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Excerpts from the approved 1992 Water Control Manual for B. Everett Jordan project.

VII. WATER CONTROL PLAN

7-01. General Objectives. The principal purposes of the B. Everett Jordan Lake project are to provide for flood control, water supply, and augmentation of low flows for purposes of pollution abatement and water-quality control in the Cape Fear River. The operation of the reservoir will primarily be governed by flow in the Deep River at its confluence with the Haw River. The objectives of the regulation plan for Jordan Lake involve consideration of the following features:

a. Flood control
b. Low flow
c. Water-quality control
d. Water supply
e. Recreation
f. Mosquito control
g. Fish propagation

7-02. Overall Plan for Water Control. The plan of operation for Jordan Lake provides for maintaining a normal pool elevation of 216.0 feet m.s.l. throughout the year. Flood control storage space is reserved between elevations 216.0 and 240.0 feet m.s.l., with surcharge storage provided above the crest of the free-overflow spillway between elevations 240.0 and 261.5 feet, m.s.l. Releases for flood control are outlined in detail in section 7-04. Conservation storage between elevations 202.0 and 216.0 feet, m.s.l., is reserved for water supply, low flow augmentation, and water quality control. Immediately below the dam, a minimum instantaneous flow of 40 c.f.s. shall be maintained. This flow quantity is the 7-day, 10-year low flow frequency amount at the Jordan damsite (7Q10 flow). In practice, however, the minimum gate setting is typically a single service gate opened 4 to 6 inches, which produces a flow of approximately 130 to 200 c.f.s.. Jordan Lake shall also be operated to maintain water quality flow requirement of approximately 600 c.f.s. in the Cape Fear River at the Lillington streamflow gage throughout the year. Discharges from the multilevel water quality gates shall be maintained as described in section 7-05d. Rate of release changes will be made within the guidelines described in section 7-11.

7-03. Standing Operating Instructions to Damtender. A summary of reservoir regulation procedures for the damtender during both normal and emergency situations is found in [the main manual].

7-04. Flood Control. The primary objective of the project is the control of floods in the Cape Fear River, essentially in the vicinity of Fayetteville, North Carolina. A storage of 538,400 acre-feet between elevations 216 and 240 feet, m.s.l., is reserved exclusively for the detention storage of floodwaters. An additional 893,000 acre-feet of surcharge storage exists above the crest of the free-overflow spillway between elevations 240 and 261.5 feet, m.s.l. The basic plan of operation is to maintain a normal pool elevation of 216 feet, m.s.l. by releasing inflows up to non-damage stages in the downstream reaches of the river. Excess inflow is stored until it can be released without creating damaging stages downstream of Jordan Dam. Whenever the reservoir level is above the spillway crest elevation of 240 feet, m.s.l. and the flood at Fayetteville has crested, the conduit will be utilized to compliment spillway releases and evacuate the surcharge storage space. However, the conduit flow will not be of

such magnitude as to cause a higher flood peak at Fayetteville than originally occurred from the uncontrolled flood flow. Paragraphs a. through d. outline the plan of operation for flood control based on reservoir level. Fayetteville, North Carolina is usually the critical flood damage center on the Cape Fear River for which Jordan Lake is operated. The non-damage stage at Fayetteville is 31 feet at the river gage, or approximately 20,000 c.f.s. (Note: The present-day non-damage stage at Fayetteville is somewhat higher than 31 feet, but 31 feet is used because development along the Cape Fear River has encroached on the flood plain and it is believed that this is a trend which will continue. Also note: The stage-discharge relationship at Fayetteville is affected by backwater, and a stage of 31 feet may not be equal to 20,000 c.f.s. in all cases.) The channel capacity between Jordan Dam and Fayetteville is 20,000 c.f.s. or more at all locations. Consequently, the channel is not a limiting factor when releasing for 20,000 c.f.s. at Fayetteville. The effects of runoff from uncontrolled drainage areas on Fayetteville stages is forecast by monitoring flows at the Deep River at Moncure gage, the Cape Fear River at Lillington gage, and the Cape Fear River at Fayetteville gage. Flows from the Deep River are particularly significant. Because of the long distance from the dam to Fayetteville (51 miles) and the amount of uncontrolled drainage area above Fayetteville (2,706 square miles, or 62 percent of the total drainage area), releases from Jordan Dam will sometimes be terminated (except for low flow release) at the beginning of a storm event to prevent Jordan releases from contributing to flooding at Fayetteville. Operational criteria for various flood situation are outlined below.

a. Reservoir level at normal pool elevation of 216 feet m.s.l. Reservoir releases will equal inflow or the quantity of water which can be released such that the expected total flow at Fayetteville will not exceed 20,000 c.f.s., whichever is the lesser amount. However, the minimum release will be 200 c.f.s. (6-inch, single gate setting) plus any additional release needed in order to meet the 600 c.f.s. low flow target at Lillington, North Carolina. Rate of release changes will be made within the guidelines described in section 7-11.

