Chapter VII. Falls Lake Project -- Water Control Plan

(This January 2000 revision incorporates approved structural and guide curve changes made at Falls Dam per 1994 EA/1995 FONSI to address storage shortage.)

7-01. General Objectives. The authorized purposes of the Falls Lake project are to provide for flood control, water supply, water quality, recreation, and other purposes in the Neuse River Basin. The operation of Falls Lake will be to maximize the benefits of the authorized purposes.

7-02. Overall Plan for Water Control. The current plan of operation became effective on 1 January 2000 for Falls Lake and provides for maintaining a year-round normal pool elevation of 251.5 feet-NGVD29. This operation differs from the original plan of maintaining 250.1 feet-NGVD29 at all times and a later interim guide curve of 250.1 from November through March, and 251.0 feet-NGVD29, May through September, with April and October as transition periods.

Flood control storage space is reserved between elevations 251.5 and 264.8 feet-NGVD29, with surcharge storage provided above the crest of the free-overflow spillway (elevation 264.8 feet-NGVD29). Releases for flood control are outlined in detail in Section 7-04. Conservation storage between elevations 251.5 and 236.5 feet-NGVD29 is reserved for water supply as well as low flow and water quality control. Immediately below the dam, a minimum instantaneous flow of approximately 60 c.f.s. shall be maintained November through March and 100 c.f.s. April through October. The 7-day, 10-year low flow frequency amount for the Falls damsite is 27 c.f.s. Falls Lake shall also be operated to maintain water quality flow requirements in the Neuse River at the Clayton gage of 184 c.f.s. and 254 c.f.s. during the period of November through March and April through October, respectively. Discharges from the multilevel water quality gates shall be maintained from May 1 through November 14 during non-flood release periods to ensure that the highest quality water is released downstream.

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 exhibit A.

7-04. Flood Control. The primary objective of the project is the control of floods on the Neuse River. A storage of 221,182 acre-feet between elevations 251.5 and 264.8 feet-NGVD29 is reserved exclusively for the detention storage of floodwaters, with additional surcharge storage above the free-overflow spillway. The plan of operation provides for maintaining a normal pool elevation in Falls Lake by releasing flows that

produce nondamage stages in the downstream reaches of the river whenever possible. Specific operational criteria that focus on using the observed and forecast stage and flow at Clayton for various flood situations are outlined in the paragraphs below. Additionally, existing and forecast flows and stages in the Neuse River reach from the dam down to Kinston will be monitored and considered during operations.

The flood control objective is to store water in the flood control space in Falls Lake whenever the Clayton River gage exceeds bankfull (damage) stage of 11 feet, or approximately 7,000 c.f.s. Discharges through the conduit at Falls (except for the minimum instantaneous release of 60 or 100 c.f.s.) normally will not be made when the river at Clayton exceeds damage stage. Because of the distance from the dam to Clayton and the amount of uncontrolled drainage area above Clayton, releases from Falls Dam will sometimes be terminated at the beginning of a storm to prevent normal discharges from contributing substantially to the uncontrolled floodwaters at Clayton. Therefore, discharges from the conduit will be halted (except for the minimum instantaneous release) whenever the lake level is below elevation 264.8 feet-NGVD29 and it is forecast that runoff from a storm may cause damaging flows in the lower Neuse River Basin. Afterwards, the flood control space in the reservoir will be evacuated at a rate that will cause a nondamage stage of 11 feet on the Clayton gage. The channel capacity below Falls Lake is 4,000 to 8,000 c.f.s. (the first plateau of the flood plain begins to flood at approximately 4,000 c.f.s.). Whenever the reservoir level is above spillway crest elevation of 264.8 feet-NGVD29 and the flood at Clayton has crested, the conduit can be utilized to evacuate the flood control space. However, when the reservoir level is below elevation 264.8 feet-NGVD29, the conduit flow will not be of such magnitude that it would cause a stage at Clayton to be higher than occurrences from the uncontrolled drainage area. Operational criteria for various flood situations are outlined as follows.

