

APPENDIX C: LOW INFLOW PROTOCOL (LIP) FOR THE CATAWBA-WATEREE PROJECT

PURPOSE

The purpose of this Low Inflow Protocol (LIP) is to establish procedures for reductions in water use during periods of low inflow to the Catawba-Wateree Project (the Project). The LIP was developed on the basis that all parties with interests in water quantity will share the responsibility to establish priorities and to conserve the limited water supply.

OVERVIEW

This Low Inflow Protocol provides trigger points and procedures for how the Catawba-Wateree Project will be operated by the Licensee, as well as water withdrawal reduction measures and goals for other water users during periods of low inflow (i.e., periods when there is not enough water flowing into the Project reservoirs to meet the normal water demands while maintaining Remaining Usable Storage in the reservoir system at or above a seasonal target level).

The Licensee will provide flow from hydro generation and other means to support electric customer needs and the instream flow needs of the Project. During periods of normal inflow, reservoir levels will be maintained within prescribed Normal Operating Ranges. During times that inflow is not adequate to meet all of the normal demands for water and maintain reservoir levels as normally targeted the Licensee will progressively reduce hydro generation. If hydrologic conditions worsen until trigger points outlined herein are reached, the Licensee will declare a Stage 0 - Low Inflow Watch and begin meeting with the applicable agencies and water users to discuss this LIP. If hydrologic conditions continue to worsen, the Licensee will declare various stages of a Low Inflow Condition (LIC) as defined in the Procedure section of this document. Each progressive stage of the LIC will call for greater reductions in hydro station releases and water withdrawals, and allow additional use of the available water storage inventory.

The goal of this staged LIP is to take the actions needed in the Catawba-Wateree River Basin to delay the point at which the Project's usable water storage inventory is fully depleted. While there are no human actions that can guarantee that the Catawba-Wateree River Basin will never experience operability limitations at water intake structures due to low reservoir levels or low streamflows, this LIP is intended to provide additional time to allow precipitation to restore streamflow, reservoir levels, and groundwater levels to normal ranges. The amount of additional time that is gained during the LIP depends primarily on the diagnostic accuracy of the trigger points, the amount of regulatory flexibility the Licensee has to operate the Project, and the effectiveness of the Licensee and other water users in working together to implement their required actions and achieve significant water use reductions in a timely manner.

To ensure continuous improvement regarding the LIP and its implementation throughout the term of the New License, the LIP will be re-evaluated and modified periodically. These re-evaluations and modifications will be as determined by the Catawba-Wateree Drought Management Advisory Group (CW-DMAG).

KEY FACTS AND DEFINITIONS

1. Human Health and Safety and the Integrity of the Public Water Supply and Electric Systems are of Utmost Importance – Nothing in this protocol will limit the Licensee's ability to take any and all lawful actions necessary at the Project to protect human health and safety, protect its equipment from major damage, protect the equipment of the Large Water Intake Owners from major damage, and ensure the stability of the regional electric grid and public water supply systems. It is recognized that the Licensee may take the steps that are necessary to protect these things without prior consultation or notification. Likewise, nothing in this LIP will limit the States of North Carolina and South Carolina from taking any and all lawful actions necessary within their jurisdictions to protect human health and safety. It is recognized that North Carolina and South Carolina may also take the steps necessary to protect these things without prior consultation or notification.
2. No Abrogation of Statutory Authority – It is understood that the South Carolina Department of Natural Resources (SCDNR) must operate under the statutory authority of its drought response statutes, and nothing in this LIP will require the SCDNR to take any action that exceeds its authority under their drought response statute.
3. Normal Full Pond Elevation – Also referred to simply as “full pond,” this is the level of a reservoir that corresponds to the point at which water would first begin to spill from the reservoir's dam(s) if the Licensee took no action. This level corresponds to the lowest point along the top of the spillway (including flashboards) for reservoirs without floodgates and to the lowest point along the top of the floodgates for reservoirs that have floodgates. To avoid confusion among the many reservoirs the Licensee operates, it has adopted the practice of referring to the Full Pond Elevation for all of its reservoirs as equal to 100.0 ft. relative. The Full Pond Elevations for the Catawba-Wateree Project reservoirs are as follows:

