DOMINION VIRGINIA POWER / NORTH CAROLINA POWER
DOWNSTREAM WATER QUALITY MONITORING PLAN
LICENSE ARTICLE 404
Roanoke Rapids and Gaston
FERC Project Number 2009

REVISION 1

To the September 30, 2005 FERC Approved Plan
March 24, 2010

DOMINION GENERATION
ROANOKE RAPIDS AND GASTON PROJECT
FERC NO. 2009
DOWNSTREAM WATER QUALITY MONITORING PLAN

1. INTRODUCTION

1.1 Project Description

The Roanoke Rapids and Gaston Project is located on the Roanoke River in Virginia and North Carolina downstream of the U.S. Army Corps of Engineers (USACE) Kerr Dam. Kerr, Gaston, and Roanoke Rapids form a continuous chain of reservoirs used for flood control and power generation along the middle portion of the Roanoke River basin.

1.1.1 Gaston Development

The Gaston development is located approximately 34 miles downstream from the John H. Kerr dam and reservoir at river mile (RM) 145.5. The development's principal, existing features consist of: (1) a concrete and earthen dam measuring 3,600 feet in length, with a maximum height of about 105 feet; (2) a concrete ogee-type spillway, measuring 550 feet in length, with 11 steel radial gates measuring 40 feet wide by 38 feet high; (3) a 34-mile long impoundment, with a total storage volume of 450,000 acre-feet (AF; 20,000 AF useable storage) and surface area of 20,300 acres at a normal water surface elevation of 200 feet mean sea level (msl); (4) intakes integral with the powerhouse, with trashracks having a clear bar spacing of 8½ inches; (5) a submerged rockfill and concrete weir with a total length of about 1,010 feet, located upstream of the intake and surrounding the intake on three sides; (6) a 294-foot-long concrete and masonry powerhouse, and an adjacent 80-foot-long service bay and 45-foot-long uploading bay; (7) three vertical shaft, fixed blade turbines and one vertical shaft Kaplan turbine, having a total installed capacity of 225 MW (225 MW dependable) and a maximum hydraulic capacity of 44,000 cubic feet per second (cfs); (8) four 14.4-kilovolt (kV) generators connected to two 230-kV transformers; and (9) appurtenant facilities

The Gaston development was constructed between 1960 and 1962, with commercial operation beginning in February 1963. The development produces an average of 336,362,000 MWh annually. The Gaston development occupies all of the about 252 acres of federal land administered by the USACE.

1.1.2 Roanoke Rapids Development

The Roanoke Rapids development is located 42 miles downstream from the Kerr dam (7.5 miles downstream from the Gaston development) at RM 135. The development's principal, existing features consist of: (1) a concrete gravity dam, measuring 3,050 feet long (includes powerhouse) and a maximum of 72 feet high; (2) a concrete ogee-type spillway, measuring 1,133 feet in length and having 24 spillway bays, with 24 steel radial gates measuring 38 feet wide by 23 feet high,, one 25-foot-wide skimmer bay, and a 48-foot-wide non-overflow section; (3) an 8-mile long impoundment, with a total storage volume of 77,140 AF (20,640 AF useable storage) and surface area of 4,600 acres at a normal water surface elevation of 132 feet msl; (4) intakes integral with the powerhouse, with trashracks having a clear bar spacing of 6 inches; (5) a submerged rockfill weir, located upstream of the intake and surrounding the intake on three sides; (6) a 224-foot-long concrete and masonry powerhouse and an adjacent 182-foot-long service bay; (7) four Kaplan turbines (three fixed-blade propeller and one variable-pitch blade), having a total installed capacity of 104 MW (99 MW dependable) and a maximum hydraulic capacity of 20,000 cfs; (8) a 7,800-foot-long by 80-foot-wide tailrace channel, with variable depth (33 to 50 feet) and a normal water surface elevation of 55 feet msl; (9) four 14.4-kV generators connected to two 110-kV transformers; and (10) appurtenant facilities.

The Roanoke Rapids development was constructed between 1953 and 1955, with commercial operation beginning in September 1955. The development produces an average of 336,408 MWh annually. The Roanoke Rapids development does not occupy any federal lands.

1.2 Project Operation

The Roanoke Rapids and Gaston Project is operated in close coordination with the John H. Kerr Project. The Kerr Project is operated for flood control and power production. Generation of power is accomplished within the limits prescribed for flood control and minimum river flow regulation. The Kerr Project is operated in accordance with a reservoir guide curve and accompanying guidelines. Generally, whenever the reservoir is below the level of the guide curve, the power station is operated to meet the minimum power declaration per the Southeastern Power Administration (SEPA) contracts, which varies monthly. Water stored in the power pool and above the guide curve is generally released as timely as is practical to provide additional capacity for the control of floods.

