




INTEGRATED LETTER REPORT AND TIERED ENVIRONMENTAL ASSESSMENT

OF THE

OPERATIONAL ANALYSIS AND TARGETED WATER CONTROL PLAN UPDATES FOR THE APALACHICOLA-CHATTAHOOCHEE-FLINT RIVER BASIN IN ALABAMA, FLORIDA, AND GEORGIA

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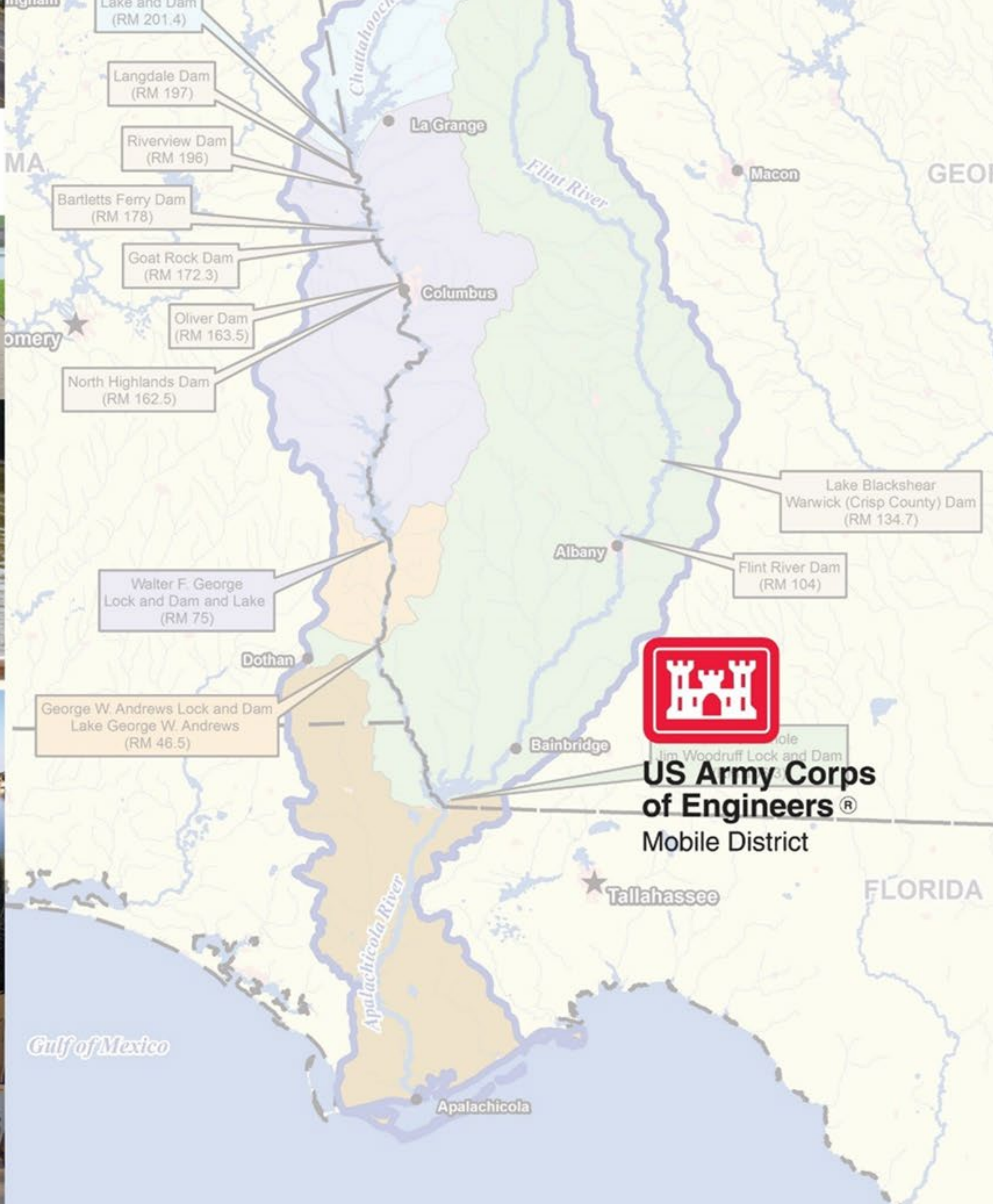

US Army Corps of Engineers®
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Appendix E

Walter F. George Water Control Plan

The enclosed document contains chapters 3, 7, and Exhibit C: Standing Instructions to the Damtenders for Water Control from each of the West Point, Walter F. George, George W. Andrews, and Master Water Control Manuals. These chapters have been selected out of the complete 2017 Water Control Manuals due to their direct relation to implementation of the 4 Flow Objectives analyzed in the ILR/TEA pursuant to the Stay Agreement Alternative. The Stay Agreement itself can be found in Appendix A. All added language within is indicated by red text.

US Army Corps
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WATER CONTROL MANUAL

APPENDIX C

WALTER F. GEORGE LOCK AND DAM AND LAKE

CHATTAHOOCHEE RIVER
GEORGIA AND ALABAMA

U.S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
MOBILE, ALABAMA

APRIL 1965

Revised February 1993, March 2017 and

December 2024

Walter F. George Lock and Dam and Lake

III - HISTORY OF PROJECT

3-01. Authorization. The Corps first considered navigation locks and dams for the Apalachicola River Basin in the early 1930s in a report on the Apalachicola River System in accordance with House Document No. 308, 69th Congress, First Session. The report, which had a general plan for the overall development of the basin was submitted to Congress in 1934 but was immediately recalled to consider additional information. The Rivers and Harbors Act of 1945 approved the general plan presented in House Document No. 342, 76th Congress, First Session, and authorized the initiation and partial accomplishment of that plan by constructing two locks and dams, one of which was the Junction Project. No work was accomplished on the project authorized by the Rivers and Harbors Act of 1945.

The Rivers and Harbors Act of 1946, House Document No. 300, 80th Congress (Public Law 79-525) approved modification of the general plan including the substitution for the authorized lock and dam at Junction of a higher lock and dam with normal pool elevation 77.0 feet NGVD29 and with provisions for a hydroelectric power plant. The modification also included an increase in the size of the locks at all navigation dams from 45 by 450 feet to 82 by 450 feet. On 19 May 19, 1953, the House of Representatives Committee on Public Works approved a plan consisting of a low navigation dam near Columbia, Alabama, and a high navigation and power dam near Fort Gaines, Georgia, in lieu of the Fort Benning Lock and Dam and the upper Columbia projects.

In March 1958, the 85th Congress, Second Session, enacted Public Law 85-363 officially designating Fort Gaines Lock and Dam as the Walter F. George Lock and Dam in honor of the Senator Walter F. George of Georgia.

3-02. Planning and Design. Design Memorandum No. 1. *Basic Hydrology* was submitted on 14 August 1953, and approved by the Chief of Engineers on 12 November 1953. Design Memorandum No. 2 was submitted on 9 October 1953, and approved 10 November 1953, subject to the outcome of additional studies. Additional design memoranda for the Walter F. George Project are listed in Table 3-1. The *Operation and Maintenance Manual* for Walter F. George Lock and Dam was issued in 1962.

Table 3-1. Design Memoranda

Letter Report - Report on Development of Chattahoochee River Between Upper Limits of Jim Woodruff Pool and Columbus, Georgia	November 29, 1952
DM No. 1 - Basic Hydrology	August 14, 1953
DM No. 2 - Determination of Site location and Reservoir Level at Fort Gaines Dam, Chattahoochee River	October 8, 1953
DM No. 3 - General Design	June 29, 1954
DM No. 4 - Non-overflow Dike, West Bank	October 5, 1955
DM No. 5 - Real Estate Requirements, Construction Area, Right Bank	July 7, 1955
DM No. 6 - Real Estate Requirements, Construction Area, Left Bank	January 19, 1956
DM No. 7 - Staffing and Operating Requirements	December 21, 1956
DM No. 10 - Geology	November 1, 1956
DM No. 11 - Fort Gaines Lock and Dam, Chattahoochee River, Alabama - Georgia	June 28, 1956
DM No. 12 - Relocations	August 12, 1957
DM No. 13 - Design of Lock and Control Station	September 3, 1958
DM No. 14 - Sources of Aggregate and Riprap	November 20, 1956
DM No. 15 - Reservoir Clearing, Mosquito Control and Floatage Removal	November 18, 1959
DM No. 16-A - Preliminary Master Plan - Part of the Master Plan	August 24, 1956
DM No. 16-B - Construction Design Memo, Public Use and Access Facilities	March 1, 1961

3-03. Construction. Construction began in September 1955 under a contract awarded to Moss Construction Company for the earth dike on the Alabama side of the river. In December 1956, a contract for construction of the spillway was awarded to Hardaway Contracting Company and in September 1958, Thomason and Associates was awarded the contract for the earth dike on the Georgia side. Perini, Inc., was awarded the contract for the lock in December 1959, and in January 1961, Hardaway Contracting Company was awarded the contract for the powerhouse. The powerhouse was completed in June 1963, essentially completing the project. The total cost of the project, including $1,300,000 for recreational development, was $87,100,000.

Filling of the reservoir began on 11 May 1962, and the pool reached the spillway crest (elevation 163 feet NGVD29) on 15 November 1962. The pool was held at approximately elevation 167 feet NGVD29 until early in March 1963 when high inflows caused it to rise to elevation 184 feet NGVD29. It was lowered to elevation 178 feet NGVD29 and held at or slightly below that level until clearing of the reservoir was completed in mid-July. After clearing was complete, filling was resumed and the pool reached elevation 183 feet NGVD29 on 27 July when it was lowered to 180 feet NGVD29 because of foundation problems with the earth dikes. On 9 August, the restrictions on the pool level were removed, and the reservoir was filled to normal operating level.

The first generating unit was placed in operation on 13 March 1963, the second unit was declared commercially available on 29 June, the third unit on 25 September, and the fourth unit on 2 November. The lock was opened to navigation in mid-1963. However, navigation was limited by channel conditions until October 1963 when dredging was completed in the upper Andrews (Columbia) pool just below the Walter F. George Lock and in the upper reaches of the Walter F. George Lake.

