Quality Assurance Project Plan

Lead and Copper Concentrations In North Creek, Gig Harbor

by
Steven Golding

Washington State Department of Ecology
Environmental Assessment Program
Olympia, Washington 98504-7710

May 2008

Publication Number 08-03-106

Publication Information

This plan is available on the Department of Ecology's website at www.ecy.wa.gov/biblio/0803106.html.

Data for this project will be available on Ecology's Environmental Information Management (EIM) website at www.ecy.wa.gov/eim/index.htm. Search User Study ID, SGOL009.

Ecology's Project Tracker Code for this study is 08-088.

303(d) Listings Addressed in this Study: North Creek (WRIA 15; LLID 1225911473375) – lead

For more information contact:

Carol Norsen
Environmental Assessment Program
P.O. Box 47600
Olympia, WA 98504-7600
E-mail: CNOR461@ecy.wa.gov
Phone: 360-407-7486

Washington State Department of Ecology - www.ecy.wa.gov/

- Headquarters, Olympia 360-407-6000
- Northwest Regional Office, Bellevue 425-649-7000
- Southwest Regional Office, Olympia 360-407-6300
- Central Regional Office, Yakima 509-575-2490
- Eastern Regional Office, Spokane 509-329-3400

Quality Assurance Project Plan

Lead and Copper Concentrations in North Creek, Gig Harbor

May 2008

Approved by:

Signature[1]:	Date: May 2008
Sally Lawrence, Water Quality Program, Northwest Regional Office	
Signature:	Date: May 2008
Dave Garland, Unit Supervisor, Water Quality Program, Northwest Regional Office	
Signature:	Date: April 2008
Kevin Fitzpatrick, Section Manager, Water Quality Program, Northwest Regional Office	
Signature:	Date: April 2008
Steven Golding, Principal Investigator, Toxics Studies Unit, EAP[2]	
Signature:	Date: May 2008
Brandee Era-Miller, EIM[3] Data Engineer, Toxics Studies Unit, EAP	
Signature:	Date: April 2008
Dale Norton, Author's Unit Supervisor, Toxics Studies Unit, EAP	
Signature:	Date: April 2008
Will Kendra, Author's Section Manager, EAP	
Signature:	Date: April 2008
Bob Cusimano, Section Manager for Project Study Area, EAP	
Signature:	Date: April 2008
Stuart Magoon, Director, Manchester Environmental Laboratory, EAP	
Signature:	Date: April 2008
Bill Kammin, Ecology Quality Assurance Officer	

[1] Signatures are not available on the Internet version
[2] Environmental Assessment Program
[3] Environmental Information Management system

Table of Contents

Abstract

This document describes a plan for obtaining metals and ancillary water quality data on North Creek in Gig Harbor, Pierce County, Washington. Samples will also be taken from Donkey Creek immediately downstream of North Creek. The metals of interest are lead and copper. Approximately 15 samples will be collected, five on each of three occasions during the spring of 2008. Clean sampling techniques and low-level analytical methods will be used.

The Gig Harbor Sportsman Club has been implicated as a source of lead in North Creek. Monitoring downstream of Club property has found lead concentrations an order of magnitude above (exceeding) Washington State water quality criteria. The headwaters of North Creek are within one mile above Club boundaries. There are no known sources of lead in North Creek upstream of the Club.

Results from the study will be used to (1) evaluate the Club as a source of lead and copper, (2) determine if water quality criteria are exceeded, and (3) make recommendations for federal Clean Water Act 303(d) listings, as appropriate.

North Creek downstream of the Club was on the 2004 303(d) list of impaired waterbodies as Category 5 for dissolved lead concentrations exceeding water quality standards. The 2004 listing was based on an error in identifying sampling occasions.

Each study conducted by the Washington State Department of Ecology must have an approved Quality Assurance Project Plan. The plan describes the objectives of the study and the procedures to be followed to achieve those objectives. After completion of the study, a final report describing the study results will be posted to the Internet.

Background

North Creek is located east of Point Defiance on the Kitsap peninsula within the city of Gig Harbor. The creek drains a small watershed of approximately 0.2 square miles made up of mixed forest, family residences, a shooting range, athletic fields, and a business park. North Creek discharges into Donkey Creek, a salmon-bearing stream which flows through the city of Gig Harbor and into Puget Sound.

