


Sampling & Analysis Plan

Spokane River Toxics Reduction Strategy Study

Prepared for:
Spokane River Regional
Toxics .Task Force

Final

July 31, 2014

LimnoTech

Water | Scientists
Environment | Engineers

SAMPLING AND ANALYSIS PLAN

MODIFICATION LOG

Modification	Date
Updated SVL Laboratory information	August 8, 2014

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1. INTRODUCTION

The Spokane River Regional Toxics Task Force (SRRTTF) is developing a comprehensive plan to reduce toxic pollutants in the Spokane River, specifically polychlorinated biphenyls (PCBs). The comprehensive plan will be designed to identify specific management actions that can be undertaken to control pollutant loads such that water quality objectives can ultimately be attained. Comprehensive plans of this type require data capable of describing individual sources and site-specific processes that drive resulting concentrations. LimnoTech (2014a) described the overall data collection strategy, based on the work conducted to identify key gaps in the existing data set and issues addressed at a December 2013 monitoring workshop.

The first year of monitoring will focus on the Spokane River upstream of Spokane Lake, and is designed to supplement the existing Washington State Department of Ecology (Ecology) mass balance assessment and address data gaps related to groundwater and upstream sources of PCBs. Monitoring plans for subsequent years will be developed later, following review of the data collected during this study and other ongoing monitoring programs.

The Sampling and Analysis Plan (SAP) is intended to document the procedural and analytical requirements of the water quality monitoring project. The SRRTTF will actively participate and provide funds to the project. The SRRTTF-ACE will serve as the contracting authority for the project and provide overall program management. The SRRTTF has hired LimnoTech to serve as the project manager, field manager and to prepare the Sampling and Analysis Plan (SAP) for the project. Gravity Environmental will be responsible for sample collection. AXYS Analytical Services will perform laboratory analysis for PCB congeners and SVL Analytical, Inc. will perform laboratory analysis for all other parameters.

1.1 Project Organization/Responsibilities

Each of the organizations included in the project team has established an organizational structure for providing technical direction and administrative control to accomplish quality-related activities for the development of the project.

Key project personnel and their corresponding responsibilities are listed in Table 1.

Table 1. Project Team Responsibilities

Name/Affiliation	Project Title/Responsibility
SRRTTF	**Oversight and direction** Secure funding for project activities Review and utilize project results Facilitate communications and provide public access to information Develop recommendations for controlling and reducing sources Develop comprehensive plan
Bud Leber – SRRTTF-ACE	**SRRTF Administrator** Manage contracts: review and approve project specifications Ensure project is completed in timely manner Receive deliverables and reports Manage data on behalf of SRRTTF Communicate with SRRTTF Communicate quality assurance issues with SRRTTF Ensure access to project information on the SRRTTF website Facilitate upload of data to EIM

Name/Affiliation	Project Title/Responsibility
David Dilks - LimnoTech	**Project Manager** General oversight Review/approval of all work products prior to delivery to SRRTTF-ACE Ensures that work is done in accordance with QAPP and SAP Reviews project with Laboratory Director/Operations Director prior to sampling Provides oversight of field activities (variances, documentation, QA/QC) Arranges for system audits
Jim Bellatty, Adriane Borgias – Department of Ecology	**Advisor** Reviews/approves QAPP
Robert Steed – Idaho DEQ	**Advisor** Reviews/approves QAPP
Cathy Whiting - LimnoTech	**Field Manager: Synoptic Survey and Quarterly sampling events** Direct all field activities, ensure samples handled in accordance with SAP Data screening, evaluation, validation, and usability determination Manage field variances, nonconformances, and corrective actions Manage reports, documentation, Project QA/QC file, and electronic data Communicates project specifics with Project Manager Conducts training of field sampling crew
Carrie Turner - LimnoTech	**Project Quality Assurance Officer** Performs systematic evaluation of data quality Receives notices, initiates investigation, and documents nonconformance with DQOs Manage the Project QA/QC file
LimnoTech	**Independent Auditor** Perform a critical, written evaluation of the work product Conducts audits at the direction of the Project Manager
Shea Hewage – AXYS Analytical Services	**Laboratory Operations Director** Sample analysis Serves as main point of contact for laboratory Manages laboratory Quality Assurance systems Final review and validation of data and field systems Initiates corrective actions for nonconformances Communicates with Project Manager and SRRTTF-ACE
Cynthia Tomey – AXYS Analytical Services	**Laboratory Project Manager** Serves as main point of contact for laboratory Assists Laboratory Operations Director with management of laboratory QA systems Communicates with Project Manager
Dale Hoover-AXYS Analytical Services	**Laboratory QA/QC Managers** Manages Laboratory QA/QC activities