During a typical week, the energy declaration for Kerr (weekly declaration) is usually proportioned and scheduled to meet load following system requirements during the 5

working days (Monday through Friday). Generation from Kerr is normally not scheduled during the weekend days (Saturday and Sunday).

1.2.1 Gaston Power Station

During normal operation, Dominion operates the Gaston development in a load following mode, in close coordination with the USACE's operation of the Kerr Project. The Gaston development typically operates with less than 1 foot fluctuation in its power pool (between elevations 199 and 200 feet msl). During the weekends, the Gaston station generally does not operate.

Gaston Units 1, 2, and 3 have fixed-pitch turbine blades and are only operated at the maximum load point of 56 MW (at a flow of about 11,000 cfs each). Gaston Unit 4 has variable pitch (Kaplan) turbine blades, which allow efficient operation over a load range from 25 MW (at 5,000 cfs) to 56 MW (at 11,000 cfs). There is no continuous minimum flow requirement for the Gaston development, as it discharges directly into Roanoke Rapids Lake. The Gaston dam has a submerged weir constructed just upstream of the intake forebays. This construction feature causes the hydropower turbines to take suction from the upper portion and most oxygenated portion of the Lake Gaston reservoir.

1.2.2 Roanoke Rapids Power Station

The Roanoke Rapids development is normally operated in a peaking (or load following) mode from Monday through Friday. Because of differences in the hydraulic capacity and storage volume (reservoir size) between the Gaston and Roanoke Rapids developments, the normal pool elevation of Roanoke Rapids Lake fluctuates more than that at Gaston, typically 3 feet during day-to-day operations and sometimes as much as 5 feet between elevations 127 and 132 feet msl.

Dominion operates Roanoke Rapids in a "run of Kerr" mode from March 1 through June 15 (exception of five peaking days in March as allowed by License Article 409). The run of Kerr mode was implemented to enhance spawning habitat for anadromous fish. During this time frame Dominion does not load follow at Roanoke Rapids.

Like the Gaston dam, Roanoke Rapids has a submerged weir constructed just upstream of the intake forebays. This construction feature causes the hydropower turbines to take suction from the upper portion and most oxygenated portion of the Roanoke Rapids reservoir.

Dominion operates at least one unit at Roanoke Rapids to maintain the required minimum flow. During the weekends when Gaston is not normally operated, the Roanoke Rapids Lake storage capacity is used to maintain the required minimum flow.

1.3 FERC License Article 404 Plan

Within one year of the issuance date of this license, the licensee shall file with the Commission, for approval, a plan to monitor dissolved oxygen (DO) and water temperature at the existing U.S. Geological Survey (USGS) gauges located at Halifax, Oak City, and Jamesville, North Carolina, downstream from the project.

The plan shall include, at a minimum:

(1) a provision to fund the existing USGS continuous water quality monitoring stations for DO and water temperature at Halifax, Oak City, and Jamesville, North Carolina. The funding shall be provided annually to the North Carolina Department of Environment and Natural Resources (NC Environment and Natural Resources) and shall be provided retroactively to the submission of the monitoring plan;

(2) a provision to maintain the DO data on a real-time basis via the internet and to forward the data to North Carolina Division of Water Quality (NC Water Quality) Wetland/401 Unit, Ecosystems Unit and Raleigh and Washington Regional Offices every other month from November 1 through May 31, and monthly from June 1 through October 31. The data shall be filed with the Commission at the same time. The licensee shall submit the data electronically and shall notify NC Water Quality in writing when the data have been transmitted. The licensee may submit accompanying printed copies in addition to the electronic submittals. Data collected by the licensee shall include (a) stage or flow, as measured in cfs, (b) site, (c) date, (d) time, (e) depth, (f) DO concentrations, measured in mg/l, and (f) water temperature, measured in degrees Celsius (°C);

(3) the methods for evaluating the data collected, based on a 5-year study cycle or some other schedule as mutually agreed to by the licensee, NC Water Quality and the North Carolina Wildlife Resources Commission (NC Wildlife Resources);

(4) in consultation with NC Water Quality and NC Wildlife Resources, a stepwise process for developing any operational changes and procedures that could be implemented, if, during the evaluation of water quality data described in this article, the NC Water Quality and NC Wildlife Resources find that scientific data establish a causal link between rescheduling, by the licensee, of the U.S. Army Corps of Engineers (Corps) weekly declaration and reduction of water quality in the main stem of the Roanoke River to below state standards such that by the end of the last study cycle if changes are made at the end of each

such study cycle the licensee shall release one seventh of the Corps weekly declaration per day as defined in Settlement Agreement Article GP2; and

(5) an implementation schedule.