The Gig Harbor Sportsman Club (the Club) is an active shooting range located off Burnham Drive in Gig Harbor and has operated since the 1940s. It consists of a shotgun range with seven regulation trap fields and a rifle and pistol range. More recently, property nearby has been developed for residential and business uses.

Responding to a citizen complaint about the water quality of North Creek, traversing Club property, the Tacoma-Pierce County Health Department collected water and soil samples from North Creek in 2002 (Table 1). Table 1 shows the results from water samples. Dissolved lead

was found in concentrations above 200 µg/L compared with an acute water quality criterion of 6.62 µg/L. The headwaters of North Creek are within one mile above the Club. There are no known sources of lead upstream of the Club.

Table 1. Results from Tacoma-Pierce County Health Department water samples from North Creek, May 9, 2002.

Waterbody	Site*	Parameter	Result	Water Quality Criteria (µg/L)	
				Acute	Chronic
North Creek	1A	Dissolved lead	231 µg/L	6.62	0.26
	1B	Dissolved lead	208 µg/L	6.62	0.26
	1C	TR lead**	210 µg/L	--	--
	1	Hardness	13 mg/L	--	--
	2A	Dissolved lead	19.5 µg/L	7.20	0.28
	2B	Dissolved lead	21.1 µg/L	7.20	0.28
	2C	TR lead**	19.1 µg/L	--	--
	2	Hardness	14 mg/L	--	--
Donkey Creek	3A	Dissolved lead	ND	30.8	1.20
	3B	Dissolved lead	ND	30.8	1.20
	3C	TR head**	ND	--	--
	3	Hardness	51 mg/L	--	--

*1A, 1B, 1C - North Creek adjacent to Sportsman Club.
2A, 2B, 2C - North Creek above Sportsman Club.
3A, 3B, 3C - Donkey Creek downstream of North Creek.
Samples A and B are replicates.
** Total metals are also referred to as *total recoverable* (TR) metals.
ND – non-detect.

North Creek downstream of the Club was placed in Category 5 on the 2004 303(d) list of impaired waterbodies for exceeding water quality criteria for lead (WQP Policy 1-11, 2006). However, the listing was not adequately substantiated as data of adequate quality were available from only one day of monitoring by the Tacoma-Pierce County Health Department. To qualify for Category 5, exceedances of water quality standards must be found on two or more sampling dates.

The Sportsman Club site was withdrawn from the Voluntary Cleanup Program for cleanup sites in May 2006 due to inactivity. Its current status is awaiting a Site Hazard Assessment (SHA). The SHA will rank the site and potentially add it to Washington State Department of Ecology's (Ecology's) Sites List database. In Pierce County, the SHAs are typically conducted by the Tacoma-Pierce County Health Department (Rose, 2008).

Project Description

Ecology will conduct a study to measure lead concentrations in North Creek and Donkey Creek and evaluate the Sportsman Club as a potential source. Copper will also be monitored as it is often elevated in surface waters and is used in bullet casings. Data will be obtained on flow, hardness, and total suspended solids (TSS) to aid in interpreting the results.

The objectives of the study will be to:

- Determine if lead and copper concentrations in North Creek and Donkey Creek are higher than (exceeding) Washington State water quality criteria.
- Evaluate sources of lead and copper.
- Make recommendations for 303(d) listings under the federal Clean Water Act, as appropriate.

Sampling will take place at five sites on three occasions. Two of the North Creek sites will be adjacent to the Club, one upstream and one downstream. North Creek will also be sampled just upstream of its confluence with Donkey Creek. Donkey Creek will be sampled upstream and downstream of the confluence. Sampling locations are shown in Figure 1.

Ecology will use the results from the study to determine if the shooting range is contributing lead or copper to North Creek resulting in exceedances of water quality standards. Results from the study will be available to surface water managers, regulatory agencies, and the public.

