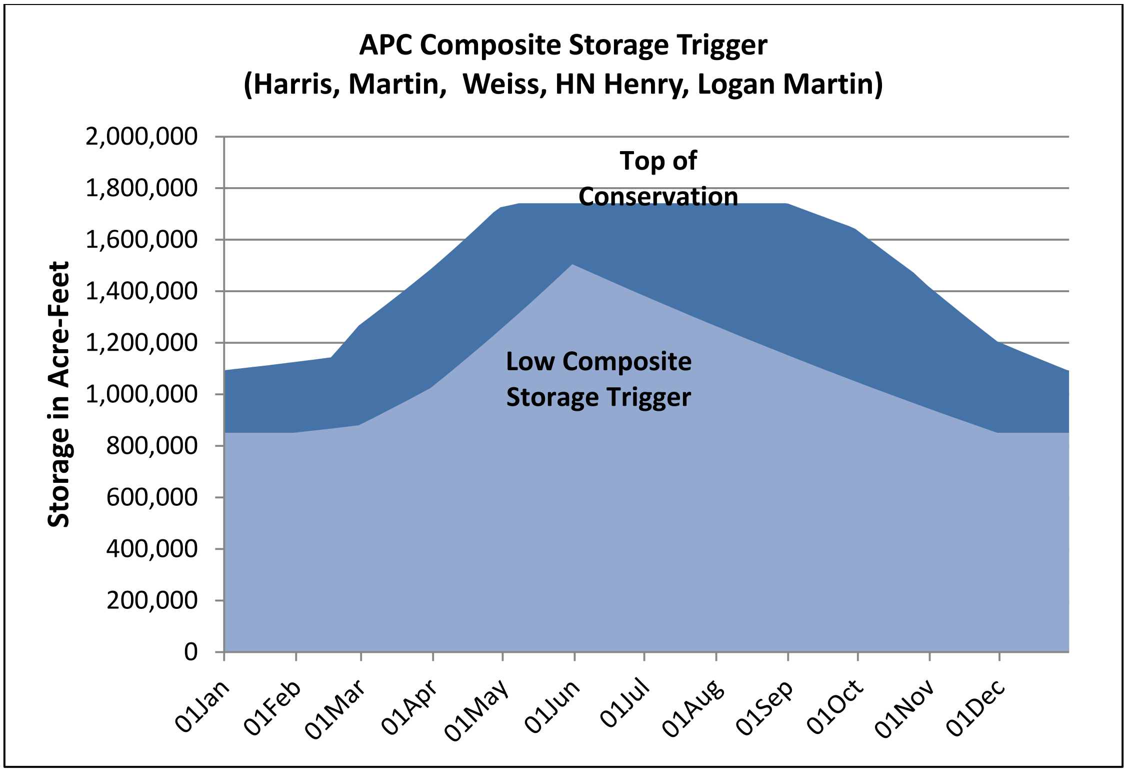


Figure 13. APC Low Composite Conservation Storage Drought Trigger

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 (determined from observed flows from 1949 – 2006). The lowest 7-day average flow over the past 14 days is computed and checked at the first and third Tuesday 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 flow 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 Allatoona Lake.

Table 9. State Line Flow Triggers

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 first and third Tuesday 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 normal operating conditions.

For normal operations, 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, the required flow is the greater of one-half of the inflow into Yates Lake or twice the Heflin USGS gage from January thru April. 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 required for 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 and 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. Under normal operations, the APC projects are operated to meet the needed navigation flow target or 4,640 cfs flow as defined in the navigation measure section. Once drought operations begin, 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.

(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.

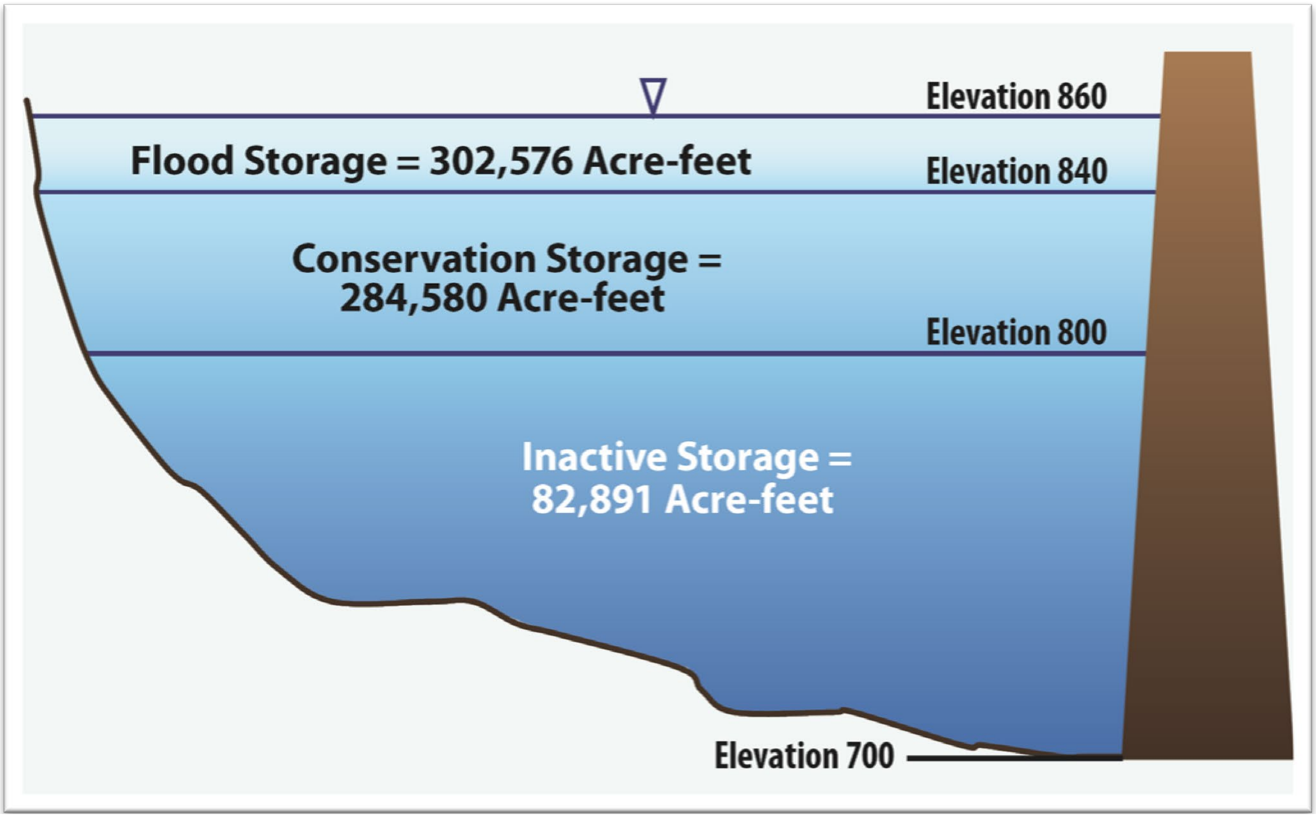


Figure 14. Storage in Allatoona Lake

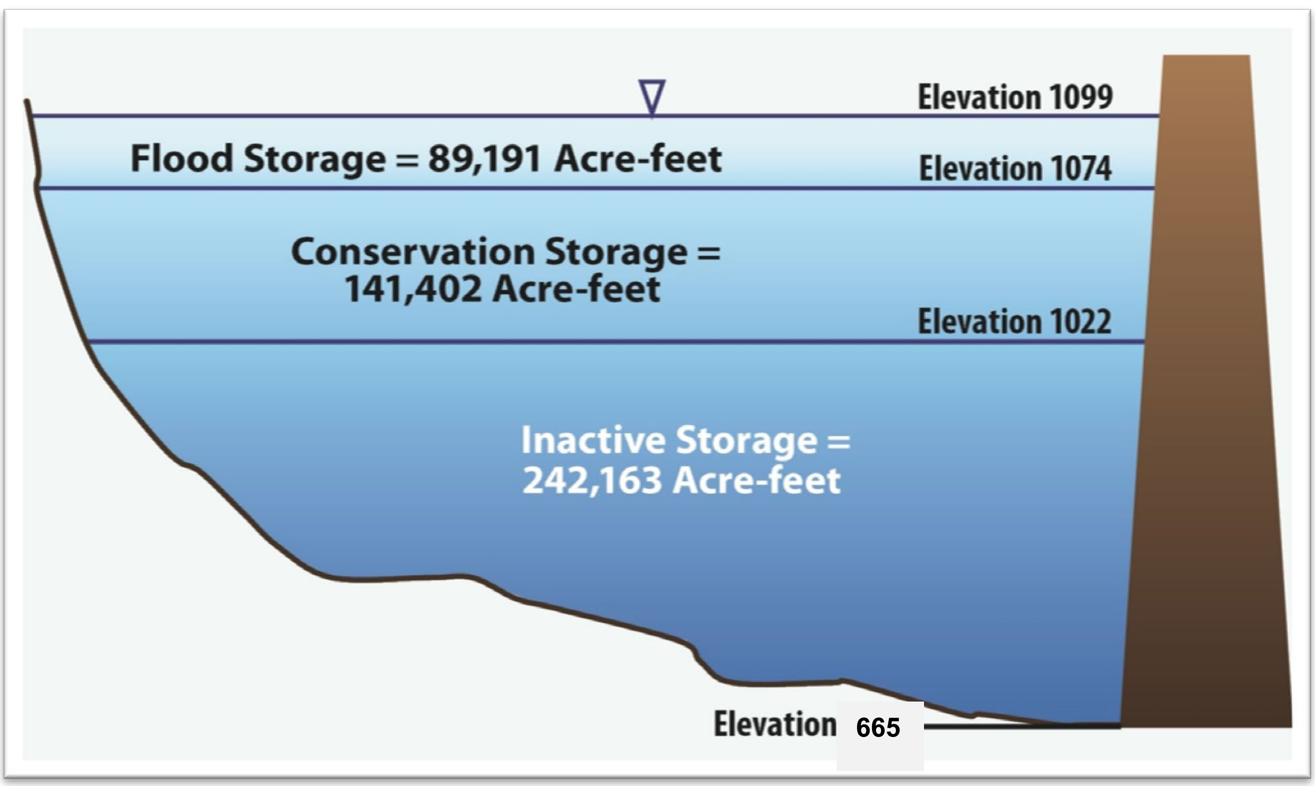


Figure 15. Storage in Carters Lake (excluding reregulation pool)

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. The Water Management Section makes daily decisions and coordinates with APC every two weeks or more often if conditions warrant 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. Interagency Coordination. 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 minimum flow targets below Claiborne Dam.

8-03. Public Information and Coordination. 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 ACT 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 publish e-newsletters regularly which are made available to the general public via email and postings on various websites. Complete, real-time information is available at the Mobile District's Water Management homepage http://water.sam.usace.army.mil/. 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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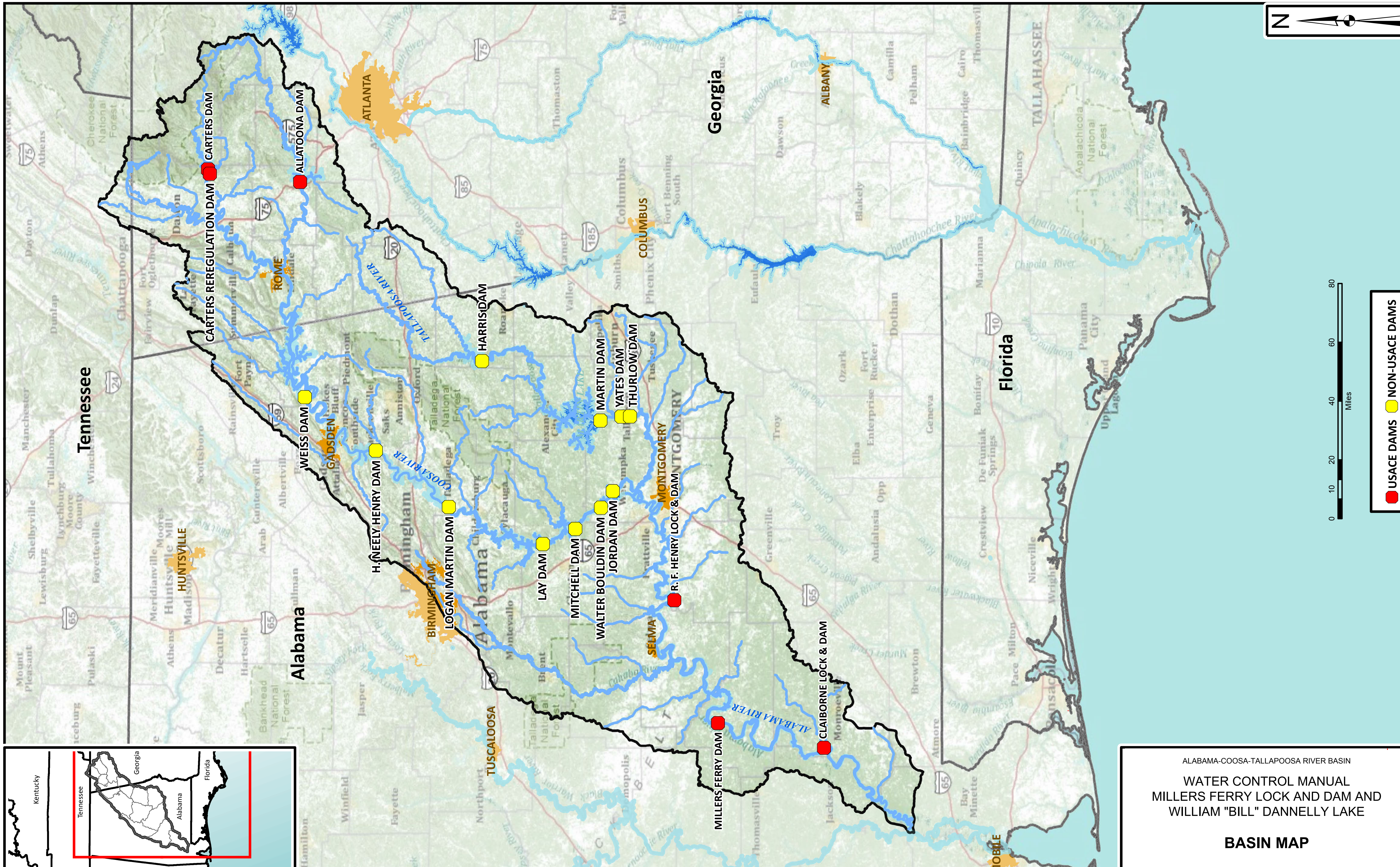
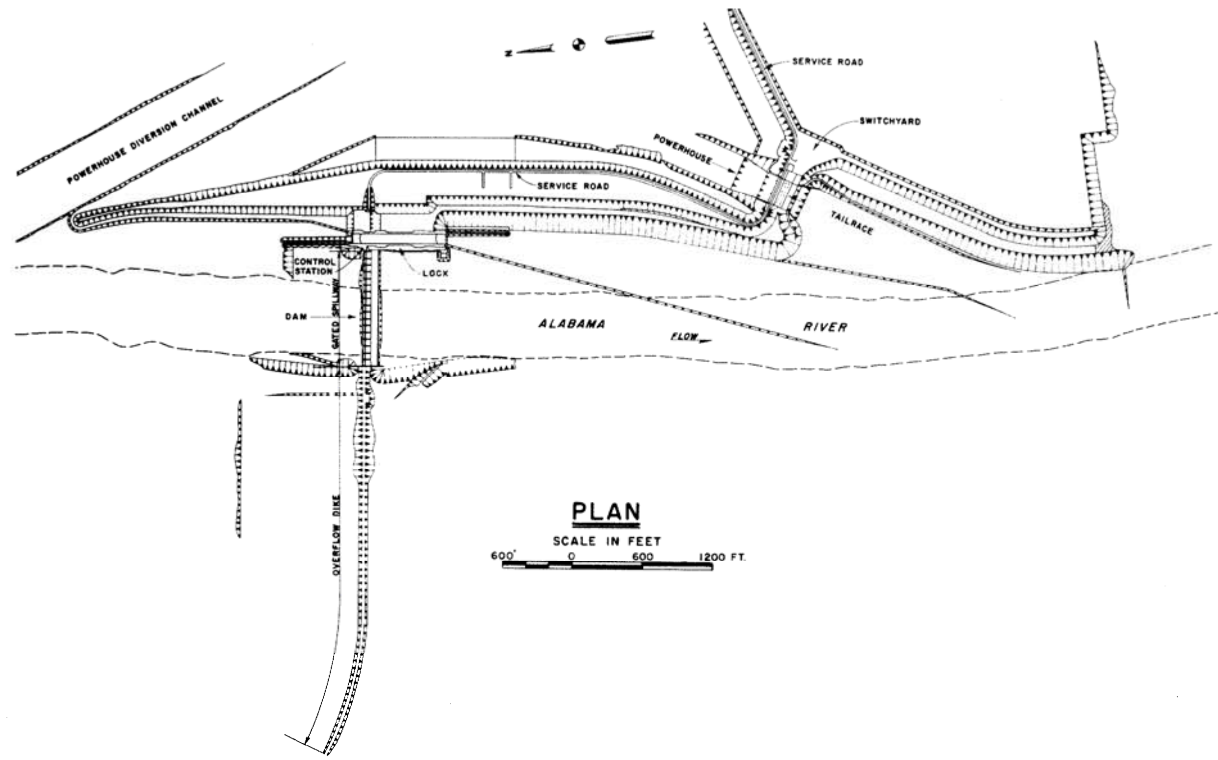
PLATES



ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

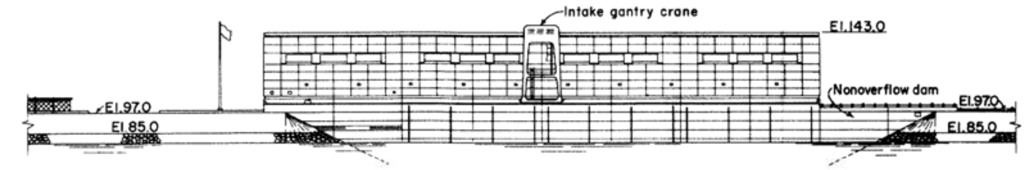
WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