Reservoir	Full Pond Elevation (ft. above Mean Sea Level)
Lake James	1200.0
Lake Rhodhiss	995.1
Lake Hickory	935.0
Lookout Shoals Lake	838.1
Lake Norman	760.0
Mountain Island Lake	647.5
Lake Wylie	569.4
Fishing Creek Reservoir	417.2
Great Falls Reservoir	355.8
Cedar Creek Reservoir	284.4
Lake Wateree	225.5

4. Net Inflow – The cumulative inflow into a reservoir, expressed in acre-feet (ac-ft) per month. Net inflow is the sum of tributary stream flow, inflow from upstream hydro development releases (where applicable), groundwater inflow, precipitation falling on the reservoir surface, land surface runoff, and on-reservoir point-source return flows, less the sum of on-reservoir water withdrawals, groundwater recharge, hydro development flow releases, evaporation, and other factors.
5. Normal Minimum Elevation – The level of a reservoir (measured in feet above Mean Sea Level (MSL) or feet relative to the full pond contour with 100.0 ft. corresponding to full pond) that defines the bottom of the reservoir's Normal Operating Range for a given day of the year. If inflows and outflows to the reservoir are kept within some reasonable range of the average or expected amounts, hydroelectric project equipment is operating properly and no protocols for abnormal conditions have been implemented, reservoir level excursions below the Normal Minimum Elevation should not occur.
6. Normal Maximum Elevation – The level of a reservoir (measured in feet above Mean Sea Level (MSL) or feet relative to the full pond contour with 100.0 ft. corresponding to full pond) that defines the top of the reservoir's Normal Operating Range for a given day of the year. If inflows and outflows to the reservoir are kept within some reasonable range of the average or expected amounts, hydroelectric project equipment is operating properly, and no protocols for abnormal conditions have been implemented, reservoir level excursions above the Normal Maximum Elevation should not occur.
7. Normal Target Elevation – The level of a reservoir (measured in feet above Mean Sea Level (msl) or feet relative to the full pond contour with 100.0 ft corresponding to full pond) that the Licensee will endeavor in good faith to achieve, unless operating in this Low Inflow Protocol, the Maintenance and Emergency Protocol, the Spring Reservoir Level Stabilization Program (Lakes James, Norman, Wylie and Wateree only), a Spring Stable Flow Period (Lake Wateree only) or a Floodplain Inundation Period (Lake Wateree only). Since inflows vary significantly and outflow demands also vary, the Licensee will not always be able to maintain actual reservoir level at the Normal Target Elevation. The Normal Target Elevation falls within the Normal Operating Range, but it is not always the average of the Normal Minimum and Normal Maximum Elevations.
8. Normal Operating Range for Reservoir Levels – The band of reservoir levels within which the Licensee normally attempts to maintain a given reservoir that it operates on a given day. Each reservoir has its own specific Normal Operating Range, and that range is bounded by a Normal Maximum Elevation and a Normal Minimum Elevation. If inflows and outflows to the reservoir are kept within some reasonable range of the average or expected amounts, hydro project equipment is operating properly and no protocols for abnormal conditions have been implemented, reservoir level excursions outside of the Normal Operating Range should not occur.
9. Large Water Intake – Any water intake (e.g., public water supply, industrial, agricultural, power plant, etc.) having a maximum instantaneous capacity greater than or equal to one Million Gallons per Day (MGD) that withdraws water from the Catawba-Wateree River Basin.
10. Public Water Supply (PWS) – Any water delivery system owned and/or operated by any governmental or private entity that utilizes waters from the Catawba-Wateree

River Basin for the public interest including drinking water; residential, commercial, industrial, and institutional uses; irrigation, and/or other public uses.

11. **Critical Reservoir Elevation** – Unless it is otherwise stated as applying only to a specific intake or type of intake, the Critical Reservoir Elevation is the highest level of water in a reservoir (measured in feet above Mean Sea Level (m/s) or feet relative to the full pond contour with 100.0 ft. corresponding to full pond) below which any Large Water Intake used for Public Water Supply or industrial uses, or any regional power plant intake located on the reservoir will not operate at its Licensee-approved capacity. The Critical Reservoir Elevations, as of June 1, 2006, are defined below:

Reservoir	Critical Reservoir Elevation (ft. relative to local datum) (100 ft = Full Pond)	Type of Limit
Lake James	61.0	Power Production
Lake Rhodhiss	89.4	Municipal Intake
Lake Hickory	94.0	Municipal Intake
Lookout Shoals Lake	74.9	Municipal Intake
Lake Norman	90.0	Power Production
Mountain Island Lake	94.3	Power Production
Lake Wylie	92.6	Industrial Intake
Fishing Creek Reservoir	95.0	Municipal Intake
Great Falls Reservoir	87.2	Power Production
Cedar Creek Reservoir	80.3	Power Production
Lake Wateree	92.5	Municipal Intake

12. **Total Usable Storage (TUS)** – The sum of the Project's volume of water expressed in acre-feet (ac-ft) contained between each reservoir's Critical Reservoir Elevation and the Full Pond Elevation.
13. **Remaining Usable Storage (RUS)** – The sum of the Project's volume of water expressed in acre-feet (ac-ft) contained between each reservoir's Critical Reservoir Elevation and the actual reservoir elevation at any given point in time.
14. **Storage Index (SI)** – The ratio, expressed in percent, of Remaining Usable Storage to Total Usable Storage at any given point in time.
15. **Target Storage Index (TSI)** – The ratio of Remaining Usable Storage to Total Usable Storage based on the Project reservoirs being at their Normal Target Elevations. The following table lists the Target Storage Index for the first day of each month:

Month	Target Storage Index For 1 st Day of Month (%)*
Jan	61
Feb	51
Mar	61
Apr	66

Month	Target Storage Index For 1 st Day of Month (%) [*]
May	75
Jun	75
Jul	75
Aug	75
Sep	75
Oct	75
Nov	69
Dec	62

^{*} Target Storage Indices for other days of the month are determined by linear interpolation.

16. U.S. Drought Monitor – A synthesis of multiple indices, outlooks, and news accounts that represents a consensus of federal and academic scientists concerning the drought status of all parts of the United States. Typically, the U.S. Drought Monitor indicates intensity of drought as D0-Abnormally Dry, D1-Moderate, D2-Severe, D3-Extreme, and D4-Exceptional. The website address is <http://www.drought.unl.edu/dm/monitor.html>. The following federal agencies are responsible for maintaining the U.S. Drought Monitor:
- Joint Agricultural Weather Facility (U.S. Department of Agriculture and Department of Commerce/National Oceanic and Atmospheric Administration)
 - Climate Prediction Center (U.S. Department of Commerce/NOAA/National Weather Service)
 - National Climatic Data Center (DOC/NOAA)
17. U.S. Drought Monitor Three-Month Numeric Average – If the U.S. Drought Monitor has a reading of D0-D4 as of the last day of the previous month for any part of the Catawba-Wateree River Basin that drains to Lake Wateree, the Basin will be assigned a numeric value for the current month. The numeric value will equal the highest Drought Monitor designation (e.g., D0 = 0, D4 = 4) as of the last day of the previous month that existed for any part of the Catawba-Wateree River Basin that drains to Lake Wateree. A normal condition in the Basin, defined as the absence of a Drought Monitor designation, would be assigned a numeric value of negative one (-1). A running average numeric value of the current month and the previous two months will be monitored and designated as the U.S. Drought Monitor Three-Month Numeric Average.
18. Critical Flows – The minimum flow releases from the hydro developments that may be necessary to:
- a. prevent long-term or irreversible damage to aquatic communities consistent with the resource management goals and objectives for the affected stream reaches;
 - b. provide some basic level of operability for Large Water Intakes located on the affected stream reaches; and,

- c. provide some basic level of water quality maintenance in the affected stream reaches.

For the purposes of this LIP, the Critical Flows are as follows:

- a. Linville River, below the Bridgewater Development: 75 cubic feet per second (cfs).
 - b. Catawba River Bypassed Reach below the Bridgewater Development: 25 cfs.
 - c. Oxford Regulated River Reach below the Oxford Development: 100 cfs.
 - d. Lookout Shoals Regulated River Reach below the Lookout Shoals Development: 80 cfs.
 - e. Wylie Regulated River Reach below the Wylie Development: 700 cfs.
 - f. Great Falls Bypassed Reaches (Long and Short) at the Great Falls-Dearborn Development: 450 cfs and 80 cfs respectively.
 - g. Wateree Regulated River Reach below the Wateree Development: 800 cfs.
 - h. Leakage flows at the remaining Project structures. Leakage flows are defined as the flow of water through wicket gates when the hydro units are not operating and seepage through the Project structures at each development.
19. Recreation Flow Reductions – Since all recreation flow releases must be made by either releasing water through hydroelectric generation or through flow releases that bypass hydro generation equipment, reductions in Project Flow Requirements will impact recreation flow releases.
20. Organizational Abbreviations – Organizational abbreviations include the North Carolina Department of Environment and Natural Resources (NCDENR), North Carolina Wildlife Resources Commission (NCWRC), South Carolina Department of Natural Resources (SCDNR), South Carolina Department of Health and Environmental Control (SCDHEC), and the United States Geological Survey (USGS).
21. Catawba-Wateree Drought Management Advisory Group (CW-DMAG) – The CW-DMAG will be tasked with working with the Licensee when the LIP is initiated. This team will also meet as necessary to foster a basin-wide response to a Low Inflow Condition (see Procedure section of this LIP). Members of the CW-DMAG agree to comply with the conditions of this LIP. Membership on the CW-DMAG is open to the following organizations, of which each organization may have up to two members:
- a. NCDENR (including Division of Water Resources and the Division of Water Quality)
 - b. NCWRC
 - c. SCDNR
 - d. SCDHEC
 - e. USGS
 - f. Each Owner of a Large Water Intake located on one of the Catawba-Wateree Project reservoirs or the main stem of the Catawba-Wateree River
 - g. Each Owner of a Large Water Intake located on any tributary stream within the Catawba-Wateree River Basin that ultimately drains to Lake Wateree
 - h. Licensee (CW-DMAG Coordinator)

The CW-DMAG will meet at least annually (typically during the month of May) beginning in 2007 and continuing throughout the term of the New License, regardless of the Low Inflow Condition status, to review prior year activities, discuss data input from Large Water Intake Owners, and discuss other issues relevant to the LIP. The Licensee will maintain an active roster of the CW-DMAG and update the roster as needed. The Licensee will prepare meeting summaries of all CW-DMAG meetings and will make these meeting summaries available to the public by posting on its Web site.

22. Revising the LIP – During the term of the New License, the CW-DMAG will review and update the LIP periodically to ensure continuous improvement of the LIP and its implementation. These evaluations and modifications will be considered at least once every five (5) years during the New License term. Modifications must be approved by a consensus of the participating CW-DMAG members. If the participating members cannot reach consensus, then the dispute resolution procedures set forth in Section 31.0 of the relicensing Final Agreement will apply. Approved modifications will be incorporated through revision of the LIP and the Licensee will file the revised LIP with the FERC. If any modifications of the LIP require amendment of the New License, the Licensee will: (i) provide notice to all Parties to the relicensing Final Agreement advising them of the proposed license article amendment and the Licensee's intent to file it with the FERC; (ii) submit the modification request to the North Carolina Division of Water Quality (NCDWQ) and/or the South Carolina Department of Health and Environmental Control (SCDHEC) for formal review and approval as may be required by any reopener conditions of the respective state's 401 Water Quality Certification for the Project; and (iii) file a license amendment request for FERC approval. During this process, the CW-DMAG may appoint an ad hoc committee to address issues and revisions relevant to the LIP. The filing of a revised LIP by the Licensee will not constitute or require modification to the relicensing Final Agreement and any Party to the relicensing Final Agreement may be involved in the FERC's public process for assessing the revised LIP. Issues such as sediment fill impact on reservoir storage volume calculations, revising the groundwater monitoring plan and substitution of a regional drought monitor for the U.S. Drought Monitor, if developed in the future, are examples of items that may be addressed.
23. Water Withdrawal Data Collection and Reporting – The Licensee will maintain information on cumulative water use from Project reservoirs beginning in 2006 and continuing throughout the term of the New License and will make the information available to water intake owners and governmental agencies upon their request. The Licensee will require all owners of Large Water Intakes located within the FERC Project Boundaries to report to the Licensee, on an annual basis in MGD, their average monthly water withdrawals from and flow returns to the Project or its tributary streams that drain to Lake Wateree. The Licensee will maintain a database of this information including the Licensee's own non-hydro water use records (i.e., water uses due to thermal power generation). These annual withdrawal summaries will be in writing, certified for accuracy by a professional engineer or other appropriate official, and will be provided to the Licensee by January 31 of each year for the preceding calendar year beginning in 2007. This information may be used to determine if future increased water withdrawals would be within the projections of the Water Supply Study conducted during the relicensing process and filed with the FERC as part of the Licensee's Application for New License for the Project.