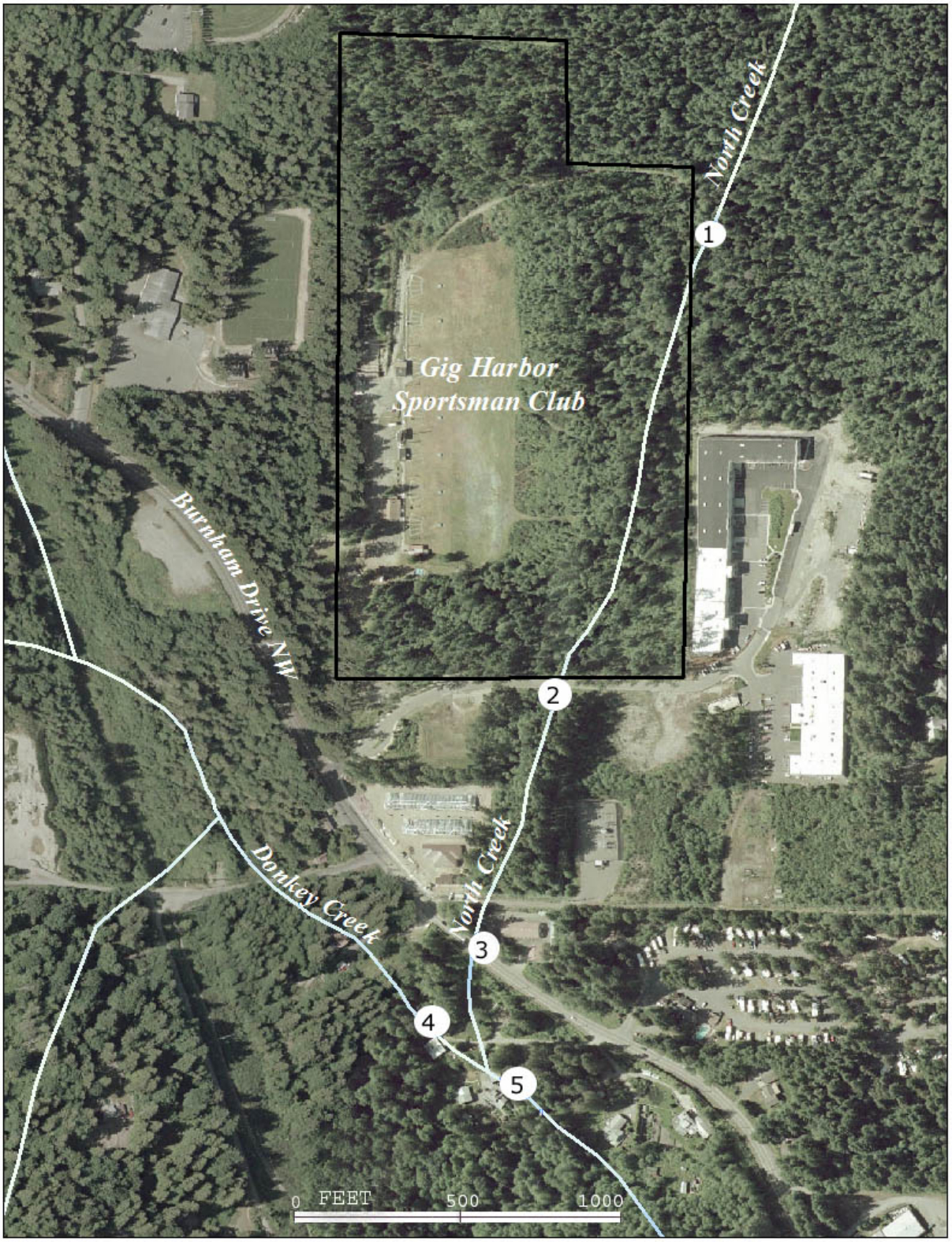

Figure 1. Site map showing Sportsman Club boundaries, creeks, and proposed sampling sites.

Organization and Schedule

The following people are involved in this project. All are employees of the Washington State Department of Ecology.

Table 2. Organization of project staff and responsibilities.