BASIN MAP



PLAN

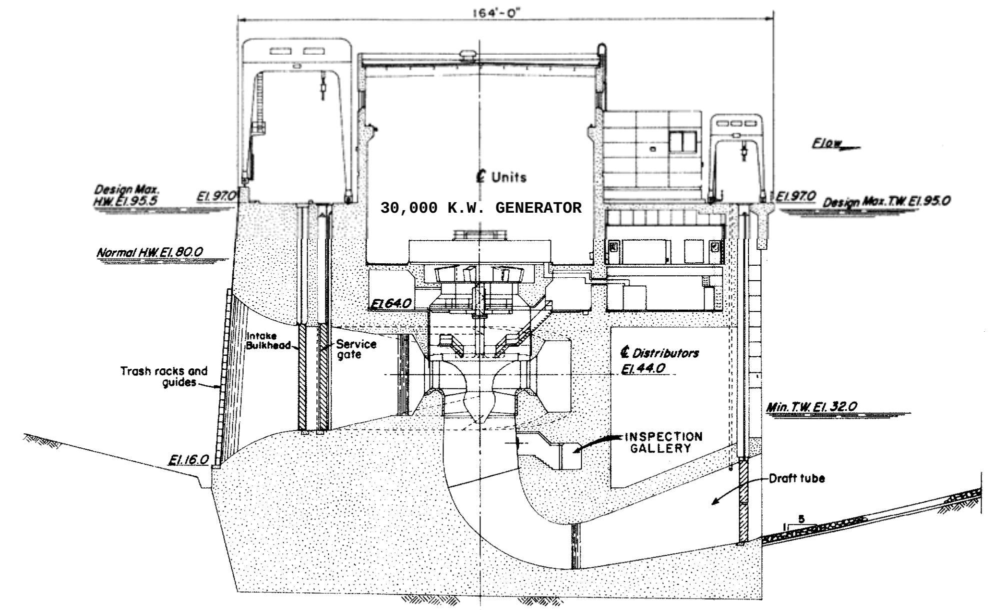
SCALE IN FEET



POWERHOUSE

UPSTREAM ELEVATION

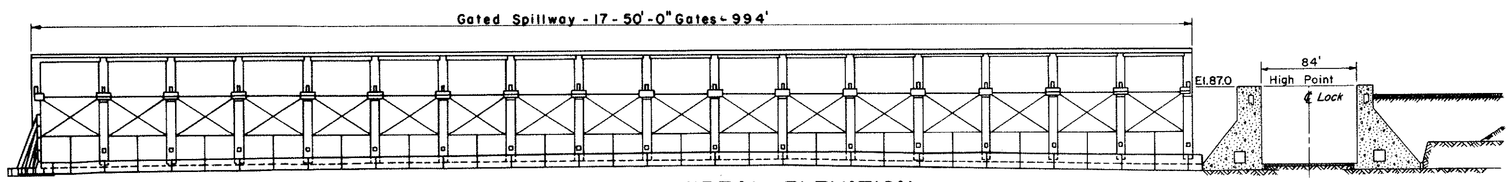
SCALE IN FEET



POWERHOUSE

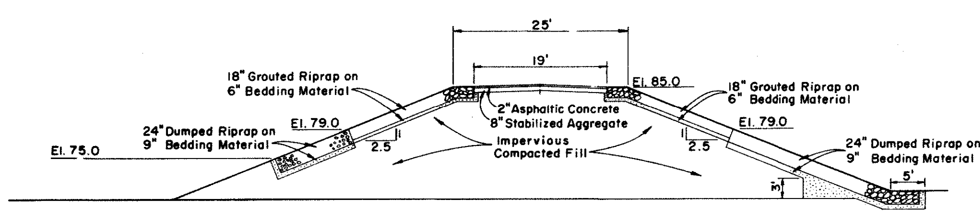
TYPICAL SECTION

SCALE IN FEET



DOWNSTREAM ELEVATION

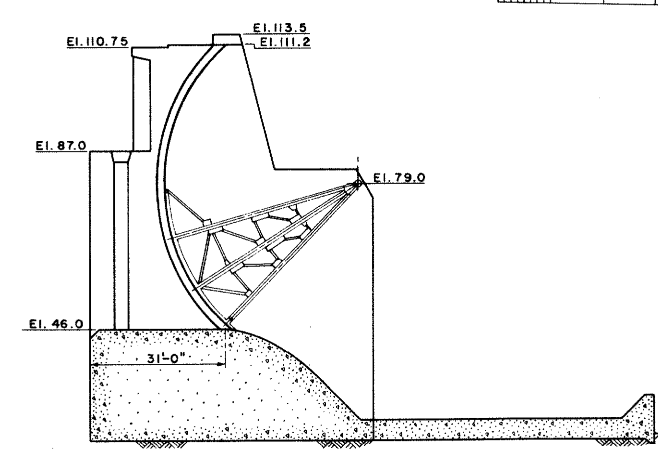
SCALE: IN FEET



TYPICAL SECTION

RIGHT BANK OVERFLOW EARTH DIKE

SCALE: IN FEET



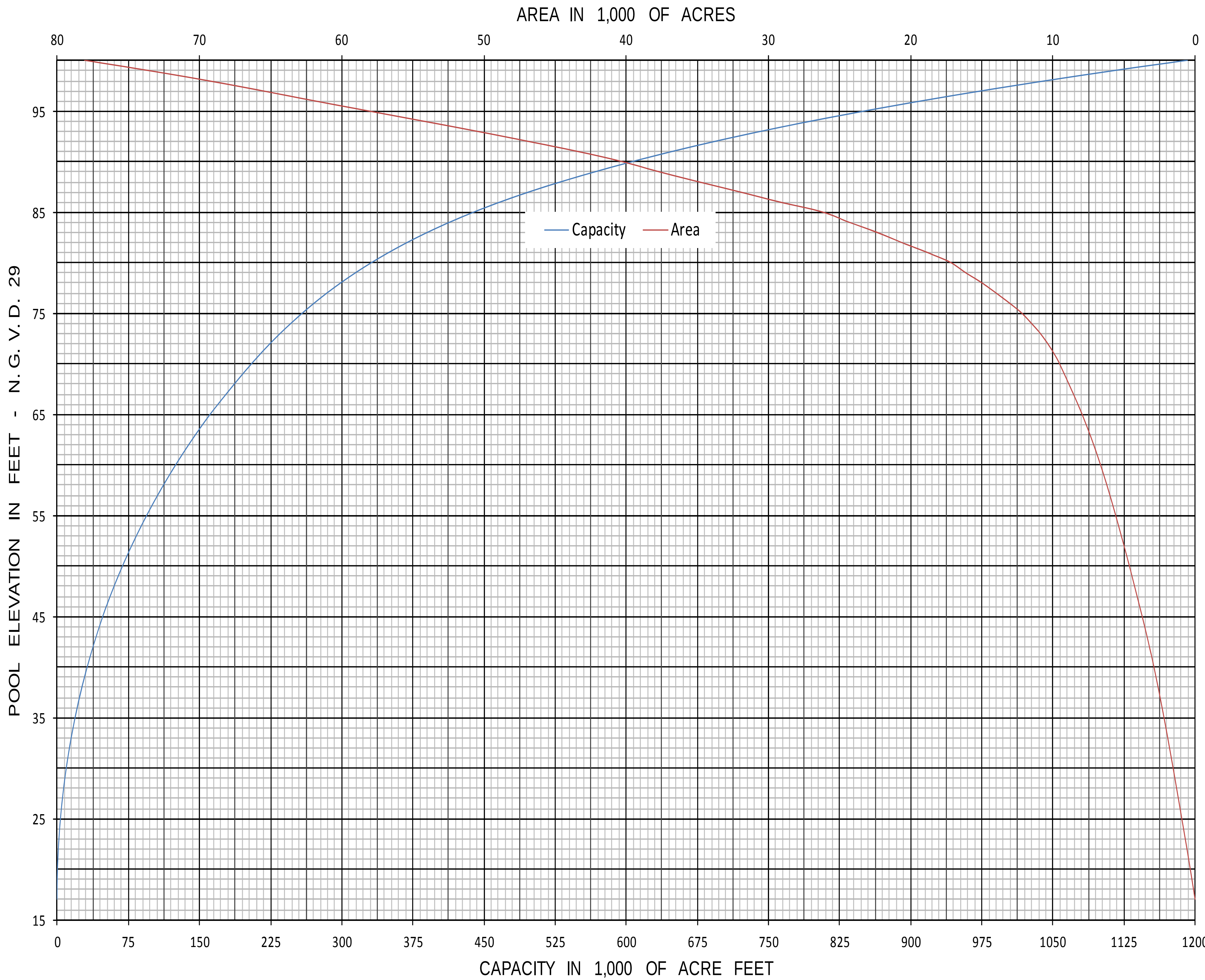
GATED SPILLWAY

TYPICAL SECTION

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

PLAN AND SECTIONS



AREA CAPACITY TABLE

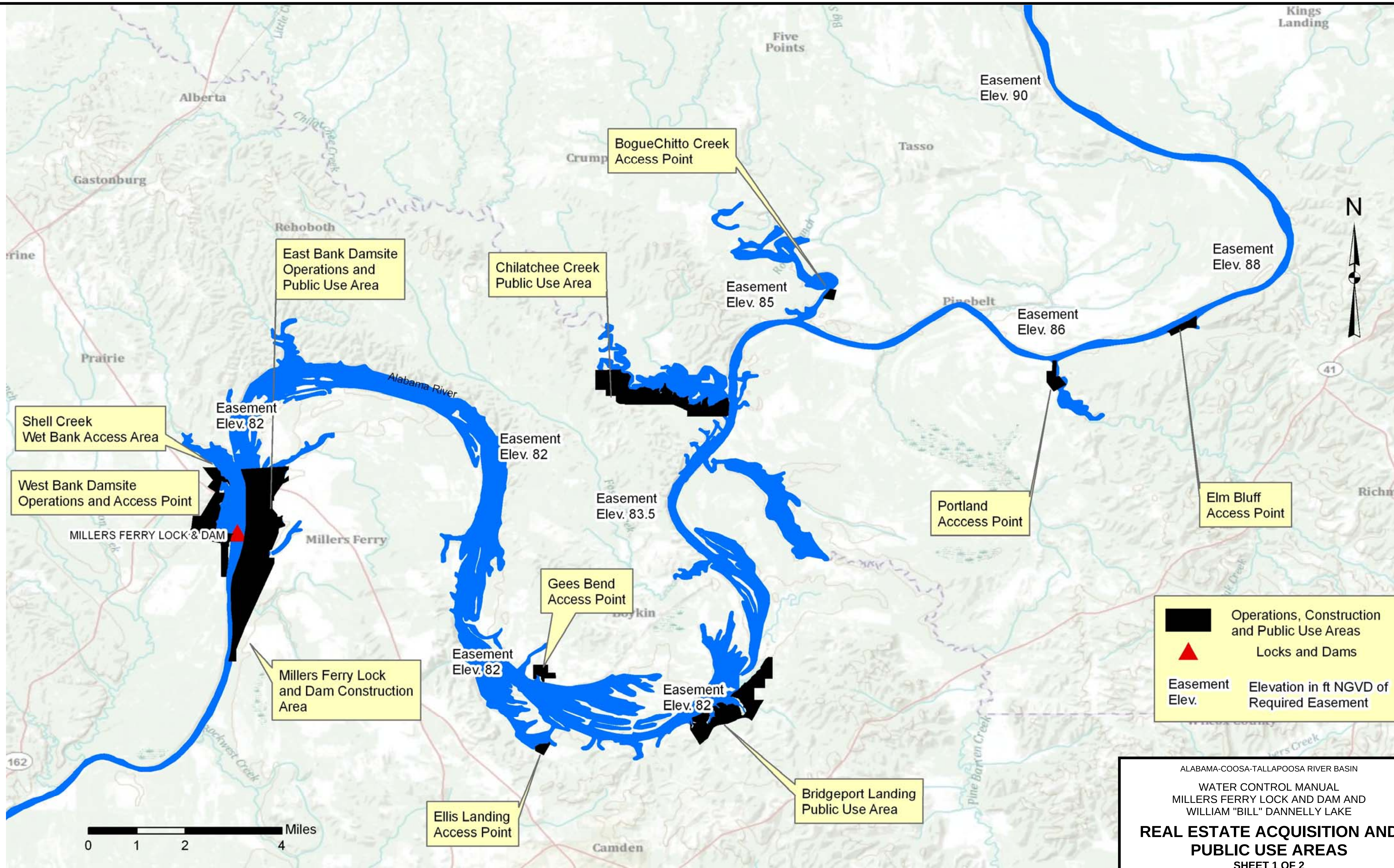
Pool Elevation (Feet)	Total Area (Acres)	Total Storage (Acre-Feet)	Pool Elevation (Feet)	Total Area (Acres)	Total Storage (Acre-Feet)
17	0	0	80	17201	331830
20	340	500	(1) 80.8	18528	346254
25	930	3660	(4) 81	18860	349860
30	1554	9850	82	20700	369640
35	2190	19170	83	22420	391200
40	2894	31860	84	24400	414610
45	3720	48330	85	26243	439930
(3) 46	3905	52140	86	29300	467700
50	4626	69200	87	32100	498400
55	5590	94760	88	35000	531950
60	6656	125300	89	37800	568350
65	7954	161660	90	40378	607440
70	9542	205210	91	43500	649380
71	9930	214950	92	47000	694630
72	10385	225110	93	50600	743330
73	10900	235750	94	54400	795930
74	11530	246960	95	58200	852230
75	12205	258830	96	62000	912330
76	13080	271470	97	65700	976180
77	14030	285030	98	69500	1043780
(2) 78	15020	299550	99	73700	1115380
79	16160	315140	100	78111	1191290

(1) Top of conservation
(2) Minimum conservation
(3) Spillw ay crest elevation
(4) Top of gates – closed position

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

AREA-CAPACITY CURVE

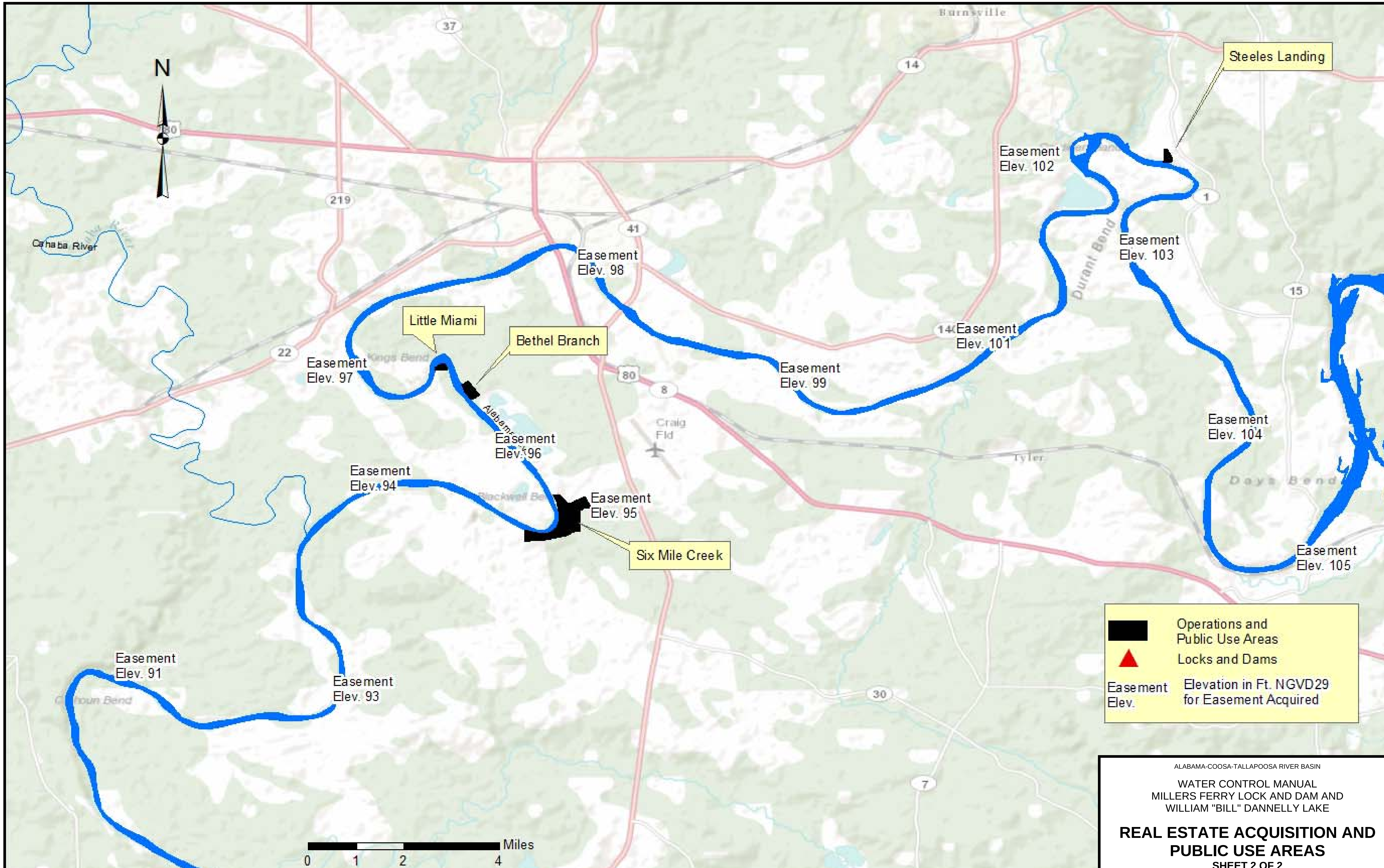


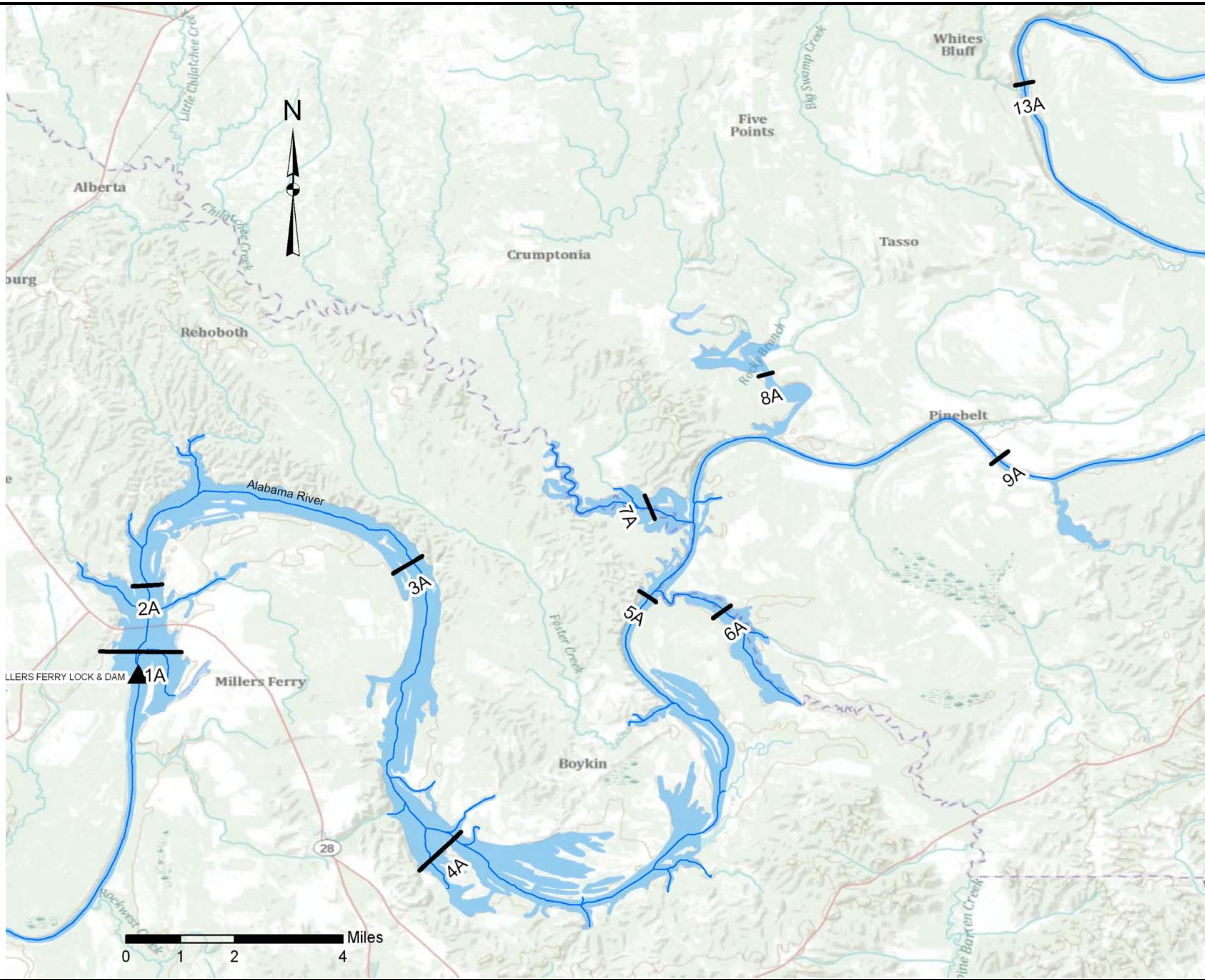
ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

REAL ESTATE ACQUISITION AND PUBLIC USE AREAS

SHEET 1 OF 2


N
Steeles Landing
Easement Elev. 102
Easement Elev. 103
Easement Elev. 98
Easement Elev. 101
Easement Elev. 99
Little Miami
Bethel Branch
Easement Elev. 97
Easement Elev. 96
Easement Elev. 94
Easement Elev. 95
Six Mile Creek
Easement Elev. 104
Easement Elev. 105
Easement Elev. 91
Easement Elev. 93
Cahaba River
Craig Fld
Tyler
Burnsville
Durant Bend
Days Bend
Kings Bend
Blackwell Bend
Calhoun Bend
Operations and Public Use Areas
Locks and Dams
Easement Elev.
Elevation in Ft. NGVD29 for Easement Acquired
Miles
0 1 2 4
ALABAMA-COOSA-TALLAPOOSA RIVER BASIN
WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE
REAL ESTATE ACQUISITION AND PUBLIC USE AREAS
SHEET 2 OF 2

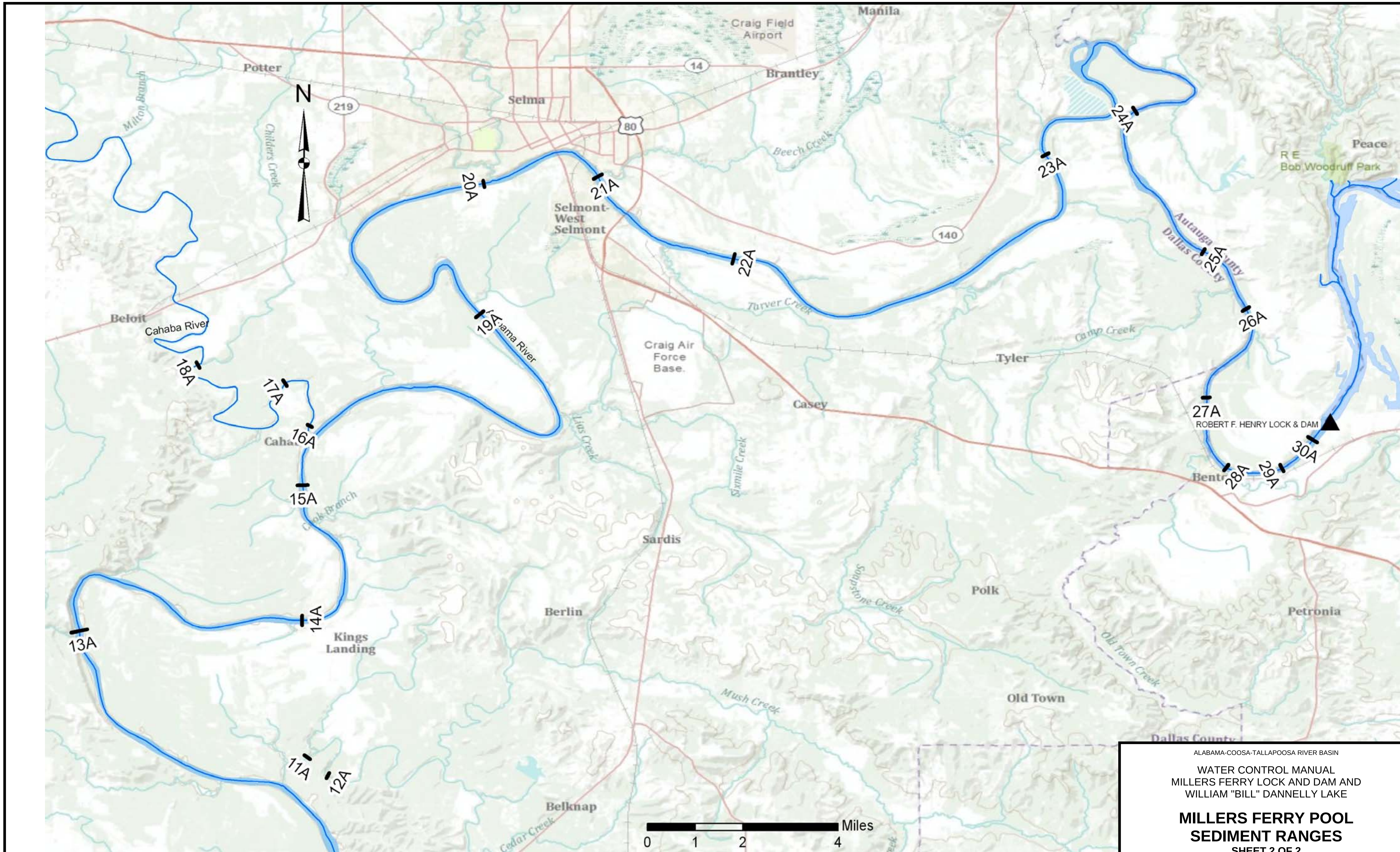


ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

MILLERS FERRY POOL SEDIMENT RANGES

SHEET 1 OF 2



ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

**MILLERS FERRY POOL
SEDIMENT RANGES**
SHEET 2 OF 2

Station: (USC00013519)
Greenville, AL From Year=1931 To Year=2009
Temperature Averages and Daily Extremes