The licensee shall prepare the plan after consultation with NC Water Quality and NC Wildlife Resources. The licensee shall include with the plan documentation of agency consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the agencies' comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the agencies to comment and to make recommendations before filing the plan with the Commission. In reporting the results of the consultation with the Commission, the licensee shall document its compliance with the consultation process and provide either the agreement reached or documentation of any dispute, including the positions taken by the parties.

The Commission reserves the right to require changes to the plan. No ground-disturbing or land-clearing activities for installation of any monitoring devices shall begin until the Commission notifies the licensee that the plan is approved. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

Following plan approval, any long-term changes to project operations or facilities identified by the monitoring results to mitigate environmental impacts, and not previously approved by the Commission in the plan, may not be implemented without prior Commission approval. If the results indicate that the project is not affecting downstream water quality, the licensee – after consultation with NC Water Quality and NC Wildlife Resources – may request that the Commission terminate the requirement to fund the downstream gauges and monitoring requirements of this article. The Commission reserves the right to direct the licensee to modify project operations to protect water quality.

In the event of emergency water quality conditions, the licensee shall cooperate with NC Water Quality and NC Wildlife Resources to take such reasonable steps to protect the water quality of the Roanoke River downstream from the Roanoke Rapids dam.

2.0 PLAN DEVELOPMENT

2.1 Background

Discussions occurred during the project relicensing that centered around downstream impacts to water quality as a result of Dominion's load following operations. Agency and downstream stakeholders hypothesized that Dominion's rescheduling of Kerr's

weekly declaration sometimes caused inundation of the floodplain downstream. During the warmer months of the year, water on the floodplain could then become oxygen depleted (hypoxic). When Dominion reduced flow following some high flow events, the hypoxic water drained into the river causing mainstem water quality to be impacted negatively.

In September of 2000 and July of 2001, Dominion performed two downstream studies to test the hypothesis (Graham and Cannon 2001; Cannon and Graham 2002). The study results were clear that Dominion's re-regulation of the Kerr weekly declaration can cause floodplain inundation and the floodplain water does become hypoxic. The study did not show a clear causal link that the drainage of floodplain water substantially impacted mainstem water quality.

During the discussions between Dominion, NC Department of Water Quality (NCDWQ) and NC Wildlife Resources Commission (NCWRC) that lead to the Comprehensive Settlement Agreement, the parties reached agreement to continue study of the downstream water quality concerns. The parties also agreed that if a causal link was established between Dominion's load following operations and negative downstream water quality effects, Dominion would make appropriate operating adjustments up to daily equal distribution of the weekly Kerr declaration. The agencies agreed to no longer require testing and funding of the three USGS water quality monitoring stations once all parties were satisfied that either a causal link did not exist or Dominion had adjusted its operations per that stated above.

2.2 Consultation

2.2.1 Initial Consultation

This plan was developed in consultation with the NCDWQ and NCWRC. An initial consultation meeting was held on June 28, 2005. At the meeting conceptual approaches were discussed. (Meeting notes are attached as Appendix 1). Dominion provided a copy of the draft plan for review to both parties on August 1, 2005 for formal 30-day review. On August 31, 2005 a phone consultation was held with the two agencies. The Plan was revised and redistributed for review on September 2, 2005. On September 7, 2005 a phone consultation was held with the two agencies. Following the consultation the Plan was revised and redistributed on September 12, 2005. Two of the agency comments were not resolved and therefore not included in the Plan (see agency comment letter, Appendix 1). Dominion's discussion related to the comments is included in the submission letter with this Plan.

2.2.2 First Five-Year Review Consultation.

During the pre-plan data report review (see section 3.4.3 below), several extension of time requests were submitted to the Commission related to the pre-plan data final report. The reason for the requests was the time required for the data analysis and the

report contractor (US Geological Service) to complete QA/QC to publish the report. During a November 2, 2009 consultation meeting, a schedule was developed for the expected publication of the final first 5-year report. Dominion was to request a first cycle extension of time from the Commission. Dominion then provided the draft plan with the revised dates to the agencies as a preferred schedule remedy in a November 9, 2009 e-mail. The meeting notes and e-mail communication related to the changes are included as Appendix 2 to this Plan. The agencies agreed to the Article 404 Plan revision with two minor modifications suggested by the NCDWQ. Dominion has incorporated these revisions in the Plan.

3.0 PLAN

3.1 Purpose

The Downstream Water Quality Monitoring Plan is required by the Federal Energy Regulatory Commission (Commission) in the License issued to Dominion on March 31, 2004 and as per the revised License Articles issued upon rehearing and License order on March 4, 2005. The plan as required by the License is in agreement with the Comprehensive Settlement Agreement (Settlement) filed by Dominion with the Commission in July of 2003. The general goal of License Article 404 and the Settlement is to ensure state water quality standards of water released from the project are met. The purposes of this plan are to:

- Determine if a causal link exists between Dominion's rescheduling of the USACE's weekly declaration (load following operations) and reduction of DO in the mainstem Roanoke River below state standards.