Name/unit and section/ regional office/phone	Title	Responsibilities
Steven Golding Toxic Studies Unit Statewide Coordination Section EAP Headquarters (360) 407-6701	Project Manager/ Principal Investigator	Writes the QAPP, oversees field sampling and transportation of samples to the laboratory, conducts QA review of data, analyzes and interprets data, and writes the draft report and final report.
Brandee Era-Miller Toxic Studies Unit Statewide Coordination Section EAP Headquarters (360) 407-6771	EIM Data Engineer	Enters data into EIM.
Dale Norton Toxic Study Unit Statewide Coordination Section EAP Headquarters (360) 407-6765	Unit Supervisor	Provides internal review of the QAPP, approves the budget, and approves the final QAPP.
Bob Cusimano Western Operations Section EAP Headquarters (360) 407-6698	Section Manager	Reviews the project scope and budget, tracks progress, reviews the draft QAPP, and approves the final QAPP.
Sally Lawrence Water Quality Program Northwest Regional Office (425) 649-7036	EAP Client	Clarifies scopes of the project, provides internal review of the QAPP, and approves the final QAPP.
Stuart Magoon EAP, Manchester Environmental Laboratory (360) 871-8801	Director	Approves the final QAPP.
William R. Kammin EAP (360) 407-6964	Ecology Quality Assurance Officer	Reviews the draft QAPP and approves the final QAPP.

EAP – Environmental Assessment Program
EIM – Environmental Information Management system
QAPP – Quality Assurance Project Plan

Table 3. Proposed schedule for completing field and laboratory work, data entry into EIM, and reports.

Field and laboratory work	
Field work completed	May, 2008
Laboratory analyses completed	July, 2008
Environmental Information System (EIM) system	
EIM data engineer	Brandee Era-Miller
EIM user study ID	SGOL009
EIM study name	North Creek Metals
Data due in EIM	November, 2008
Final report	
Author lead	Steven Golding
Schedule	
Draft due to supervisor	September, 2008
Draft due to client/peer reviewer	October, 2008
Final report due on web	November, 2008

Quality Objectives

Measurement quality objectives (MQOs) are shown in Table 4. MQOs for check standards, duplicate samples, matrix spikes, and matrix spike duplicates are Manchester Laboratory's acceptance limits for the analyses selected. Manchester Laboratory is expected to meet quality control requirements of methods selected for the project.

Table 4. Measurement quality objectives.

Parameter	Check Standards/ LCS (recovery)	Duplicate Samples (RPD)	Matrix Spikes (recovery)	Matrix Spike Duplicates (RPD)	Required Reporting Limits*
Lead	85-115%	20%	75-125%	20%	0.02 µg/L
Copper	85-115%	20%	75-125%	20%	0.16 µg/L
Hardness	85-115%	20%	75-125%	20%	1 mg/L
TSS	80-120%	20%	N/A	N/A	1 mg/L

LCS – laboratory control samples
RPD – relative percent difference
TSS – total suspended solids
N/A – not applicable
* Dissolved metals

For hardness and TSS, Manchester Laboratory's reporting limits were followed. For lead and copper, required reporting limits are based on Washington State water quality criteria which are dependent on hardness. Water quality criteria for lead and copper applicable to North and Donkey Creeks are shown in Table 5.

Table 5. Applicable water quality criteria (freshwater) for dissolved metals (µg/L)* for protection of aquatic life.

Metal	Acute	Chronic
Lead	4.91	0.19
Copper	1.94	1.59

* based on a hardness of 10 mg/L

Estimated hardness for the study is 10 mg/L. This is based on data from the Tacoma-Pierce County Health Department sampling on May 9, 2002. They found hardnesses of 13 and 14 mg/L in North Creek and 51 mg/L on Donkey Creek. The higher hardness concentration in Donkey Creek may be a result of a higher exposure to minerals in the drainage area or an uneven distribution of rainfall, higher in North Creek at the time of sampling. A hardness of 10 mg/L is unusually low for western Washington surface waters, so the use of this value for both creeks can be considered conservative.

There are no human health criteria for lead or copper.

Table 6 shows the required reporting limits needed to evaluate exceedances of Washington State chronic freshwater criteria for lead and copper. The required reporting limits shown for dissolved metals are a factor of 1/10 of criteria, and so should be adequate to identify exceedances of water quality criteria.

Table 6. Manchester Laboratory reporting limits and required reporting limits for low-level metals (µg/L).

