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**Addendum to**

**Quality Assurance Project Plan:**  
**Type N Experimental Buffer Treatment Study:**  
**Addressing Buffer Effectiveness on Riparian Inputs,**  
**Water Quality, and Exports to Fish-Bearing Waters**  
**in Basaltic Lithologies**

June 2008

Publication Number 07-03-103ADD1



DEPARTMENT OF  
**ECOLOGY**  
State of Washington

## **Publication Information**

### **Addendum**

This addendum is available on the Department of Ecology's website at [www.ecy.wa.gov/biblio/0703103ADD1.html](http://www.ecy.wa.gov/biblio/0703103ADD1.html)

### **Original Publication**

Quality Assurance Project Plan: Type N Experimental Buffer Treatment Study: Addressing Buffer Effectiveness on Riparian Inputs, Water Quality, and Exports to Fish-Bearing Waters in Basaltic Lithologies.

Publication No. 07-03-103

The Quality Assurance Project Plan is available on the Department of Ecology's website at [www.ecy.wa.gov/biblio/0703103.html](http://www.ecy.wa.gov/biblio/0703103.html)

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**DEPARTMENT OF ECOLOGY**  
Environmental Assessment Program

June 12, 2008

**TO:** Will Kendra, Statewide Operations Section Manager

**THROUGH:** Martha Maggi, Groundwater/Forests and Fish Unit Manager,  
Statewide Operations Section

**FROM:** Stephanie Estrella, Groundwater/Forests and Fish Unit, Statewide  
Operations Section

**SUBJECT:            ADDENDUM TO QUALITY ASSURANCE PROJECT PLAN:  
TYPE N EXPERIMENTAL BUFFER TREATMENT STUDY:  
ADDRESSING BUFFER EFFECTIVENESS ON RIPARIAN  
INPUTS, WATER QUALITY, AND EXPORTS TO FISH-  
BEARING WATERS IN BASALTIC LITHOLOGIES**

**PUBLICATION NUMBER: 07-03-103ADD1**  
**PROJECT CODE: 06-510**

## **Background**

The Groundwater/Forests and Fish Unit has been sampling the Type N Experimental Buffer Treatment (Type N) study sites since 2006. The most recent Quality Assurance (QA) Project Plan was completed in 2007 (Ehinger and Estrella) and our study objectives, design, and quality control procedures remain the same. The following changes, however, have been made since 2007:

- We are measuring additional water quality parameters from our sediment grab samples and turbidity threshold samples collected by the pump sampler.
- We have omitted bedload sampling from the study design.

This addendum documents these changes. The original QA Project Plan (Ehinger and Estrella, 2007) applies except as modified in this addendum.

## Sampling and Measurement Procedures

Type N field crews have been collecting grab samples every six weeks from the eight stream basins selected for export studies and fisheries assessments. We have been submitting the suspended sediment grab sample for suspended sediment concentration (SSC) analysis. In April 2007, we added the total non-volatile suspended solids (TNVSS) analysis to the suspended sediment grab samples. The sample collection and analysis methodology has not changed for the following parameters:

- conductivity
- dissolved oxygen
- pH
- temperature
- nitrite-nitrate
- ammonia
- total persulfate nitrogen
- total phosphorus
- orthophosphate
- total organic carbon

Table 1 lists the measurement methodology and resolution for the water quality parameters collected and analyzed for the Type N study.

Pump samplers have been collecting additional water samples for SSC analysis according to the Turbidity Threshold Sampling (TTS) methodology described in Estrella (2006). In April 2007, we began submitting the samples for both SSC and TNVSS analysis.

In March 2008, we added nutrient sampling to the TTS methodology. We have been submitting every odd-numbered bottle in the pump sampler carousel for SSC and TNVSS analysis, and every even-numbered bottle for nitrite-nitrate, total persulfate nitrogen, and total phosphorus analysis. The even-numbered slots in the carousel contain acid-washed bottles washed by Type N field staff. To assess possible contamination from the acid-washing process, we are submitting 10 to 15 field blanks per sampling year.

In the field, each even-numbered sample is agitated, poured off into the appropriate container for each analysis, preserved, labeled, and stored on ice until delivery to the Manchester Environmental Laboratory (Table 2). Because the nutrient samples are preserved 15 minutes after collection, we flag each nutrient submission on the Laboratory Analysis Required form and the laboratory qualifies them as estimates.

Type N field crews have been collecting bedload samples every six weeks since the onset of the study. Because sampling only takes place during the sampling runs and most often misses high-flow events, the Cooperative Monitoring, Evaluation, and Research Committee (CMER) has agreed to eliminate bedload sampling from the study design.

Table 1. Measurement methodology and resolution for the water quality parameters collected and analyzed in the field and laboratory for the Type N Experimental Buffer Treatment Study.