The Walter F. George Project is underlain by coastal plain sediments of Tertiary age. The floodplain at the project was covered with recent aged alluvium, and pockmarked with sinkholes. The sinkholes occurred in definite lines, which indicate they are controlled by jointing the Tertiary-aged strata. Foundation rock for the concrete structures is the Clayton Formation. That formation is predominately limestone and is approximately 165 feet thick. Locally, three distinct units are recognized in the Clayton. They are, in descending order, Earthy Limestone, Shell Limestone, and Sandy Limestone. Compressive strengths generally range about 200 to 450 pounds per square inch (psi) for the Earthy Limestone, 300 to 1,000 psi for the Shell Limestone, and less than 100 to more than 15,000 psi for the Sandy Limestone.

Foundation problems in the embankment area were noted near the end of construction, and seepage problems developed at the beginning of impoundment of the reservoir. The permeability of the alluvial overburden materials, and existing jointing and cavernous conditions in the Earthy Limestone caused the initial seepage problems in the embankment areas. Grouting and other remedial measures were attempted; although, the problem was not solved until concrete cutoff walls were installed through the earth embankments in the 1980s.

Limestone formations, caverns, and sinkholes (shown in Figures 3-1, 3-2, and 3-3) were an initial cause of seepage from the project. Extensive grouting (Figures 3-4 and 3-5) managed to reduce some areas of seepage. Later, a cutoff wall was installed along the center of the earthen dikes.

In October 1981, construction began on a concrete diaphragm cutoff wall placed vertically in the dikes and extending down to an impervious layer of rock. The cutoff wall consisted of 364 panels that measured 2 feet wide, the average panel length was 22.5 feet, and the average panel depth was 117.3 feet. Construction of the cutoff wall was completed in March 1985 at a total cost of $10.8 million. Seepage underneath the powerhouse section of the dam has also occurred. Conventional drilling and grouting occurred from 1982 to 1983 and was successful. Foundation drains are closely monitored for any unusual increases in seepage. Since construction of the cutoff wall, relief well and piezometer monitoring at the project has revealed that the cutoff wall has been successful, stopping seepage beneath the dikes. Figures 3-6 and 3-7 show construction of the cutoff wall.

Figure 3-1. Man Standing in Sinkhole

Figure 3-2. Cavern in Foundation Area

Figure 3-3. Early Excavation to Prevent Seepage

Figure 3-4. Grouting Crew

Figure 3-5. Boom Supplying Grouting Operation

Figure 3-6. Trench Excavation for Cutoff Wall

Figure 3-7. Cutoff Wall Construction

As the cutoff walls were solving the seepage problems through the alluvium and Earthy Limestone materials beneath the embankments, seepage became evident in the Shell Limestone foundation beneath the powerhouse and spillway. Seepage through the Shell Limestone is more complicated than that under the embankments. Construction features (inadequately grouted construction piezometers along the upstream toe) and natural features (joints in the Earthy Limestone overlying joints in the Shell Limestone) combined to provide seepage paths to lower portions of the Shell Limestone. The lower portions contain some strata in which the shell fragments are very poorly cemented. High hydraulic gradients that developed in the strata caused piping, which ultimately developed direct connections with the lower pool. In the early 1980s, a flow of about 30,000 gallons per minute (gpm) developed beneath the powerhouse, and again in 1991 a flow of about 3,000 gpm (and climbing) developed beneath the spillway. During the 1990s event, up to one and one-quarter-inch diameter limestone fragments piped from the foundation were collected from the drainage system discharge.

Investigation methods used over the years to define and attempt to control the seepage were multibeam hydrographic surveys, lake bottom and borehole camera inspections, doppler sonar surveys, dye testing, temperature studies, diving inspections, side-scan sonar surveys, bottom profiling sonar inspections, coring, and drilling and grouting (both cement and chemical).

In the summer of 2002, work began on a concrete cutoff wall construction along the upstream toe (through the reservoir) of the concrete structures. A secant pile wall (overlapping 50-inch in diameter piles) was installed through about 100 feet of water upstream of the spillway and powerhouse structures, and through the upstream lock guide and guard walls. Connecting concrete diaphragm walls were installed at the structure abutments, with excavation by hydromill. A hydromill was also used to cut through the lock concrete walls and the reinforced retaining wall upstream of the powerhouse, for the subsequent installation of the secant piles. The cutoff wall contract was completed in December 2004. Piezometric levels beneath much of the powerhouse and spillway have dropped from 50 to 60 feet and now are near tailwater level.

The seepage problem has been largely addressed by the secant wall, however the lock chamber has still been observed to leak water through old drainage systems. After anchoring the lock floor in the 1970's the lock chamber (peripheral) drainage system was determined to be no longer required and plugs were installed in the discharge pipes. Many of these plugs have failed, releasing water into the main downstream channel. This issue will need to be addressed before the next lock dewatering, however it is not believed to pose any risk to the structure. There also appears to be leakage through an old contact drainage system in the lock floor. Lock operation was monitored and it was noted that there appears to be continuous flow through this drainage system. It also discharges into the downstream channel through numerous grates on the riverside lock wall. Flow through these grates was noted the entire time the lock was kept at any elevation above the lower pool. This is also not believed to pose any risk to the structure.

3-04. Related Projects. Walter F. George Lock and Dam is one of five Corps reservoir projects in the ACF Basin. Buford Dam and West Point Dam are upstream, while George W. Andrews Lock and Dam and Jim Woodruff Lock and Dam are downstream of the project. The Corps reservoirs on the Chattahoochee River are operated as a system to accomplish authorized functions as described in the *ACF Basin Master Water Control Manual (with Appendices)*. Outflows from Walter F. George Lock and Dam are influenced by the Master Manual and requirements at other Corps projects. In addition, six privately owned dams are upstream on the Chattahoochee River in the vicinity of Columbus, Georgia, between Walter F. George Dam and West Point Dam. The privately owned reservoirs on the Chattahoochee River are primarily run-of-river projects containing very little storage capacity and, consequently, do not significantly influence flows in the river or the operation of the Corps projects.

3-05. Modifications to Regulations. From the time the Walter F. George Project became operational in 1963, changes in needs and conditions in the ACF Basin have influenced certain modifications to the regulation of the dam. The following describe the modifications to regulations that have occurred at the Walter F. George Project.

a. <u>Hydropower</u>. The Southeastern Power Administration (SEPA) negotiates contracts for the sale of power from the Walter F. George Hydropower Project in accordance with the Flood Control Act of 1944. Under the provisions of the Act, the Corps determines the amount of energy available at Walter F. George Dam each week and advises SEPA of the amount available, and SEPA arranges the sale. Walter F. George Dam is within SEPA's Georgia-Alabama-South Carolina system, which also contains Buford Dam and West Point Dam on the Chattahoochee River, four projects in the ACT Basin, and three projects on the Savannah River. SEPA began dispatching (scheduling) power in 1996. Before that, Southern Company scheduled peaking generation from Corps projects. SEPA's scheduling provided more flexibility to meet customer needs. Hydropower generation in the 1960s and 1970s was a driving force in releases from Walter F. George Dam, and days of six to eight hours of generation were common. During the 1980s, several droughts occurred and resulted in a philosophical change to more conservative hydropower operations. This led to a decrease of about 9% in hydropower generation at Walter F. George Dam from the 1960s and 1970s to the 1980s and 1990s. SEPA values the capacity at each project and supports conservative use of the resource (water). As a result, power generation demands have been balanced between the projects weekly to enhance long-term generating capability of the entire system and to provide for the needs of other project purposes in the system.

b. <u>Navigation</u>. A major factor influencing reservoir regulation was the additional flow required to maintain the authorized 9.0-foot navigation depth on the Apalachicola River. At the time the ACF system of projects was constructed, a discharge from Jim Woodruff Dam of 9,300 cfs, together with dredging, provided a 9.0-foot deep navigation channel in the Apalachicola

River. A discharge of 20,600 cfs from Jim Woodruff Dam is currently required for a 9.0-foot channel without dredging. The increase of 11,300 cfs to support a 9.0-foot channel is equivalent to 4.1 feet of storage at Lake Sidney Lanier, 5.6 feet of storage from West Point Lake, or 3.6 feet of storage from Walter F. George Lake over a one week period. In practice any use of storage to support navigation would be distributed between the three ACF storage projects with consideration to the current action zone of each reservoir. The increasing flow requirements to achieve suitable navigation channel depth in the Apalachicola River are attributable to (1) channel degradation and (2) escalating flow diversion through Chipola Cutoff. In response to those changing conditions, it became necessary to periodically schedule the release of increased flows from Jim Woodruff Lock and Dam for periods of a few days to as long as two weeks to accommodate commercial river traffic. Those periods were known as navigation windows. During navigation windows, water was released in varying amounts from the upstream reservoirs, stored in the downstream reservoirs, and then released through Jim Woodruff Lock and Dam to provide sufficient flow in the Apalachicola River to achieve suitable navigation depths. In preparation for navigation windows, releases were made from Walter F. George Lock and Dam to help supply sufficient water in storage downstream to successfully implement the navigation window. A discharge of 20,600 cfs from Jim Woodruff Lock and Dam is currently required for a 9.0-foot channel without dredging.

Increasing flow requirements plus the loss of water quality certification from Florida, which prevents the Corps from dredging the Apalachicola River, effectively closed commercial navigation on the Apalachicola River. Coordination with waterway users identified the need for changes in the Corps' water control operations to provide a more reliable flow regime, without dredging, to support at least a 7.0-foot navigation channel in the Apalachicola River. Through an iterative hydrologic modeling process, it was determined that a 5-month navigation season, January through May each year, can be provided that will improve navigation reliability without significantly affecting other project purposes. The 5-month navigation season included in the current water control plan can, in the absence of maintenance dredging, improve the total reliability of a 7.0-foot navigation channel in the Apalachicola River from 21 percent to as much as 42 percent. Releases made from Walter F. George Dam during hydropower operations contribute to the needed downstream navigation flows.

c. <u>Revised Water Control Plan</u>. Since the initiation of project operations, Walter F. George Project has operated with a seasonally varied conservation pool. From completion of the project until 1978, the conservation pool was maintained at 185 feet NGVD29 from December through April and 190 feet NGVD29 from June through October. In May and November, the levels transitioned between the summer and winter pool levels. This lower winter pool level was intended to provide sufficient storage space to contain the pool elevation in the upper reaches of the reservoir within the project limits during high-flow periods and to provide storage for high inflows that could gradually be released through the turbines for hydropower generation rather than through the spillway.