b. Reservoir level between 216 and 240 feet, m.s.l. Reservoir release will be the quantity of water which can be released such that the expected total flow at Fayetteville will not exceed 20,000 c.f.s. However, the minimum release will be approximately 200 c.f.s., (6-inch, single gate setting) plus any additional release needed to meet the 600 c.f.s. low flow target at Lillington, North Carolina. Rate of release changes will be made within the guidelines described in section 7-11.

c. Reservoir level above spillway crest elevation of 240 feet, m.s.l. When the flow from the uncontrolled drainage area above Fayetteville is, or is forecast to be, equal to or greater than 20,000 c.f.s., the only outflow from the reservoir will be from the free overflow spillway until the stage at Fayetteville has peaked. After the peak stage at Fayetteville has occurred or is forecast to occur, releases from the conduit will be controlled such that the peak stage at Fayetteville is not exceeded.

d. Flood Emergency. Whenever Jordan Lake is in a flood situation and communication with the Reservoir Regulation Section is not possible, the required release from the lake will be made by the damtender in accordance with the emergency flood control operations described in exhibit A.

7-05. Water Quality Control.

a. General. Water quality control is an authorized project purpose, with 67.38 percent of the conservation pool storage allocated for that purpose. The Jordan project must also comply with PL 92-500 which requires that Federal

facilities be managed, operated, and maintained so as to protect and enhance the quality of water and land resources through conformance with applicable Federal, State, interstate, and local substantive standards.

b. Objectives. An objective of water quality control at B. Everett Jordan Lake is meeting North Carolina and EPA standards for both the impounded water and the river water below the dam. These standards require a minimum instantaneous dissolved-oxygen content of 4.0 mg/l below the project and a minimum daily average of 5.0 mg/l. Another concern is enhancing the value of the lake in terms of authorized project purposes. The methods used to achieve this include water quality studies, selective flow withdrawal, and low flow regulation.

c. Water Quality Monitoring. Jordan Lake was intensively studied in the first 5 years after filling with respect to the water quality parameters that establish use limits for water supply and recreation. As many as 48 water quality parameters were studied on nine feeder streams, the Haw River, and a lake network of up to 21 sampling stations. An additional study was performed to identify and quantify any additional toxic substances in the lake which might affect water supply use. As a result of these studies, routine water quality data sampling in Jordan Lake has been discontinued and sampling is currently performed only on an "as need" basis. Downstream water quality monitoring is done on a regularly scheduled basis by the N.C. Division of Environmental Management and by the U.S. Geological Survey.

d. Selective Flow Withdrawal. During times of the year when the lake is stratified, surface waters are released through the multilevel intake structure. This is done to reduce surface water residence time in the lake, and thereby to reduce the potential for in-lake nuisance algae blooms. The policy for this release is that each year when operational conditions permit (i.e., except during flood events), only surface waters are released from May 1 through November 14, preferably through the water quality gate having an invert elevation of 207 feet m.s.l. From November 15 through April 30 when the lake is practically isothermal, water may be released from any intake gate, but preferably through the emergency gates.

e. Low Flow Regulation. There are 94,600 acre-feet of water quality storage reserved in the conservation pool of Jordan Lake for release during critically dry periods. A required minimum instantaneous flow of 40 cubic feet per second (7Q10 flow) will always be maintained immediately below the dam except during periods of a short duration such as periodic maintenance and inspections. However, a minimum gate setting will typically be a single service gate opened 4 to 6 inches which will produce a flow of about 130 to 200 c.f.s. Releases will be made from the conservation pool storage allocated to water quality as necessary to maintain a minimum flow of 600 c.f.s. (+/- 50 c.f.s.) as measured at the Lillington stream gage. Periodically, the flow at Lillington may drop below 600 c.f.s. because of variations in river flows induced by small hydroelectric plants located on the Deep River. An accounting of the water quality storage remaining within the conservation pool of Jordan Lake will be checked periodically during normal times. At least, a weekly updating of the water quality storage remaining is required during droughts or periods of low flow. This accounting process is described later in paragraph 7-07.

7-06. Water Supply. A contract between the Federal Government and the State of North Carolina was signed on 10 April 1988 and allows for the State to utilize an undivided 32.62 percent of the total conservation storage space between elevations 202 and 216 feet, m.s.l. This percent of the conservation storage allocated to water supply is estimated to contain 45,800 acre-feet. On 8 December 1988, the Environmental Management Commission of North Carolina met to allocate water supply amounts to prospective users. The cities of Cary and

Apex, North Carolina, were granted an immediate joint allocation of 12 million gallons per day (MGD) and Chatham County was granted an immediate allocation of 4 MGD. Future allocations of 2 MGD to Chatham County, 4 MGD to Cary-Apex, 5.5 MGD to Hillsborough, 10 MGD to Orange Water and sewer Authority (OWASA), 1 MGD to Orange County, and 3.5 MGD to Orange-Alamance Water Systems were also made. An additional amount of 58 MGD is still to be allocated for future water supply use .... An account of the water supply storage remaining within Jordan Lake will be updated periodically during normal times and at least weekly during periods of drought or low lake levels. This accounting process is described in the next paragraph ....