Metal	Laboratory		Required
Lead	Total Recoverable	0.1	0.19 / 10 = 0.019 = approx 0.02
	Dissolved	0.02	
Copper	Total Recoverable	0.1	1.59 / 10 = 0.159 = approx 0.16
	Dissolved	0.1	

Bias can be defined as systematic error due to contamination, sample preparation, calibration, or the analytical process. Sources of bias will be minimized by adherence to established protocols for collection, preservation, transportation, storage, and analysis of study samples.

Precision is a measure of the ability to consistently reproduce results. Precision will be evaluated by analysis duplicates/replicates, matrix spikes, and blanks. Field replicates will be analyzed to estimate *overall precision* of the entire sampling and analysis process. Analysis of laboratory duplicates, which consist of aliquots from one sample container, will estimate *laboratory precision*. The difference between the precision of the laboratory duplicates and the field replicates is an estimate of *field precision*.

Accuracy is the closeness of analytical results to true values of a parameter. To the extent that bias is low and precision is high, results will be accurate. Accuracy will be evaluated by analysis of laboratory control samples.

Sampling Process Design (Experimental Design)

Ecology will sample five locations during each of the sampling events, as shown in Figure 1:

- North Creek will be sampled adjacent to the Club boundary, upstream and downstream of the Club (#1; #2), to evaluate contributions of lead and copper to the portions of the creek traversing Club property.
- North Creek will also be sampled just upstream of North Creek's confluence with Donkey Creek (#3).
- Donkey Creek will be sampled above and below the confluence (#4; #5) to determine background levels in Donkey Creek and any measurable impact of North Creek metals on Donkey Creek.

Creek water will be sampled for analysis of dissolved lead and copper concentrations. Dissolved metals will be compared with water quality criteria. Total recoverable metals data will be used to determine fractions in dissolved and particulate form. The results of hardness analyses will be used as inputs to determine water quality standards for lead and copper. Total suspended solids (TSS) results may be related to the extent of lead and copper in particulate form.

Total recoverable lead and copper will be analyzed for only three of the five sampling locations to save project expense. Total recoverable metals is an ancillary parameter, and the fraction of dissolved metals tends not to vary to a great extent in streams within short distances. Total recoverable lead and copper will be sampled at locations #1, #2, and #5. This will provide for determinations of dissolved fractions in upstream and downstream North Creek adjacent to the Club, as well as in Donkey Creek just below the confluence with North Creek.

The field study will take place during April and May 2008, typically the final months of the winter wet season. North Creek is narrow, in some places one or two feet in width, with a small drainage area of approximately 0.20 square miles (130 acres). There are indications that the creek is intermittent, at times not flowing during periods of dry weather (Bell, 2002).

Three field trips are planned to collect samples on North Creek and Donkey Creek. An attempt will be made for one sampling event to be proceeded by several days of dry weather.

There are indications that North Creek may flow during only part of the year. For this reason, sampling will target wetter periods. Samples from Donkey Creek will be taken below the mixing zone with North Creek. North Creek is narrow (only two feet across in places) with flow interrupted by small obstructions in the creek. For this reason, the two flows can be expected to mix within 100 feet of the confluence.

The number and type of samples are shown in Table 7.

Table 7. Summary of water samples to be collected during April and May, 2008.

Type of Sample	Parameter	No. of sites	No. of samples per event	No. of sampling events	Total No. of samples
Ambient Stream	Lead, dissolved	5	5	3	15
	Copper, dissolved	5	5	3	15
	Lead, total recoverable	3	3	3	9
	Copper, total recoverable	3	3	3	9
	Hardness	5	5	3	15
	Total suspended solids	5	5	3	15
Field Replicate	Lead, dissolved	1	1	3	3
	Copper, dissolved	1	1	3	3
	Lead, total recoverable	1	1	3	3
	Copper, total recoverable	1	1	3	3
Filter Blanks	Lead, dissolved	--	1	3	3
	Copper, dissolved	--	1	3	3

Flow may be difficult to measure with current velocity meters because the creeks are only a few feet in width, with channels that are neither straight nor well defined. Vegetation encroaches into the creeks and in some places, particularly adjacent to and upstream of the Sportsman Club, partially spreads out into wetlands. Where a meter cannot be used, flow may be sufficiently low and well defined at some sites to estimate flows based on time to fill a bucket. Otherwise, the width and depth of the creek will be estimated, and velocity estimates of floating material will allow for a rough estimate for flow.