After the West Point Project became operational in 1975, the Corps reviewed the Walter F. George Project seasonal water control operations. It was determined that using the flood risk management storage in West Point Lake had changed the timing of high inflows into Walter F. George Lake. Further, using the West Point Lake flood risk management storage in combination with a higher winter pool and an early start of continuous power generation at Walter F. George Dam during high-flow periods would accomplish the same control of downstream flows as previously provided by maintaining the Walter F. George Lake winter pool elevation of 185 NGVD29. The evaluation of proposed changes to the Walter F. George Project water control operations concluded that a winter pool elevation of 188 feet NGVD29 would provide increased economic benefits for hydropower and recreation. Using flood risk management storage at the West Point Project, combined with the two feet of storage provided by the 188 feet NGVD29 winter pool elevation at Walter F. George Lake and the early start to continuous power generation at Walter F. George Dam meant that most of the water evacuated from the reservoir during high-flow periods was released through the turbines, rather than through the spillway, which resulted in increased power generation. Maintaining a winter pool elevation of 188 feet NGVD29, rather than the previous 185 feet NGVD29, gave greater assurance that the summer conservation pool elevation of 190 feet NGVD29 could be reached, particularly during years when less than normal rainfall occurred during the winter and spring months, to the benefit of recreation. Consequently, those new operating guidelines were implemented for Walter F. George Project.

d. Revised Interim Operating Plan. The Revised Interim Operating Plan (RIOP) was implemented in June 2008 and modified in May 2012. The purpose of the RIOP was to support compliance with the Endangered Species Act of 1973 for Federally listed threatened and endangered species and their Federally designated critical habitat in the Apalachicola River and to avoid or minimize potential adverse effects associated with discretionary operations at Jim Woodruff Lock and Dam. The RIOP directly affected flows and fall rates in the Apalachicola River and prescribed the minimum flow releases to be made from Jim Woodruff Dam under specific hydrologic conditions. However, the releases made from Jim Woodruff Dam in accordance with the RIOP used the composite conservation storage of all the upstream reservoirs in the ACF System. The Corps operates five Federal reservoirs on the ACF as a system, and releases made from Jim Woodruff Dam under the RIOP reflected the downstream end-result for system wide operations measured by daily releases from Jim Woodruff Dam into the Apalachicola River. The RIOP did not describe operational specifics at any of the four Federal reservoirs upstream of Jim Woodruff Lock and Dam or other operational parameters at those reservoirs. Instead, the RIOP described the use of the composite conservation storage of the system and releases from the upstream reservoirs as necessary to assure that the releases made from Jim Woodruff Dam would comply with the Endangered Species Act of 1973 by minimizing effects on Federally listed threatened and endangered species and Federally designated critical habitat.

a. Settlement Flow Objectives. Settlement negotiations in the lawsuit challenging the 2017 updates to ACF Water Control Manuals resulted, after completion of the *Integrated Letter Report and Tiered Environmental Assessment (ILR/TEA) for the Operational Analysis and Targeted Water Control Plan Updates for the Apalachicola Chattahoochee Flint River Basin in Alabama, Florida, and Georgia*, in dismissal of the state of Alabama's lawsuit against USACE and option of the following Flow Objectives:

1. An objective to maintain a minimum average daily flow of 1,350 cfs over any 7-day period at the gage located on the Chattahoochee River at 14th, Street at Columbus, Georgia (Gage No. 02341460) when the ACF Basin is not in "Drought Zone Operations" as that term is defined in the 2017 ACF Master Manual;

2. An objective to maintain a minimum average weekday flow of 2,000 cfs at the gage located on the Chattahoochee River near Columbia, Alabama (Gage No. 02343801) when the ACF Basin is not in "Drought Zone Operations" as that term is defined in the 2017 ACF Master Manual;

3. An objective to maintain the minimum average flows at Columbus, Georgia and Columbia, Alabama, described in items (1) and (2) above, on two days each

calendar week starting each Monday, when the ACF Basin is in "Drought Zone Operations" as that term is defined in the 2017 ACF Master Manual; and

4. An objective to maintain Lake Seminole at or above an elevation of 76 feet NVGD in the same manner and to the same extent as provided in the 2017 ACF Master Manual, and in particular the following paragraphs from Appendix A, the Water Control Manual for Jim Woodruff Lock and Dam and Lake Seminole: Chapter Ill, paragraph 3-03; Chapter VII, paragraphs 7-03, 7-0S(a), 7-10, and 7-11; and Chapter VIII, Paragraph 8-11 b.

In order to meet the Flow Objectives at West Point, the discharges necessary to support maintaining a daily average flow of 1,350 cfs over any 7-day period (7-day forward moving average) at 14th, Street at Columbus, Georgia (Gage No. 02341460) and a minimum average weekday flow of 2,000 cfs on the Chattahoochee River near Columbia, AL (Gage No. 02313801) under normal conditions will be made. When Drought operations have been triggered, the flow target shifts to maintain the minimum average Flows of 1,350 cfs for at least two calendar days at Columbus, Georgia and 2,000 cfs for at least two calendar days at Columbia, Alabama, on two days each calendar week starting each Monday.

3-06. Principal Regulation Problems. To maintain the structural integrity of the dam and powerhouse, a head differential between the Walter F. George Lake and the tailwater elevation must not exceed 88 feet at any time. When the tailwater elevation is less than 102 feet NGVD29 and the pool elevation of Walter F. George Lake is greater than 190 feet NGVD29, a constant release of water must occur from the project sufficient enough to raise the tailwater elevation above 102 and maintain a head differential of less than 88 feet.

VII - WATER CONTROL PLAN

7-01. General Objectives. The authorized purposes for the Walter F. George Lock and Dam and Lake as specified in the authorizing documents are hydroelectric power and navigation. Several other project purposes have been authorized at the Walter F. George Project through nationwide authorizing legislation. Those purposes are water quality, recreation, conservation of threatened and endangered species, fish and wildlife conservation, and water supply. Flood risk management is not an authorized function; however, peak flows downstream are reduced by normal reservoir regulation operations providing flood-reduction benefits. The regulation plan seeks to balance the needs of all project purposes at the Walter F. George Project.

7-02. Constraints. The tailwater at Walter F. George Dam must not, at any time, be more than 88 feet below the headwater, so as not to exceed the project design-head limitation. In particular, the Walter F. George Project tailwater must not be allowed to fall, below elevation 102 feet NGVD29, when the headwater is at summer operating pool, elevation 190 feet NGVD29. Tailwater elevation 102 feet NGVD29 is also required to provide a controlling navigation depth of nine feet (with normal maintenance dredging) in the upper reaches of Lake George W. Andrews. It is important that operators coordinate any drawdown at George W. Andrews Project pool with releases through the powerhouse to prevent excessive lowering of the tailwater. It is important to note that during summer and fall conditions, a constant tailwater of 102 feet NGVD29 might not be possible, thereby limiting the ability to reach full summer pool of 190 feet NGVD29 under certain situations. If the tailwater elevation falls below 102 feet NGVD29 and the pool elevation is at or slightly above 190 feet NGVD29, operating one hydropower unit will return the tailwater elevation to above 102 feet NGVD29 and maintain a net head of less than 88 feet.

7-03. Overall Plan for Water Control

a. <u>General Regulation</u>. The water control operations of the Walter F. George Project are in accordance with the regulation schedule as outlined in the following paragraphs. The Corps operates the Walter F. George Project to provide for the authorized project purposes of the project. All authorized project purposes are considered when making water control regulation decisions, and those decisions affect how water is stored and released from the project. Deviations from the prescribed instructions, which can occur due to planned or unplanned events as described in Section 7-15, will be at the direction of the Mobile District. Additionally, if communication between the district office and the dam is interrupted, the operator will follow the emergency operation schedule found at Exhibit C, Instructions to the Damtenders for Water Control.

b. <u>Conservation Pool</u>. The Walter F. George Lake pool is regulated between a minimum elevation of 184 and a top-of-conservation elevation of 188 to 190 feet NGVD29. The top-of-conservation pool guide curve and minimum conservation pool are shown in Figure 7-1 along with other operating zones.

c. <u>Guide Curves and Action Zones.</u> The Corps operates the ACF system of reservoirs to provide for all the authorized project purposes. Each of the authorized project purposes is considered when making operational decisions, and those decisions affect how water is stored and released from the projects. The multiple water demands in the basin require that the Corps operate the system in a balanced manner in an attempt to meet all authorized purposes, while continuously monitoring the total system water availability to ensure that project purposes can at least be minimally satisfied during critical drought periods. The balanced water management strategy for the Corps reservoirs in the ACF Basin does not prioritize any project function but seeks to balance all project authorized purposes. Flow support might be required from Walter F. George Dam to support downstream requirements.

The *ACF Master Water Control Manual* and project appendices (to include this manual) prescribe guide curves to facilitate the water control regulation of the three major storage projects in the ACF Basin, Buford, West Point, and Walter F. George. Figure 7-1 and Plate 7-1 depicts the guide curve and action zones for Walter F. George Lake in graphical form. The reservoir storage zones' elevation and volume associated with each guide curve are shown on Plates 7-2 and 7-3 respectively. Table 7-1 depicts the action zones in tabular form. The guide curve defines the top of conservation storage water surface elevation associated with the storage limits, which guide the regulation for authorized purposes. The water control plan also establishes action zones within the conservation storage for each project. The zones are used to manage the lakes at the highest level possible while balancing the needs of all the authorized purposes. Zone 1, the highest zone, defines a reservoir condition where all authorized project purposes should be met. As lake levels decline, Zones 2 through 4 define increasingly critical system status where purposes can no longer be fully met. The action zones also provide guidance on meeting minimum hydroelectric power needs at each project. Table 7-2 below shows the typical hydropower at full plant generation by action zone that can be expected from the Walter F. George Project.

