NC Division of Water Quality
Planning Section – Modeling & TMDL Unit
Technical Memorandum

February 3, 2006

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FROM: Pam Behm, Modeling & TMDL Unit

RE: 2006 Monitoring Plan for Falls of the Neuse Reservoir (Neuse River Basin)

This memo outlines the 2006 monitoring plan for Falls of the Neuse Reservoir and supercedes any references to data collection in 2006 in the original plan outlined in the February 15, 2005 memo from George Hunt. There is the possibility that the state will receive an extension for this study due to the loss of April-August 2005 chlorophyll *a* data. If that happens, the study will continue into 2007 and an addendum to this monitoring plan will be prepared.

The data to be collected in this study and the subsequent modeling analysis will allow the DWQ to determine the extent of impairment of the reservoir. A summary of the scope of the monitoring plan can be found in Table 1. Please let me know immediately if some aspect of the study will be difficult or impossible to obtain.

Lake Monitoring

This special study should continue through December 2006. Sampling events should be conducted twice each month, as close to every other week as possible during this period, for a total of approximately 24 sampling events. At the end of the study, all special study data should be provided to the Modeling & TMDL Unit, with a transmittal memorandum at the completion of the study. Special study data should be provided in an electronic format compatible with MS Excel or MS Access. If possible, updates should be sent to the Modeling & TMDL Unit in an electronic format compatible with MS Excel approximately every four months. Information collected during the cross-section study

should be provided to the Modeling & TMDL Unit in an electronic format compatible with MS Excel as soon as the data has been processed. These quarterly updates and the separate request for cross-section data are asked for so that the modeling process can begin as soon as possible, as time is critical on this project.

Table 1. Summary of lake samples for scoping study period covering January – December 2006.

Media	Type of analyses	No. of sites	No. of sampling events over period	No. of samples to be processed
Surface water	All chemical parameters	12	24	288
	Physicals	12	24	288
	Cross-sections & Lateral Physicals	9(10)	1	N/A
	Algae	4	6-12	24-48
	Continuous Temperature	3	Continuous, 10 *in-situ* Tidbits	N/A
Sediment	SOD	4	2	8
	Benthic nutrient flux (TN and TP)	4	2	8

Spatial Coverage.
Sample all ten existing monitoring stations with the exception of NEU013 (i.e., NEU010, NEU013B, NEU0171B, NEU018E, NEU019C, NEU019E, NEU019L, NEU019P, NEU020D). Discontinue sampling of NEU013 because during low flow conditions, there is significant channelization in this part of the reservoir and the placement of NEU013 does not capture flow from Ellerbe Creek. Establish three new stations at Ellerbe Creek cove, Ledge Creek cove, and Little Lick Creek cove. All stations should be located upstream of the mouth. Establish coordinates (i.e. latitude and longitude) and a unique site label for each new site. Sampling at the new sites should begin as soon as possible. Total number of locations: 12

Parameters.

- Physical parameters: depth profiles of dissolved oxygen, water temperature, pH, fluorescence, and conductivity. Secchi depth should also be included as a physical parameter. These data should be collected along with the chemical data bi-weekly, as stated previously.

  Along the cross sections described in the following section take three measurements of physical data, including one measurement in the middle of the waterbody, one measurement at the right side of the waterbody, and one measurement at the left side of the waterbody. This data is necessary to test a lateral-average assumption. The timing of this lateral data collection can be at the discretion of the collectors, however, it is preferred if the data is collected when

the water level in the reservoir is as close to normal pool elevation as possible. If resources and time allow, a second lateral data collection would be desired.

- Chemical parameters: total organic carbon (TOC), total phosphorus, total dissolved phosphorus, orthophosphorus, ammonia, TKN, nitrite & nitrate, BOD5, total solids, total suspended solids, total volatile solids, and turbidity. Biological Parameters: chlorophyll *a*.

  For all stations (including three new stations), chemical and biological parameters should be taken from the photic zone (i.e. twice the secchi depth). In addition, for mainstem stations only (NEU0171B, NEU018E, NEU019E, NEU019L, NEU019P, and NEU020D), collect samples of the following parameters at a depth of one-third of total depth from the bottom: total organic carbon (TOC), total phosphorus, ammonia, TKN, nitrite and nitrate, and total suspended solids.