Sampling Procedures

Table 8 lists the sample size, container, preservation, and holding time for each study parameter. Sample containers will be obtained from Ecology's Manchester Laboratory.

Table 8. Sample containers, preservation, and holding times for study samples.

Parameter	Minimum Quantity Required	Container	Preservative*	Holding Time
Metals	250 mL	500 mL Teflon bottle	HNO_3 to pH<2, 4°C	6 months
Hardness	100 mL	125 mL poly bottle	H_2SO_4 to pH<2, 4°C	6 months
TSS	1,000 mL	1,000 mL poly bottle	Cool to 4°C	7 days

* dissolved metals to be field-filtered (0.45 µm) within 15 minutes of sample collection (EPA, 2007).
TSS – total suspended solids.

Metals sampling procedures will follow the guidance in EPA Method 1669 *Sampling Ambient Water for Trace Metals at EPA Water Quality Levels.* All samples will be taken by hand as simple grabs from mid-channel. Metals samples will be collected directly into pre-cleaned 500 mL Teflon bottles. Samples for dissolved metals will be filtered in the field through pre-cleaned 0.45 um Nalgene filter units (#450-0045, type S). The filtrate will be transferred to a new pre-cleaned 500 mL Teflon bottle. All samples will be preserved to pH <2 with sub-boiled 1:1 nitric acid carried in small Teflon vials. Teflon sample bottles, Nalgene filters, and Teflon acid vials will be cleaned by Manchester Laboratory, as described in Kammin et al. (1995), and sealed in plastic bags. Powder-free nitrile gloves will be worn by personnel filtering the samples. Filtering will be done in a clean box constructed of a PVC frame and polyethylene cover.

Field staff will record field activities in a notebook with waterproof pages. A hand-held Global Positioning System (GPS) will be used to determine latitude and longitude of sampling locations.

All samples will be placed in polyethylene bags and held in a secure cooler on ice for transport to a secure walk-in cooler at Ecology headquarters, then to Manchester Laboratory. Water samples will be returned to Ecology headquarters and held in a secure cooler at 4° C for transportation to Manchester Laboratory within a one-day to two-day period. Staff will follow chain-of-custody procedures (Manchester Environmental Laboratory, 2005).

Measurement Procedures

Laboratory

The Manchester Environmental Laboratory's low-level reporting limits for lead and copper should be adequate to meet the required reporting limits shown in Table 6.

Table 9 shows the number of samples, expected range of results, and analytical methods for this project. Metals will be analyzed by Inductively Coupled Plasma Mass Spectrometer (ICP/MS) (EPA Method 200.8). With this safety factor, the Manchester Laboratory's low-level reporting limits for lead and copper should be adequate to identify exceedances of water quality criteria.

All project samples will be analyzed at Manchester Laboratory. The laboratory may use other appropriate methods following consultation with the project lead.

Table 9. Analytical methods.

Analyte	Field Preparation	Analysis	Expected Range of Results	Sample Preparation Method	Analytical Method
Lead	whole water	total recoverable	0.1 - 500 µg/L	HNO3/HCl digest	EPA 200.8
	filtered water	dissolved	0.02 - 500 µg/L	HNO3/HCl digest field filter and preserve	EPA 200.8
Copper	whole water	total recoverable	0.1 - 500 µg/L	HNO3/HCl digest	EPA 200.8
	filtered water	dissolved	0.05 - 500 µg/L	HNO3/HCl digest field filter and preserve	EPA 200.8
Hardness	whole water	total	10 - 60 mg/L	N/A	SM 2340
TSS	whole water	total	1 - 50 mg/L	N/A	EPA 160.2

TSS – total suspended solids
N/A – not applicable
HNO3 – nitric acid
HCl – hydrochloric acid
EPA – U.S. Environmental Protection Agency
SM – standard method

Quality Control Procedures

Field

Table 10 lists the field quality control (QC) samples to be analyzed for the project. Field QC will consist of replicate samples and filter blanks. Replicates will consist of two samples collected one after the other close to the same time and location. Filter blanks will consist of reagent grade water prepared by Manchester Laboratory and placed in a Teflon container, taken to the field during sample collection, filtered, transferred to a new bottle, acidified, and returned to Manchester Laboratory as other samples for analysis.