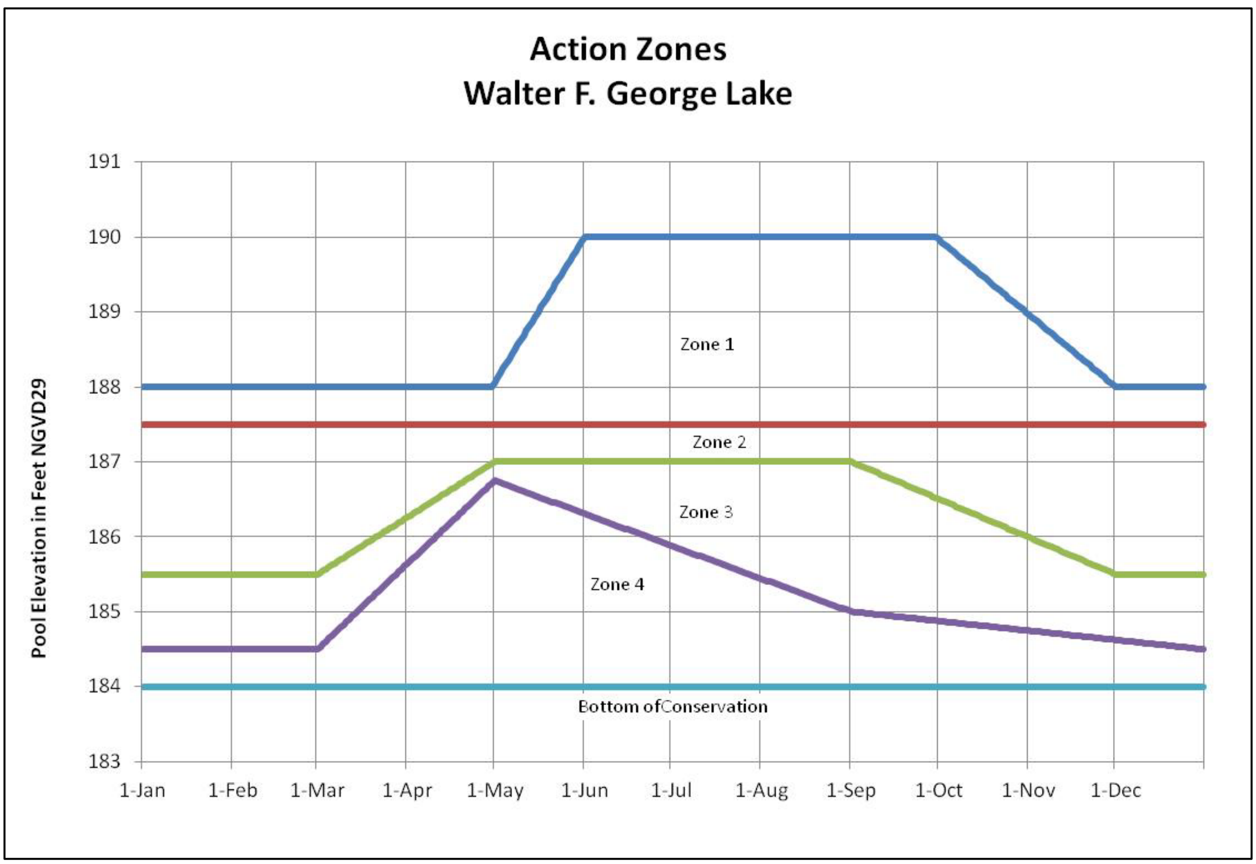

Figure 7-1. Action Zones for Walter F. George Lake

Table 7-1. Top of Conservation and Action Zone Elevations, Walter F. George Lake

Date	Elevation (feet NGVD29)			
	Top of Zone 1	Top of Zone 2	Top of Zone 3	Top of Zone 4
1 Jan	188.00	187.50	185.50	184.50
1 Mar	188.00	187.50	185.50	184.50
1 May	188.00	187.50	187.00	186.75
1 Jun	190.00	187.50	187.00	186.31
1 Sep	190.00	187.50	187.00	185.00
1 Oct	190.00	187.50	186.51	184.88
1 Dec	188.00	187.50	185.50	184.62
31 Dec	188.00	187.50	185.50	184.50

Table 7-2. Typical Hours of Peaking Hydropower Generation at Walter F. George Project

Action zone	Walter F. George (hours of operation)
Zone 1	Up to 4
Zone 2	Up to 2
Zone 3	Up to 2
Zone 4	0

While hydropower would still be generated in Zone 4, it could not be generated on a regular peaking schedule under severe drought conditions.

The zones were derived on the ability of the reservoirs to refill (considering hydrology, watershed size, and physical constraints of each reservoir), recreation effects and hazard levels, and the proportionality of zone drawdown between projects. Other factors or activities might cause the lakes to operate differently than the action zones described. Examples of the factors or activities include exceptional flood risk management measures, fish spawn operations, maintenance and repair of turbines, emergency situations such as a drowning and chemical spills, draw-downs because of shoreline maintenance, releases made to free grounded barges, and other circumstances.

The storage projects are operated to maintain their lake level in the same zones concurrently. However, because of the hydrologic and physical characteristics of the river system and other factors that can influence lake levels, there might be periods when one lake is in a higher or lower zone than another. When that occurs, the Corps makes an effort to bring the lakes back into balance with each other as soon as conditions allow. By doing so, effects on the river basin are shared equitably among the projects.

The action zones are integral to the system-wide regulation of the ACF Basin through the concept of composite conservation storage. Composite conservation storage is calculated by combining the conservation storage of Lake Sidney Lanier, West Point Lake, and Walter F. George Lake. Composite conservation storage is shown in Figure 7-2. Each of the individual storage reservoirs consists of four action zones. The composite conservation storage uses the four zone concepts as well; i.e., Zone 1 of the composite conservation storage represents the combined storage available in Zone 1 for each of the three storage reservoirs. When composite conservation storage is in Zones 1 and 2, a less conservative operation is in place. When composite conservation storage is in Zone 3, hydropower is supported at a reduced level, water supply and water quality releases are met, and drought contingency operations are triggered. When composite conservation storage is in Zone 4, severe drought conditions exist and hydropower is likely generated only during concurrent uses. Navigation is not supported.

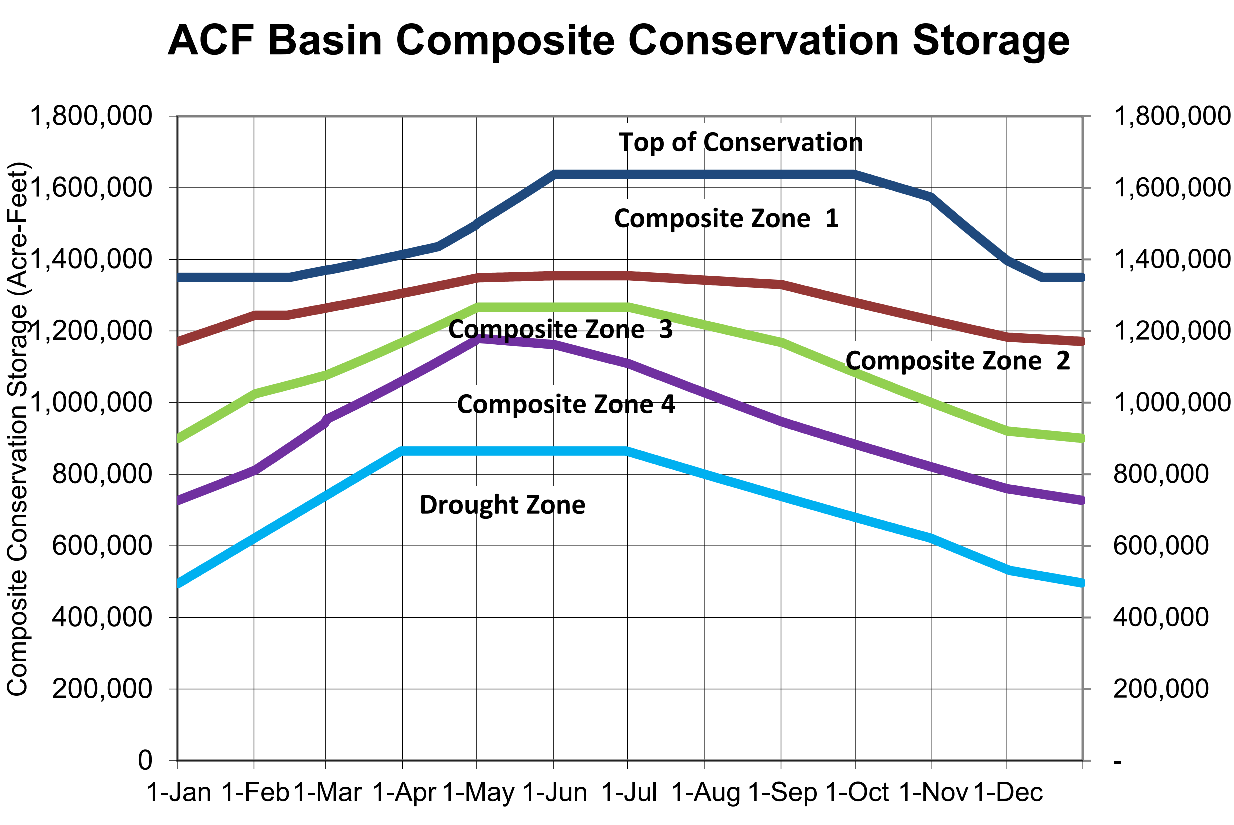

Figure 7-2. ACF Basin Composite Conservation Storage

7-5

The following definitions apply to the composite action zones:

Zone 1: If all the lakes are in Zone 1 or above, the river system would operate in a fairly normal manner. Releases can be made for hydroelectric power, water supply, and water quality. If system composite conservation storage is in Zone 1, releases can be made in support of a navigation season (January to April or May). Drought contingency operations cease when levels return to composite action Zone 1.

Zone 2: Hydroelectric power generation is supported at the same or a reduced level. Water supply and water quality releases are met. Minimum flow targets are met. If system composite conservation storage is in Zone 2, releases can be made in support of a navigation season (January to April or May).

Zone 3: Hydroelectric power generation is supported at a reduced level. Water supply and water quality releases are met. Minimum flow targets are met. If system composite conservation storage is in Zone 3, navigation is not supported. Drought contingency operations are triggered when levels drop to Zone 3.

Zone 4: Hydroelectric power demands will be met at a minimum level and might occur for concurrent uses only. Water supply and water quality releases are met. Minimum flow targets are met. If system composite conservation storage is in Zone 4, navigation is not supported.