Cross Sections.
Measure the bathymetry at every location (including NEU013) located on the included map. There are ten (10) cross sections shown (See Figure 1). If resources and time are scarce, then the cross-section measurement at Beaverdam Lake should not be performed. Cross-sectional data should be taken during immediately and as close to normal pool elevation as possible. Notes describing the lake bottom should be recorded at each of the cross sections (e.g. rocky, sandy, muddy, tree stumps).

Phytoplankton Data.
Phytoplankton assemblages at four sites should be assessed for structure (i.e. taxa identification and dominance), density, and biovolume. Assemblages should be assessed at a minimum of every other month, but preferably once a month, for a total of approximately 6-12 sampling events. The four sites selected for assessment are: NEU013B, NEU018E, NEU019P, and Beaverdam Lake NEU019C.

Continuous Temperature Data.
Using the temperature thermistors, continuous temperature should be measured at three stations using a total of 10 thermistors. Table 2 shows a summary of requested thermistor sampling.

Table 2. Summary of Thermistor Sampling

Ambient Lake Station	Existing Buoy	Number of Thermistors at Station	Depths to Place Thermistors (meters)
NEU018E	CA04041	2	1,3
NEU019E	CA04013	2	1,3
NEU019P	CA04035	6	1,3,5,7,9,11

Thermistors should be set to record temperature every two hours and should be deployed for the entire scoping period to December 2006.

Sediment Oxygen Demand and Nutrient Flux.
Sediment oxygen demand (SOD) and nutrient flux should be measured at four different locations on two separate occasions. The stations where SOD and nutrient flux should be measured are: NEU013B, NEU018E, NEU019P, and Beaverdam Lake (NEU019C). Total number of sediment samples to be analyzed: 8.

Watershed Monitoring

This section includes monitoring plans for both the ambient program and Intensive Survey. There are no monitoring coalition stations within this watershed to assist with study development. There is no change for ambient monitoring as described in the original plan outlined in the February 15, 2005 memo from George Hunt.

Ambient:
Duration. March 2005 to December 2006.

Frequency. The minimum monitoring frequency for all stations is two times per month, with 10 to 14 days between events, for the desired parameters. If resources allow, a more ambitious weekly monitoring program should be pursued. Number of sampling events per year: 20 in 2005, 24 in 2006.

Spatial coverage. The following stations should have this enhanced monitoring: J0770000 (Eno River @ US 501 nr Durham), J0820000 (Little River @ SR1461 nr Durham), J1100000 (Flat River @ SR1004 nr Willardsville), J1210000 (Knap of Reeds Creek at WWTP Outfall nr Butner), J1330000 (Ellerbee Creek @ SR1636 nr Durham), and J1890000 (Neuse River @ SR2000 nr Falls). Figure 2 shows the locations of these stations. Total number of stations: 6

Parameters. The following parameters should be included in the enhanced monitoring: nitrogen series (ammonia-nitrogen, nitrate/nitrite-nitrogen, TKN-nitrogen), total phosphorus, and TSS. This enhanced monitoring should not replace standard ambient monitoring including physicals and metals.

Intensive Survey (or Ambient Monitoring)
Duration. March 2005 to December 2006

Frequency. The monitoring frequency for all tributary chemical stations is once every two months, as close to every other month as possible. If resources are not available for an every-other-month schedule, quarterly is acceptable.

Spatial coverage. The following stations should be monitored: Little Lick Creek at Stallings Road, Lick Creek at Kemp Road, Ledge Creek at Peed Road, Beaverdam Creek at Horseshoe Road, and if resources allow, Horse Creek at Thomson Mill Road. Note that EEP will also be conducting a special study on Little Lick Creek. Thus, monitoring may be accomplished using a combination of resources. Total number of stations: 4(5)

Parameters. The following chemical parameters should be included: physicals (i.e., DO, pH, temperature, conductivity), nitrogen series (ammonia-nitrogen, nitrate/nitrite-nitrogen, TKN-nitrogen), total phosphorus, and TSS. Cross-section and flow information should also be collected at each site.