Table 10. Field quality assurance samples.

Analysis	Replicates
Field Replicates	
TR/Dissolved Lead	3/project (1 TR and 1 dissolved for each of 3 sampling events)
TR/Dissolved Copper	3/project (1 TR and 1 dissolved for each of 3 sampling event)
Filter Blanks	
Dissolved Lead	3/project (1 for each of 2 sampling events)
Dissolved Copper	3/project (1 for each of 2 sampling events)

TR – total recoverable

Laboratory

Manchester Laboratory will follow standard operating procedures (SOPs) as described in the *Manchester Environmental Laboratory Quality Assurance Manual* (Manchester Laboratory, 2006). Laboratory QC samples will include laboratory control samples, method blanks, analytical duplicates, matrix spikes, and matrix spike duplicates, at the frequencies indicated in Table 11.

Laboratory control samples will be spiked at 10 µg/L for lead and copper.

Standard Reference Material SLRS-4 (Riverine Water) will be analyzed (0.09 µg/L lead; 1.8 µg/L copper) once per batch.

Three metals samples will be analyzed in duplicate to provide estimates of analytical variability. The samples will be selected in the field as representing anticipated high, medium, and low metals concentrations. Samples for duplicate analysis will be identified on the sample tags and the chain-of-custody form. Duplicates for the conventional analyses will be selected by Manchester Laboratory, following their standard practice.

The laboratory will prepare a spiked blank (LCS) for the metals analysis. The laboratory's data report will include the metals concentrations measured in the laboratory control samples and their names, sources, and certified values. These will be in addition to the percent recovery data normally reported.

Table 11. Laboratory quality control samples.

Analysis	Laboratory Control Sample	Standard Reference Material	Method Blank	Analytical Duplicate	Matrix Spikes and Spike Duplicates
TR and Dissolved Lead	1/batch	1/batch	1/batch	1/batch	1/set
TR and Dissolved Copper	1/batch	1/batch	1/batch	1/batch	
Hardness	1/batch	--	1/batch	1/batch	1/set
Total Suspended Solids	1/batch	--	1/batch	1/batch	N/A

TR – total recoverable

Cost Estimate

The laboratory cost for this project is estimated at $3,801 (50% discounted price at Manchester Laboratory; true cost is 2 x).

Itemized project costs are shown in Table 12.

Table 12. Laboratory costs.

Type of Sample	Parameter	Total No. of Samples	Analysis Cost per Sample	Metals Prep.	Teflon Bottle	Preserver Vial	Filter	Subtotal ($)
Ambient Stream	Pb, Cu, dissolved	15	55	--	16	8	24	1545
	Pb, Cu, TR	9	55	28	16	--	--	891
	Hardness	15	20	--	--	--	--	300
	TSS	15	10	--	--	--	--	150
Field Replicate	Pb, Cu, dissolved	3	55	--	16	8	24	309
	Pb, Cu, TR	3	55	28	16	--	--	297
Filter Blanks	Pb, Cu, dissolved	3	55	--	16	8	24	309
SRM	--	1	55	200	--	--	--	--
							Total Cost:	3,801

Pb – lead
Cu – copper
TR – total recoverable
TSS – total suspended solids
SRM – standard reference material

Data Management Procedures

Case narratives included in the data package from Manchester Laboratory will discuss any problems encountered with the analyses, corrective action taken, changes to the requested analytical method, and a glossary for data qualifiers. Data will be presented in the report with any pertaining qualifiers.

Laboratory quality control results will also be included in the data package. This will include results for surrogate recoveries, laboratory duplicates, matrix spikes, and laboratory blanks. The information will be used to evaluate data quality, determine if the MQOs were met, and act as acceptance criteria for project data. Data will appear in the report with qualifiers.