- If a causal link is established, systematically change Dominion's load-following operations to a point where water quality impacts from the load-following operations are reduced to the point where state water quality standards are no longer impacted.

This study plan is intended to collect additional data using USGS gauging stations in the mainstem Roanoke River. The additional data will then be used to meet the objectives stated above.

3.2 Downstream Gauging and Funding

Annually Dominion will provide funding to the North Carolina Department of Environment and Natural Resources (NCDENR) to operate and maintain the following USGS gages in the Roanoke River below the Roanoke Rapids Dam:

Halifax USGS gage 0208062765
Oak City USGS gage 02081022

Jamesville USGS gage 02081094
Funding began effective July 1, 2005.

3.3 Data Availability and Reporting

The data from the three river gages are currently in operation and are available via the internet through the following websites:

Halifax: http://waterdata.usgs.gov/nc/nwis/uv?0208062765
Oak City: http://waterdata.usgs.gov/nc/nwis/uv?02081022
Jamesville: http://waterdata.usgs.gov/nc/nwis/uv?02081094

3.3.1 Reports:

3.3.1.1 Dominion's Environmental Tracking System (ETS) will send out monthly reminders of reporting due dates to the project's Operations and Maintenance Manager and Station Services Coordinator.

3.3.1.2 Dominion will obtain "reviewed" data for the three USGS websites from the USGS in an electronic format. (Reviewed data is provisional data that has had an initial review by the USGS to remove data that is obviously in error. Typically the data is available about 30 days after the end of the month). Dominion will either request the data monthly from the USGS or work with the USGS to have the data automatically sent to Dominion on a monthly schedule.

3.3.1.3 The monthly report shall be sent electronically to NC Division of Water Quality's 401 Wetlands Unit, Raleigh Regional Office and Washington Regional Office and the Commission within 15 days of being received from USGS by Dominion.

3.3.1.4 A letter shall be sent to the Wetlands and Stormwater Branch notifying the NCDWQ that the data has been sent electronically.

3.3.1.5 The electronic report will identify each USGS site by name. Each site's data shall include hourly:

- Date,
- Time,
- Stage,
- Depth,
- Dissolved Oxygen concentration in mg/l,
- Water temperature in degrees Celsius (°C).

3.3.1.6 Also included with the report will be flow in cfs for the USGS Roanoke Rapids gage.

3.4. Data Evaluation

3.4.1 Annual Evaluation and Report

Dominion will provide an annual evaluation covering the warm weather releases from the Roanoke Rapids Dam. The purpose of the annual evaluation is to give Dominion and the agencies a snapshot of peaking effects on downstream DO prior to the license required five-year review. The annual evaluation and accompanying report shall be sent electronically to NC Division of Water Quality's 401 Wetlands Unit, Raleigh Regional Office and Washington Regional Office and the Commission by April 30 of the year following the report year. Data from June 16 through October 31 will be evaluated. The annual evaluation will include:

- Graphic interpretation of flow and DO for the weeks from June 16 – October 31.
- Graphs to be included in the report shall be:
  - Roanoke Rapids flow (in cfs) and DO from the Roanoke Rapids Dam tailrace
  - Halifax stage and DO
  - Oak City stage and DO
  - Jamesville stage and DO
- Graphs shall be of monthly plots of hourly data.

3.4.2 Five-year Data Evaluation and Report

By December 31 of the year following the fifth annual evaluation and report, Dominion will submit to the NCDWQ, NCWRC and the Commission a 5-year summary report and include a statistical analysis of load following effects on downstream water quality. (NOTE: Dominion will continue collecting data during this time until conditions of section 4.4 below are met.) Data analyzed will be USGS water year corrected data (generally available in April of the year following the USGS water year). (NOTE: The fifth year of data will only include data through September 30 since USGS's water year is from October through September)

Statistical analysis methods will be applied to the USGS water quality data by a qualified statistician approved by Dominion, NCDWQ and NCWRC. The statistical analysis will be designed to examine correlations among peaking magnitude and duration, and day to day changes in DO. Prior to initiating the statistical analysis the two agencies and Dominion will agree on the hypothesis to be tested and the associated significance levels. The analysis will be designed to indicate daily and weekly changes in mainstem DO resulting from load following. The analysis will further be designed to correlate DO changes with the weekly declarations between 5,000 cfs and 12,000 and any rescheduling of the weekly declaration as performed by Dominion.

3.4.3 Evaluation of Pre-plan Data

During preliminary consultation with the NCDWQ and NCWRC, the agencies expressed interest in historical data (period of record for the three gages). By December 31, 2009, Dominion will provide an evaluation report to the NCDWQ, NCWRC and the

Commission of the historical record for the Halifax, Oak City and Jamesville water quality gauges. The evaluation report shall be designed to apply the same type of statistical analysis as applied in section 3.4.2 above.