	Monthly Averages			Daily Extremes			
	Max.	Min.	Mean	High	Date	Low	Date
	(F)	(F)	(F)	(F)		(F)	
January	57.6	33.4	45.5	83	1/12/1949	-1	1/21/1985
February	61.7	36.7	59.2	86	2/27/1962	9	2/5/1996
March	69.1	42.3	55.7	89	3/23/1995	15	3/1/2002
April	75.9	49.1	62.5	96	4/22/1987	28	4/1/2003
May	83.0	58.2	70.6	100	5/27/1953	38	5/5/2004
June	88.3	65.3	76.8	108	6/28/1954	48	6/3/1956
July	90.4	68.2	79.3	106	7/23/1952	56	7/20/2009
August	90.0	68.1	79.0	105	8/17/2000	50	8/29/1992
September	85.7	63.1	74.4	103	9/4/1951	38	9/29/1967
October	77.2	52.2	64.7	100	10/6/1954	28	10/29/2008
November	68.4	42.8	55.6	91	11/3/1987	11	11/25/1970
December	59.4	35.6	47.5	86	12/8/1951	5	12/24/1989
Annual	75.6	51.3	63.5	108	6/28/1954	-1	1/21/1985

Station:(USC00012245)
Demopolis L&D From Year=1951 To Year=2009
Temperature Averages and Daily Extremes

	Monthly Averages			Daily Extremes			
	Max.	Min.	Mean	High	Date	Low	Date
	(F)	(F)	(F)	(F)		(F)	
January	55.0	32.1	43.5	81	1/29/1957	-2	1/22/1985
February	59.4	35.3	47.3	85	2/24/1996	6	2/6/1996
March	67.6	41.8	57.7	89	3/24/1955	16	3/9/1996
April	75.2	49.1	62.1	96	4/19/2006	25	4/2/1987
May	82.9	58.3	70.6	99	5/6/1955	40	5/22/2001
June	88.5	65.7	77.1	104	6/29/1954	42	6/1/1984
July	91.0	68.8	79.9	105	7/15/1980	56	7/16/1967
August	90.5	68.6	79.5	105	8/29/1954	53	8/30/1986
September	85.4	62.6	74.0	103	9/1/1951	38	9/30/1967
October	76.1	50.9	63.5	100	10/7/1957	24	10/30/1952
November	66.8	41.2	54.0	87	11/16/2005	17	11/25/1970
December	57.2	34.2	45.7	82	10/8/1998	4	12/24/1989
Annual	74.7	50.8	62.7	105	8/29/1954	-2	1/22/1985

Station:(USC00011301)
Camden 3NW From Year=1961 To Year=2001
Temperature Averages and Daily Extremes

	Monthly Averages			Daily Extremes			
	Max.	Min.	Mean	High	Date	Low	Date
	(F)	(F)	(F)	(F)		(F)	
January	56.7	35.2	46.0	80	1/26/1962	0	1/22/1985
February	61.4	38.5	49.9	85	2/27/1962	7	2/4/1970
March	69.9	45.2	57.5	89	3/18/1982	15	3/14/1993
April	77.0	52.0	64.5	94	4/22/1987	26	4/11/1973
May	84.2	60.4	72.3	98	5/28/1962	35	5/4/1971
June	89.6	68.0	78.8	103	6/15/1963	44	6/1/1966
July	91.7	70.3	81.0	105	7/16/2000	52	7/7/1972
August	91.4	69.9	80.7	107	8/19/2000	52	8/30/1968
September	87.2	64.6	75.9	102	9/16/1980	36	9/30/1967
October	77.7	53.6	65.6	94	10/4/1990	27	10/26/1968
November	68.0	44.4	56.2	87	11/4/2000	13	11/25/1970
December	59.1	37.3	48.2	82	12/8/1998	4	12/24/1989
Annual	76.2	53.4	64.8	107	8/19/2000	0	1/22/1985

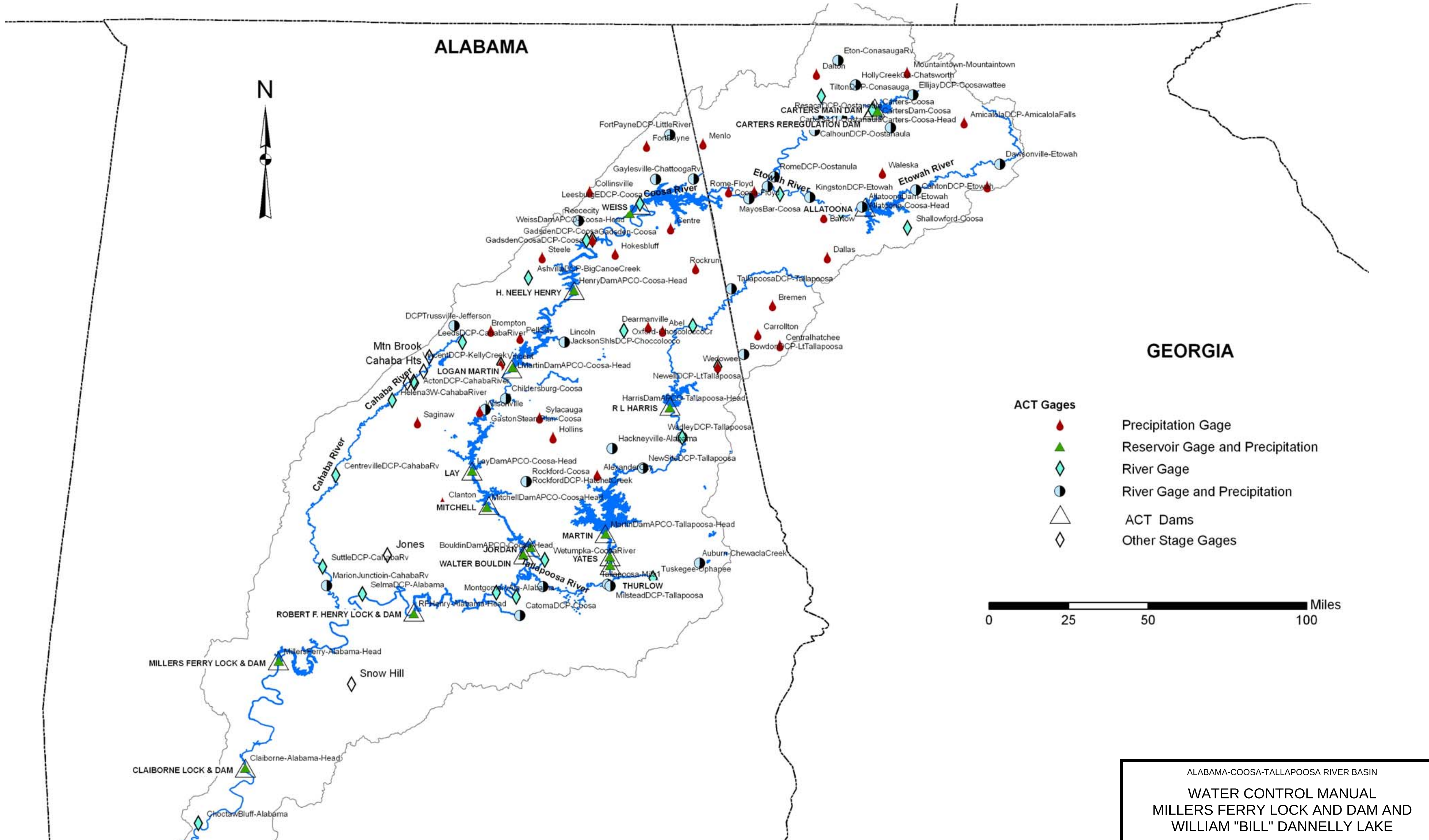
Station:(USC00017336)
Selma From Year=1931 To Year=2009
Temperature Averages and Daily Extremes

	Monthly Averages			Daily Extremes			
	Max.	Min.	Mean	High	Date	Low	Date
	(F)	(F)	(F)	(F)		(F)	
January	57.4	35.4	46.4	83	1/30/1950	0	1/21/1985
February	91.5	38.9	50.2	85	2/27/1962	9	2/3/1951
March	69.6	44.7	57.1	90	3/25/1936	18	3/4/1980
April	76.4	51.0	63.7	93	4/22/1987	29	4/13/1940
May	84.0	60.5	72.3	100	5/27/1953	40	5/7/1944
June	89.8	68.3	79.1	108	6/28/1954	42	6/1/1984
July	92.0	71.3	81.7	107	7/14/1980	57	7/15/1967
August	91.6	70.9	81.3	105	8/12/1954	57	8/15/2004
September	86.9	65.5	86.2	105	9/6/1954	40	9/30/1967
October	77.7	54.0	65.9	100	10/5/1954	27	10/30/1952
November	68.6	43.7	56.2	91	11/3/1933	13	11/25/1950
December	59.1	37.3	48.2	85	12/6/1951	5	12/13/1962
Annual	76.3	53.5	64.9	108	6/28/1954	0	1/21/1985

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

BASIN TEMPERATURE AVERAGES AND EXTREMES



ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

ACT REPORTING GAGES

Station:(USC00013519)
Greenville, AL From Year=1931 To Year=2009
Precipitation Averages and Daily Extremes

	Monthly Averages					1 Day Maximum	
	Mean (in.)	High (in.)	Year	Low (in.)	Year	(in.)	Date
January	5.28	15.86	1936	0.91	1981	6.90	1/6/1946
February	4.86	20.28	1961	1.06	1947	8.32	2/25/1961
March	6.10	16.31	2001	0.67	2004	8.40	3/16/1938
April	3.97	16.48	1964	0.70	1987	8.38	4/27/1964
May	3.94	11.42	1952	0.49	2007	3.85	5/4/1978
June	5.00	13.60	1999	0.40	1931	4.66	6/2/1946
July	5.79	21.44	1994	0.71	2000	8.75	7/7/1994
August	4.76	13.37	1939	0.83	1989	4.89	8/24/2008
September	4.17	20.68	1998	0.57	2008	15.36	9/29/1998
October	3.64	12.86	1995	0.03	1963	7.20	10/05/1995
November	5.20	20.92	1948	0.24	1949	6.27	11/25/2001
December	4.66	16.46	2009	1.15	1980	4.76	12/15/2009
Annual	5.73	21.44	1994	0.03	1963	15.36	9/29/1998

Station:(USC00012245)
Demopolis L&D From Year=1904 To Year=2009
Precipitation Averages and Daily Extremes

	Monthly Averages					1 Day Maximum	
	Mean (in.)	High (in.)	Year	Low (in.)	Year	(in.)	Date
January	5.44	13.05	1972	1.49	1981	4.16	1/10/1972
February	5.37	17.02	1961	1.50	2000	4.05	2/2/1983
March	5.04	13.95	1976	0.60	2007	4.11	3/31/1976
April	4.45	17.25	1964	0.34	1987	6.21	4/13/1974
May	4.13	12.99	1991	0.35	1968	3.70	5/19/1986
June	4.14	11.40	1989	0.00	1988	4.58	6/15/2008
July	4.68	11.62	1958	0.85	1983	4.70	7/11/2005
August	4.60	11.78	2008	0.62	1954	4.00	8/13/2008
September	3.69	8.81	1974	0.40	1955	4.81	9/20/1969
October	3.54	11.32	1984	0.00	1963	5.22	10/22/1984
November	4.62	11.06	1986	0.30	1981	3.62	11/22/1991
December	4.82	13.91	1961	0.83	1980	4.58	12/22/1968
Annual	5.45	17.25	1964	0.00	1988	6.21	4/13/1974

Station:(USC00011301)
Camden 3NW From Year=1961 To Year=2001
Precipitation Averages and Daily Extremes

	Monthly Averages					1 Day Maximum	
	Mean (in.)	High (in.)	Year	Low (in.)	Year	(in.)	Date
January	5.54	12.75	1999	1.31	1981	6.10	1/31/1999
February	5.09	10.18	1966	1.58	1999	4.47	2/3/1982
March	5.93	12.37	1961	1.87	1978	5.65	3/16/1990
April	4.12	13.63	1979	0.23	1987	8.06	4/3/1979
May	4.32	10.59	1991	0.28	1965	3.69	5/31/1970
June	4.25	9.75	1989	0.47	1966	4.25	6/3/1978
July	5.56	11.49	1975	0.66	2000	4.49	7/31/1975
August	4.15	8.62	1970	1.02	1990	4.28	8/4/1995
September	3.57	12.71	1998	0.06	1984	7.90	9/29/1998
October	2.86	9.87	1995	0.00	1963	6.57	10/5/1995
November	5.32	11.45	1986	0.91	1981	2.96	11/22/1997
December	5.14	19.86	1961	1.59	1980	9.20	12/10/1961
Annual	5.59	19.89	1961	0.00	1963	9.20	12/10/1961

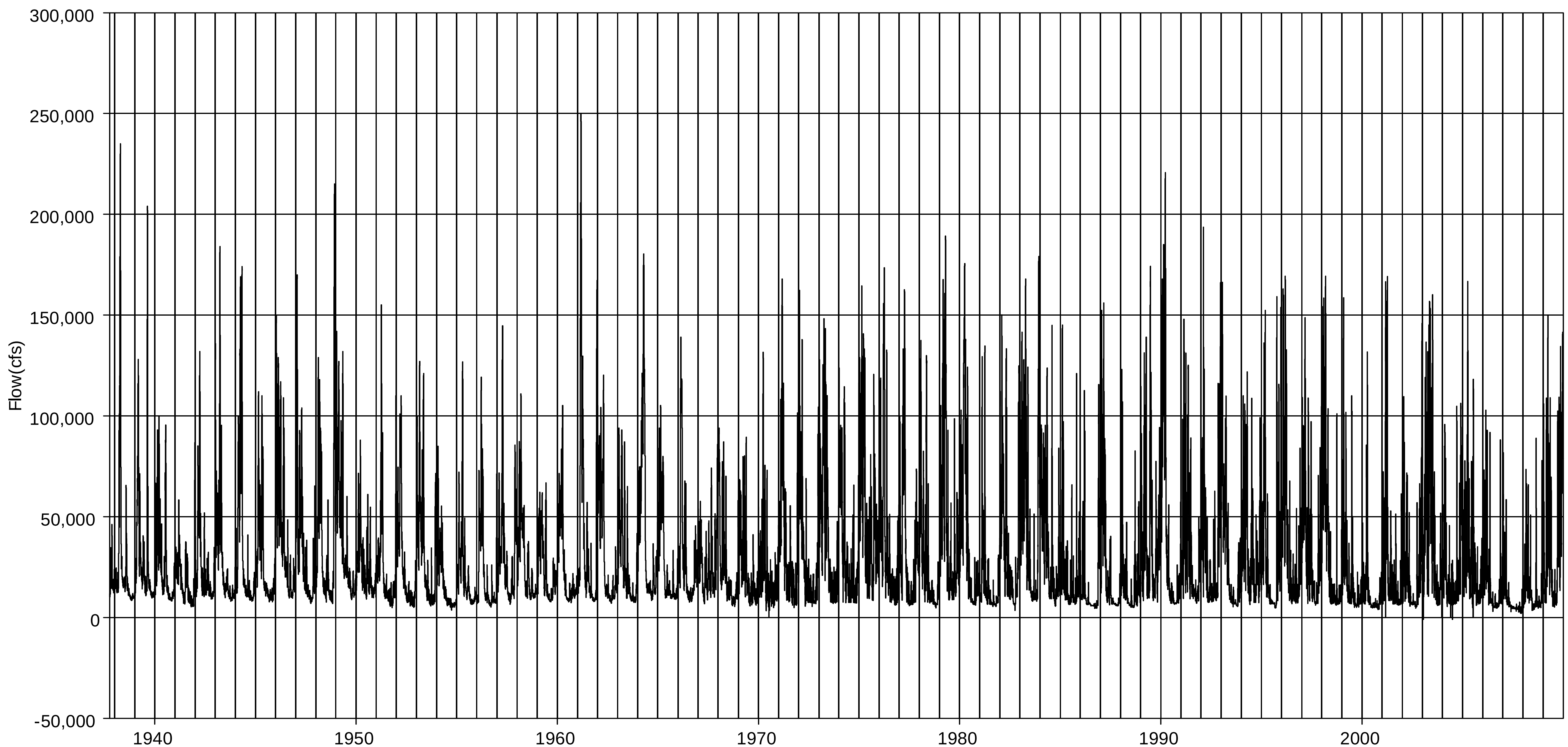
Station:(USC00017366)
Selma From Year=1931 To Year=2009
Precipitation Averages and Daily Extremes

	Monthly Averages					1 Day Maximum	
	Mean (in.)	High (in.)	Year	Low (in.)	Year	(in.)	Date
January	4.75	12.24	1972	1.07	1986	4.20	1/6/1932
February	5.03	12.42	1961	1.51	1943	5.31	2/3/1982
March	5.47	14.06	1973	1.07	1985	9.75	3/16/1990
April	3.93	20.51	1938	0.22	1986	8.74	4/8/1938
May	3.26	9.50	2003	0.07	1941	3.40	5/4/1957
June	4.07	10.41	2003	0.10	1969	3.65	6/25/1991
July	4.72	11.47	2003	0.53	1962	4.25	7/11/2005
August	4.42	21.26	1939	0.16	1945	5.35	8/15/1939
September	3.32	10.96	1998	0.24	1954	6.15	9/29/1998
October	2.68	10.11	1959	0.06	2000	6.09	10/5/1995
November	4.55	14.57	1948	0.29	1933	3.62	11/27/1948
December	4.89	18.14	1961	1.29	1980	7.08	12/10/1961
Annual	5.11	21.26	1939	0.06	2000	9.75	3/16/1990