Hydrology. For the Knap of Reeds Creek site, the USGS now has an established and working flow gage. Therefore, there is no need to continue efforts to establish a rating curve for Knap of Reeds Creek.

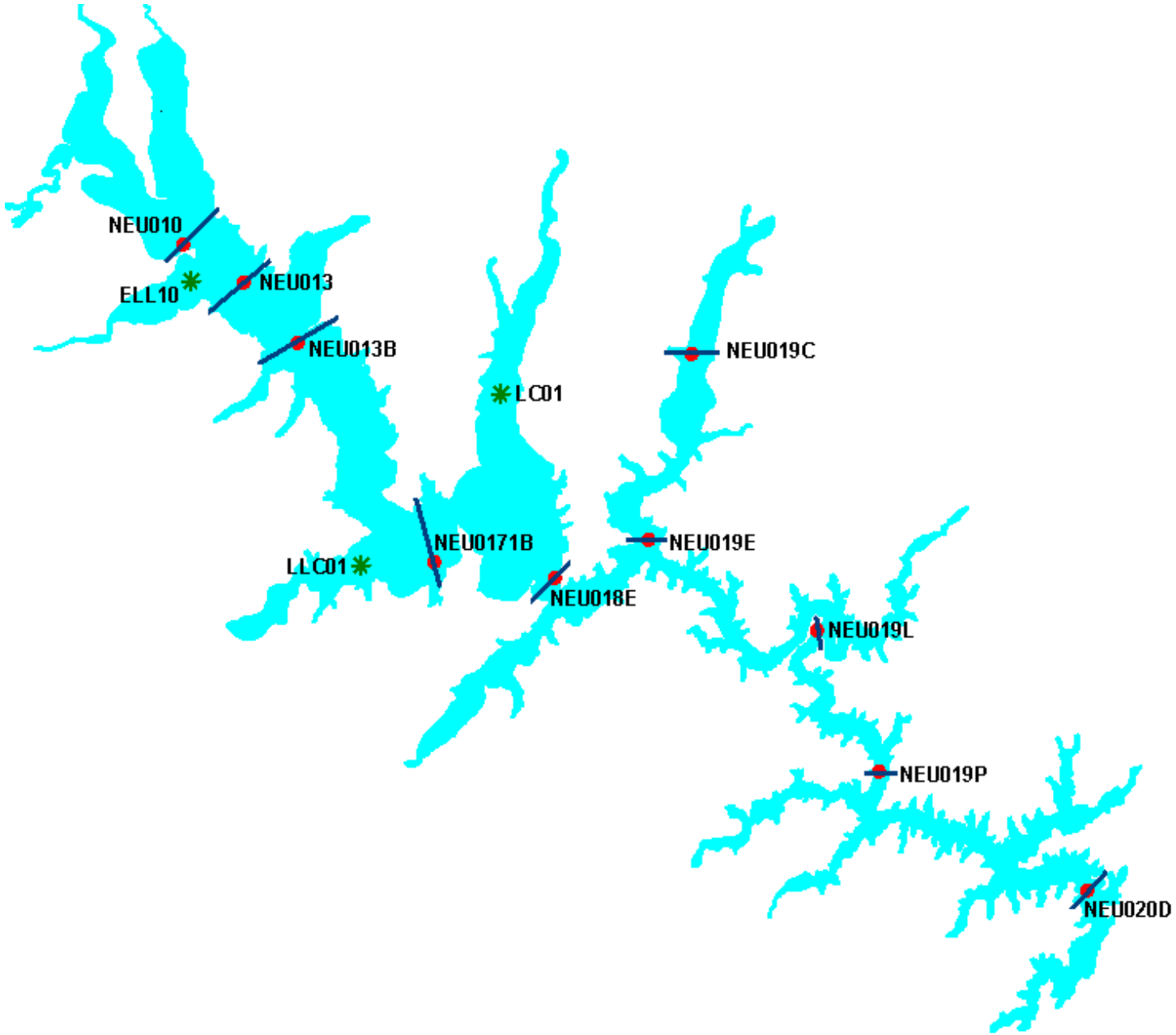

Figure 1. Falls of the Neuse Reservoir with locations of sampling sites. The three new sites are denoted by the green star symbol. Station NEU013 is shown only for cross section measurement.