4.0 DETERMINATION OF OPERATIONAL CHANGES

4.1 Five-year determination meeting

By January 31, 2011, Dominion will convene a meeting of the NCDWQ and NCWRC to review Dominion's 5-year report. The three parties will determine through consensus (per License Article 427) whether a causal link is established between Dominion's rescheduling of the US Army Corps of Engineers (USACE) weekly declaration and reduction of water quality in the main stem of the Roanoke River below state standards. Notes from the meeting will be reviewed and approved by all parties to document decisions made at the meeting.

At the end of the first 5-year cycle, if consensus is reached that no causal link has been established, the three parties may agree to either:

- Continue data collection and review another 5 years or
- Determine that no additional data is collected
- Only one cycle of 5-years of additional data may be required after a determination of no causal link exists is made.

If consensus is reached that a causal link exists, Dominion will propose potential methods that would reduce the water quality impacts. Examples of impact reduction methods that may be agreed to are:

- Setting limits on the Kerr weekly declaration that may be re-scheduled by Dominion. (e.g. Roanoke Rapids may reschedule only weekly declarations less than 11,000 cfs. The potential next 5-year determination if a causal link still existed after this step would be to allow rescheduling at 10,000 cfs or less).
- Higher minimum releases on weekends (or non-peak days).

NOTE: Similar meetings will occur after each 5-year data collection review meetings until there is a determination that after the most current 5-year data collection period there was no causal link established.

4.2 Limits to Operational Changes Required

The maximum obligation to Dominion is to equally distribute the weekly declaration over 7 days so each day scheduling of the water from Roanoke Rapids is one seventh of the weekly declaration. Therefore proposals from Dominion at the 2011, 2016, 2021 (etc.) meetings will continue until there is agreement of a causal link no longer exists or an equal 7-day scheduling of the weekly distribution is in place.

Changes to Dominion's method of rescheduling of water will only be required when said changes will cause water quality at any of the three downstream stations to fall below state water quality standards (DO less than 4.0 mg/l instantaneous or 5.0 mg/l daily average).

4.3 Impact on other License requirements

If an equal 7-day scheduling of the weekly declaration is determined as the final or best way to eliminate Dominion's impacts to mainstem river water quality, prior to implementation of this step, a joint meeting of NCWRC, NCDWQ, Dominion and the Cooperative Management Teams from License Articles 414, 415 and 424 will be convened to review potential impacts to other downstream interest groups.

4.4 Release of downstream gaging requirement

At such time Dominion, NCWRC and NCDWQ agree that no causal links exist or appropriate measures have peen implemented to remove the links, Dominion will no longer be required to provide funding for the USGS gages as established in section 2.0 (with the exception of the Gage at Halifax as required by the License Article 424 plan).

5.0 SCHEDULE

The table below summarizes reports and due dates required in this plan:

Fund Downstream Gages	Began July 1, 2005*
Historical data evaluation report	December 31, 2009
Monthly downstream DO data report	Monthly, by 20th of the following month
Annual evaluation report	Annually by April 30th of following year
Five-year evaluation report	December 31, 2010, 2015, 2020, etc.
Five-year determination report	April 30, 2011, 2016, 2021, etc.

* The USGS downstream gauges have been operating for more than five years. Per agreement with NCDWQ, Dominion began funding on July 1, 2005.

6.0 REFERENCES

Effects of Load Following at Roanoke Rapids Power Station on Lower Roanoke River Mainstem Floodplain Water Quality September 2000. Graham, Robert and John Cannon; April, 2001.

Load Following at Roanoke Rapids Station, Floodplain Inundation, and Lower Roanoke River Mainstem and Floodplain Water Quality Studies Conducted July 2001; Cannon, John and Robert Graham; May 2002.

DOWNSTREAM WATER QUALITY MONITORING PLAN
LICENSE ARTICLE 404
Roanoke Rapids and Gaston
FERC Project Number 2009
APPENDIX 1

September 30, 2005

ROANOKE RAPIDS AND GASTON FERC PROJECT NO. 2009
License Article 403 Roanoke Rapids DO Monitoring plan
License Article 404 Water Quality Monitoring Plan
Consultation Meeting
June 28, 2005

Attendees
Stratford Kay – NC Department of Water Quality
Kathy Paull – NC Department of Water Quality
Jennifer Everett – NC Department of Water Quality
Bennett Wynn – NC Wildlife Resources Commission
Pete Kornegay – NC Wildlife Resources Commission
Bob Graham – Dominion
Jeff Jeffers – Dominion
Jim Thornton – Dominion

Purpose
The meeting was held to determine the appropriate location for the Gaston tailwater DO analyzer location as required by License Article 403's Plan, section 4.1.1 and to begin discussions to determine methods for evaluating downstream water quality data for the Plan required by section (3) of License Article 404.