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

ACT BASIN PRECIPITATION EXTREMES



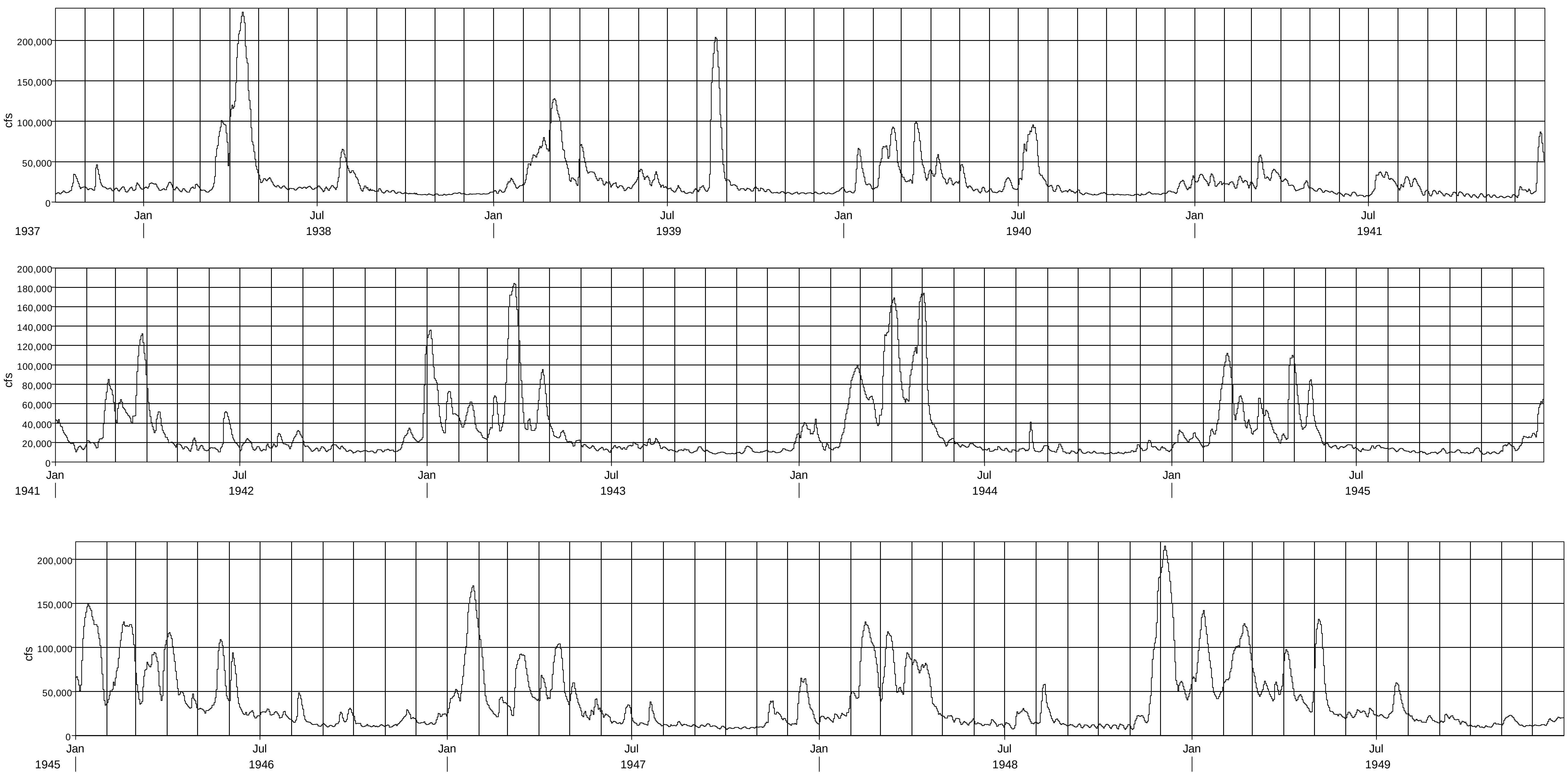
MEAN FLOW AT MILLERS FERRY

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

AVERAGE DAILY DISCHARGE HYDROGRAPH

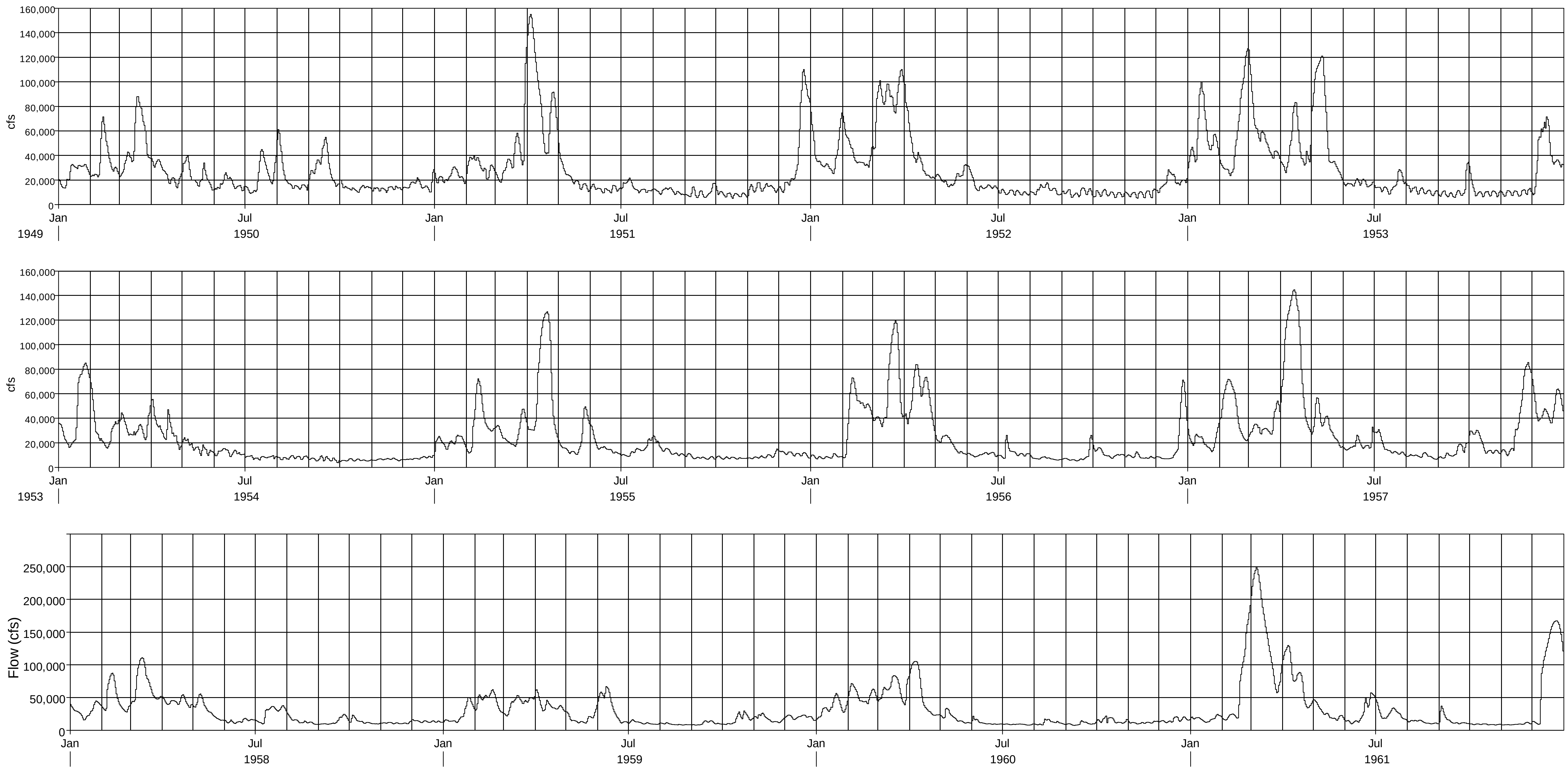
OCT 1937 THROUGH DEC 2009



ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

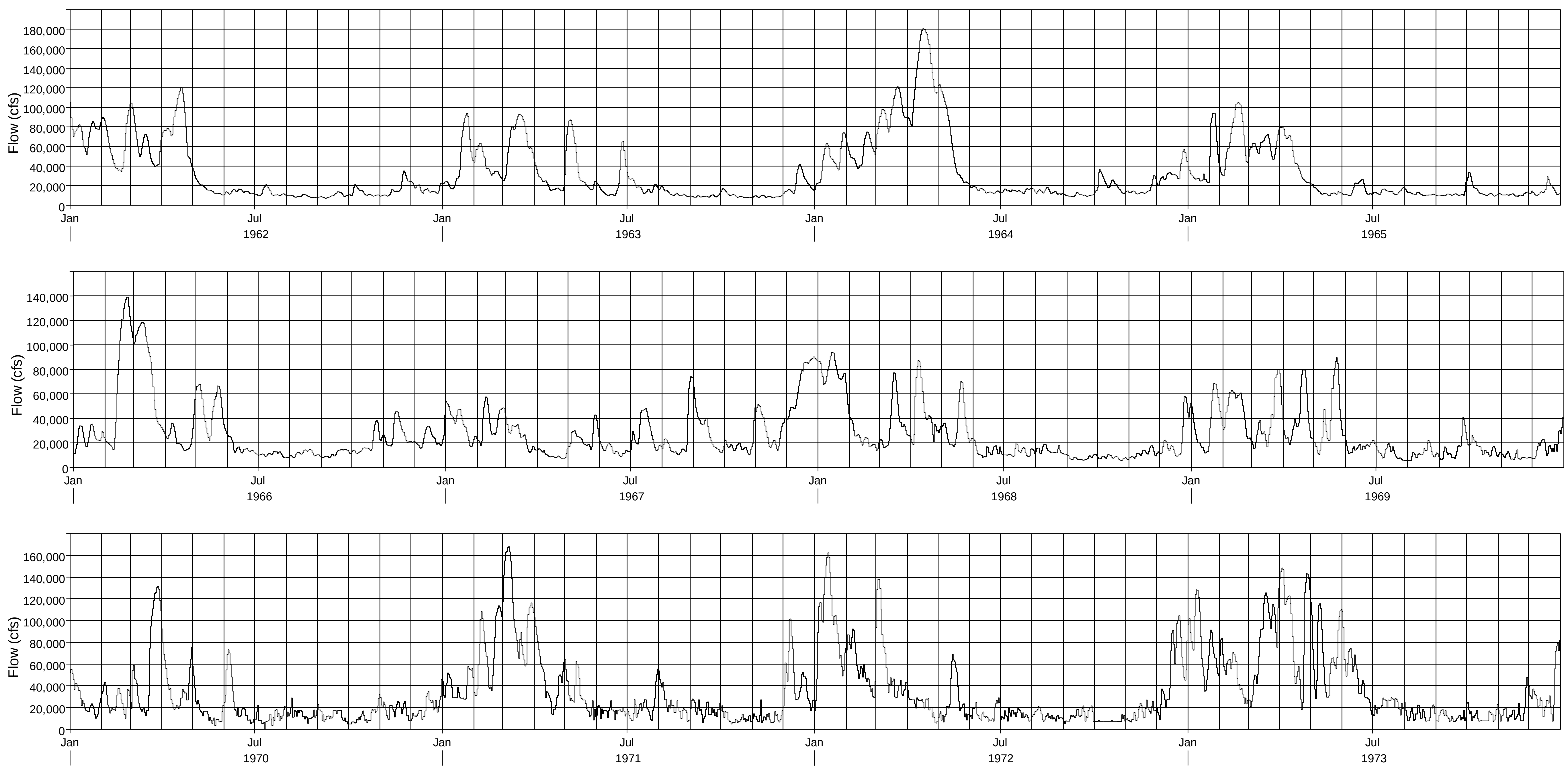
AVERAGE DAILY DISCHARGE HYDROGRAPHS



ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

AVERAGE DAILY DISCHARGE HYDROGRAPHS



ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

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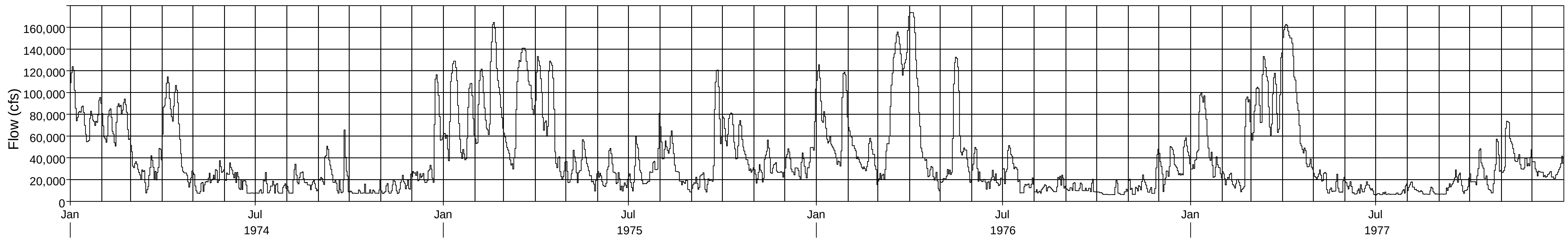
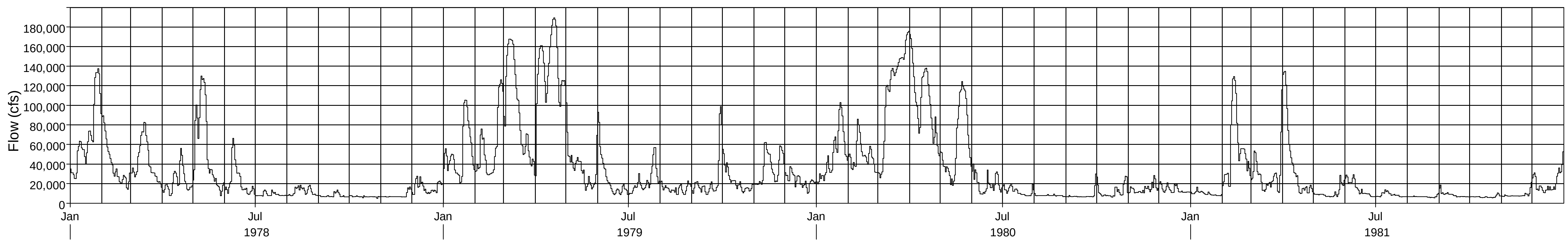
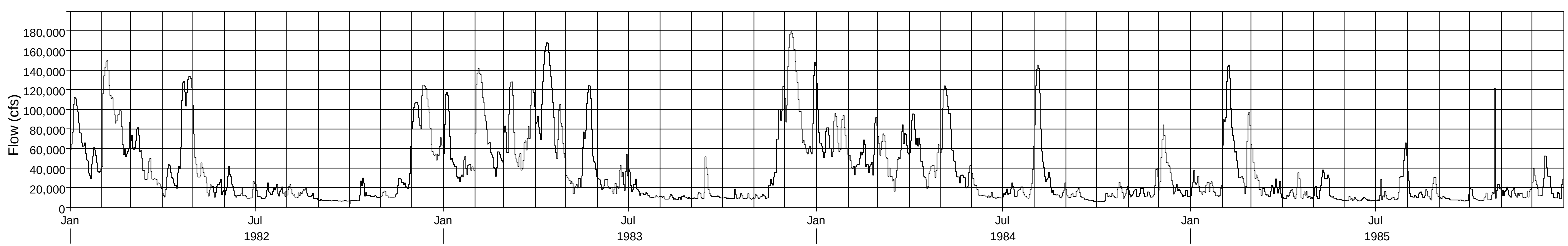
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

AVERAGE DAILY DISCHARGE HYDROGRAPHS



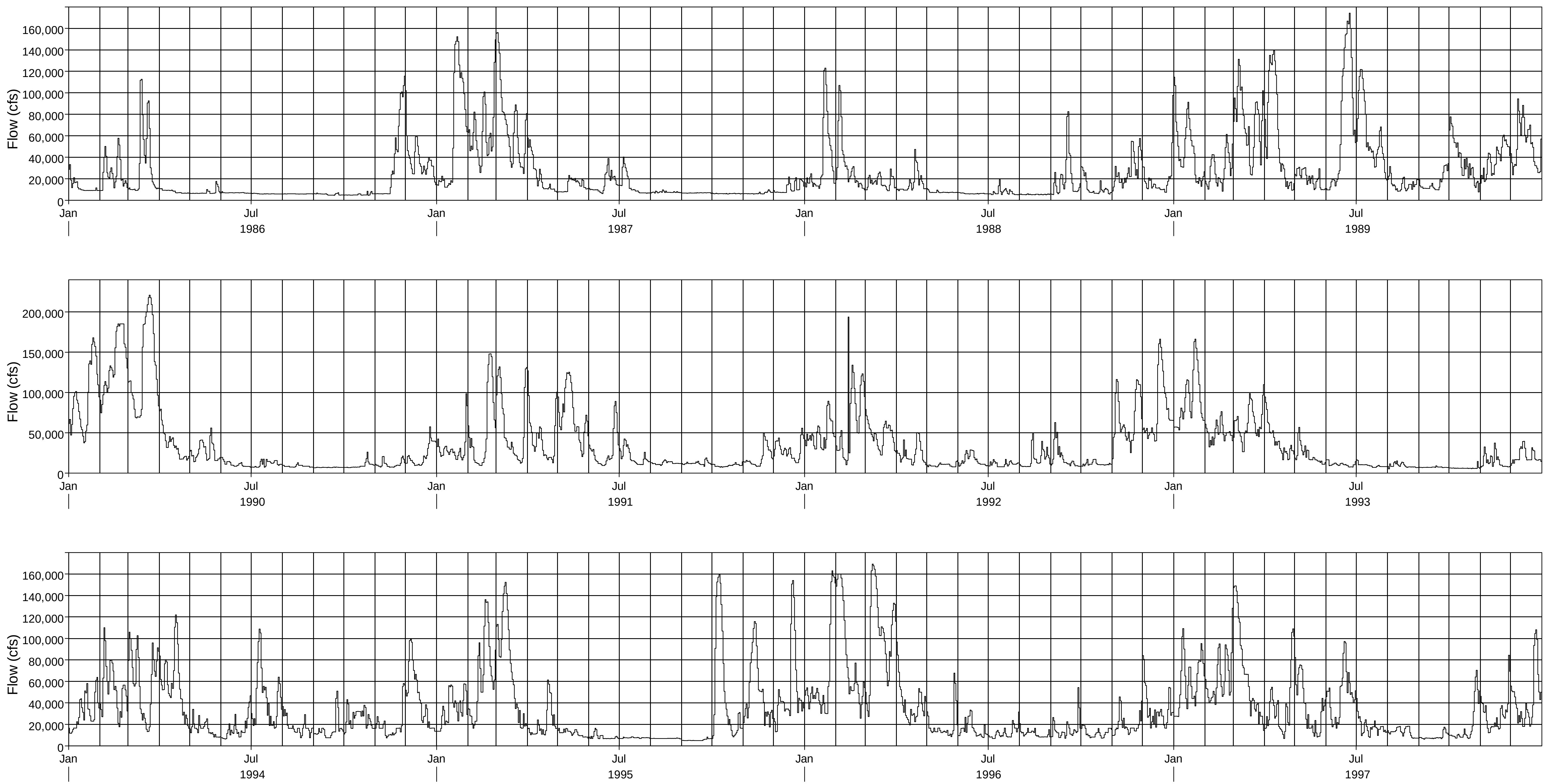




ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

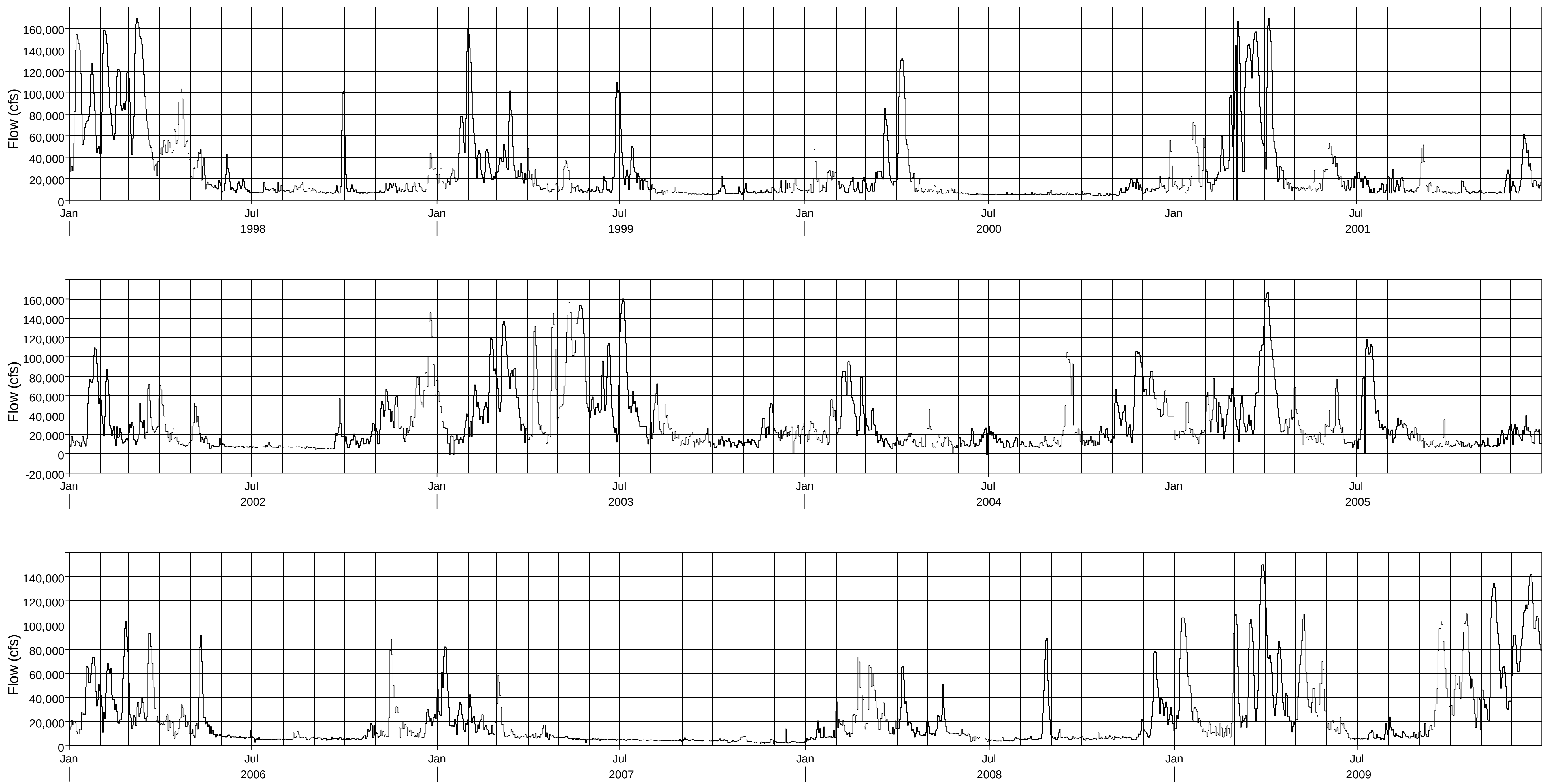
AVERAGE DAILY DISCHARGE HYDROGRAPHS



ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

AVERAGE DAILY DISCHARGE HYDROGRAPHS



ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

AVERAGE DAILY DISCHARGE HYDROGRAPHS

Millers Ferry Damsite Flow Summary Data

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave Mean Monthly	Min Mean Monthly	Max Mean Monthly	Min Daily	Max Daily
	Mean Monthly Discharge (cfs)																
1938	19348	16404	44206	28897	22526	17353	28987	23068	12693	9767	9884	10439	20298	9767	44206	8440	235000
1939	18732	59914	33174	35783	20848	27227	14081	23729	18147	13387	11051	12232	24025	11051	59914	9720	204000
1940	26235	56090	43297	32390	19894	17903	55332	15119	10310	9144	10115	18619	26204	9144	56090	8200	100000
1941	26594	23896	34258	20620	13489	8974	26406	20559	10509	8636	7112	28980	19169	7112	34258	5260	86800
1942	22981	41111	45035	32107	15148	23920	16077	22194	13833	12437	11366	24481	23391	11366	45035	9080	132000
1943	49777	39246	34448	52460	24448	13968	15739	16584	11882	9202	11346	13885	24415	9202	52460	8080	184000
1944	26910	52528	47961	38303	28632	16310	12348	15335	11394	9499	10641	14316	23682	9499	52528	8080	174000
1945	23461	41346	47832	32340	46165	15850	13871	11703	9915	10682	12043	30594	24650	9915	47832	7760	112000
1946	31390	35589	62684	40587	38223	37883	24329	19616	17502	11614	16959	17603	29498	11614	62684	9490	150000
1947	34516	35914	57910	53280	33777	21003	16823	12065	10484	8814	20664	31413	28055	8814	57910	6980	170000
1948	23306	40634	59052	58017	17639	13122	18624	23348	11074	10816	25058	39784	28373	10816	59052	6910	215000
1949	47129	44754	54142	52133	28445	25547	32068	17829	17273	11136	15443	15642	30128	11136	54142	8860	142000
1950	25752	35893	50248	25557	22939	16647	23995	21639	30457	13475	12873	16610	24674	12873	50248	9050	88000
1951	22581	31636	33823	49770	20871	12718	13842	10639	9766	8079	13755	37914	22116	8079	49770	4890	155000
1952	40958	41524	72974	38457	21835	16073	9722	11871	9656	8721	8815	19067	24973	8721	72974	5060	110000
1953	53400	37864	49681	47253	32032	17180	15866	11071	11704	10338	9715	42285	28199	9715	53400	5730	127000
1954	47200	29871	33323	30320	15906	11896	8202	7803	6455	5803	6417	7701	17575	5803	47200	3700	85000
1955	20938	38209	28508	68843	21953	16127	14720	13920	8115	7627	9229	10878	21589	7627	68843	6520	126826
1956	8532	48234	63783	57473	18198	10408	11904	7122	9046	10873	8682	22121	23031	7122	63783	5158	119311
1957	22183	46859	35260	91656	32669	18921	15993	9058	13023	18650	41386	48003	32805	9058	91656	6567	144676
1958	30469	49076	69183	43663	30850	14114	26550	13805	13762	12898	11020	13392	27399	11020	69183	8831	110856
1959	24035	45758	41900	38546	18222	35546	11219	9133	10590	16554	17555	20044	24092	9133	45758	7779	66795
1960	34839	54093	63046	55650	18353	11500	8838	11576	10037	14868	11652	15622	25840	8838	63046	7384	105219
1961	17750	64645	152195	79221	25893	27031	25553	12477	15219	8963	9235	104321	45208	8963	152195	7844	249895
1962	75932	62038	62122	82215	18098	13625	12540	9047	9772	12527	17190	16913	32668	9047	82215	7055	121190
1963	43854	42088	67201	22243	41378	22888	19256	12358	9176	10238	8806	22183	26806	8806	67201	7478	93945
1964	46300	54495	95440	136634	62498	15207	14783	13925	10155	21050	15733	33496	43310	10155	136634	8455	180375
1965	43003	67047	61095	49409	13661	15968	13755	11758	10943	15600	10846	14865	27329	10846	67047	9038	105219
1966	24929	77706	79832	24025	47924	15658	10329	11156	11257	19471	27097	23614	31083	10329	79832	7628	139039
1967	35560	37759	24774	10129	24883	14017	28302	25089	29405	18135	31252	70029	29111	10129	70029	6811	90188
1968	76735	23535	35936	44705	33257	13066	12203	13540	7746	7767	11522	24512	25377	7746	76735	5477	93945
1969	35099	47033	38951	39930	39175	16644	10861	11342	15939	14957	8619	18188	24728	8619	47033	5637	89530
1970	27377	26694	61398	40073	16989	24953	10858	13741	12707	11940	18518	20030	23773	10858	61398	0	131524
1971	38843	73481	109932	47055	31061	16757	20739	22984	17950	10100	10867	44212	36998	10100	109932	4831	167889
1972	96596	58495	60256	22247	26486	14808	13137	12344	12837	7786	14981	53375	32779	7786	96596	5356	162250
1973	78042	52452	82005	97530	70437	49299	22296	14184	11082	12490	16256	34404	45040	11082	97530	6920	148262
1974	82886	73553	29815	63697	19760	17793	11814	16911	24754	8769	13274	41114	33678	8769	82886	7193	123813