Field and laboratory data for the project will be entered into Ecology's Information Management System (EIM). Laboratory data will be downloaded directly into EIM from Manchester Laboratory's data management system (LIMS). Data reports from contract laboratories used for the project will be delivered in Excel spreadsheets formatted for input into the EIM system.

Audits and Reports

Manchester Laboratory participates in performance and system audits of their routine procedures. Results of these audits are available upon request.

A draft report of the study findings will be completed by the project lead in October 2008. A final report will be completed in November 2008. The report will include at a minimum the following:

- A map showing all sampling locations and any other pertinent features to the study area.
- Coordinates of each sample site.
- Description of field and laboratory methods.
- Discussion of data quality and the significance of any problems encountered.
- Summary tables of the chemical and physical data.
- Results of the lead and copper samples and a comparison of dissolved lead and copper results with water quality standards.
- Evaluation of the significant findings and comparisons of historical data to current conditions.
- Recommendations for 303(d) listings, as appropriate.
- Complete set of chemical and physical data, as well as Manchester Laboratory quality assurance review, in the Appendix for 303(d) listings, as appropriate.

Upon completion of the study, all project data will be entered into Ecology's EIM system. Public access to electronic data and the final report for the study will be available on Ecology's internet homepage (www.ecy.wa.gov).

Data Verification

Data verification is a review process to assess the quality and completeness of analytical datasets. Verification of laboratory data is normally performed by a Manchester Laboratory unit supervisor or an analyst experienced with the method. It involves a detailed examination of the data package using professional judgment to determine whether the method quality objectives (MQOs) have been met.

Data verification involves examining the data for errors, omissions, and compliance with quality control (QC) acceptance criteria. Manchester Laboratory's standard operating procedures for data reduction, review, and reporting will also be evaluated in meeting the needs of the project. Data packages, including QC results conducted by Manchester Laboratory, will be assessed by laboratory staff using EPA Functional Guidelines.

Manchester Laboratory staff will provide a written report of their data review. This report will include a discussion verifying if (1) MQOs were met, (2) proper analytical methods and protocols were followed, (3) calibrations and controls were within limits, and (4) data were consistent, correct, and complete, without errors or omissions.

The project lead is responsible for final acceptance of the project data. The project lead will assess the complete data package, along with Manchester Laboratory's written report, for completeness and reasonableness. Based on these assessments, the data will either be accepted, accepted with qualifications, or rejected and re-analysis considered.

Data Quality Assessment (Usability)

After the project data have been reviewed and verified, the project lead will determine if the data are of sufficient quality to make decisions for which the study was conducted. Laboratory and quality assurance staff familiar with assessment of data quality may be consulted. The project final report will discuss data quality and whether the project objectives were met. If limitations in the data are identified, they will be noted. Analysis of Standard Reference Material SLRS-4 will be compared with its standard values.

References

Bell, Sharon, 2002. Site Hazard Assessment – Initial Investigation Report - Gig Harbor Sportsman Club. Tacoma-Pierce County Health Department, Tacoma, WA. April 25, 2002.

EPA, 2007. Federal Register / Vol. 72, No. 57 / Monday, March 26, 2007 / Rules and Regulations. U.S. Environmental Protection Agency, 40 CFR Parts 136 and 503.

Kammin, W.R, S. Cull, R. Knox, J. Ross, M. McIntosh, and D. Thomson, 1995. Labware Cleaning Protocols for the Determination of Low-level Metals by ICP-MS. American Environmental Laboratory 7(9).

Manchester Environmental Laboratory, 2005. Manchester Environmental Laboratory Lab Users Manual, Eighth Edition. Manchester Environmental Laboratory, Washington State Department of Ecology, Manchester, WA.

Manchester Environmental Laboratory, 2006. SOPs from Manchester Environmental Laboratory Quality Assurance Manual.

Rose, Scott, 2008. Personal communication. Toxics Cleanup Program, Southwest Regional Office, Washington State Department of Ecology, Olympia, WA. Email February 13, 2008.

WQP Policy 1-11, Washington State Department of Ecology, Water Quality Program, Olympia, WA. September 2006. www.ecy.wa.gov/programs/wq/303d/policy1-11_rev.html