Article 403
The group visited the Gaston tailrace area and Dominion presented four potential locations for the permanent Gaston tailrace DO analyzer required in the Article 403 compliance plan.

(1) Tailrace level stilling well. Dominion stated this was considered because of ease of construction and proximity to the tailrace. However, review of the stilling well indicated the presence of a dampening valve that may restrict inflow / outflow of water.

(2) South side of Unit 4 (southern most generating unit), north facing wall near stilling well location. Location good for ease of construction but Dominion concerned about good water mix when only Unit 1 and / or Unit 2 in operation.
(3) East side of wall just north of Unit 1 turbine outlet. Same mixing concern for 2 above.
(4) Approximately 200 yards downstream on south side of tailrace at Dominion's private boat ramp. Preferred by Dominion. Construction would be more difficult because a pier and radio-transmission equipment required. However, Dominion believes good mixing would occur by this point and data collected during relicensing studies were near here.

NC agencies expressed a concern because they thought turbulence may cause saturation of tailrace water with DO that would quickly dissipate and therefore would not be a true indication of water quality leaving the dam (entering Roanoke Rapids Lake).

The group then visited the Thelma NCWRC boat landing about 1.5 – 2 miles downstream of the Gaston Dam. The state representatives thought this presented a better sampling site because it was further away from turbulence and it seemed to be a location prior to when lake effects would occur. It is likely when the generators are operating a current will be noticeable at this site.

Suggested some profile and different condition sampling. [Profile sampling should be at one-meter intervals from surface to bottom at both stations]

Upon returning to the meeting room, Dominion provided some oxygen profiles that were performed in 1994 –1996 during relicensing studies. These were part of the Applicant Prepared Environmental Assessment. Dominion gave the report to the state to review further. There was a discussion about the potential for additional DO analysis at each of the two sites. The Dominion Gaston boat ramp and the WRC Thelma boat ramp each were very close in proximity to the sampling and analysis performed during the relicensing studies.

(ACTION ITEM) The state will look at the data provided by Dominion and try to determine if enough information is present for the state to determine a preferred location for the new analyzer. **(ACTION ITEM)** Dominion will provide to the state operational data that coincides with the DO profiles at the two sites.

Following data review the state will determine if additional sampling and analysis is warranted to make a location determination. **(ACTION ITEM)** If required, Dominion will propose a sampling protocol that will include varying conditions such as no dam operations for two days prior to sampling and while some and all units are in operation.

TARGET: All action items prior to sampling need to occur prior to August 1 so sampling and analysis can occur during warm weather conditions. If sampling is required, Dominion will organize data and provide to state weekly or biweekly. Data should be provided in an electronic format (e.g., Excel spreadsheet or similar format).

By the end of September, the above activities should be complete and data reviewed so a second consultation meeting can occur (perhaps by conference call).

Article 404

Jim reviewed the history of the relicensing agreement and License Article 404 and what Dominion understands as the purpose. He also shared a power point presentation to review and help persons unfamiliar with the article background to understand the Dominion's contribution to the altered hydrology of the lower Roanoke River.

The License Article 404 condition (3) requires a method of evaluating data collected at the three downstream gages and the tailrace gage to be mutually agreed. Dominion's desire was to have a framework in place prior to placing language in the required FERC plan. Jim suggested that the data set for all four analysis points and all the associated data was too large to grasp. The NCDWQ disagreed stating that the data should be easy to handle if provided in an electronic format – probably a spreadsheet as indicated above. Several statistical packages are available that will accept data from spreadsheets and will put them into summary graphs or tables for each station and suggested the following:

(1) Only look at data from June 16 – Oct 31 (June 15 ends fish flow (non-peaking) season and cooler water after October has higher DO and is less of an issue downstream).

(2) All weekly average flows (weekly declarations) above 10,000 not be considered since flood control with or without Dominion's peaking causes bottom land inundation

(3) All weekly average flow below 5500 to 6000 cfs not be considered since even when Dominion peaks the maximum amount, inundation is unlikely and minor at the most.

Dominion further suggested that each year once these data sets were obtained, the DO data would be matched with the operating condition and determine the effect on mainstem DO from the operating condition. The state suggested that it would be best to get these data more frequently than once each year, if it is possible to do so. Monthly or bimonthly would be useful.

The state indicated that a statistical analysis should be performed using all the data available. Since the data will be collated and put in electronic spreadsheet files, data analysis and manipulation should not be difficult. Pete Konegay stated he had talked to Hydrologics' Brian McCrodden and Brian believed that would be something that could be handled by a good statistician. Dominion expressed concerns that in order for

someone to make appropriate links that the person should be familiar with the relationships between river hydrology and water quality. **(ACTION ITEM)** Dominion will make contact with Jerad Bales (USGS) and Brian McCrodden in an effort to develop an evaluation method to which both parties can agree.