Drought Zone: Hydroelectric power will only be met as a result of meeting other project purposes. Water supply and water quality releases are met. Minimum flow targets are met but are reduced to their lowest level. If system composite conservation storage is in the Drought Zone, navigation is not supported and the emergency drought operations are triggered. This reduces the minimum discharge from Jim Woodruff Dam to 4,500 cfs.

7-04. Standing Instructions to Damtender. During normal operations, the powerhouse operators will operate the Walter F. George Project in accordance with the daily hydropower schedule. Any deviation from the schedule must come through the Mobile District. Normally, flood risk management instructions are issued by the Mobile District. However, if a storm of flood-producing magnitude occurs and all communications are disrupted between the Mobile District and the powerhouse operators, the operators will follow instructions in Exhibit C Standing Instructions to the Damtender for Water Control.

7-05. Flood Risk Management. The Walter F. George Project does not have flood risk management as one of its congressionally authorized purposes, but there are guidelines to follow during high-flow periods that provide flood risk management benefits. The operation of the Walter F. George Project for these flood risk management benefits in accordance with instructions issued by the Mobile District, and releases depend on the Walter F. George Lake pool level and expected conditions.

a. <u>Flood Regulation Plan</u>

(1) During high flows, the pool will be regulated by passing inflow through the turbines to the extent possible. When the pool is below elevation 190 feet NGVD29 (and expected to rise above that level) and the inflow exceeds the capacity of the turbines (approximately 26,000 cfs) a discharge of 30,000 cfs or that indicated by the induced surcharge schedule, whichever is greater, will be maintained by passing the outflow through the turbines or spillway gates, or both, allowing the pool to rise.

(2) When the pool reaches elevation 190 feet NGVD29, the required discharge will be determined by the induced surcharge schedule as shown in Plate 7-4. When the pool peaks and begins to fall, the discharge rate indicated in Plate 7-4 will be followed unless other instructions are issued from the Mobile District. The Operations Project Manager and the Site Manager will be advised when the lake is expected to rise above 190.0 feet NGVD29 so necessary actions can be taken. If communications loss occurs, the powerhouse operator will refer to Exhibit C. The discharge will be released through the turbines or spillway gates or both. The spillway gates will be operated in accordance with instructions and the gate opening schedule shown on Plates 2-5 through 2-11.

b. Induced Surcharge Schedule. If current pool levels and inflow rates indicate that runoff from a storm will appreciably exceed the storage capacity below nearly 192.00 feet NGVD29 (top of gates in the closed position) flood risk management operations will be directed by the induced surcharge curves shown on Plate 7-4. As gates are open to meet the induced surcharge release, the available flood risk management pool increases as the top of gate elevation increases. Table 7-3 describes the induced surcharge operating procedures as well as emptying instructions for after the pool has peaked and begun to fall. Modifications to this operation can only be made at the direction of the Mobile District. This schedule follows the objectives set forth in EM 1110-2-3600 as follows:

1) Peak rate of reservoir release during damaging floods should not exceed peak rates of the corresponding floods that would have occurred under runoff conditions prevailing before construction of the reservoir.

2) The rate of increase in reservoir releases during significant increment of time should be limited to values that would not constitute a major hazard to downstream interests.

Table 7-3. Induced Surcharge Operating Procedures

<u>Flood Regulation Schedule</u>

<u>I. Increasing Inflows (Pool Rising)</u>

A. Check induced surcharge schedule on Plate 7-4 each hour. If pool level and 3-hour average inflow require a release based on the induced surcharge schedule, commence making combined powerhouse and spillway releases that are equal to that required by the induced surcharge schedule. If the discharge value taken from the induced surcharge schedule is less than the previous hour's discharge, maintain the previous hour's discharge.

B. If no release is required from the induced surcharge schedule and the pool elevation is above 189.0 feet NGVD29 and the 3-hour average inflow is between 40,000 cfs and 50,000 cfs, begin making a discharge that is 8,000 cfs less than the 3-hour average inflow. If inflows rise above 50,000 cfs, follow the induced surcharge schedule.

<u>II. Pool at Crest</u>. Maintain the maximum gate setting reached for 6 hours to ensure that inflow has peaked.

<u>III. Emptying Instructions (Pool Falling)</u>

A. If peak outflow as determined by induced surcharge schedule is greater than 125,000 cfs, maintain peak outflow until pool falls below elevation 191 feet NGVD29. Then follow a or b below.

  a. If peak outflow is more than double the 3-hour average inflow, begin reducing outflow by 5,000 cfs per hour. When the outflow falls below 70,000 cfs reduce outflow by 2,000 cfs per hour. When the outflow is greater than 10,000 cfs more than the 3-hour average inflow and the pool elevation is below 189 (190.5) feet NGVD29, begin reducing outflow by 1,000 cfs per hour until the pool falls to 188.5 (189.5) feet NGVD29. Then revert to normal operations.

  b. If peak outflow is less than double the 3-hour average inflow, reduce outflow to 65,000 cfs or to inflow plus 10,000 cfs, whichever is greater. If this results in an outflow greater than 65,000 cfs, continue passing inflow plus 10,000 cfs until outflow reaches 65,000 cfs. When outflow reaches 65,000 cfs begin reducing outflow at a rate of 1,000 cfs per hour until the pool falls to 188.5 (189.5) feet NGVD29. Then revert to normal operations

B. If peak outflow as determined by induced surcharge schedule is between 125,000 cfs and 65,000 cfs, maintain outflow until pool falls below 190 feet NGVD29. Then follow a or b below.

  a. If peak outflow is more than double the 3-hour average inflow, begin reducing outflow by 5,000 cfs per hour. When the outflow falls below 70,000 cfs reduce outflow by 2,000 cfs per hour. When the outflow reaches 10,000 cfs greater than the 3-hour average inflow and the pool is below 189 (190.5) feet NGVD29, begin reducing outflow by 1,000 cfs per hour until the pool falls to 188.5 (189.5) feet NGVD29. Then revert to normal operations

  b. Otherwise, reduce outflow to 65,000 cfs or to inflow plus 10,000 cfs, whichever is greater. If this results in an outflow greater than 65,000 cfs, continue passing inflow plus 10,000 cfs until outflow reaches 65,000 cfs. When outflow reaches 65,000 cfs begin reducing outflow 1,000 cfs per hour until the pool falls to 188.5 (189.5) feet NGVD29. Then revert to normal operations

C. If peak outflow, as determined by induced surcharge schedule, is less than 65,000 cfs, continue passing peak outflow until pool falls to 190 feet NGVD29; if pool is already below 190 feet NGVD29, continue peak outflow until pool begins to drop. Then, reduce outflow by 1,000 cfs per hour until pool recedes to 188.5 (189.5) feet NGVD29. Then revert to normal operations.

<u>Note</u>: In the event the 3-hour average inflow begins increasing again after emptying commences, refer back to the increasing inflows instructions at the top of this page. During emptying, when elevation 188.5 (189.5) feet NGVD29 is reached, revert to normal operations.

<u>Note</u>: Elevations in parentheses are for May thru November; all other elevations are year-round values.

c. Gate Operating Schedule. The gate opening schedule and the approximate discharge at each opening for varying pool elevations are shown in Plates 2-5 through 2-11. All gate operations, except for special operations, will be operated in the order and at the increments specified on those plates. The 14 spillway gates are numbered in sequence beginning at the left or east bank, adjacent to the lock. The gates will normally be operated only during floods or at times when the required release cannot be discharged through the powerhouse.

The Walter F. George Project is designed to pass the Standard Project Flood without exceeding the elevation of 200.1 feet NGVD29. In this flood, inflow would equal discharge as the pool approached 199.0 feet NGVD29 and no reduction in flows downstream would be provided by the project.

The Spillway Design Flood has an expected elevation of 206.6 feet NGVD29. In this flood, the spillway gates would be fully opened at elevation 199.0 feet NGVD29 and the pool would continue to rise to its peak elevation of 206.4.

The peak pool elevation of 194.72 feet NGVD29 occurred on March 1990. This storm is shown on Plate 8-7. The flood risk management operations at the Walter F. George Project reduced the peak flood wave by over 230,000 cfs.

Constraints: During and after high-flow periods, bank sloughing can become an issue downstream of the project when large release reductions area made in short periods. While there is no maximum rate of release change from the Walter F. George Project, consideration should be given when reducing releases from the project.

7-06. Recreation. Most recreational activities at Walter F. George Lake occur during the summer when the reservoir is at its full conservation pool elevation of 190.0 feet NGVD29. When the lake recedes several feet below the top of conservation pool, access to the water and beaches becomes progressively limited. Conversely, lake levels above top of conservation pool begin to flood certain public use areas and facilities. Water management personnel are aware of recreational effects caused by reservoir fluctuations at Walter F. George Lake and attempt to maintain reasonable lake levels during the peak recreational use periods; however, other authorized purposes are also served by the project which often conflict with the ability to maintain a stable pool. To classify recreation effects associated with conservation storage usage at Walter F. George Lake, various impact levels have been identified. They are briefly described below.

The effects of the Walter F. George Project water control operations on recreation facilities and use at Walter F. George Lake are described as impact levels - Initial Impact Level, Recreation Impact Level, and Water Access Limited Level. The impact levels are defined as pool elevations with associated effects on recreation facilities and exposure to hazards within the lake. The following are general descriptions of each impact level:

a. Initial Impact Level - The Initial Impact Level is defined at lake elevation 187.0 feet NGVD29. The swim areas are only marginally usable when the pool level falls below this impact level. Docks must be shifted to deeper water, if allowable. Unmarked recreational navigation hazards begin to appear. Approximately 30 percent of private docks become marginally usable with only two feet of water beneath them. Lanes of boat ramps can become partially silted in at some areas.

b. Recreation Impact Level - The lake elevation of 185.0 feet NGVD29 is defined as the Recreation Impact Level. At this level, all swimming areas become unusable. Public docks will need to be moved to deeper water if possible. Approximately 40 to 50 percent of private docks become unusable. Unmarked navigation hazards continue to emerge. Activities such as water skiing and wakeboarding become unsafe in some areas. Four project boat launch ramps become unusable. All other boat launch ramps are affected by silt buildup. Approximately 50 percent of courtesy ramps become unusable.

c. Water Access Limited Level - The lake elevation of 184.0 feet NGVD29 is defined as the Water Access Limited Level. It is at this level that the most severe effects on recreation begin to occur. At this level, water is 50 to 100 feet from the normal shoreline, and access to water is limited by extensive mud flats. Recreational navigation hazards continue to emerge, and waterborne activities such as boating and water skiing are limited to the main bodies of the lake. Silt buildup and drop-offs continue to increase at boat ramps. Approximately 75 percent of the boat launch ramps and 85 to 90 percent of private boat docks are unusable at this level.