a. Lake Elevation Between 251.5 and 255.0 feet-NGVD29. If the flow from the uncontrolled drainage area above Clayton is, or is forecast to be, equal to or greater than 7,000 c.f.s., the reservoir outflow will be the minimum instantaneous release of 60 or 100 c.f.s. If the flow from the uncontrolled drainage area is less than 7,000 c.f.s., the reservoir release will be equal to the difference between 7,000 c.f.s. and the flow from the uncontrolled drainage area, or 4,000 c.f.s., whichever is the least.

b. Lake Elevation Between 255.0 and 258.0 feet-NGVD29. Same as “a” except 4,000 c.f.s. limitation lifted.

c. Lake Elevation Between 258.0 and 264.8 feet-NGVD29. Same as "b" except regulate to 8,000 c.f.s., instead of 7,000 c.f.s. at Clayton.

d. Lake Elevation Between Spillway Crest 264.8 and 268.0 feet-NGVD29. If the lake level is forecast not to exceed elevation 268.0 feet-NGVD29 and the flow from the uncontrolled drainage area above Clayton is, or is forecast to be, equal to or greater than 8,000 c.f.s., the only outflow from the reservoir will be from the free overflowing spillway until the peak flow at Clayton has occurred. After the peak at Clayton has occurred, releases from the conduit shall be the maximum possible without causing a peak at Clayton higher than that caused from the uncontrolled drainage area. When the lake level is forecast to exceed elevation 268.0 feet-NGVD29, the conduit will be fully open to pass maximum discharge regardless of downstream flow conditions, (Note: This is in keeping with the operating criteria established for the spillway design flood.)

e. Lake Elevation Above 268.0 feet-NGVD29. The conduit will be fully open to pass maximum discharge regardless of downstream flow conditions.

f. Flood Emergency. Whenever Falls Lake is in a flood situation and communication with the Water Control Unit 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 with 61,322 acre-feet or 57.7 percent of the conservation pool storage allocated for that purpose. The Falls 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. A prime objective for water quality releases from Falls Lake is to meet North Carolina standards. 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. (Note: These objectives are met all the time, due to the reaeration that occurs through the conduit and stilling basin at Falls Dam.) Because of thermal stratification within the lake, reservoir releases will normally be maintained from the multilevel water quality gates beginning each year on May 1 and continuing through November 14 except for periods requiring flood releases. Minimum daily average water quality

flows in the lower Neuse River as established by the State of North Carolina measured at the Clayton gage are shown in table 7-1.

Table 7-1
Minimum Water Quality Flows at Clayton, NC

Month	Flow in c.f.s.
Nov-Mar	184
Apr-Oct	254

Another water quality objective of the multilevel intakes is to prevent downstream water temperatures from exceeding natural temperatures by more than 5 degrees F and to maintain temperatures of all releases below 90 degrees F.

c. Low Flow Regulation. During periods of normal flow, releases from the reservoir will equal inflow. A minimum instantaneous flow of 60 or 100 c.f.s. depending on the time of year will be maintained immediately below the dam. Also, releases will be made from the conservation storage pool as necessary to maintain the minimum requirements shown in table 7-1. It should be noted that the storage available for this release may be depleted once in every 10 to 20 years given a reoccurrence of the critical dry period.

d. Selective Flow Withdrawal. To meet the water quality standards downstream of Falls Dam, selective flow withdrawal will normally be made from Falls Lake through the multilevel outlet structure beginning May 1 through November 14 each year. In the winter when the reservoir is practically isothermal, releases may be made from any intake gate. Based on at least 5 years of water quality data (consisting primarily of dissolved oxygen (DO) and temperature), a consistent year-to-year pattern has been shown to exist in DO concentrations and temperature both in the lake and downstream. Over the period-of-record, Falls Lake generally becomes stratified by May 1 and destratified by November 15. This pattern is based on monitoring by both District personnel and a separate water quality contractor. The State of North Carolina has requested that surface waters be released at Falls Lake during stratified conditions to lower the nutrient concentrations downstream and thus reduce the potential for nuisance algae conditions associated with eutrophication.

e. Water Quality Data. Routine water quality data sampling at Falls Lake has been discontinued and future sampling will be performed only on an “as needed” basis.