Parameter	Methodology	Resolution
Conductivity	Electrode	1 $\mu$ hos/cm ( $\mu$ S/cm) <sup>b</sup>
Dissolved Oxygen	Winkler titration	0.1 mg/L <sup>b</sup>
pH	Electrode	0.1 unit <sup>b</sup>
Water Temperature	StowAway TidbiT -5°C to 37°C	0.20°C
Air Temperature	StowAway TidbiT -20°C to 50°C	0.40°C
Soil Temperature	StowAway TidbiT -5°C to 37°C	0.20°C
Nitrate-Nitrite	SM 4500-NO <sub>3</sub> <sup>-</sup> I <sup>a</sup>	0.01 mg/L <sup>c</sup>
Ammonia	SM 4500-NH <sub>3</sub> H <sup>a</sup>	0.01 mg/L <sup>c</sup>
Total Persulfate Nitrogen	SM 4500-NO <sub>3</sub> <sup>-</sup> B <sup>a</sup>	0.025 mg/L <sup>c</sup>
Total Phosphorus	EPA200.8	0.001 mg/L <sup>c</sup>
Soluble Reactive Phosphorus or Orthophosphate	SM 4500-P G <sup>a</sup>	0.003 mg/L <sup>c</sup>
Total Organic Carbon	EPA415.1	1 mg/L <sup>c</sup>
Suspended Sediment Concentration	ASTMD3977B	1 mg/L <sup>c</sup>
Total Non-Volatile Suspended Solids	EPA160.4	1 mg/L <sup>c</sup>
Turbidity	DTS 12 Digital Turbidity Sensor	0.01 NTU

<sup>a</sup> SM=Standard Methods

<sup>b</sup> Ward (2001)

<sup>c</sup> Manchester Environmental Laboratory (2005)

Table 2. Sample container, preservation, and holding period requirements for the water quality parameters analyzed at the Manchester Environmental Laboratory for the Type N Experimental Buffer Treatment Study.<sup>a</sup>

Parameter	Container	Preservation	Holding Time
Nitrite-Nitrate	125 mL clear wide-mouth polyethylene, pre-acidified with H <sub>2</sub> SO <sub>4</sub>	H <sub>2</sub> SO <sub>4</sub> to pH<2; cool to <4°C	28 days
Ammonia	125 mL clear wide-mouth polyethylene, pre-acidified with H <sub>2</sub> SO <sub>4</sub>	H <sub>2</sub> SO <sub>4</sub> to pH<2; cool to <4°C	28 days
Total Persulfate Nitrogen	125 mL clear wide-mouth polyethylene, pre-acidified with H <sub>2</sub> SO <sub>4</sub>	H <sub>2</sub> SO <sub>4</sub> to pH<2; cool to <4°C	28 days
Total Phosphorus	60 mL clear narrow-mouth polyethylene, pre-acidified with HCl	1:1 HCl to pH<2; cool to <4°C	28 days
Soluble Reactive Phosphorus or Orthophosphate	125 mL amber wide-mouth polyethylene; 0.45 µm pore size filters	Filter in field; cool to <4°C	48 hours
Total Organic Carbon	60 mL clear narrow-mouth polyethylene, pre-acidified with HCl	1:1 HCl to pH<2; cool to <4°C	28 days
Suspended Sediment Concentration	1000 mL clear wide-mouth polyethylene	Cool to <4°C	7 days
Total Non-Volatile Suspended Solids	1000 mL clear wide-mouth polyethylene	Cool to <4°C	7 days

<sup>a</sup> Manchester Environmental Laboratory (2005)

Table 3. Report submittal schedule for the Type N Experimental Buffer Treatment Study.

<b>Environmental Information System (EIM) Data Set</b>	
EIM Data Engineer	Stephanie Estrella
EIM User Study ID	WEHI0000
EIM Study Name	Type N Experimental Buffer Treatment Study
EIM Completion Due	December 31, 2011
<b>Final Report</b>	
Report Author Lead	Bill Ehinger
Schedule:	
Report Supervisor Draft Due	December 31, 2011
Report Client/Peer Draft Due	March 31, 2012
Report External Draft Due	May 31, 2012
Report Final Due (original)	July 31, 2012

Annual progress reports will be submitted to the Washington State Department of Natural Resources and then to CMER. The final report will be published as a CMER report in conjunction with the other cooperators.

## References

Ehinger, W. and S. Estrella. 2007. Quality Assurance Project Plan: Type N Experimental Buffer Treatment Study: Addressing Buffer Effectiveness on Riparian Inputs, Water Quality, and Exports to Fish-Bearing Waters in Basaltic Lithologies. Washington State Department of Ecology, Environmental Assessment Program, Lacey, WA. 28 pp. + appendices. Publication No. 07-03-103. [www.ecy.wa.gov/biblio/0703103.html](http://www.ecy.wa.gov/biblio/0703103.html)

Estrella, S. 2006. Standard Operating Procedures for Turbidity Threshold Sampling. Washington State Department of Ecology, Environmental Assessment Program, Lacey, WA. 11 pp. + appendices.

Manchester Environmental Laboratory. 2005. Lab Users Manual, 8<sup>th</sup> Edition. Environmental Assessment Program, Washington State Department of Ecology, Manchester, WA. 194 pp.+

cc: William Ehinger, Environmental Assessment Program  
Stuart Magoon, Manchester Environmental Laboratory  
Bill Kammin, Ecology Quality Assurance Officer