The water control plan takes the effects on recreation facilities into account in developing action zones for Walter F. George Lake. In dry periods, the lake will often drop to or below the impact levels and Water Management personnel will keep the Operations Project Manager at the Walter F. George Project informed of projected pool levels through the district's weekly water management meetings. The Operations Project Manager is responsible for contacting various lakeshore interests and keeping the public informed of lake conditions during drawdown periods. The Operations Project Manager closes beaches and boat ramps as necessary, patrols the lake, marks hazards and performs other necessary tasks to mitigate the effects of low lake levels.

7-07. Water Quality. Water control regulation of the ACF projects is not performed to meet specific water quality standards. However, the objective of water quality sustainability of the rivers is a goal the Corps attempts to meet through specific continuous minimum releases and other incidental releases that provide benefits to water quality in the basin. Twelve inch diameter spillage siphons have been installed on the dam that can be used in lieu of spillway gate discharges. The siphons provide a gravity-fed, typically continuous, minimum flow that benefits dissolved oxygen levels below the dam and are used continuously from 1 May to 30 September passing approximately 400 cfs. If a low dissolved oxygen alarm is received in the powerhouse from the water quality monitor downstream while the siphons are in operation, additional releases are made by opening a spillway gate. This occurs only rarely. Additionally, a water quality monitor was installed in 1971 that measures dissolved oxygen, pH, turbidity, and conductivity. Records of those parameters are available for 1971 through 1976 and 1981 to date. The Standard Operating Procedures (SOP) for actions to be taken during periods of low dissolved oxygen and fish distress downstream of the Walter F. George Project is included in Exhibit F of this manual.

7-08. Fish and Wildlife. During the reproduction period for bass and crappie and during the nesting period for Canada geese, the fluctuation of the pool will be limited to no more than one-half foot when practicable. The beginning and ending of the spawning and nesting seasons will be determined by Mobile District fishery biologists in cooperation with fish and game personnel from the states concerned and the USFWS.

15 March to 15 May is the expected timing for fish spawning at Walter F. George Lake. The length of the spawning period depends on how rapidly temperatures increase after spawning begins, but in general, it varies from one to three weeks. During that period, the pool level should not be lowered more than six inches. Fish spawning operations are described in Division Regulation 1130-2-16, *Lake Regulation and Coordination for Fish Management Purpose*, dated 31 May 2010, and Mobile District's draft Standard Operating Procedure 1130-2-

9, *Lake Reservoir Regulation and Coordination for Fish Management Purposes*, dated February 2005.

The USFWS has relocated Canada geese into the Eufaula National Wildlife Refuge, which is in the reservoir. During the nesting period of the geese and migrant shore birds, which usually begins in March and continues until June, USFWS personnel monitor the location and elevation of new nests, which are usually a few feet above the reservoir level. If the pool is above elevation 188 feet NGVD29, normally no special operation is required. However, if the pool is low, 184 - 187 feet NGVD29, special operations might be required if practicable to keep from flooding the nests. Also, the transition month for the top of conservation pool is May, which must also be taken into consideration for special operations.

Operations for fish and wildlife do not supersede the normal operating procedure of maintaining the pool within the top of conservation. During a high-flow event, it might be necessary to decrease the pool by more than six inches to return the pool to within normal operating levels. Additionally, during periods of high flows or drought conditions, it may be necessary to reduce lake levels more than the six inches.

7-09. Water Supply. The Water Supply Act of 1958 authorizes the Corps to allocate water supply contracts from the Walter F. George Project for water supply. Currently, no water supply contracts have been issued for project storage in the Walter F. George Lake.

7-10. Hydroelectric Power. Reservoir releases required for conservation, or flood risk management operations in Paragraphs 7-03 through 7-09 will normally be used to produce hydropower. Such production is scheduled during peak energy demand hours throughout the week. The level of hydropower support is determined by the reservoir's condition as well as its zone in relation to the other two Federal storage projects in the ACF Basin. Typically, the Walter F. George Project provides generation five days a week at plant capacity throughout the year, as long as their respective lake levels are in Zone 1 and drought operations have not been triggered. The minimum hours represent releases that normally meet water system demands and provide the capacity specified in marketing arrangements. During dry periods, generation could be eliminated or limited to conjunctive releases. The typical, but not required, hours of operation by action zone are presented in Table 7-2. Historical hydropower production is shown in Plates 7-5 and 7-6. Actual monthly and annual production is tabulated. The average annual production from 1964 through 2015 is 421,207 megawatt hours (MWH).

In addition to hydroelectric power generation being governed by action zone, there are also physical limitations that factor into the power generation decisions. During high flow conditions, the reduction in the difference in headwater and tailwater may cause the hydropower units at Walter F. George Dam to become inoperable due to loss of head. A reduction in the generation capacity of a unit can also occur as a result of extremely low lake levels during droughts. Scheduled and unscheduled unit outages can also occur throughout the year affecting the ability to release flow through some or all the turbines.

SEPA markets the energy generated at Walter F. George Dam to the government's preference customers, and enters into and administers the contracts with those entities to deliver that energy. The generation (and water release) is based on a weekly declaration of energy and capacity forecasted to be available that is updated daily by the Mobile District on the basis of the overall ACF water control plan and changing basin conditions. The declarations, which are designed to keep the ACF reservoir elevations balanced by zone, where practicable, are prepared by the Mobile District and furnished to the 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 Mobile District, SEPA, and the hydropower customers. Local restraints can dictate generation during certain hours.

In addition to the weekly declaration, the Mobile District periodically prepares extended forecasts for all the hydropower plants in the District. Interactive weekly forecasting is often done to project operations for the coming weeks to determine generation and downstream flow support that is consistent with the ACF Water Control Plan. The extended forecast is usually prepared weekly and is intended for use as a guide to determine where and when any problem might be developing in the system and to assist in making the weekly power declaration.

7-11. Navigation. The existing project authorizes a 9-foot deep by 100-foot wide waterway from Apalachicola, Florida, to Columbus, Georgia, on the Chattahoochee River, and to Bainbridge, Georgia, on the Flint River. Conditions on the Apalachicola River have been such in recent years that a 9-foot deep channel has not been available for much of the year. Dredging on the Apalachicola River has been reduced since the 1980s because of a lack of adequate disposal area capacity in certain reaches of the river. No dredging has been conducted on the Apalachicola River since 2001 for a variety of reasons related to flow or funding levels and has been indefinitely deferred because of denial of a Section 401 water quality certificate from the State of Florida. Also, the Apalachicola River was designated as a low use navigation project in FY2005 which greatly reduces the likelihood of receiving funding for maintenance dredging. The lack of dredging and routine maintenance has led to inadequate depths in the Apalachicola River navigation channel.

When supported by ACF Basin hydrologic conditions, the Corps will provide a reliable navigation season. The water management objective is to ensure a predictable minimum navigable channel in the Apalachicola River for a continuous period that is sufficient for navigation use.

Assuming basin hydrologic conditions allow, a typical navigation season would begin in January of each year and continue for 4 to 5 consecutive months (January through April or May). Figure 7-3 graphically represents the navigation season and its relationship to composite conservation storage. During the navigation season, the flows at the Blountstown, Florida, gage (USGS # 02358700) should be adequate to provide a minimum channel depth of 7 feet. The most recent channel survey and discharge-stage rating was used to determine the flow required to sustain a minimum navigation depth during the navigation season. Flows of 16,200 cfs provide a channel depth of 7 feet. Flows of 20,600 cfs provide a channel depth of 9 feet. The Corps' capacity to support a navigation season will be dependent on actual and projected system-wide conditions in the ACF Basin before and during January, February, March, April and May. Those conditions include the following:

- A navigation season can be supported only when ACF Basin composite conservation storage is in Zone 1 or Zone 2.
- A navigation season will not be supported when the ACF Basin composite conservation storage is in Zone 3 and below. Navigation support will resume when basin composite conservation storage level recovers to Zone 1.
- A navigation season will not be supported when drought operations are in effect. Navigation will not be supported until the ACF Basin composite conservation storage recovers to Zone 1.
- The determination to extend the navigation season beyond April will depend on ACF Basin inflows, recent climatic and hydrologic conditions, meteorological forecasts, and

basin-wide model forecasts. On the basis of an analysis of those factors, the Corps will determine if the navigation season will continue through part or all of May.

- Down-ramping of flow releases will adhere to the Jim Woodruff Dam fall rate schedule for Federally listed species during the navigation season.
- Releases that augment the flows to provide a minimum 7-foot navigation depth will also be dependent on navigation channel conditions that ensure safe navigation.

When it becomes apparent that downstream flows and depths must be reduced due to diminishing inflows, navigation bulletins will be issued to project users. 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 Jim Woodruff Lock and Dam to reduce releases.

Although special releases will not be standard practice, they could occur for a short duration to assist navigation during the navigation season. For instance, releases can be requested to achieve up to a 9-foot channel. The Corps will evaluate such request on a case by case basis, subject to applicable laws and regulations and the conditions above.