7-07. Water Supply and Water Quality Storage Accounting. Normally, there is no special reservoir operation required for water supply operations. However, during a critical dry period, the conservation pool may be completely depleted of water supply and/or water quality storage. Accounting of the water supply and water quality storage remaining will be done at least weekly during drought periods. When full, the water supply account contains 45,800 acre-feet and the water quality account contains 94,600 acre-feet. To determine the storage account balance of each use, the net inflow for the preceding day is computed. The net inflow into Jordan Lake is the flow after adjustments for evaporation and other losses. The water supply account will receive 32.62 percent of the net inflow and the water quality account will receive 67.38 percent of the net inflow. Water supply and water quality use from the previous day will be subtracted from their respective accounts. Theoretically, should either account fall to zero, only the respective percent of the net inflow for the previous day would go to either use. However, the purpose of the accounting procedure is to anticipate potential problems. The State of North Carolina will be notified as the water quality and water supply accounts are being depleted as per the "Drought Contingency Plan" for Jordan Lake .... This action will identify potential problems with the remaining storages and allow conservation efforts to be established to minimize the impacts of drought operation.

7-08. Recreation. The reservoir will be operated in the best interest of recreation to the maximum extent possible. The reservoir water level will be maintained near elevation 216 feet, m.s.l. whenever possible, which is ideal for recreation. Only during abnormal periods will the reservoir rise or fall appreciably above or below elevation 216 during the prime recreation season.

7-09. Mosquito Control. Normal flood control operation, resulting in major pool fluctuations during the months of February, March, and April will not appreciably affect mosquito breeding, due to prevailing low water temperature during this period. However, as water temperatures increase during the summer months and occasional floods are stored above the clearing line for periods in excess of 2 weeks, an increase in malaria-mosquito production may be expected. At such times, extensive larviciding of inundated wooded areas adjacent to populated areas may be required. The drawdown to the normal pool elevation following flood events will tend to lessen the mosquito-breeding potential. During periods when the mosquito population is abnormally large, cyclical fluctuation of the reservoir may be considered to decrease mosquito breeding. This would involve a lake fluctuation of about 1 foot on a weekly, or 10-day, interval provided that inflow conditions permit. The drawdown required would have to be fairly rapid, thus stranding the mosquito larvae, with restoration of the level occurring gradually to expose the larvae to aquatic predication.

7-10. Fish and Wildlife. The U.S. Fish and Wildlife Service and the North Carolina Wildlife Resources Commission have requested that consideration be given to minimizing water level fluctuation, especially the lowering of such water levels during the spring of each year. This will aid in the reproduction of bass and crappie. Consequently, each year consideration will be given to not lowering the water levels in the lake by more than 6 inches from the time the

water temperature reaches 65 degrees Fahrenheit until 3 weeks after the temperature first reaches 70 degrees Fahrenheit; provided benefits attributed to primary project purposes are not jeopardized by this operation ....

7-11. Deviation from Normal Regulation.

a. General. The Water Control Manager is occasionally requested to deviate from normal regulation of Jordan Lake. Prior approval for a deviation is obtained from the South Atlantic Division Office (SAD), except as follows:

b. Emergencies. Unexpected emergencies include drownings, other accidents, failure of operation facilities, and flushing of pollution during fish kills. Necessary action in emergency situations will be taken immediately unless such action would create equal or worse conditions. The South Atlantic Division will be informed as soon as practicable and a written confirmation showing the deviation and conditions will be furnished to SAD.

c. Unplanned Minor Deviations. Construction, which includes utility stream crossing, bridge work, and major construction contracts, account for the majority of unplanned deviations. Changes in releases are sometimes necessary for maintenance and inspection. Requests for changes of release rates are generally for a few hours to a few days. Each request is analyzed and consideration is given to upstream watershed conditions, potential flood threat, condition of Jordan Lake, and possible alternative measures. Favorable consideration is normally granted provided there are no adverse effects on the overall regulation of the project for the authorized purposes. The District water control manager (Hydrology and Hydraulics Branch) will report these minor deviations to SAD, if appropriate. A written confirmation showing the deviation and conditions will be furnished to SAD upon request.

d. Planned Deviations. Each condition will be analyzed on its merit. 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 will be presented by letter or telephone to South Atlantic Division along with recommendations for review and approval.

e. Drought Contingency. Project operating procedures to provide relief during critical drought situations is described in detail in the Drought Contingency Plan for Jordan Lake, exhibit B.

7-12. Rate of Release Change. Increases in discharge rates normally will not exceed 1,000 c.f.s. in the first hour of flood releases and 1,500 c.f.s. per hour, thereafter. Conversely, the transition from high flow releases will typically be made by reducing discharges from the dam in approximately 1,500 c.f.s. increments. This action is to preclude hazards of sudden surges in river stages downstream and to reduce streambank erosion.