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

MONTHLY AND DAILY FLOW DATA

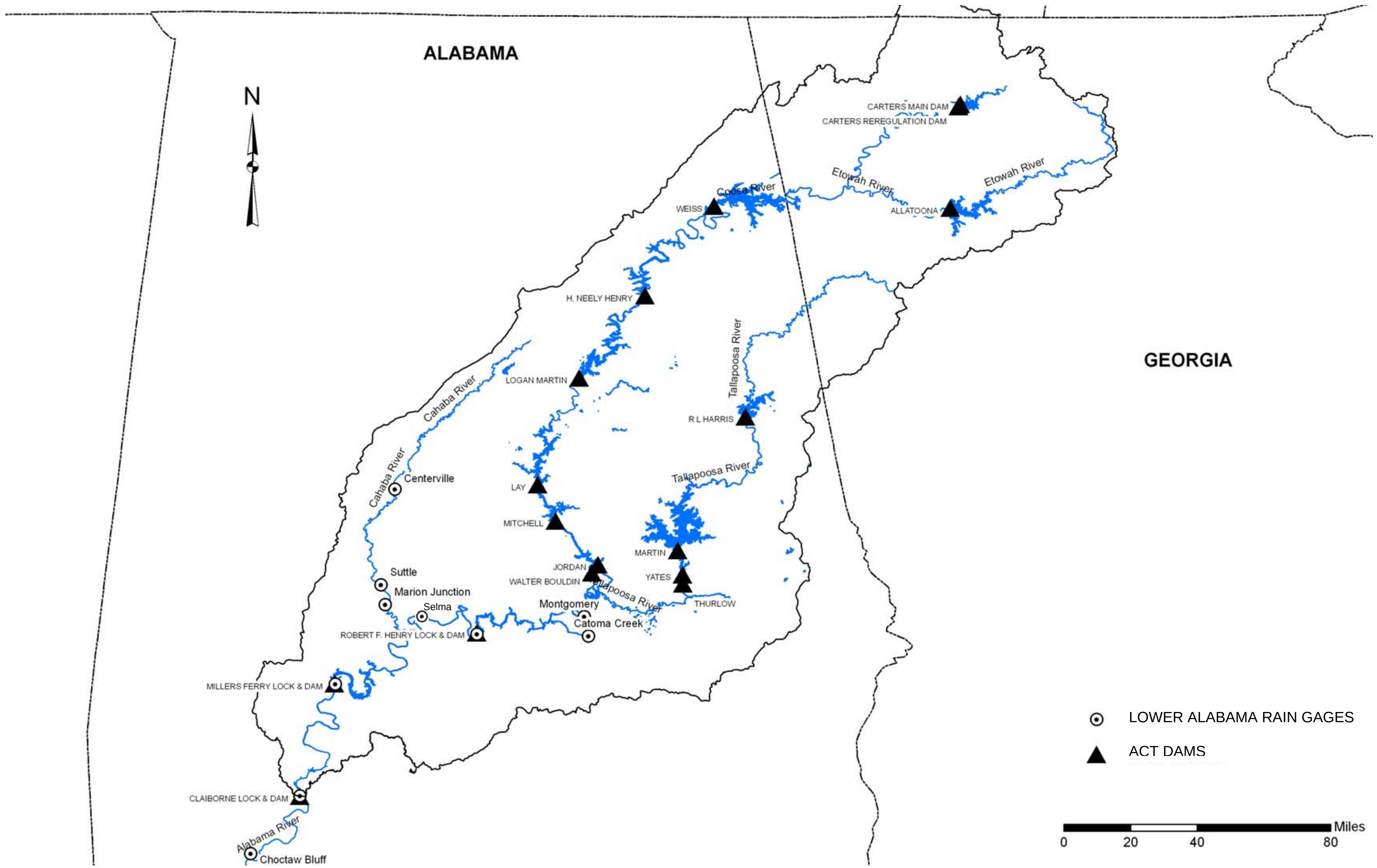
Millers Ferry Damsite Flow Summary Data

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave Mean Monthly	Min Mean Monthly	Max Mean Monthly	Min Daily	Max Daily
	Mean Monthly Discharge (cfs)																
1975	77948	100694	88203	75873	29326	22759	29024	33527	37789	53989	30498	38291	51493	22759	100694	8462	164521
1976	72828	42563	95072	68874	49237	23126	23911	12915	11712	8090	15206	34508	38170	8090	95072	6091	173570
1977	49667	32555	94472	92498	16880	11484	7548	9695	13928	25613	42352	27530	35352	7548	94472	5870	162630
1978	68542	39835	41817	22089	55069	22572	8891	11876	7729	6654	7889	16129	25758	6654	68542	4760	137420
1979	52315	59087	94447	138748	36584	25520	22666	14999	23687	22698	36298	23290	45862	14999	138748	8721	189260
1980	48614	48679	116880	105695	61926	20015	12148	7798	7906	12047	14481	14012	39183	7798	116880	6158	175630
1981	9827	55908	29621	41809	10643	14983	8430	6656	8577	6607	8483	21156	18558	6607	55908	5375	134648
1982	62250	94861	44330	64142	29928	17149	14869	13545	6789	11713	19379	85281	38686	6789	94861	3491	150180
1983	51622	77782	77819	102115	50531	25684	16086	9696	14250	10025	38103	109363	48590	9696	109363	7980	179068
1984	73372	50597	53610	52199	57200	13770	17681	44366	10519	12154	16369	28804	35887	10519	73372	5571	144990
1985	19520	69893	23113	13683	16343	7607	18899	15376	8110	15720	14209	22250	20394	7607	69893	6433	145094
1986	12515	25127	33281	8149	7569	6879	5987	5902	5496	5312	34751	37204	15681	5312	37204	4601	115523
1987	61732	63724	71999	22265	13704	15500	13359	7492	6780	6172	6636	11405	25064	6172	71999	5692	156070
1988	36005	32358	16556	15730	7564	6233	7368	5331	20101	11729	27679	18970	17135	5331	36005	5002	123038
1989	46785	28463	74189	59935	20024	71139	60841	14828	16379	36607	38002	51399	43216	14828	74189	7579	174165
1990	93716	137606	133422	35313	26577	11099	11304	8455	6898	9320	10972	21903	42215	6898	137606	6471	220730
1991	30271	52353	56845	43563	72496	27272	20079	12332	12197	9389	19301	28427	32044	9389	72496	7113	148027
1992	48211	68355	47772	23666	9737	16102	11099	17272	18823	11439	67850	78213	34878	9737	78213	7525	193654
1993	91087	50064	62112	40078	21913	10726	9309	9083	7080	6194	14450	20555	28554	6194	91087	5220	166213
1994	31034	53820	59577	57939	15425	16009	44409	17967	15266	25513	19148	43955	33338	15266	59577	6310	121831
1995	34458	64635	71965	21158	11751	8297	7416	6869	5389	52144	51697	52366	32345	5389	71965	4775	159137
1996	64586	85522	103946	40292	18605	15321	12015	11175	15316	12150	19518	34453	36075	11175	103946	6793	169289
1997	59470	62990	67480	37550	35529	46849	17807	12732	8505	19208	29572	44057	36813	8505	67480	6118	148839
1998	81829	101798	86663	58064	22495	13898	9139	9993	15752	10148	10043	16865	36391	9139	101798	6117	169287
1999	39840	48409	37283	15223	14364	24366	26687	8075	6016	7944	8161	10651	20585	6016	48409	5014	158637
2000	17470	12466	26300	43552	8353	5904	5452	5661	5639	5298	10559	14139	13400	5298	43552	3971	131750
2001	25523	33422	106549	49548	13495	24655	13528	12444	15511	8346	9448	23147	27968	8346	106549	0	169166
2002	39614	29877	30029	21408	17015	7413	7312	6762	11725	14363	37329	66321	24097	6762	66321	4653	145957
2003	25333	57776	68524	53071	102947	54704	62281	29171	13774	10919	20817	21239	43380	10919	102947	NA	160167
2004	25542	54367	18661	12528	13760	13299	13268	9359	34512	15245	51740	55570	26488	9359	55570	NA	106297
2005	22963	45035	51912	70812	21473	25051	53501	23540	11441	9310	12740	21184	30747	9310	70812	0	166721
2006	36293	46936	36846	18294	21349	7442	5474	6558	5952	7920	23157	15545	19314	5474	46936	2952	102806
2007	32158	18391	14819	8693	5978	5258	4956	4516	4682	4509	3564	3346	9239	3346	32158	1990	81815
2008	8673	23899	26828	20919	15507	7309	4776	18360	6862	6309	7861	30244	14795	4776	30244	3109	88883
2009	43874	16040	70834	47584	49407	12478	7871	9454	38655	52745	63659	96121	42394	7871	96121	5087	149785

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

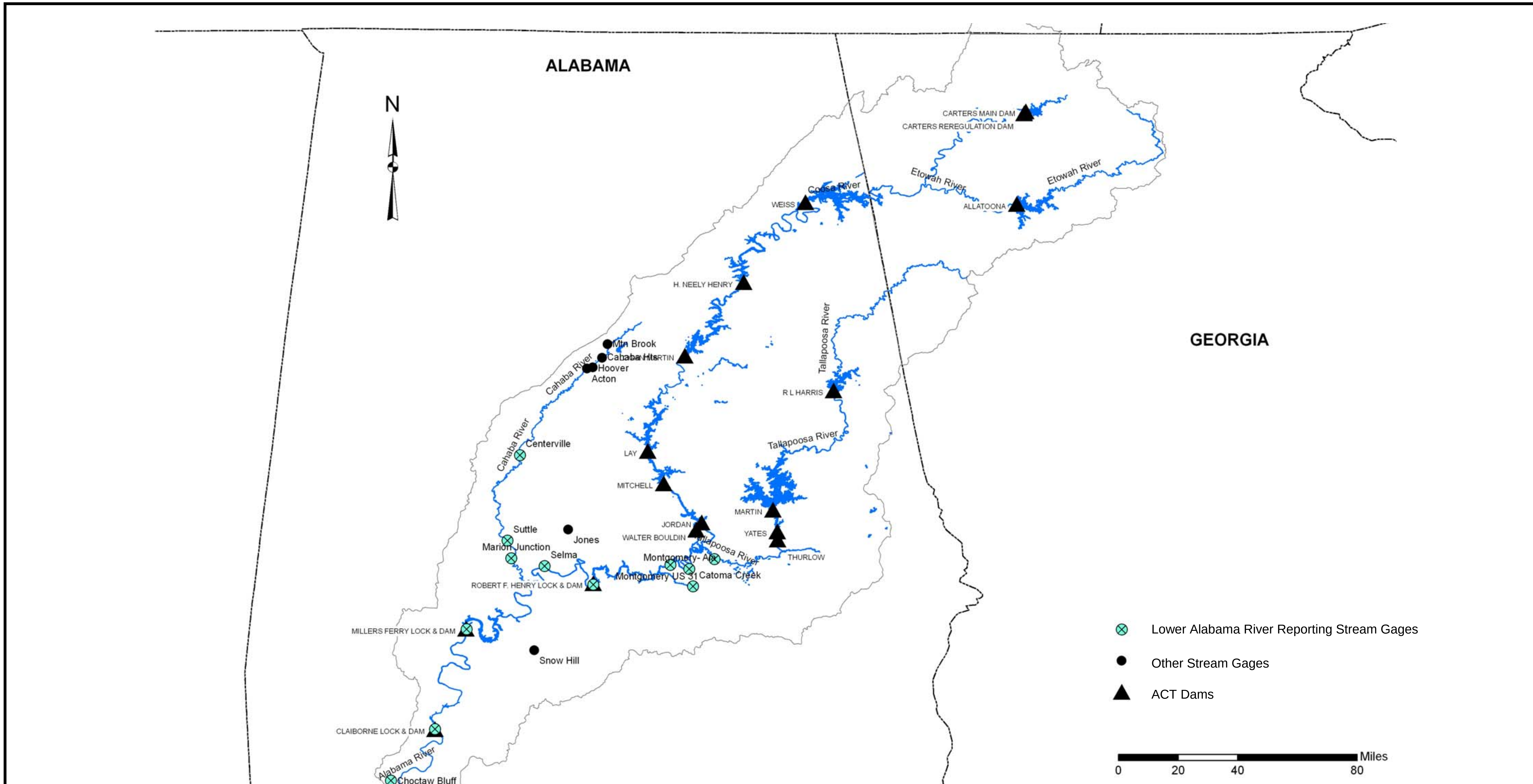
MONTHLY AND DAILY FLOW DATA



ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

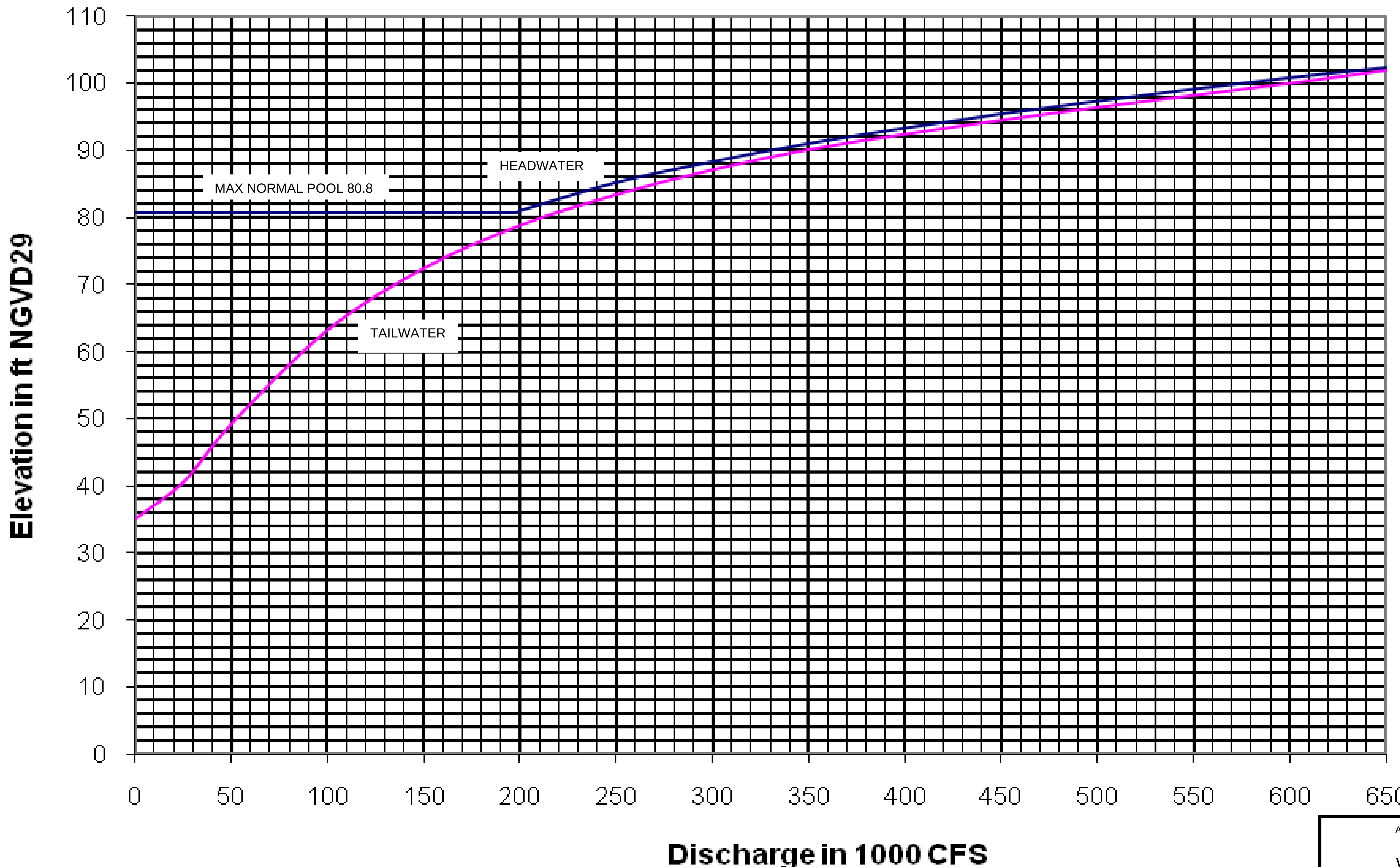
LOWER ALABAMA RIVER
REPORTING RAIN GAGES



ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

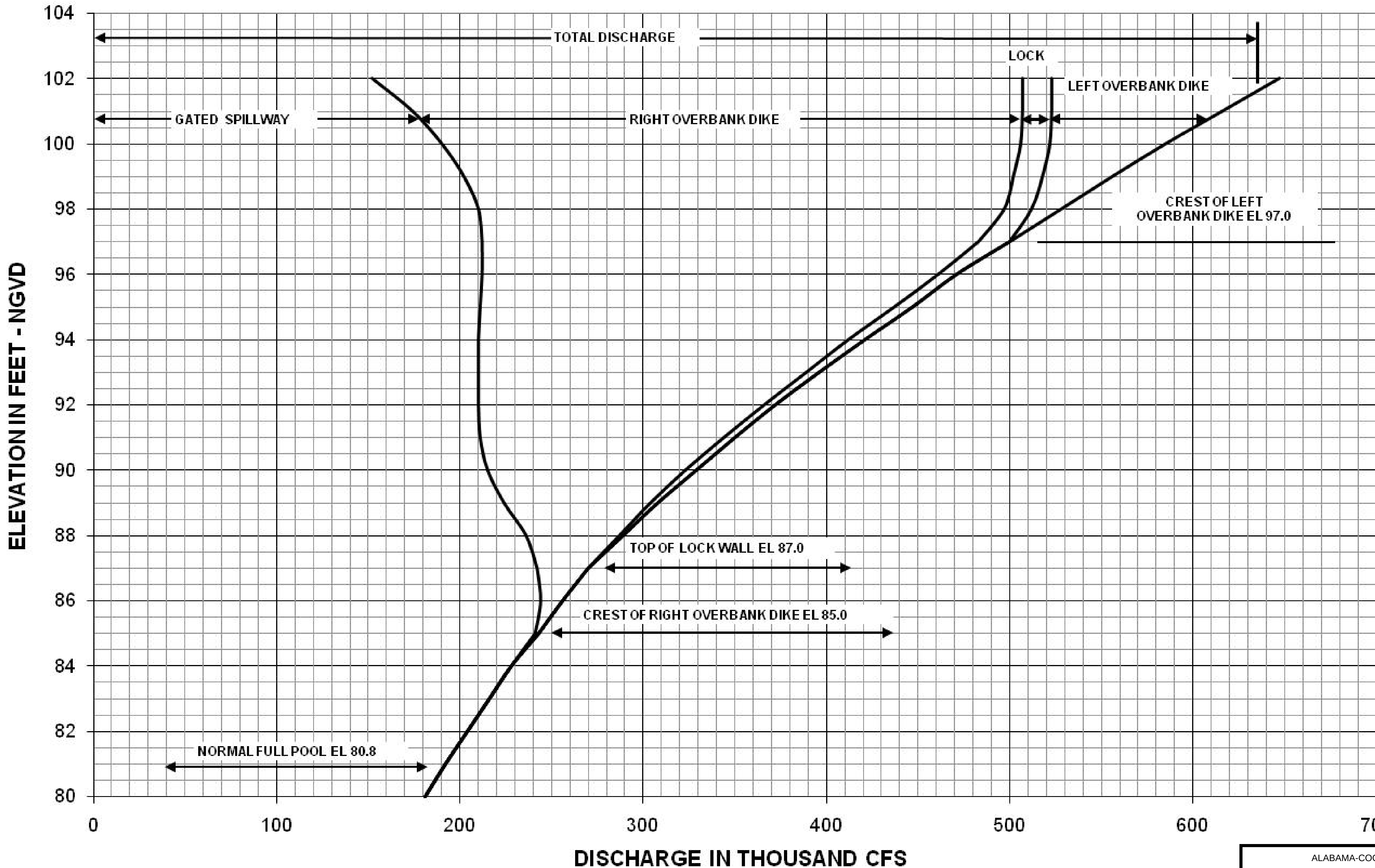
LOWER ALABAMA RIVER REPORTING RIVER AND STREAM GAGES



ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

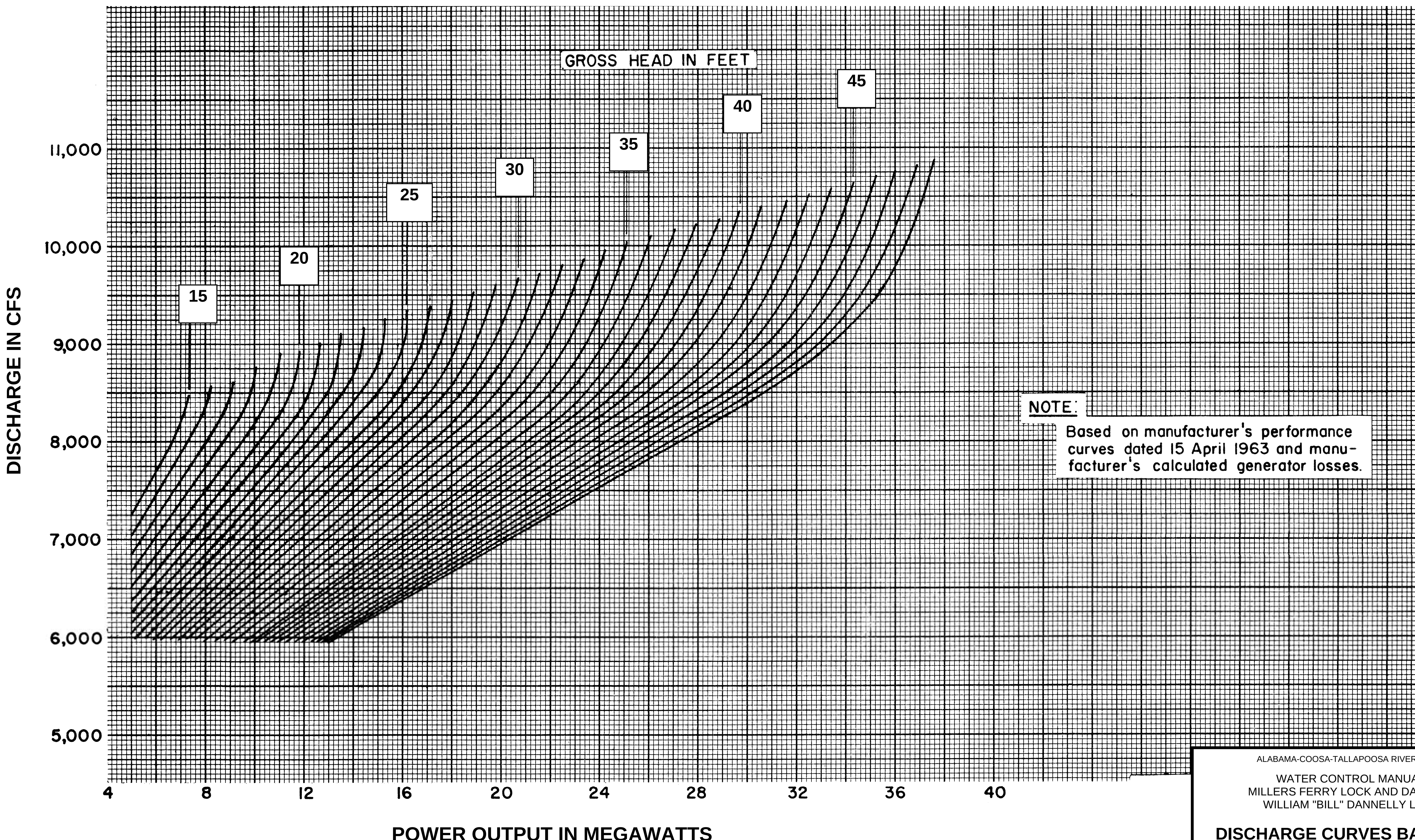
HEADWATER TAILWATER RATING CURVES



ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

SPILLWAY, LOCK AND OVERBANK RATING CURVES



ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

DISCHARGE CURVES BASED ON ORIGINAL GENERATOR OUTPUT

STEP NUMBER	GATE OPENING IN FEET																	SPILLWAY DISCHARGE IN C.F.S.									
	GATE NUMBER																	POOL ELEVATION									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	76.5	77.0	77.5	78.0	78.5	79.0	79.5	80.0	80.5	81.0
1	1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2010	2020	2040	2060	2070	2090	2100	2120	2140	2150
2	1.0	1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4010	4050	4080	4110	4150	4180	4210	4240	4270	4300
3	1.0	1.0	1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6020	6070	6120	6170	6220	6270	6310	6360	6410	6460
4	1.0	1.0	1.0	1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	8030	8090	8160	8230	8290	8350	8420	8480	8550	8610
5	1.0	1.0	1.0	1.0	1.0	0	0	0	0	0	0	0	0	0	0	0	0	10030	10120	10200	10280	10360	10440	10520	10600	10680	10760
6	1.0	1.0	1.0	1.0	1.0	1.0	0	0	0	0	0	0	0	0	0	0	0	12040	12140	12240	12340	12440	12530	12630	12720	12820	12910
7	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0	0	0	0	0	0	0	0	0	0	14050	14160	14280	14390	14510	14620	14730	14840	14950	15060
8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0	0	0	0	0	0	0	0	0	16050	16190	16320	16450	16580	16710	16840	16960	17090	17220
9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0	0	0	0	0	0	0	0	18060	18210	18360	18510	18650	18800	18940	19090	19230	19370
10	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0	0	0	0	0	0	0	20070	20230	20400	20560	20730	20890	21050	21210	21360	21520
11	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0	0	0	0	0	0	22070	22260	22440	22620	22800	22980	23150	23330	23500	23670
12	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0	0	0	0	0	24080	24280	24480	24680	24870	25060	25260	25450	25640	25820
13	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0	0	0	0	26090	26300	26520	26730	26940	27150	27360	27570	27770	27980
14	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0	0	0	28090	28330	28560	28790	29020	29240	29470	29690	29910	30130
15	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0	0	30100	30350	30600	30840	31090	31330	31570	31810	32040	32280
16	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0	32110	32370	32640	32900	33160	33420	33670	33930	34180	34430
17	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	34110	34400	34680	34960	35230	35510	35780	36050	36320	36580
18	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	35220	35510	35800	36080	36360	36630	36900	37170	37460	37730
19	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	36320	36620	36910	37200	37480	37760	38030	38300	38600	38890
20	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	37420	37730	38030	38320	38610	38880	39150	39420	39740	40040
21	2.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	38520	38840	39150	39440	39730	40010	40280	40550	40880	41190
22	2.0	2.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	39630	39960	40270	40570	40850	41130	41400	41670	42020	42340
23	2.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	40730	41070	41390	41690	41980	42260	42530	42800	43160	43490
24	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	41830	42180	42500	42810	43100	43380	43660	43920	44300	44640
25	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	42930	43290	43620	43930	44230	44510	44780	45050	45440	45790
26	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	44030	44400	44740	45050	45350	45630	45910	46170	46580	46940
27	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	45140	45510	45860	46170	46470	46760	47030	47300	47720	48090
28	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	46240	46630	46970	47300	47600	47880	48160	48420	48860	49240
29	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	47340	47740	48090	48420	48720	49010	49280	49550	50000	50400
30	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	48440	48850	49210	49540	49850	50130	50410	50670	51140	51550
31	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0	1.0	49540	49960	50330	50660	50970	51260	51530	51800	52270	52700
32	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0	50650	51070	51450	51780	52090	52380	52660	52920	53410	53850
33	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0	51750	52180	52560	52910	53220	53510	53780	54050	54550	55000
34	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	52850	53290	53680	54030	54340	54630	54910	55170	55690	56150
35	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	53850	54310	54700	55060	55390	55700	55980	56260	56790	57260
36	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	54850	55320	55730	56100	56440	56760	57060	57360	57890	58370
37	3.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	55850	56330	56750	57140	57500	57830	58140	58450	58990	59490
38	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	56850	57340	57770	58180	58550	58890	59220	59540	60090	60600
39	3.0	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	57850	58350	58800	59210	59600	59960	60300	60630	61190	61710
40	3.0	3.0	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	58850	59360	59820	60250	60650	61020	61380	61720	62290	62820
41	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	59840	60370	60840	61290	61700	62090	62460	62820	63390	63940
42	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	60840	61380	61870	62320	62750	63150	63540	63910	64490	65050
43	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	61840	62390	62890	63360	63800	64220	64620	65000	65590	66160
44	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	62840	63400	63910	64400	64850	65290	65700	66090	66690	67270
45	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	63840	64410	64940	65430	65900	66350	66780	67190	67790	68390
46	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	64840	65420	65960	66470	66960	67420	67850	68280	68890	69500
47	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0	65840	66430	66980	67510	68010	68480	68930	69370	69990	70610
48	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.0	2.0	2.0	66840	67440	68010	68550	69060	69550	70010	70460	71090	71720
49	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.0	2.0	67840	68450	69030	69580	70110	70610	71090	71550	72180	72840
50	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.0	68830	69460	700050	70620	71160	71680	72170	72650	73280	73950
51	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	69830	70470	71080	71660	72210	72740	73250	73740	74380	75060

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

GATE OPENING SCHEDULE

WITHOUT POWERHOUSE OPERATING

SHEET 1 OF 6

STEP NUMBER	GATE OPENING IN FEET																	SPILLWAY DISCHARGE IN C.F.S.									
	GATE NUMBER																	POOL ELEVATION									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	76.5	77.0	77.5	78.0	78.5	79.0	79.5	80.0	80.5	81.0
1	1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2010	2020	2040	2060	2070	2090	2100	2120	2140	2150
2	1.0	1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4010	4050	4080	4110	4150	4180	4210	4240	4270	4300
3	1.0	1.0	1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6020	6070	6120	6170	6220	6270	6310	6360	6410	6460
4	1.0	1.0	1.0	1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	8030	8090	8160	8230	8290	8350	8420	8480	8550	8610
5	1.0	1.0	1.0	1.0	1.0	0	0	0	0	0	0	0	0	0	0	0	0	10030	10120	10200	10280	10360	10440	10520	10600	10680	10760
6	1.0	1.0	1.0	1.0	1.0	1.0	0	0	0	0	0	0	0	0	0	0	0	12040	12140	12240	12340	12440	12530	12630	12720	12820	12910
7	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0	0	0	0	0	0	0	0	0	0	14050	14160	14280	14390	14510	14620	14730	14840	14950	15060
8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0	0	0	0	0	0	0	0	0	16050	16190	16320	16450	16580	16710	16840	16960	17090	17220
9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0	0	0	0	0	0	0	0	17250	17400	17540	17680	17810	17950	18080	18200	18340	18490
10	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0	0	0	0	0	0	0	18460	18620	18760	18900	19040	19190	19320	19440	19590	19760
11	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0	0	0	0	0	0	19670	19830	19980	20130	20280	20420	20550	26890	20840	21020
12	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0	0	0	0	0	20880	21040	21200	21350	21510	21650	21790	21930	22090	22290
13	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0	0	0	0	22080	22260	22420	22580	22740	22880	23030	23170	23330	23560
14	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0	0	0	23290	23470	23640	23800	23970	24120	24270	24410	24380	24830
15	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0	0	24500	24680	24860	25030	25200	25350	25500	25660	25830	26090
16	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0	25700	25900	26080	26260	26430	26590	26740	26900	27080	27360
17	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	26910	27110	27300	27480	27660	27820	27980	28140	28330	28630
18	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	28210	28430	28650	28850	29050	29240	29420	29600	29810	30120
19	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	29520	29760	30000	30220	30440	30650	30860	31060	31290	31610
20	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	30830	31090	31350	31590	31840	32070	32300	32520	32770	33100
21	2.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	32130	32420	32700	32970	33230	33480	33730	33980	34250	34590
22	2.0	2.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	33440	33750	34050	34340	34620	34900	35170	35430	35720	36090
23	2.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	34750	35080	35400	35710	36020	36310	36610	36890	37200	37580
24	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	36060	36400	36750	37080	27410	37730	38040	38350	38680	39070
25	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	37360	37730	38100	38450	38800	39150	39480	39810	40160	40560
26	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	38670	39060	39450	39820	40200	40560	40920	41270	41640	42050
27	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	39980	40390	40800	41200	41590	41980	42360	42730	43120	43550
28	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	41280	41720	42150	42570	42980	43390	43790	44190	44600	45040
29	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	42590	43050	43500	43940	44380	44810	45230	45650	46080	46530
30	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	43900	44380	44850	45310	45770	46220	46670	47110	47550	48020
31	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0	1.0	45200	45700	46200	46680	47160	47640	48110	48570	49030	49510
32	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0	46510	47030	47550	48050	48560	49050	49540	50030	50510	51000
33	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0	47820	48360	48900	49430	49950	50470	50980	51490	51990	52500
34	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	49130	49690	50250	50800	51340	51880	52420	52950	53470	53990
35	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	50340	50910	51470	52030	52570	53110	53640	54170	54700	55230
36	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	51560	52130	52700	53250	53800	54340	54870	55390	55930	56470
37	3.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	52780	53360	53920	54480	55030	55560	56090	56620	57160	57710
38	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	54000	54580	55150	55710	56250	56790	57320	57840	58390	58950
39	3.0	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	55220	55800	56370	56930	57480	58020	58540	59060	59620	60190
40	3.0	3.0	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	56430	57020	57600	58160	58710	59240	59770	60290	60850	61430
41	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	57650	58250	58820	59390	59940	60470	61000	61510	62080	62670
42	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	58870	59470	60050	60610	61160	61700	62220	62730	63310	63910
43	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	60090	60690	61270	61840	62390	62930	63450	63950	64540	65150
44	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	61310	61910	62500	63070	63620	64150	64670	65180	65770	66380
45	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	62520	63140	63730	64290	64850	65380	65900	66400	67000	67620
46	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	63740	64360	64950	65520	66070	66610	67120	67620	68230	68860
47	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0	64960	65580	66180	66750	67300	67830	68350	68850	69460	70100
48	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.0	2.0	2.0	66180	66800	67400	67980	68530	69060	69570	70070	70690	71340
49	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.0	2.0	67390	68030	68630	69200	69760	70290	70800	71290	71920	72580
50	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.0	68610	69250	69850	70430	70980	71510	72020	72520	73150	73820
51	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	69830	70470	71080	71660	72210	72740	73250	73740	74380	75060

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

GATE OPENING SCHEDULE

WITH POWERHOUSE OPERATING

SHEET 2 OF 6

STEP NUMBER	GATE OPENING IN FEET																	SPILLWAY DISCHARGE IN C.F.S.									
	GATE NUMBER																	POOL ELEVATION									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	76.5	77.0	77.5	78.0	78.5	79.0	79.5	80.0	80.5	81.0
52	4.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	70610	71260	71880	72460	73030	73560	74090	74600	75250	75940
53	4.0	4.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	71400	72050	72680	73210	73840	74390	74920	75460	76120	76820
54	4.0	4.0	4.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	72180	72840	73470	74080	74660	75210	75760	76310	76990	77690
55	4.0	4.0	4.0	4.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	72970	73640	74270	74890	75470	76040	76600	77170	77860	78570
56	4.0	4.0	4.0	4.0	4.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	73750	74430	75070	75690	76290	76860	77430	78030	78730	79450
57	4.0	4.0	4.0	4.0	4.0	4.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	74540	75220	75870	76500	77110	77690	78270	78890	79600	80330
58	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	75320	76010	76670	77310	77920	78510	79110	79750	80470	81200
59	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	76100	76800	77470	78120	78740	79340	79940	80610	81340	82080
60	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	76890	77590	78270	78920	79550	80160	80780	81460	82210	82960
61	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	77670	78380	79070	79730	80370	80980	81620	82320	83080	83840
62	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	3.0	3.0	3.0	3.0	3.0	78460	79180	79870	80540	81180	81810	82450	83180	83950	84710
63	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	3.0	3.0	3.0	3.0	79240	79970	80670	81350	82000	82630	83290	84040	84820	85590
64	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	3.0	3.0	3.0	80020	80760	81470	82150	82820	83460	84130	84900	85690	86470
65	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	3.0	3.0	80810	81550	82270	82960	83630	84280	84960	85760	86560	87340
66	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	3.0	81590	82340	83070	83770	84450	85110	85800	86610	87430	88220
67	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	82380	83130	83870	84580	85260	85930	86640	87470	88290	89100
68	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	83160	83920	84660	85380	86080	86760	87470	88330	89160	89980
69	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	84240	85020	85780	86510	87230	87930	88670	89540	90390	91220
70	6.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	85320	86120	86890	87640	88380	89110	89870	90760	91620	92470
71	6.0	6.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	86400	87210	88000	88770	89530	90290	91070	91970	92840	93710
72	6.0	6.0	6.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	87480	88310	89110	89900	90680	91460	92270	93180	94070	94950
73	6.0	6.0	6.0	6.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	88560	89400	90230	91020	91830	92640	93470	94390	95300	96200
74	6.0	6.0	6.0	6.0	6.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	89640	90500	91340	92150	92980	93810	94670	95610	96520	97440
75	6.0	6.0	6.0	6.0	6.0	6.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	90720	91600	92450	93280	94130	94990	95870	96820	97750	98690
76	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	91800	92690	93560	94410	95280	96170	97070	98030	98980	99930
77	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	92880	93790	94670	95540	96430	97340	98270	99250	100200	101180
78	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	93960	94890	95790	96660	97580	98520	99470	100460	101430	102420
79	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	95040	95980	96900	97790	98730	99700	100660	101670	102660	103670
80	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	4.0	4.0	4.0	4.0	4.0	96120	97080	98010	98920	99880	100870	101860	102880	103880	104910
81	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	4.0	4.0	4.0	4.0	97200	98170	99120	100050	101030	102050	103060	104100	105110	106150
82	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	4.0	4.0	4.0	98280	99270	100230	101180	102180	103220	104260	105310	106340	107400
83	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	4.0	4.0	99360	100370	101350	102300	103330	104400	105460	106520	107560	108640
84	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	4.0	100440	101460	102460	103430	104480	105580	106660	107730	108790	109890
85	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	101520	102560	103570	104560	105630	106750	107860	108950	110020	111130
86	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	102240	103290	104320	105330	106420	107570	108700	109810	110910	112050
87	8.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	102960	104030	105070	106100	107210	108380	109540	110680	111810	112970
88	8.0	8.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	103680	104760	105820	106860	108000	109190	110380	111550	112700	113890
89	8.0	8.0	8.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	104400	105490	106570	107630	108790	110000	111220	112420	113600	114810
90	8.0	8.0	8.0	8.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	105110	106230	107320	108400	109580	110810	112060	113290	114490	115730
91	8.0	8.0	8.0	8.0	8.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	105830	106960	108070	109170	110370	111630	12900	114150	115390	116650
92	8.0	8.0	8.0	8.0	8.0	8.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	106550	107700	108820	109940	111160	112440	113740	115020	116290	117570
93	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	107270	108430	109570	110700	111950	113250	114580	115890	117180	118490
94	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	107980	109160	110320	111470	112740	114060	115420	116760	118080	119410
95	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	108700	109900	111070	112240	113530	114870	116260	117630	118970	120330
96	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0	109420	110630	111820	113010	114320	115690	117100	118490	119870	121250
97	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	6.0	6.0	6.0	6.0	6.0	110140	111370	112570	113780	115110	116500	117940	119360	120760	22170
98	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	6.0	6.0	6.0	6.0	110860	112100	11320	114540	115900	117310	118780	120230	121660	123090
99	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	6.0	6.0	6.0	111570	112830	114070	115310	116690	118120	119620	121100	122560	124010
100	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	6.0	6.0	112290	113570	114820	116080	117490	118930	120460	121970	123450	124920
101	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	6.0	113010	114300	115570	116850	118280	119750	121300	122830	124350	125840
102	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	113730	115040	116320	117610	119070	120560	122140	123700	125240	126760