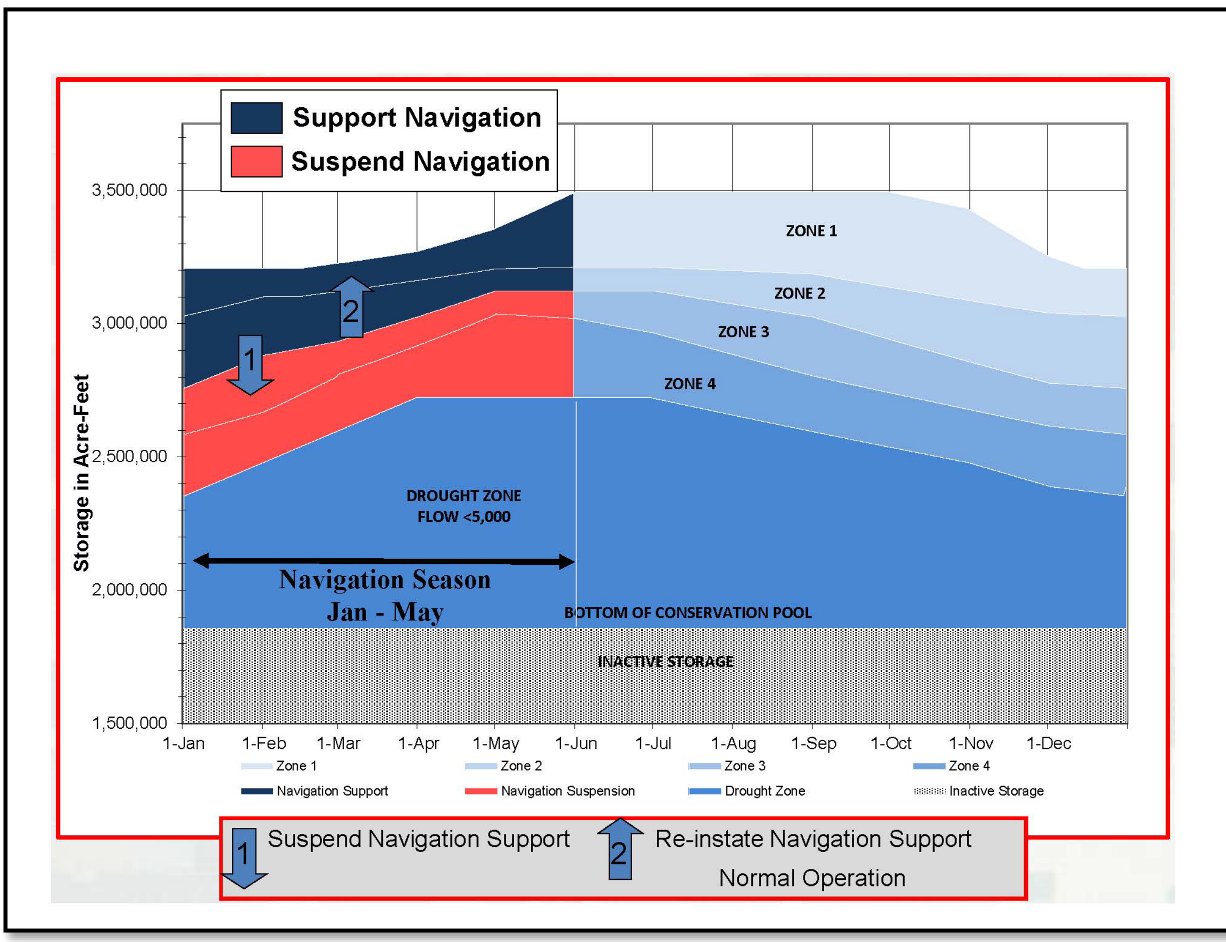

Figure 7-3. Composite Conservation Storage for Navigation

A tailwater elevation of 102 feet NGVD29 is required at Walter F. George Dam to provide the 9-foot navigation depth in the upper reaches of the Lake George W. Andrews. Normally, the Walter F. George and George W. Andrews Projects will be operated to assure the minimum tailwater of 102 feet NGVD29 at Walter F. George Dam, but conditions could occasionally arise that cause a temporary drawdown below elevation 102 feet NGVD29. Shoaling in the upper reaches could also reduce depths in the navigation channel to less than 9 feet. If it is necessary to raise the upstream portion of Lake George W. Andrews pool for navigation, it can be accomplished by making special releases from the Walter F. George Dam. When such releases are required, the Lockmaster or the Power Project Manager will contact the Mobile District. The powerhouse will be the preferred method of release to float grounded vessels in the Lake George W. Andrews pool.

7-12. Drought Contingency Plan. ER 1110-2-1941, *Drought Contingency Plans*, dated 15 September 1981, called for developing drought contingency plans for Corps' reservoirs. For the Walter F. George Project, the Corps will coordinate water management during drought with other Federal and state agencies, private power companies, navigations interests, and other interested stakeholders. Drought operations will be in compliance with the plan for the entire ACF Basin as outlined in Exhibit D, and summarized below.

Drought operations are triggered on the first day of the month following the day that ACF composite conservation storage enters Zone 3, from Zone 2 (Figure 7-4). At that time, all the composite conservation storage Zone 1 - 3 provisions (seasonal storage limitations, maximum fall rate schedule, and minimum flow thresholds) are suspended and management decisions are based on the provisions of the drought plan. Under the drought plan, the minimum discharge is determined in relation to composite conservation storage only. The drought plan for the ACF Basin specifies a minimum release from Jim Woodruff Dam and temporarily suspends the other minimum release and maximum fall rate provisions until composite conservation storage in the basin is replenished to a level that can support the minimum releases and maximum fall rates. The drought plan also includes a temporary waiver from the water control plan to allow temporary storage above the winter pool guide curve at the West Point Project if the opportunity presents itself. There is also an opportunity to begin spring refill operations at an earlier date to provide additional conservation storage for future needs.

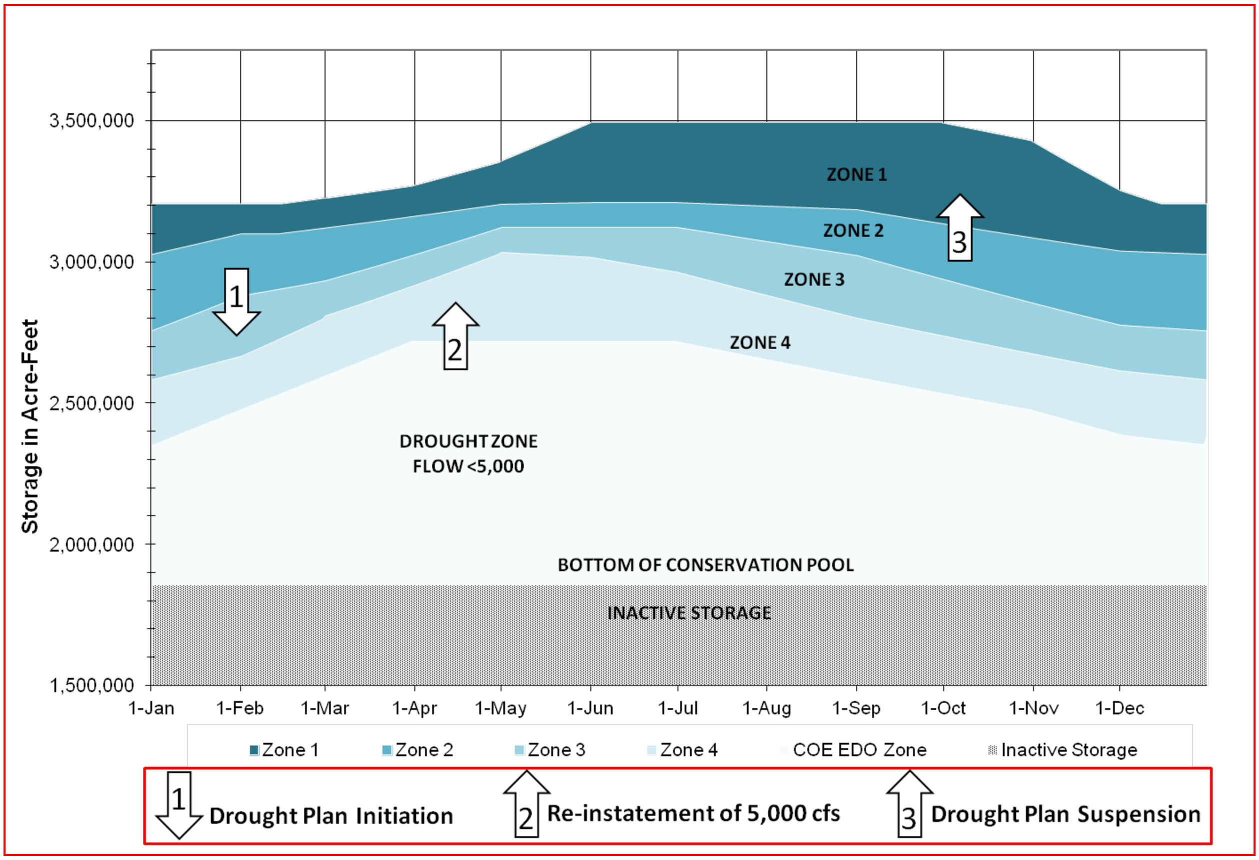

Figure 7-4. Drought Operation Triggers

The drought plan prescribes two minimum releases based on composite conservation storage in Zones 3 and 4 and an additional zone referred to as the Drought Zone. The Drought Zone delineates a volume of water roughly equivalent to the inactive storage in Lake Sidney Lanier, West Point Lake and Walter F. George Lake plus Zone 4 storage in Lake Sidney Lanier. The Drought Zone line has been adjusted to include a smaller volume of water at the beginning and end of the calendar year. When the composite storage is within Zone 4 and above the Drought Zone, the minimum release from Jim Woodruff Lock and Dam is 5,000 cfs, and all basin inflow above 5,000 cfs that is capable of being stored may be stored. Once the composite conservation storage falls into the Drought Zone, the minimum release from Jim Woodruff Lock and Dam is 4,500 cfs and all basin inflow above 4,500 cfs that is capable of being stored may be stored. When transitioning from a minimum release of 5,000 to 4,500 cfs, fall rates will be limited to a 0.25-ft/day drop. The 4,500 cfs minimum release is maintained until composite conservation storage returns to a level above the top of the Drought Zone, at which time the 5,000-cfs minimum release is reinstated.

The drought plan provisions remain in place until conditions improve such that the composite conservation storage reaches Zone 1. At that time, the temporary drought plan provisions are suspended, and all the other provisions are reinstated. During the drought contingency operations, a monthly monitoring plan will be implemented that tracks composite conservation storage to determine the water management operations (the first day of each month will represent a decision point) that will be implemented and to determine which operational triggers, if any, should be applied. There is a special provision for the month of March under drought operation. If recovery conditions are achieved in February (after the 1st), drought plan provisions will not be suspended until 1 April, unless the level of composite conservation storage reaches the top of zone 1 (i.e. all Federal reservoirs are full) prior to 1 March. The month of March usually provides the highest inflows into the reservoirs, but also has some of the highest flow requirements for release from Jim Woodruff Lock and Dam. This extension of drought operations allows for the full recovery of the Federal storage projects in preparation for the spawning and spring refill period that occur from April through June.