NC Wildlife Resources Commission and NC Department of Water Quality
Joint Comments to the Downstream Water Quality Monitoring Plan
September 13, 2005

MEMORANDUM

TO: Jim Thornton, Dominion/North Carolina Power

FROM: James W. (Pete) Kornegay, Coastal Region Supervisor JWK

DATE: September 13, 2005

SUBJECT: Comments on Draft Downstream Water Quality Monitoring Plan
Gaston/Roanoke Rapids Hydropower Project, FERC Project # 2009,
License Article 404

I have reviewed the draft Downstream Water Quality Monitoring Plan and have participated in telephone discussions with you concerning the plan on August 31 and September 7, 2005. Pursuant to Article 404 of Dominion/North Carolina Power's FERC license for the Gaston/Roanoke Rapids Hydropower Project, consultation is required with the North Carolina Division of Water Quality and the North Carolina Wildlife Resources Commission in developing the plan. The plan identifies obligations and timelines for Dominion/North Carolina Power in monitoring water quality parameters in the downstream reaches of Roanoke River that may be affected by hydropower operations.

We have two concerns about the plan as it currently written:

1. Both the North Carolina Wildlife Resources Commission and the North Carolina Division of Water Quality recommended that Dominion/North Carolina Power retrospectively analyze data from the U.S. Geological Survey's continuous water quality monitoring stations on the Roanoke River and perform correlation analysis on the relationship between hydropower operations and downstream water quality, specifically dissolved oxygen. We believe these analyses would be immediately helpful in guiding further water quality monitoring efforts as outlined in the plan. Although not required in the license, Dominion/North Carolina Power has agreed to perform such analyses but not until the year 2008. The U.S. Geological Survey has been recording these data at four stations since 1997 so there is an extensive data set from which to examine possible patterns. We believe that waiting for three years to analyze existing

data may result in a missed opportunity to optimize the upcoming studies.

2. Once monitoring begins, Dominion/North Carolina Power proposes to examine the relationship between hydropower peaking and downstream water quality only from "warm-weather" months, as those months are the most likely periods in which water quality standards in Roanoke River might be contravened should hydropower operations cause river water to pool in the adjacent swamps. We suggest that since river flow and water quality data are readily available from all months of the year, the relationship between hydropower peaking and downstream water quality be examined during "cool-weather" months as well to determine whether effects occur, even on a lower impact scale. The use of data from all months of the year will increase the probability of detecting the influence, or lack thereof, of hydropower peaking on downstream water quality in general.

We appreciate the opportunity to comment on the draft Downstream Water Quality Monitoring Plan. If you have any questions or need further information, please contact me at 252/338-3607.

cc: Jennifer Everett, N.C. Division of Water Quality
Stratford Kay, N.C. Division of Water Quality
Bennett Wynne, N.C. Wildlife Resources Commission

ROANOKE RAPIDS AND GASTON
ARTICLE 404 DOWNSTREAM WATER QUALITY PLAN
APPENDIX 2
RECORD OF CONSULTATION FOR PLAN REVISION 1

I. Initial 5-year review meeting with consulting parties
See item 4 in Action Item section

ROANOKE RAPIDS AND GASTON
PEAKING IMPACT ON DOWNSTREAM DO IN THE LOWER ROANOKE RIVER
SCOPING MEETING NOTES
November 4, 2009

1. Attendance:
Loren Wehmeyer - USGS
Chad Wagner - USGS
Bennett Wynne - NCWRC
Bob Graham – Dominion
Jim Thornton – Dominion
Stratford Kay – NCDW

2. Introduction
Jim Thornton had everyone introduce themselves then began a review of the reason for the project. The Roanoke Rapids and Gaston FERC license requires a study to determine if peaking operations at Roanoke Rapids Dam negatively impacts dissolved oxygen (DO) in the lower Roanoke. If so determined, Dominion is to reduce the impact by altering operations at the Roanoke Rapids dam.

There was some discussion of due dates. Jim will review and discuss with Loren to determine if a FERC extension of time is needed. All agreed to the extension of time in order to get the final version of the 1998 – 2005 report in the published format. There was consensus that a draft version would not be appropriate to file with FERC. There was some discussion concerning how the 2005 – 2009 study will mesh with other downstream studies required by the license (i.e. erosion and tree seedling studies and potential required operational changes).