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

GATE OPENING SCHEDULE

WITHOUT POWERHOUSE OPERATING

SHEET 3 OF 6

STEP NUMBER	GATE OPENING IN FEET																	SPILLWAY DISCHARGE IN C.F.S.									
	GATE NUMBER																	POOL ELEVATION									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	76.5	77.0	77.5	78.0	78.5	79.0	79.5	80.0	80.5	81.0
103	10.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	114230	115570	116890	118220	119690	121200	122800	124370	125930	127460
104	10.0	10.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	114730	116110	117460	118820	120310	121840	123450	125040	126610	128160
105	10.0	10.0	10.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	115240	116640	118030	119420	120930	122480	124110	125710	127300	128860
106	10.0	10.0	10.0	10.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	115740	117180	118600	120020	121550	123120	124760	126380	127980	129560
107	10.0	10.0	10.0	10.0	10.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	116240	117720	119170	120620	122170	123770	125420	127050	128670	130260
108	10.0	10.0	10.0	10.0	10.0	10.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	116750	118250	119740	121220	122790	124410	126080	127720	129350	130960
109	10.0	10.0	10.0	10.0	10.0	10.0	10.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	117250	118790	120310	121820	123420	125050	126730	128400	130040	131660
110	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	117760	119330	120880	122420	124040	125690	127390	129070	130720	132360
111	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	118260	119860	121440	123020	124660	126330	128050	129740	131410	133060
112	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	118760	120400	122010	123620	125280	126970	128700	130410	132090	133750
113	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	8.0	8.0	8.0	8.0	8.0	8.0	119270	120940	122580	124220	125900	127620	129360	131080	132780	134450
114	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	8.0	8.0	8.0	8.0	8.0	119770	121470	123150	124820	126520	128260	130010	131750	133460	135150
115	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	8.0	8.0	8.0	8.0	120270	122010	123720	125420	127140	128900	130670	132420	134150	135850
116	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	8.0	8.0	8.0	120780	122540	124290	126020	127770	129540	131330	133090	134830	136550
117	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	8.0	8.0	121280	123080	124860	126620	128390	130180	131980	133760	135520	137250
118	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	8.0	121790	123620	125430	127220	129010	130820	132640	134430	136200	137950
119	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	122290	124150	126000	127820	129630	131470	133290	135100	136890	138650
120	12.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	122690	124570	126420	128260	130080	131920	133770	135610	137420	139210
121	12.0	12.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	123100	124980	126850	128700	130530	132380	134250	136120	137960	139780
122	12.0	12.0	12.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	123500	125400	127280	129140	130980	132840	134730	136630	138500	140350
123	12.0	12.0	12.0	12.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	123900	125810	127720	129570	131430	133300	135210	137140	139040	140910
124	12.0	12.0	12.0	12.0	12.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	124310	126220	128130	130010	131880	133750	135690	137640	139570	141480
125	12.0	12.0	12.0	12.0	12.0	12.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	124710	126640	128550	130450	132320	134210	136170	138150	140110	142050
126	12.0	12.0	12.0	12.0	12.0	12.0	12.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	125120	127050	128980	130890	132770	134670	136650	138660	140650	142610
127	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	125520	127460	129400	131320	133220	135130	137130	139170	141190	143180
128	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	125920	127880	129830	131760	133670	135590	137610	139680	141720	143740
129	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	126330	128890	130250	132200	134120	136040	138090	140190	142260	144310
130	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	10.0	10.0	10.0	10.0	10.0	10.0	126730	128700	130680	132640	134570	136500	138570	140700	142800	144880
131	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	10.0	10.0	10.0	10.0	10.0	127130	129120	131110	133070	135020	136960	139040	141200	143340	145440
132	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	10.0	10.0	10.0	10.0	127540	129530	131530	133510	135470	137420	139520	141710	143880	146010
133	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	10.0	10.0	10.0	127940	129950	131960	133950	135920	137870	140000	142220	144410	146580
134	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	10.0	10.0	128350	130360	132380	134380	136370	138330	140480	142730	144950	147140
135	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	10.0	128750	130770	132810	134820	136820	138790	140960	143240	145490	147710
136	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	129150	131190	133230	135260	137260	139250	141440	143750	146030	148270
137	14.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	129440	131470	133510	135550	137590	139620	141830	144170	146490	148780
138	14.0	14.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	129730	131760	133790	135830	137920	139980	142230	144590	146950	149280
139	14.0	14.0	14.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	130020	132040	134070	136120	138250	140350	142620	145010	147410	149790
140	14.0	14.0	14.0	14.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	130310	132330	134340	136410	138580	140720	143020	145430	147870	150290
141	14.0	14.0	14.0	14.0	14.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	130600	132610	134620	136700	138900	141090	143410	145850	148340	150790
142	14.0	14.0	14.0	14.0	14.0	14.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	130890	132900	134900	136980	139230	141460	143810	146270	148800	151300
143	14.0	14.0	14.0	14.0	14.0	14.0	14.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	131190	133180	135170	137270	139560	141820	144200	146690	149260	151800
144	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	131480	133470	135450	137560	139890	142190	144600	147110	149720	152300
145	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	131770	133750	135730	137850	140210	142560	144990	147530	150180	152810
146	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	132060	134040	136010	138130	140540	142930	145390	147950	150650	153310
147	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	12.0	12.0	12.0	12.0	12.0	12.0	132350	134320	136280	138420	140870	143300	145780	148370	151110	153820
148	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	12.0	12.0	12.0	12.0	12.0	132640	134610	136560	138710	141200	143660	146180	148790	151570	154320
149	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	12.0	12.0	12.0	12.0	132930	134900	136840	139000	141520	144030	146570	149210	152030	154820
150	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	12.0	12.0	12.0	133220	135180	17120	139280	141850	144400	146970	149640	152490	155330
151	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	12.0	12.0	133510	135470	137390	139570	142180	144770	147360	150060	152960	155830
152	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	12.0	133800	135750	137670	139860	142510	145130	147760	150480	153420	156340
153	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	134090	136040	137950	140140	142830	145500	148150	150900	153880	156840

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
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GATE OPENING SCHEDULE

WITH OR WITHOUT POWERHOUSE OPERATING

SHEET 4 OF 6

STEP NUMBER	GATE OPENING IN FEET																	SPILLWAY DISCHARGE IN C.F.S.									
	GATE NUMBER																	POOL ELEVATION									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	76.5	77.0	77.5	78.0	78.5	79.0	79.5	80.0	80.5	81.0
154	16.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	134350	136330	138290	140510	143200	145880	148550	151310	154280	157240
155	16.0	16.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	134620	136620	138630	140880	143560	146260	148950	151710	154690	157630
156	16.0	16.0	16.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	134880	136920	138970	141250	143930	146640	149340	152120	155090	158030
157	16.0	16.0	16.0	16.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	135150	137210	139310	141620	144300	147010	149740	152530	155490	158430
158	16.0	16.0	16.0	16.0	16.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	135410	137500	139650	141990	144660	147390	150140	152940	155900	158820
159	16.0	16.0	16.0	16.0	16.0	16.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	135680	137790	139990	142350	145030	147770	150540	153350	156300	159220
160	16.0	16.0	16.0	16.0	16.0	16.0	16.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	135940	138090	140330	142720	145390	148150	150930	153760	156700	159610
161	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	136210	138380	140670	143090	145760	148520	151330	154170	157110	160010
162	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	136470	138670	141010	143460	146120	148900	151730	154580	157510	160410
163	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	136740	138970	141350	143830	146490	149280	152130	154990	157910	160800
164	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	14.0	14.0	14.0	14.0	14.0	14.0	137000	139260	141690	144190	146850	149660	152520	155390	158320	161200
165	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	14.0	14.0	14.0	14.0	14.0	137270	139550	142030	144560	147220	150030	152920	155800	158720	161600
166	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	14.0	14.0	14.0	14.0	137530	139840	142370	144930	147580	150410	153320	156210	159120	161990
167	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	14.0	14.0	14.0	137800	140140	142710	145300	147950	150790	153720	156620	159530	162390
168	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	14.0	14.0	138060	140430	143050	145670	148310	151170	154110	157030	159930	162790
169	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	14.0	138330	140720	143390	146030	148680	151540	154510	157440	160330	163180
170	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	138600	141020	143730	146400	149040	151920	154910	157850	160740	163580
171	18.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	138770	141200	143950	146640	149330	152240	155240	158200	161120	163980
172	18.0	18.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	138950	141430	144170	146890	149620	152550	155580	158560	161490	164390
173	18.0	18.0	18.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	139130	141640	144390	147130	149900	152860	155910	158920	161870	164790
174	18.0	18.0	18.0	18.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	139300	141850	144620	147370	150190	153180	156250	159270	162250	165190
175	18.0	18.0	18.0	18.0	18.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	139480	142060	144840	147610	150470	153490	156580	159630	162630	165600
176	18.0	18.0	18.0	18.0	18.0	18.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	139660	142270	145060	147850	150760	153810	156920	159990	163010	166000
177	18.0	18.0	18.0	18.0	18.0	18.0	18.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	139830	142480	145280	148090	151050	154120	157250	160340	163390	166410
178	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	140010	142690	145510	148330	151330	154440	157590	160700	163770	166810
179	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	140180	142890	145730	148580	151620	154750	157930	161060	164140	167220
180	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	140360	143100	145950	148820	151900	155070	158260	161410	164520	167620
181	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	16.0	16.0	16.0	16.0	16.0	16.0	140540	143310	146170	149060	152190	155380	158600	161770	164900	168020
182	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	16.0	16.0	16.0	16.0	16.0	140710	143520	146400	149300	152480	155700	158930	162130	165280	168430
183	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	16.0	16.0	16.0	16.0	140890	143730	146620	149540	152760	156010	159270	162480	165660	168830
184	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	16.0	16.0	16.0	141070	143940	146840	149780	153050	156330	159600	162840	166040	169240
185	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	16.0	16.0	141240	144150	147060	150020	153330	156640	159940	163200	166420	169640
186	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	16.0	141420	144360	147290	150270	153620	156960	160270	163550	166800	170040
187	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	141600	144560	147510	150510	153910	157270	160610	163910	167170	170450
188	20.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	141750	144720	147660	150690	154100	157480	160830	164140	167430	170740
189	20.0	20.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	141900	144870	147810	150870	154290	157680	161040	164370	167680	171030
190	20.0	20.0	20.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	142060	145020	147960	151040	154480	157890	161260	164600	167940	171320
191	20.0	20.0	20.0	20.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	142210	145170	148120	151220	154670	158090	161480	164830	168190	171610
192	20.0	20.0	20.0	20.0	20.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	142370	145330	148270	151400	154860	158290	161690	165060	168450	171900
193	20.0	20.0	20.0	20.0	20.0	20.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	142520	145480	148420	151580	155050	158500	161910	165300	168700	172200
194	20.0	20.0	20.0	20.0	20.0	20.0	20.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	142670	145630	148570	151760	155240	158700	162130	165530	168960	172490
195	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	142830	145780	148720	151940	155440	158900	162350	165760	169210	172780
196	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	142980	145940	148870	152120	155630	159110	162560	165990	169470	173070
197	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	143130	146090	149030	152300	155820	159310	162780	166220	169720	173360
198	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	18.0	18.0	18.0	18.0	18.0	18.0	143290	146240	149180	152480	156010	159520	163000	166450	169980	173650
199	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	18.0	18.0	18.0	18.0	18.0	143440	146390	149330	152660	156200	159720	163210	166680	170230	173940
200	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	18.0	18.0	18.0	18.0	143590	146550	149480	152840	156390	159920	163430	166910	170490	174230
201	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	18.0	18.0	18.0	143750	146700	149630	153020	156580	160130	163650	167140	170740	174530
202	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	18.0	18.0	143900	146850	149780	153200	156780	160330	163860	167370	171000	174820
203	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	18.0	144050	147000	149940	153370	156970	160540	164080	167600	171250	175110
204	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	144210	147160	150090	153550	157160	160740	164300	167830	171500	175400

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

GATE OPENING SCHEDULE

WITH OR WITHOUT POWERHOUSE OPERATING

SHEET 5 OF 6

STEP NUMBER	GATE OPENING IN FEET — GATE NUMBER 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
205	FULL	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
206	FULL	FULL	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
207	FULL	FULL	FULL	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
208	FULL	FULL	FULL	FULL	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
209	FULL	FULL	FULL	FULL	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
210	FULL	FULL	FULL	FULL	FULL	FULL	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
211	FULL	FULL	FULL	FULL	FULL	FULL	FULL	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
212	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
213	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
214	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	20.0	20.0	20.0	20.0	20.0	20.0	20.0
215	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	20.0	20.0	20.0	20.0	20.0	20.0
216	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	20.0	20.0	20.0	20.0	20.0
217	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	20.0	20.0	20.0	20.0
218	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	20.0	20.0	20.0
219	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	20.0	20.0
220	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	20.0
221	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL

STEP NUMBER	SPILLWAY DISCHARGE IN C.F.S. — POOL ELEVATION 76.5	77.0	77.5	78.0	78.5	79.0	79.5	80.0	80.5	81.0
205	144670	147690	150700	154210	157850	161500	165140	168770	172540	176530
206	145130	148220	151310	154870	158550	162270	165980	169710	173570	177660
207	145590	148760	151920	155530	159250	163030	166820	170640	174600	178800
208	146050	149290	152530	156190	159940	163790	167660	171580	175630	179930
209	146510	149820	153140	156840	160640	164550	168500	172510	176670	181060
210	146970	150360	153760	157500	161340	165320	169330	173450	177700	182200
211	147430	150890	154370	158160	162030	166080	170170	174390	178730	183330
212	147890	151430	154980	158820	162730	166840	171010	175320	179760	184460
213	148350	151960	155590	159470	163430	167610	171850	176260	180800	185590
214	148810	152490	156200	160130	164120	168370	172690	177190	181830	186730
215	149270	153030	156810	160790	164820	169130	173530	178130	182860	187860
216	149730	153560	157430	161450	165510	169890	174370	179060	183890	188990
217	150190	154090	158040	162110	166210	170660	175210	180000	184930	190120
218	150650	154630	158650	162760	166910	171420	176050	180940	185960	191260
219	151110	155160	159260	163420	167600	172180	176890	181870	186990	192390
220	151570	155700	159870	164080	168300	172950	177730	182810	188020	193520
221	152030	156230	160480	164740	169000	173710	178570	183740	189060	194650

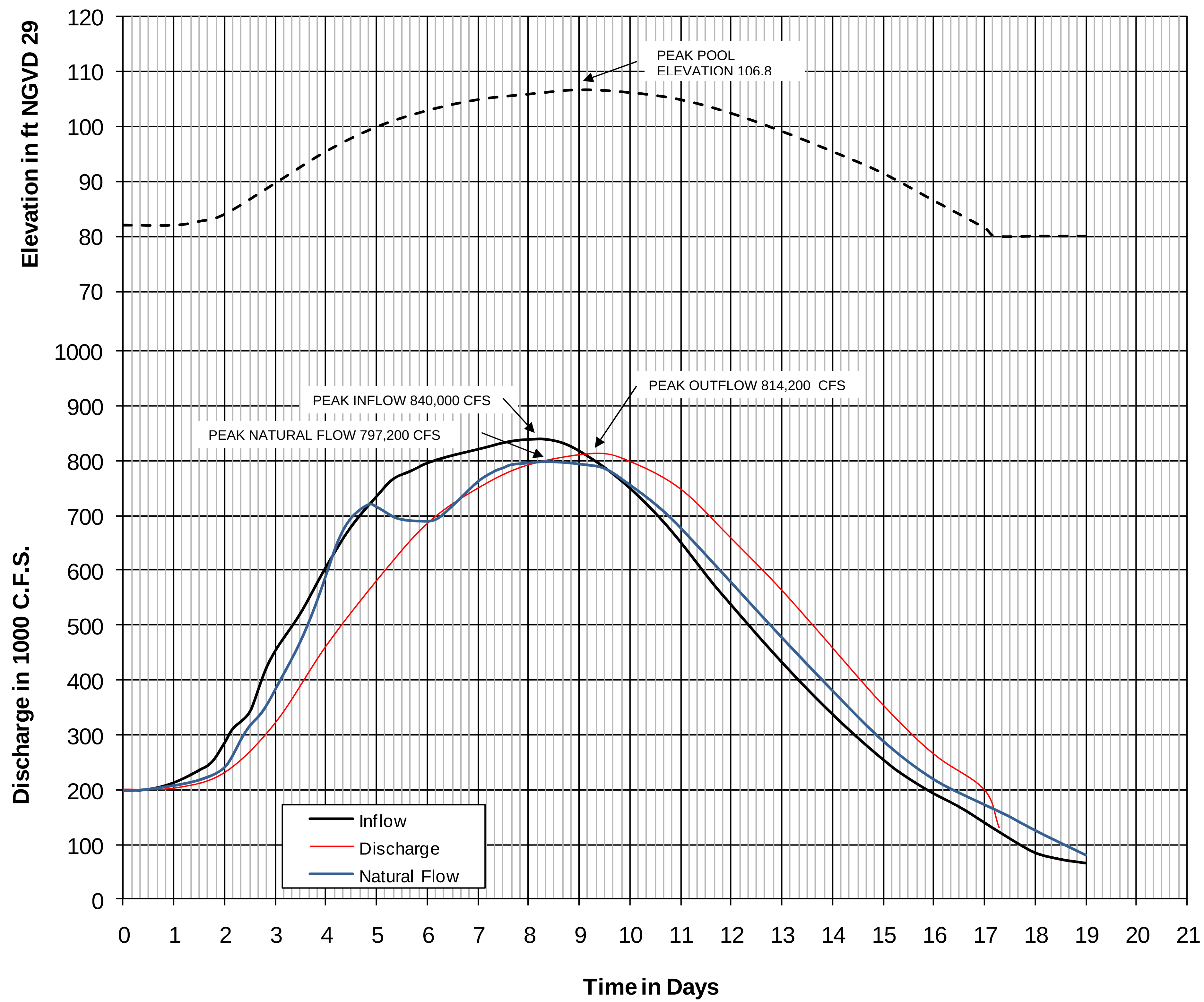
ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

GATE OPENING SCHEDULE

WITH OR WITHOUT POWERHOUSE OPERATING

SHEET 6 OF 6

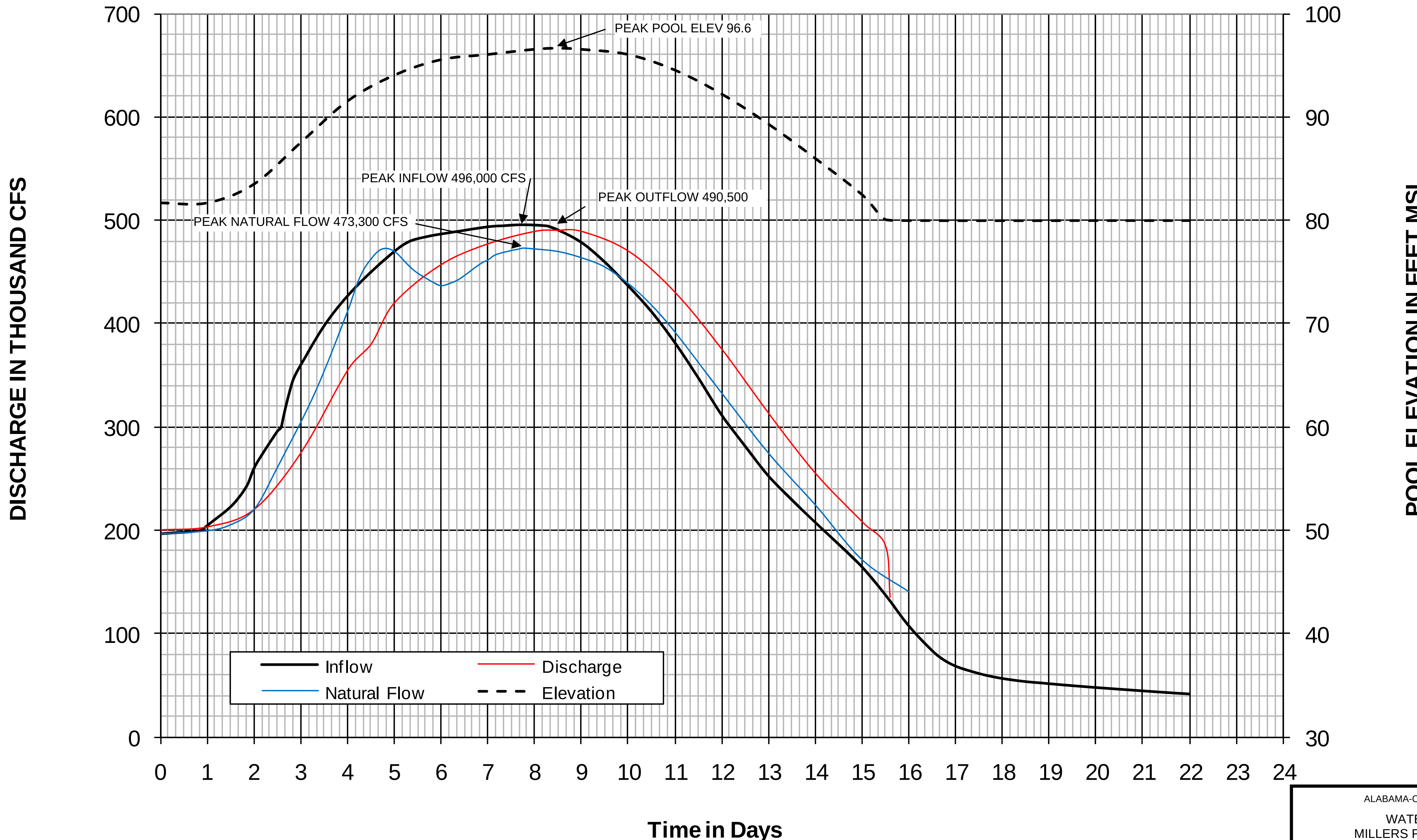


NOTE: FLOOD OF MARCH 1929 FOLLOWED BY SPILLWAY DESIGN FLOOD. EXISTING AND PROPOSED ALA POWER CO DAMS AND RF HENRY DAM ASSUMED IN OPERATION

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

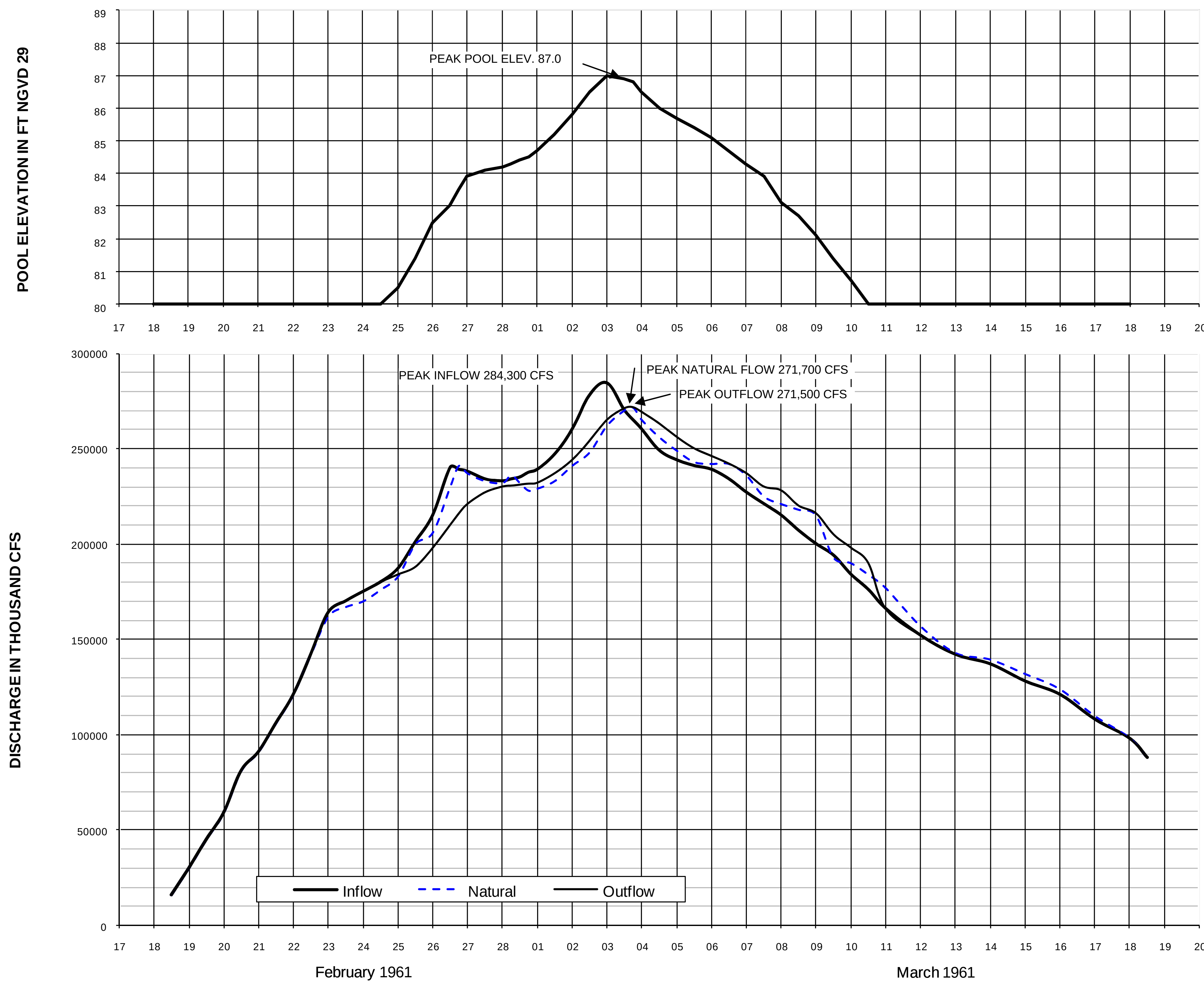
INFLOW OUTFLOW POOL HYDROGRAPHS SPILLWAY DESIGN FLOOD



ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

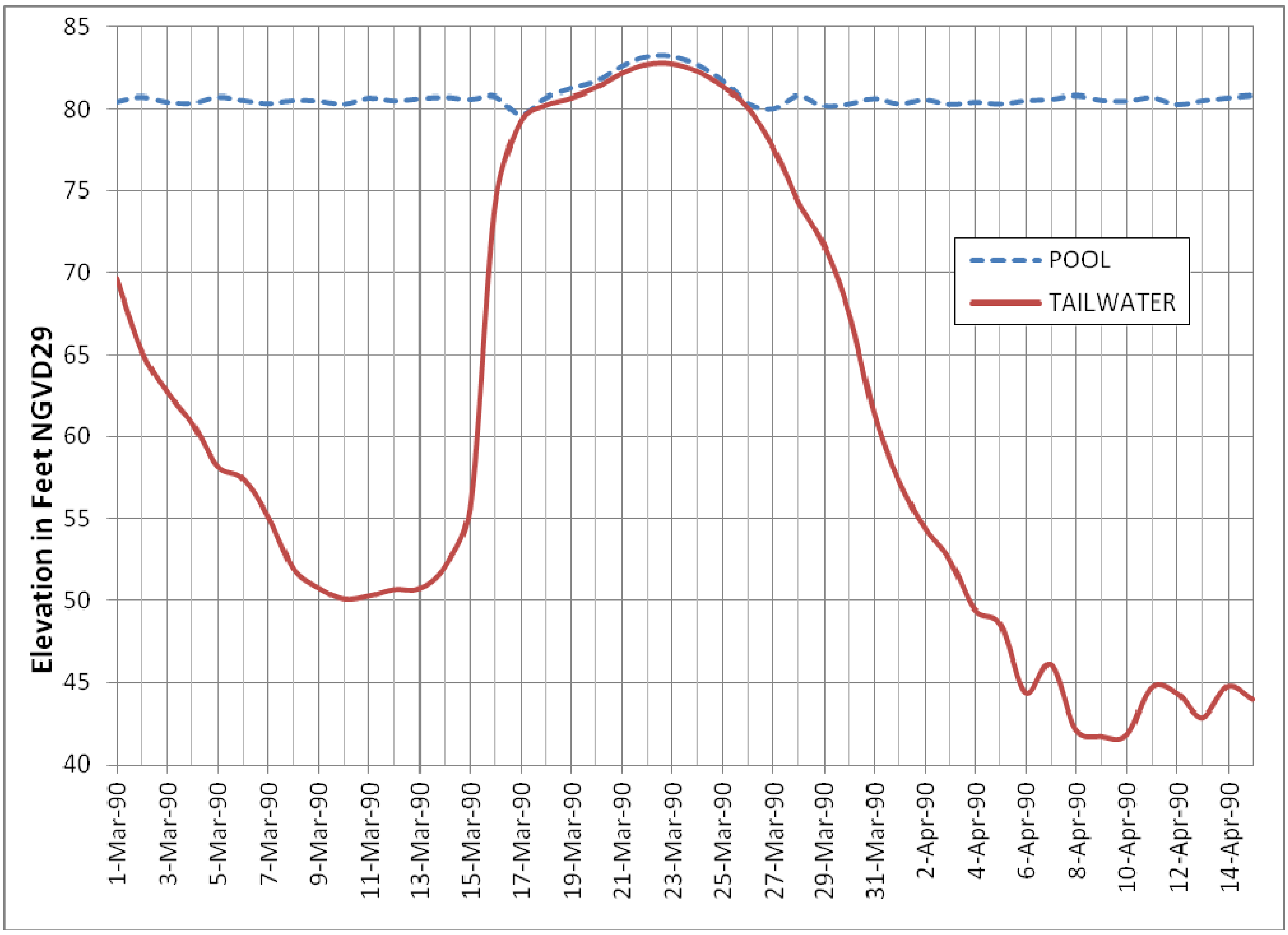
INFLOW OUTFLOW POOL HYDROGRAPHS STANDARD PROJECT FLOOD

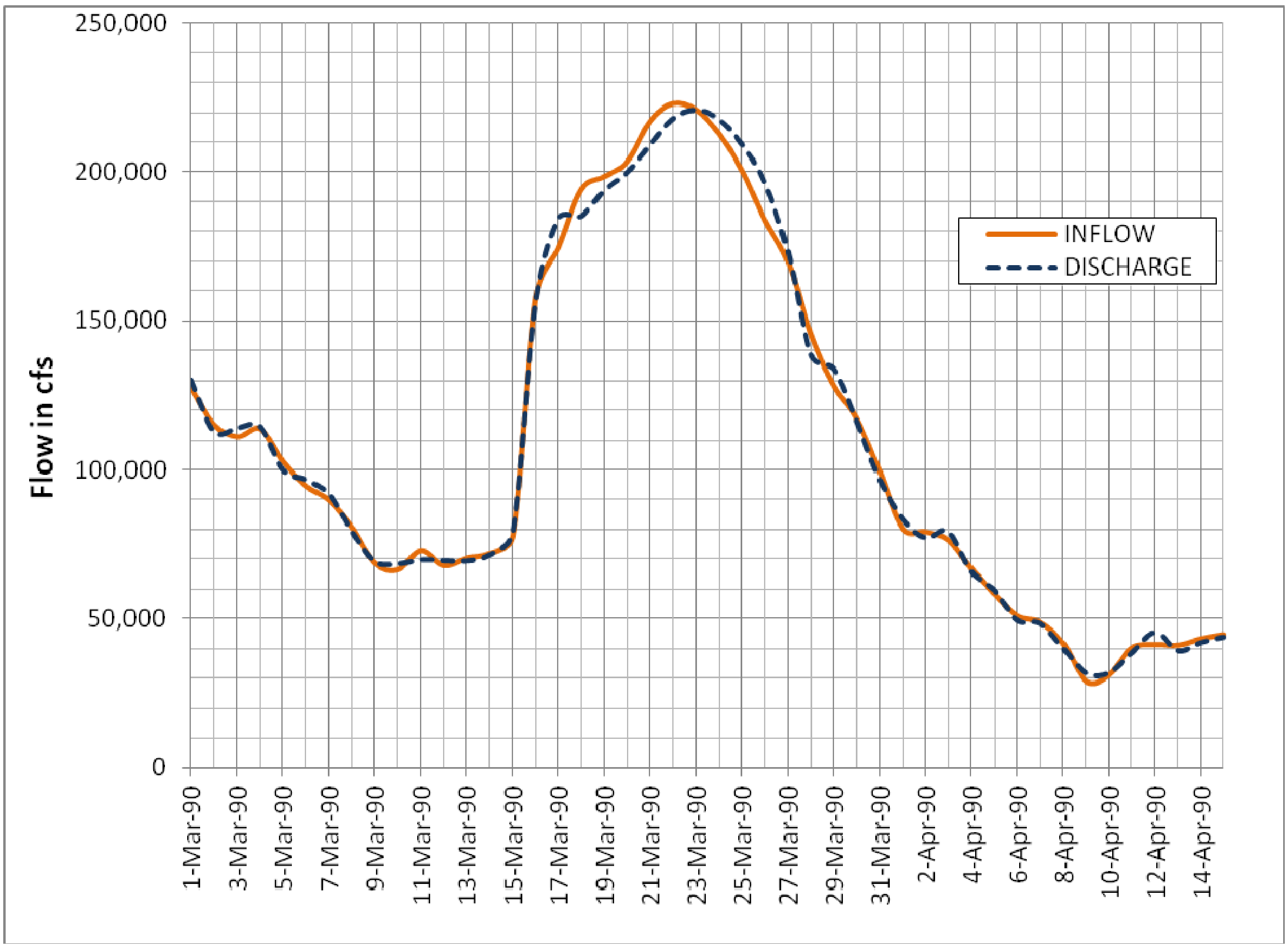


ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

INFLOW OUTFLOW POOL HYDROGRAPHS FLOOD OF FEB-MAR 1961

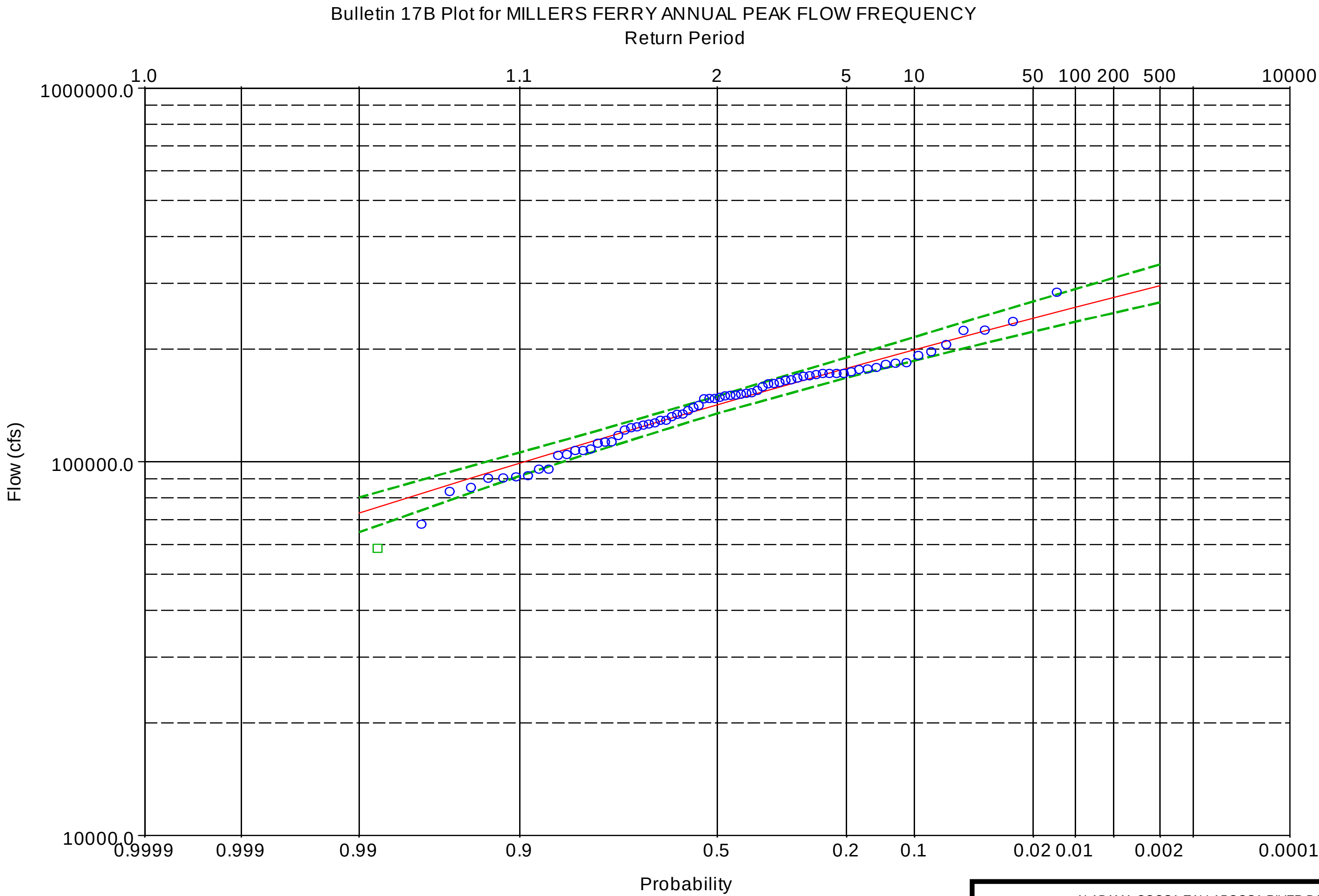




ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

INFLOW OUTFLOW POOL HYDROGRAPHS
FLOOD OF MARCH 1990

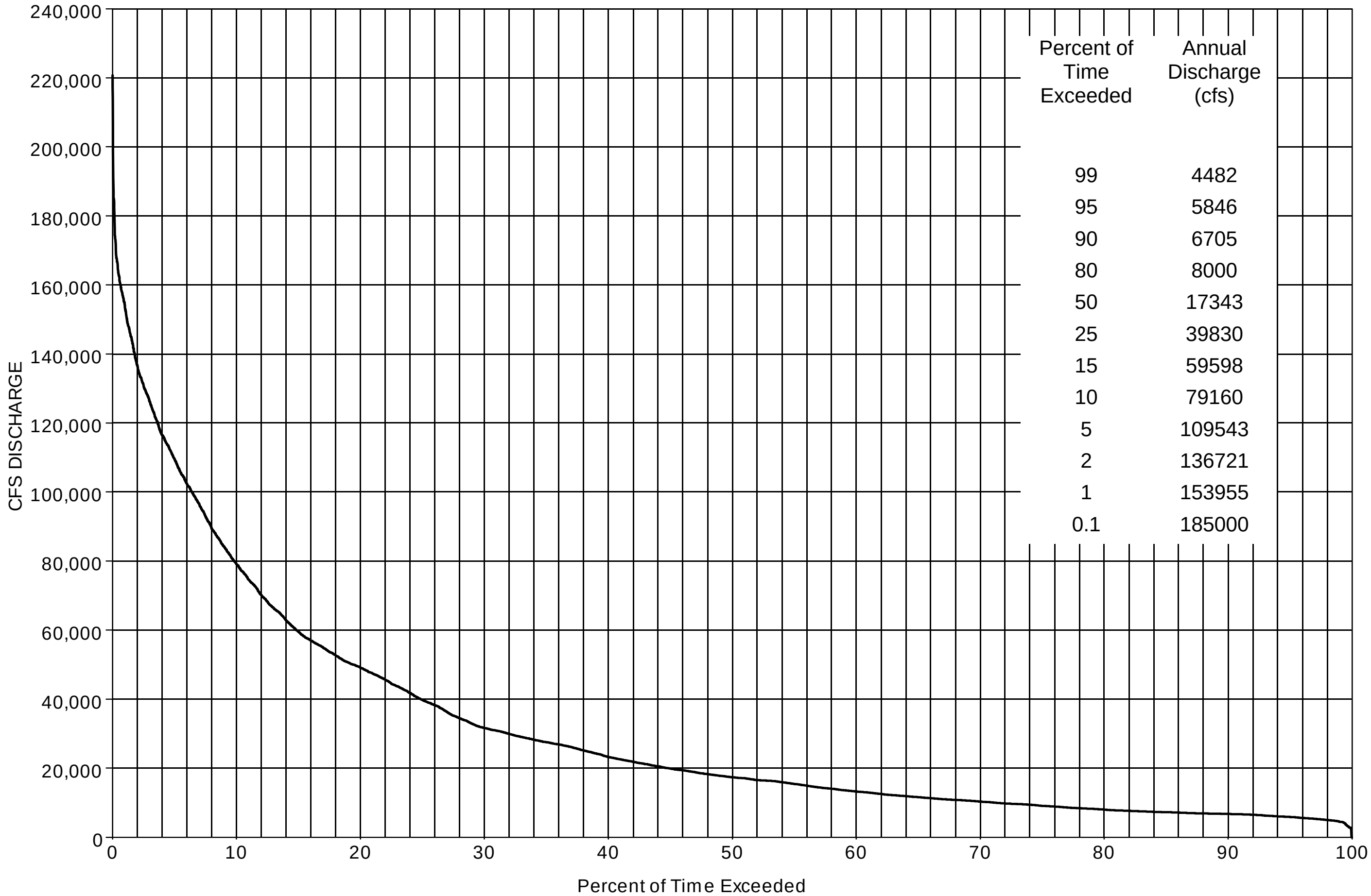


1938 – 1954, AND 1961 DATA FROM USGS GAGE 02427500
1955 – 1975 DATA FROM USGS GAGE 02429500
1976 – 2009 DATA FROM MOBILE DISTRICT WATER MANAGEMENT

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

ANNUAL PEAK FLOW FREQUENCY
1938-2009



Percent of Time Exceeded	Annual Discharge (cfs)
99	4482
95	5846
90	6705
80	8000
50	17343
25	39830
15	59598
10	79160
5	109543
2	136721
1	153955
0.1	185000

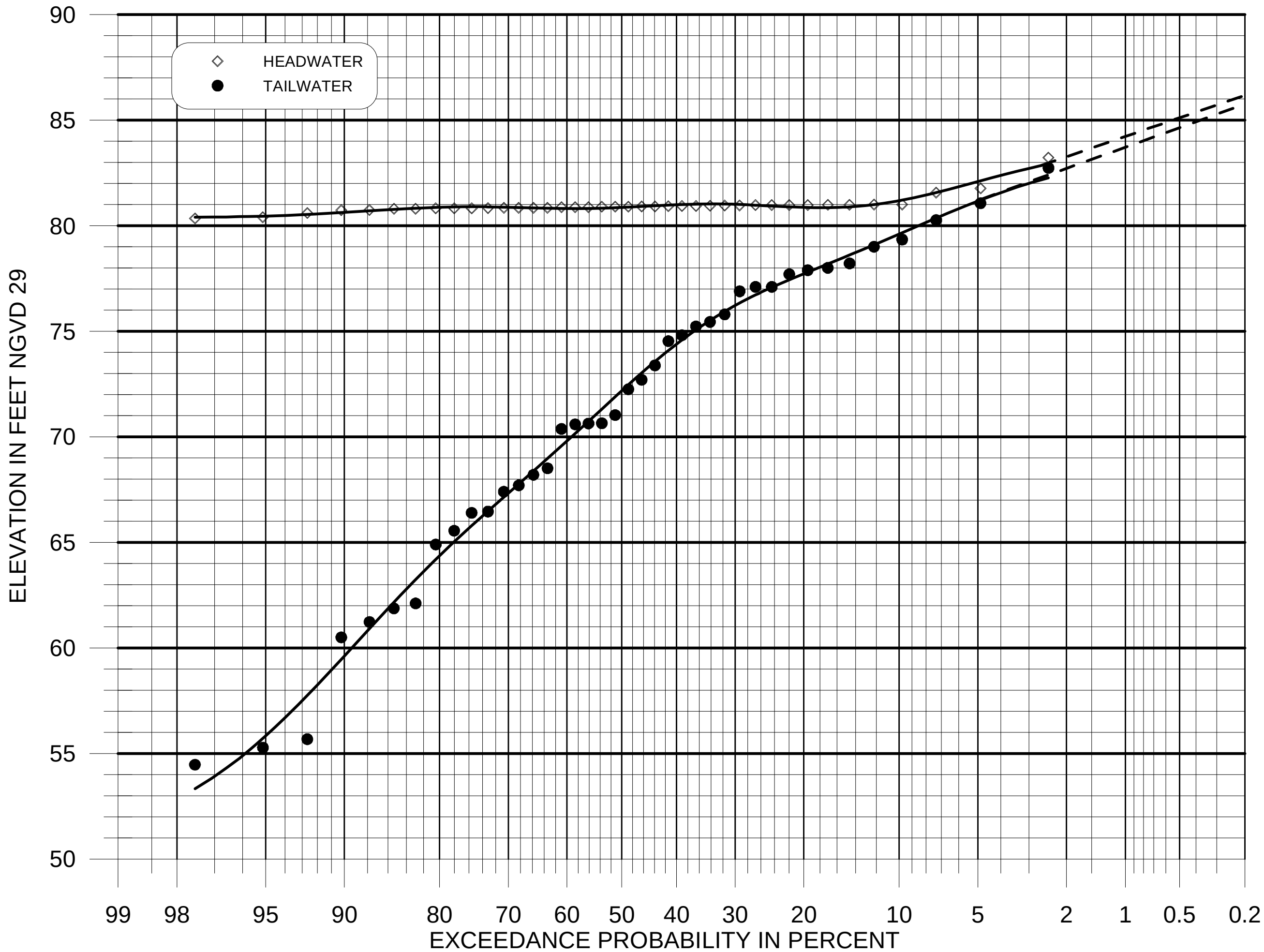
Data from Mobile District files for the period May 1970 – Dec 2009.

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM
AND WILLIAM "BILL" DANNELLY LAKE

ANNUAL DISCHARGE DURATION

MAY 1970 – DECEMBER 2009



Data from Mobile District files for the period 1971 - 2009.
Sixth degree polynomial curves were used to fit data. Curves were extrapolated to 0.2 exceedance probability. Curves are based on annual peak data.

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
MILLERS FERRY LOCK AND DAM AND
WILLIAM "BILL" DANNELLY LAKE

HEADWATER/TAILWATER ELEV FREQUENCY
1971-2009