7-13. Flood Emergency Action Plans. The Corps is responsible for developing Flood Emergency Action Plans for the ACF System, in accordance with ER 1110-2-1156, *Engineering and Design Safety of Dams – Policy and Procedures*, 31 March 2014. The Walter F. George Project Emergency Action Plan, undated, is a stand-alone document retained on site and in the MDO. Example data available are emergency contact information, flood inundation information, management responsibilities, and procedures for use of the plan.

7-14. Other. Other considerations, in addition to the authorized project purposes, may be accommodated on an as needed basis. Adjustments are made to system regulation at times for downstream construction, to aid in rescue or recovery from drowning accidents, environmental studies, or cultural resource investigations.

a. Regulation during Low Flows. There is no minimum release requirement at the Walter F. George Project. The tailwater at Walter F. George Dam is maintained during periods of non-generation by the headwater of the George W. Andrews Project downstream. However, downstream water requirements for navigation will be carefully considered in preparing weekly power declarations. Any special releases that might be required in emergencies will be included in a revised power declaration when possible. Also, the releases from Jim Woodruff Dam required for the protection of Federally listed threatened and endangered species will be supported.

b. Constraints. Walter F. George Dam has a maximum head limitation of 88 feet between the pool and the tailwater. That can become an issue during low-flow periods, and additional releases might be needed to maintain the tailwater at the desired level.

c. Extraordinary Drawdown of Walter F. George Lake. Droughts experienced in 1986 and 1988 were extreme throughout the ACF Basin and caused water managers to consider what plans could be followed if the basin's total conservation storage, about 1.7 million acre-feet, were to be depleted or seriously threatened with depletion. Such an occurrence could be contemplated in the second or later year of a severe drought. Fortunately, the three storage reservoirs on the Chattahoochee River contain a significant volume of storage below the minimum conservation pool. The Walter F. George Lake contains 271,000 acre-feet of water below the conservation pool between elevations 184 and 175, which is the expected lower operating limit for the powerhouse. An additional 222,300 acre-feet is between elevation 175 and 163, which is the gated spillway crest elevation. Use of that usable, but normally inactive, storage would be a serious decision requiring SAD approval. The prerequisites for the Mobile District Engineer to recommend such an action would be as follows:

- Upstream reservoirs are nearly depleted (i.e., Lake Sidney Lanier below elevation 1,045 feet NGVD29 and West Point Dam below elevation 622 feet NGVD29).
- There is a clear public interest such as a water supply, water quality, or public safety need, for a release from Walter F. George Lake, which would draw it below elevation 184 feet NGVD29.

- The need for water release outweighs the adverse impact caused by the drawdown. Alternatives to the proposed release will be investigated.

To help ensure that those requirements are fulfilled, the District Engineer will have performed the following tasks:

- A public notice will be issued describing as best as possible the expected drawdown and the circumstances that might make such a drawdown necessary.
- Congressional interests are notified.
- One or more public meetings will be held to explain the necessity for the drawdown.
- In-lake interests are given adequate time to prepare for the effects of the drawdown.

d. High Water Action Plan. During periods of high inflow when the pool is expected to exceed its top of conservation, certain actions are taken by the project staff to prepare areas around the project for rising pool levels and to ensure public safety. In the event abnormally high releases (usually exceeding turbine capacity) are forecast to be made from the project, the project staff will also notify the downstream interests of potential flooding as a result of operations at the dam. Critical elevations and releases are discussed in detail in the High Water Action Plan provided in Exhibit E.

When a flood inducing storm is forecast, Water Management will contact the project site office and provide a forecast of daily peak pool elevations and releases from the project based on the best data available for the extent of the potential high inflow event. Anytime a change is made to this forecast, Water Management will inform the project site office as promptly as possible to allow project staff the time to make any additional preparations dictated by the High Water Action Plan. Details on communication with the project are discussed in more detail in Paragraph 5-06.

e. For the purpose of meeting the requirements of the Settlement Flow Objectives, discharges from George Andrews will be made to support maintaining a minimum average weekday flow of 2,000 cfs on the Chattahoochee River near Columbia, Georgia (Gage No. 02343801) when the ACF basin is not in Drought Zone Operations. When the ACF basin enters Drought Zone Operations, two days each calendar week starting each Monday, releases from George Andrews, will be made to maintain the 2,000 cfs daily average flow as measured by the downstream gage at Columbia, Alabama (Gage No. 02343801).

7-15. Deviation From Normal Regulation. Water management inherently involves adapting to unforeseen conditions. The development of water control criteria for the management of water resource systems is carried out throughout all phases of a water control project. The water control criteria are based on sound engineering practice utilizing the latest approved models and techniques for all foreseeable conditions. There may be further refinements or enhancements of the water control procedures, in order to account for changed conditions resulting from unforeseen conditions, new requirements, additional data, or changed social or economic goals. However, it is necessary to define the water control plan in precise terms at a particular time in order to assure carrying out the intended functional commitments in accordance with the authorizing documents (EM 1110-2-3600 Management of Water Control Systems). Adverse impacts of the water control plan may occur due to unforeseen conditions. When this occurs, actions will be taken within applicable authority, policies, and coordination to address these conditions when they occur through the implementation of temporary deviations to the water control plan, such as interim operation plans. Such deviations may require additional environmental compliance prior to implementation.

The Corps is occasionally requested to deviate from the water control plan. Prior approval for a deviation is required from the Division Commander except as noted in subparagraph a. 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 division 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 MDO. 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 SAD 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 the division office for review and approval.

7-16. Rate of Release Change. There are no restrictions on releases from the Walter F. George Lock and Dam during normal operations. There are restrictions on the rate of change below the Jim Woodruff Project that could require releases from the Walter F. George Lock and

Dam. 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.

EXHIBIT C

STANDING INSTRUCTIONS TO THE DAMTENDERS FOR WATER CONTROL

WALTER F. GEORGE DAM

EMERGENCY FLOOD REGULATION SCHEDULE FOR POWERPLANT OPERATORS

Note: Elevations in parentheses are for May thru November. All other elevations are year-round values.

If any 3-hour average inflow; is not a result of pool surges (which are defined as large fluctuations in pool elevation resulting from wave action due to high winds, a sloshing lake or equipment malfunction) exceeds 40,000 cfs and the reservoir pool rises above elevation 188.0 feet NGVD29, contact Water Management Section personnel as soon as possible if no other prior instructions have been provided. The instructions provided below are to be followed **only** if communications with Water Management Section personnel are not possible.

I. Increasing Inflows

A. Check induced surcharge schedule on Plate 7-4 each hour. If pool level and 3-hour average inflow require a release based on the induced surcharge schedule, commence making combined powerhouse and spillway releases that are equal to that required by the induced surcharge schedule. If the discharge value taken from the induced surcharge schedule is less than the previous hour's discharge, maintain the previous hour's discharge.

B. If no release is required from the induced surcharge schedule and the pool elevation is above 189.0 feet NGVD29 and the 3-hour average inflow is between 40,000 cfs and 50,000 cfs, begin making a discharge that is 8,000 cfs less than the 3-hour average inflow. If inflows rise above 50,000 cfs, follow the induced surcharge schedule.

II. Pool at Crest. Maintain the maximum gate setting reached for 6 hours to ensure that inflow has peaked.

III. Emptying Instructions

A. If peak outflow as determined by induced surcharge schedule is greater than 125,000 cfs, maintain peak outflow until pool falls below elevation 191 feet NGVD29. Then follow a or b below.

a. If peak outflow is more than double the 3-hour average inflow, begin reducing outflow by 5,000 cfs per hour. When the outflow is greater than 10,000 cfs more than the 3-hour average inflow and the pool elevation is below 189 (190.5) feet NGVD29, begin reducing outflow by 1,000 cfs per hour until the pool falls to 188.5 (189.5) feet NGVD29. Then revert to normal operations.

b. If peak outflow is less than double the 3-hour average inflow, reduce outflow to 65,000 cfs or to inflow plus 10,000 cfs, whichever is greater. If this results in an outflow greater than 65,000 cfs, continue passing inflow plus 10,000 cfs until outflow reaches 65,000 cfs. When outflow reaches 65,000 cfs begin reducing outflow at a rate of 1,000 cfs per hour until the pool falls to 188.5 (189.5) feet NGVD29. Then revert to normal operations.

B. If peak outflow as determined by induced surcharge schedule is between 125,000 cfs and 65,000 cfs, maintain outflow until pool falls below 190 feet NGVD29. Then follow a or b below.

a. If peak outflow is more than double the 3-hour average inflow, begin reducing outflow by 5,000 cfs per hour. When the outflow falls below 70,000 cfs reduce outflow by 2,000 cfs per hour. When the outflow reaches 10,000 cfs greater than the 3-hour average inflow and the pool is below 189 (190.5) feet NGVD29, begin reducing outflow by 1,000 cfs per hour until the pool falls to 188.5 (189.5) feet NGVD29. Then revert to normal operations

b. Otherwise, reduce outflow to 65,000 cfs or to inflow plus 10,000 cfs, whichever is greater. If this results in an outflow greater than 65,000 cfs, continue passing inflow plus 10,000 cfs until outflow reaches 65,000 cfs. When outflow reaches 65,000 cfs begin reducing outflow 1,000 cfs per hour until the pool falls to 188.5 (189.5) feet NGVD29. Then revert to normal operations

C. If peak outflow, as determined by induced surcharge schedule, is less than 65,000 cfs, continue passing peak outflow until pool falls to 190 feet NGVD29; if pool is already below 190 feet NGVD29, continue peak outflow until pool begins to drop. Then, reduce outflow by 1,000 cfs per hour until pool recedes to 188.5 (189.5) feet NGVD29. Then revert to normal operations.

Note: In the event the 3-hour average inflow begins increasing again after emptying commences, refer back to the increasing inflows instructions on the previous page. During emptying, when elevation 188.5 (189.5) feet NGVD is reached, revert to normal operations.

Note: Elevations in parentheses are for May thru November; all other elevations are year-round value.