

Roanoke Rapids and Gaston Hydropower Project  
FERC No. 2009

Implementation of Article 415

Study Plan:

Effects of Within-Week Peaking on Benthic Macroinvertebrates in Tributary Streams

APPENDIX 3

September 18, 2006

Introduction

Concerns were raised during the relicensing of the Roanoke Rapids/Gaston Project about the effects of within-week peaking operations on benthic macroinvertebrates in tributary streams to the lower Roanoke River downstream of Roanoke Rapids Dam.

As a result of settlement negotiations, the Order of Settlement issued by the Federal Energy Regulatory Commission (Commission) for the Project March 4, 2005 addressed the concerns with effects of within-week peaking on benthic macroinvertebrates in tributary streams (Article 415). This plan describes how studies to address these concerns will be conducted.

Background

As part of relicensing the Roanoke Rapids/Gaston Hydropower Project, studies were conducted that examined how the project's releases of the weekly flow declaration from John H. Kerr Reservoir may inundate floodplain areas downstream of the Roanoke Rapids Dam (Graham and Cannon 2001; Cannon and Graham 2002). These studies documented that under certain conditions water with relatively high dissolved oxygen may be released in such a way to penetrate the river levees via tributary streams and manmade breeches, inundate the floodplain, become hypoxic within the floodplain, and then drain back to the river. There is concern that these kinds of within-week peaking events may be detrimental to benthic macroinvertebrates in tributary streams.

Methods

Aquatic macroinvertebrate abundance and diversity in select tributary streams will be characterized in relation to areas affected and not affected by Dominion's peaking operations. Two or three relatively large tributaries in the river's low gradient reaches most susceptible to flooding will be studied. Candidates include Conoho, Conniott, and Indian creeks. The limits of inundation caused by peaking will be determined by a model

relating floodplain inundation to Roanoke River stage developed by Dr. Phil Townsend, University of Wisconsin (Townsend et al. 2000).

Sampling sites will be located upstream and downstream of the limits of inundation caused by peaking. Benthic macroinvertebrates will be collected from the tributary streams between Roanoke Rapids and Oak City using protocol for swamp waters outlined by the North Carolina Division of Water Quality (DENR 2003). These protocol call for sampling in February or early March. However, the potentially detrimental effects of peaking are unlikely to occur during this winter time frame as low water temperatures are likely to limit the microbial activity that causes hypoxic conditions. Therefore, an expansion of sampling over that recommended by DENR is proposed that may provide greater insight into peaking effects.

Sampling of benthic macroinvertebrates will be conducted in February per DENR swamp protocol for consistency with ongoing programs. Sampling will also occur during the first two weeks of June, and repeated during the last two weeks of June to compare non-peaking and peaking periods. Hydropower peaking operations are curtailed at Roanoke Rapids Power Station during the period March 1 to June 15, except for up to 5 days in March. Therefore, sampling during the first two weeks of June follows a prolonged period of uniform weekly flow releases, and sampling during the last two weeks of June coincides with a period when peaking will occur (given sufficient water availability).

The amount of effort to be devoted to sampling and appropriate statistical analyses will be determined in consultation with the contractor that will conduct the studies. The contractor will possess certification from the North Carolina Division of Water Quality (NCDWQ) in acceptable benthic macroinvertebrate sampling and sample processing techniques, have equivalent certification, or develop a quality control/quality assurance plan that meets NCDWQ approval.

For collections made both upstream and downstream of the limits of inundation caused by peaking, appropriate indices of water quality and/or community health (e.g., presence/absence, relative abundance, density, community similarity indices) will be calculated and compared following consultation with the contractor and CMT.

### Schedule

The first year of sampling will be 2007. Results of annual sampling in 2007, 2008 and 2009 will be used to assess the effects of unmodified peaking operations at Roanoke Rapids Power Station. A report detailing findings of this baseline period will be submitted to the Commission by February 28, 2010.

### Literature Cited

Cannon, J., and B. Graham. 2002. Load following at Roanoke Rapids Power Station, floodplain inundation, and lower Roanoke River mainstem and floodplain water quality studies conducted July 2001. Prepared for Dominion by Montgomery Watson Harza and Dominion.

DENR. 2003. Standard operating procedures for benthic macroinvertebrates. North Carolina Department of Environment and Natural Resources, Raleigh, North Carolina.

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Townsend, Philip A., Sam Pearsall, Brian McCrodden, Dean Randall, and Bruce Stauffer. 2000 as updated. Flood Model for the Lower Roanoke River, North Carolina. ArcGis Extension.