7-06. Water Supply. A volume of 45,000 acre-feet or 42.3 percent of the conservation pool storage has been allocated to water supply. A contract entered into on 24 February 1972 (Contract No. DACW54-72-C-0022) between the Federal Government (Wilmington District) and the City of Raleigh, North Carolina, allows for maximum instantaneous withdrawal of 100 million gallons per day of water supply directly from the reservoir (refer to exhibit C). Normally, there is no special reservoir operation required for water supply. However, during a critical dry period, the conservation pool may be completely depleted of water storage. Water budgeting will be maintained by the Water Control Unit to properly allocate conservation storage to water supply and water quality use. Water supply is allocated 39 percent of the net inflow into the lake with the remainder going to water quality control. Drought operation is described in detail in the Drought Contingency Plan (exhibit B).

7-07. Recreation. In order to provide as near ideal recreation conditions as possible, the lake will be operated to maintain a normal pool elevation of 251.5 feet-NGVD29. Only during abnormal periods will the reservoir rise or fall appreciably above or below the normal pool elevation during the prime recreation season. Beaverdam Creek, a subimpoundment of Falls Lake, is to be operated by the State of North Carolina as a recreational area.

7-08. 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 temperatures 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 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 providing 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 which exposes the larvae to predation.

7-09. 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 F until 3 weeks after the temperature first reaches 70 degrees F; provided benefits attributed to primary project purposes are not jeopardized by this operation. Basic guidance for taking water temperature is described in exhibit A in the instructions to the damtender.

7-10. Deviation from Normal Regulation.

a. General. The District Engineer is occasionally requested to deviate from normal regulation of Falls Lake. Prior approval for a deviation is obtained from the South Atlantic Division Office (SAD), except as noted.

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 CESAD-EN-H.

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 Falls 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 (Water Control Unit) will obtain approval for these minor deviations from SAD, normally by telephone. A written confirmation showing the deviation and conditions will be furnished to CESAD-EN-H 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 Falls Lake, exhibit B.

7-11. Rate of Release Change. Increases in discharge rates normally will not exceed 500 c.f.s. in the first hour of flood releases and 1,000 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 500 c.f.s. increments for each 0.5 foot decrease in elevation below lake elevation of 253 feet-NGVD29.

7-12. Major Constraints.

a. The original design of Falls project had no provisions for releasing the original minimum flow rate of 27 c.f.s. other than by direct release through a service gate. Currently, the minimum release is approximately 60 c.f.s. from November through March and 100 c.f.s. April through October. A single service gate opening of less than 0.3 feet is sufficient to release 60 c.f.s., and 0.5 feet for 100 c.f.s. However, gate openings of less than 0.5 feet should not be used on a routine basis due to excessive cavitation damage. A low-level outlet in the form of a piggyback gate (1-foot square opening) is installed in each service gate to release cold water when needed to meet water temperature objectives downstream (see WES Miscellaneous Paper H-76-6. "Falls Lake Water-Quality Study" dated April 1976). While these piggyback openings are ideal for meeting the 60 c.f.s. minimum flow from November through March, it is questionable if the openings are effective in meeting water temperature objectives since temperatures are controlled by flow through water quality and emergency gates. If the piggyback gates had been installed on the emergency gates rather than service gates, then cold water from the bottom of the lake could be released through the piggyback gates to reduce temperatures of water coming from the water quality openings. Releases from the piggyback openings should however, cause some reaeration of discharge downstream below the service gates.

b. (See paragraph 3-06 for other operating constraints)