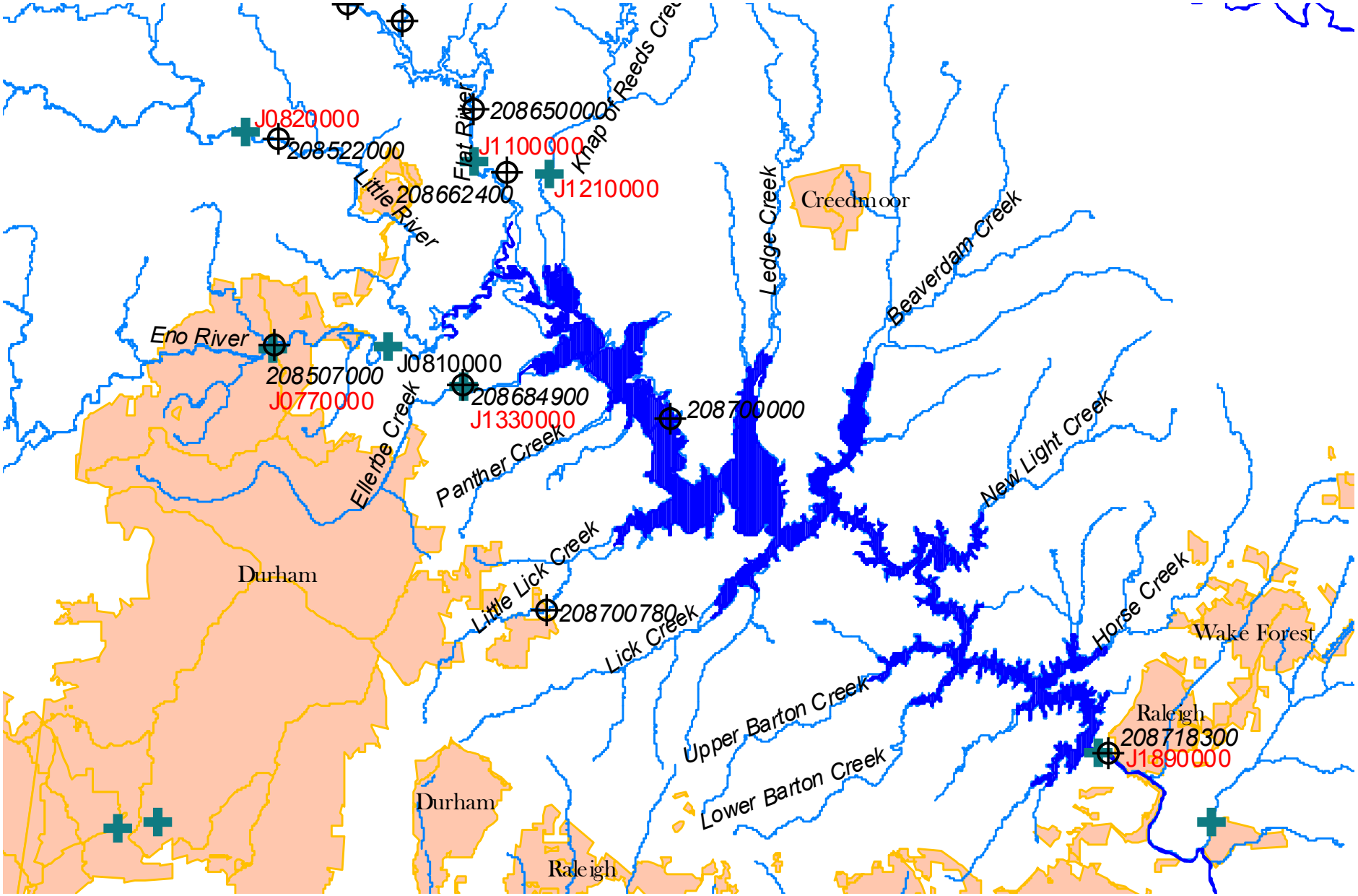

Figure 2. DWQ Watershed Monitoring Stations.