



**Upper Neuse River Basin Association
Special Study Plan
Date Issued: August 4, 2015**

Special Study Name, ID# and Origination:

High Flow Event Sampling, SS.LR.3

This Special Study originated in the Cardno FY 2015 monitoring contract and was extended into the 2016 contract to provide for additional water quality data collection representative of high flows.

Responsible Contractor(s):

Cardno – Planning, management and oversight, data review and analysis, reporting

Environment 1 – Field sampling and laboratory analysis

Purpose of Study:

This Special Study is essentially an extension of the Routine Monitoring effort intended to obtain supplementary water quality data from select tributaries to Falls Lake under high flow conditions. High flow conditions are qualitatively defined for this study as periods when stream flow increases markedly above baseflow or normal flows in response to a rain event, generally characterized by faster water velocity, higher water levels and/or increased turbidity. Since high flow conditions are relatively rare (as compared to the daily flows at a specific site over a long period of record), they are not likely to be well-represented in the regular, pre-scheduled Routine Monitoring efforts of the Lake Loading Stations. This supplemental effort helps to ensure that data are available for tributaries or locations that are expected to reflect substantially different pollutant loading during periods of high flows. Data from this study will help to inform the updated modeling of Falls Lake, as well as providing general insight into water quality characteristics during typically under-represented sampling conditions.

This Special Study supports these objectives of the UNRBA Monitoring Program:

- Lake response modeling,
- Support of regulatory options, and
- Source allocation and estimation of jurisdictional loading

Anticipated Schedule:

The number of High Flow Events in a given monitoring year is dictated by the scope of work and associated budget for that year. The FY2016 (July 1, 2015 through June 30, 2016) contract provides for two High Flow Events. Timing of the events is dependent upon rain event magnitude, and the associated stream response. Cardno is responsible for determining when a sampling event occurs, based upon weather forecasts and observations. This is discussed further below.

Summary of Study Methods:

Samples will be collected from the eight Lake Loading Stations listed in Table 1 during a period of high flow. These stations include significant loading contributors to Falls Lake, along with wetland dominated and/or stagnant sites observed to have low flow under most routine monitoring conditions.

The same grab sample and field data collection procedures, laboratory analyses, and quality assurance considerations are employed for High Flow Sampling as are used for the Lake Loading Stations during Routine Monitoring. Parameters to be measured include nutrients, chlorophyll *a*, and carbon concentrations associated with storm flows, as well as field measurements of temperature, pH, specific conductance and dissolved oxygen (the same as in the Routine Monitoring of Lake Loading stations). Four of the streams involved in High Flow Event Sampling have USGS gaging stations upstream of the sampling location, so water quality results can be linked to gaged flows or height; the other four are not gaged (see Table 1). As with the Routine Monitoring, a dye-based qualitative method is used to estimate water velocity at each station at the time of sampling.

Table 1. High-flow Event Sampling Stations

Station ID	Waterbody	Location Description	Gaged Flow
FLR-5.0	Flat River	at Old Oxford Highway	Yes
LTR-1.9	Little River	at Old Oxford Road	Yes
ENR-8.3	Eno River	at Old Oxford Highway	Yes
LLC-1.8	Little Lick Creek	at Patterson Road	Stage only
UNT-0.7	Unnamed Tributary	at Northside Road	No
LGE-5.1	Ledge Creek	at Highway 15	No
ROB-2.8	Robertson Creek	at Brassfield Road	No
BDC-2.0	Beaverdam Creek	at Horseshoe Road	No

Cardno developed a detailed evaluation of rainfall pattern and streamflow responses as part of the Storm Event Sampling Special Study (provided as a separate Special Study Plan). The same general factors presented in that plan will inform the decision process for initiating a High Flow Sampling event. It is the general intent of this plan to collect samples while streamflow is significantly above baseflow or “normal” conditions, as represented by markedly increased flows, water levels and/or turbidity as noted above.

Because of the considerable spatial and temporal variability in tributary flows to Falls Lake, it is unlikely for any given rain event to result in the same degree of increase in stream flows in all of the target tributaries. Thus, selection of a rain event for sampling is based on weather forecasts and real-time USGS stream gage data, but is not based on a specific quantitative metric or trigger. In the event a High Flow Sampling Event is initiated by Cardno, but some of the target stations do not reflect substantially higher flows at the time of sample collection (e.g., as a result of spatial variability in rainfall amounts across the watershed), Cardno will communicate with field and laboratory personnel to avoid collecting and/or analyzing samples that do not represent high flow conditions. For the locations with USGS gages, Cardno will evaluate the stage or flow at the time of sample collection with respect to previously sampled conditions at those locations before authorizing Environment 1 to begin laboratory analysis. Samples that are collected but do not represent high flows will not be analyzed. This practice should provide the most efficient use of monitoring resources.



Quality Assurance/Quality Control:

All pertinent QA/QC sampling considerations in place for the Routine Monitoring also apply to this Special Study. Laboratory analyses will be performed by the same state-certified lab that analyzes samples for the UNRBA Routine Monitoring and will follow the DWR-approved UNRBA Quality Assurance Project Plan for sample analysis.

Reporting/Deliverables:

Cardno will communicate with the UNRBA Executive Director on a regular basis on the progress of this Special Study. Status updates will be provided to the UNRBA Path Forward Committee and the Board of Directors at their regular meetings during Cardno's updates on the overall Monitoring Program status.

Discussion of the status and any available results from this Special Study will be included as part of the Mid-Year and Annual Reports. Data generated by this Special Study will largely be used to inform future lake modeling efforts, thus there will not necessarily be a separate detailed analysis of High Flow Sampling data, but summary statistics and graphics may be developed to portray relationships between water quality and flow conditions.

Data from the High Flow Sampling will be included in the overall UNRBA database and will thus be available online to UNRBA members, agencies, and the general public.