3. Review of USGS Scope
Loren Wehmeyer reviewed the scope of work. A one dimensional model for timing of water moving down the river is used to track peaks and its effects. The draft 1998 – 2005 study indicated large rainfall events can have a significant impact on the river DO, potentially disguising peaking effects, or at least making it difficult to isolate peaking effects. There was discussion of use of rain gages; an NC State Doppler estimator tool

for rainfall may serve for additional data. There was consensus that for this study USGS's planned use of rainfall will be from 4 stations vs. 1 (1998 – 2005 report) and DO data from RR gage will be for the entire period. There was discussion concerning the use of May – June 15. There was consensus that this data will provide some good warm weather data to compare to the June 16 – November data.

There was discussion concerning a reference river, i.e. comparing the lower Roanoke DO conditions to a similar river without peaking re-regulation. Bob talked about the challenges faced in biological studies being conducted in the lower Roanoke and that some of the license implementation cooperative management teams had ruled that out because there just were not enough similarities with other rivers.

Loren stated that the 2005 – 2009 report has two key additional areas: (1) DO deficit should be added because it encompasses temperature effects and (2) there will be additional data that should support better statistical analysis. Other than better data, the statistical analysis should not be very different from the 1998 – 2005 report.

REPORTS
USGS not sure when the 1998 – 2005 report will be published. Likely will not complete 2005 – 2009 report until September 2010.

Action items:
1. Jim to send annual reports to Loren.
2. Jim to ask FERC for an extension of time for the 1998 – 2005 report
3. Loren to check when he expects 1998 – 2005 report to be published
4. Jim to ask FERC for an extension of time for the 2005 – 2009 report (October report date, March 31 determination date.
5. Bob to send Loren 2000 and 2001 relicensing lower Roanoke River water quality reports to Loren.
6. USGS should provide cost agreement to Dominion for signature (2005 – 2009 report).

II. Initiating E-mail correspondence from Dominion

From: James Thornton [mailto:james.thornton@dom.com]
Sent: Monday, November 09, 2009 1:10 PM
To: bennett wynne; Stratford.Kay@ncdenr.gov; Karoly, Cyndi; Dorney, John; Bob Graham
Cc: Loren L Wehmeyer; Al Hodge; Nisely, Myrl; Bill Bolin
Subject: Extension of Time, FERC Request, Roanoke Rapids Peaking Effect on Downstream Water Quality 2005- 2009 Report

Folks,

As we discussed in our meeting last week, I need to ask FERC for an extension of time not only for the 1998 – 2005 draft now being finalized by USGGS, but also for the 2005 – 2009 report of which we discussed the scope. One of the action

items for that meeting was to follow up with an extension of time request. My thought at that time was to ask for the extension next year sometime. However, once I reviewed the plan, the best way would be to ask for a revision to the plan. That way we will not need to ask for an extension of time every 5-years (assuming the study continues beyond the first cycle). To that end, I have revised the 2005 version of the plan and am attaching a draft of a revised plan. Please note revisions in the consultation section (2.2.2) and the schedule section (5.0). Please send any comments to me by December 9, 2009. Let me know if you have any questions.

Jim Thornton
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III. Response from NC Division of Water Quality

From: Kay, Stratford [mailto:stratford.kay@ncdenr.gov]
Sent: Thursday, February 18, 2010 1:16 PM
To: James Thornton (Generation - 3)
Cc: Dorney, John; Karoly, Cyndi; Strickland, Bev
Subject: RE: Extension of Time, FERC Request, Roanoke Rapids Peaking Effect on Downstream Water Quality 2005- 2009 Report

Dear Mr. Thornton:

I have reviewed your request for the schedule change in the FERC-approved plan mentioned below. This proposed change is acceptable to DWQ, with the following minor changes:

1. Please indicate on the first page of the final draft that this is a revision to the September 30, 1995 Downstream Water Quality Monitoring Plan.
2. Please indicate on p. 8 in section 3.3.1.4 that a copy of the letter also will be provided to my office, as it has been done previously.

Thank you,
Stratford H. Kay

CC: John Dorney
Cyndi Karoly
Bev Strickland

NOTE: These changes were made in the final revision to the Document.

IV. Response from NC Wildlife Resources Commission

From: bennett wynne [mailto:wynnemb@suddenlink.net]
Sent: Monday, November 23, 2009 11:02 AM
To: James Thornton (Generation - 3); Stratford.Kay@ncdenr.gov; 'Karoly, Cyndi'; 'Dorney, John'; Bob Graham (Services - 6)
Cc: 'Loren L Wehmeyer'; 'Al Hodge'; 'Nisely, Myrl'; Bill Bolin (Services - 6); Kornegay Pete
Subject: RE: Extension of Time, FERC Request, Roanoke Rapids Peaking Effect on Downstream Water Quality 2005- 2009 Report

Jim,

The NC Wildlife Resources Commission does not object to revision of the Dominion Virginia Power / North Carolina Power Downstream Water Quality Monitoring Plan's reporting schedule to accommodate the US Geological Survey's internal review and publishing requirements.

Thank you,

Bennett Wynne