Name/Affiliation	Project Title/Responsibility
	Reviews and verifies field records, laboratory records and laboratory data Addresses noncomformances and carries out corrective actions at the laboratory.
John Kern – SVL Analytical, Inc.	**Laboratory Director** Final review of data Communicates with Project Managers and SRRTTF-ACE
Michael Desmarais	**Laboratory QC Manager** Manages laboratory quality assurance systems Initiates corrective actions for non-conformance Manages Laboratory QA/QC activities Addresses non-conformances and carries out corrective actions at the laboratory.
Christine Meyer – SVL Analytical, Inc.	**Client Services Manager** Serves as main point of contact for laboratory Communicates with Project Manager and SRRTTF-ACE
Shawn Hinz – Gravity Environmental	**Conducts Sample Collection** Collects samples in accordance with QAPP and SAP Prepares and follows the Invasive Species Plan Prepares and administers Health and Safety Plan for employees Maintains equipment logs, field records and data sheets Transfers field data to Field Manager Manages field equipment, conducts calibrations Addresses nonconformance findings and responds to corrective actions

1.3 Project Background

The goal of the Spokane River Regional Toxics Task Force (SRRTTF) is to develop a comprehensive plan to reduce PCB inputs to the Spokane River and to bring into compliance with applicable water quality standards for PCB. PCBs are the pollutant of primary concern, however dioxins will be addressed as resources allow for inclusion in the comprehensive plan formulation (LimnoTech, 2014a).

The Spokane River and Lake Spokane exceed the water quality standard (170 pg/L – based on a fish consumption rate of 6.5 g/day) for polychlorinated biphenyls (PCBs) in several segments. Fifteen waterbody segments of the Spokane River and Lake Spokane (also known as Long Lake, herein referred to as Lake Spokane) and one segment of the Little Spokane River are on the 2008 303 (d) list for exceeding human health water quality criteria for PCBs. The Spokane Tribe of Indians have water quality standards for PCBs in the Spokane River below Lake Spokane (also known as the Spokane Arm of Lake Roosevelt) that are more than 95% lower than State standards (1.3 pg/L), based on a higher fish consumption rate (865 g/day) than the general population (Spokane Tribe of Indians, 2010).

In April 2011, the Department of Ecology published a PCB source assessment report based on data collected between 2003 and 2007 (Publication No. 11-03-013). In Figure 19 of this report a schematic diagram summarized the state of knowledge with respect to identified sources and in-stream loads for Total PCB. This figure showed an identified source contribution to the river of 996.9 mg/day of PCB between the Idaho/Washington state line (RM 96.1) and Ninemile Dam (RM 58.1). In addition, the figure also showed an in-stream loading increase of 1,804 mg/day between these two locations. Thus, source contribution of 807.1 mg/day of Total PCB was not able to be accounted for – roughly 44.7% of the in-stream loading between those two points on the river.

To accomplish its goal, the SRRTTF is taking what has been referred to as a "Direct to Implementation" approach. In order to take this approach, the SRRTTF has determined that it needs to develop a sufficient clearer understanding of in-stream loadings and source contribution to the Spokane River between its headwaters at the outlet of Lake Coeur d'Alene (RM 111) and the Ninemile Dam (RM 58.1) (Figure 1). This 53 mile segment of the river has been chosen to be the focus of the SRRTTF's initial efforts for several reasons. In no particular order they are:

- Discharges from all of the major municipal and industrial sources in the watershed are located in this section
- Virtually all urban area storm runoff in the watershed (the largest identified source contribution from the 2003-2007 data) enters the river in this section
- This section of the river contains numerous river flow gauging stations, which will allow for the determination of in-stream loadings at multiple locations through mass balance calculations
- In this section of the river the vast majority of the aquifer/river interchange occurs, the impact of which has not been quantified by previous studies
- The likelihood of making near term source contribution reductions is greatest in this section of the river given the concentration of point source and storm runoff locations and the significant level of unidentified source contribution
- The ability to monitor and assess the effectiveness of PCB reductions is enhanced by the ability to track in-stream loadings with the infrastructure present (gauging stations) in this section of the river

To develop a sufficiently clear understanding of in-stream loadings and source contribution, data will need to be collected at various times of the year so that the seasonal variability of in-stream loading at the outlet of Lake Coeur d'Alene can be evaluated. In addition to potential seasonal loading variability, the contribution of groundwater as well as episodic storm runoff events to in-stream loading needs to be quantified and more clearly understood. Once a clearer understanding of in-stream loading and source contribution is obtained, the SRRTTF can then move forward with developing recommendations for controlling and reducing sources through such efforts as providing input on Toxic Management Plans, Source Management Plans, and Best Management Practices (BMPs).

This study uses the best technology available to assess current conditions of the river. The PCB concentrations in the water are very low, close to or below the limits of the analytic system to evaluate with statistical rigor.

As stated above, the data collection and analysis efforts of the SRRTTF are focused on supporting the "Direct to Implementation" approach. With this approach being the focus of the SRRTTF's efforts, data collection is not intended to satisfy the requirements of data collection needs for regulatory undertakings such as evaluating compliance with applicable water quality standards for PCB or developing information for Load or Wasteload Allocations. It is possible that the data collection on in-stream loadings and source contribution may be usable by some NPDES permit holders for fulfilling some permit monitoring requirements.

This SAP was developed to address the first year of data collection and is designed to ensure that all monitoring activities undertaken result in representative water quality and quantity information necessary to support a low-flow mass balance assessment to the extent possible, given the limitations of the data, and assess the seasonal variability of upstream loads. Monitoring and sampling stations have been selected to provide appropriate coverage to meet the assessment needs of the task force.

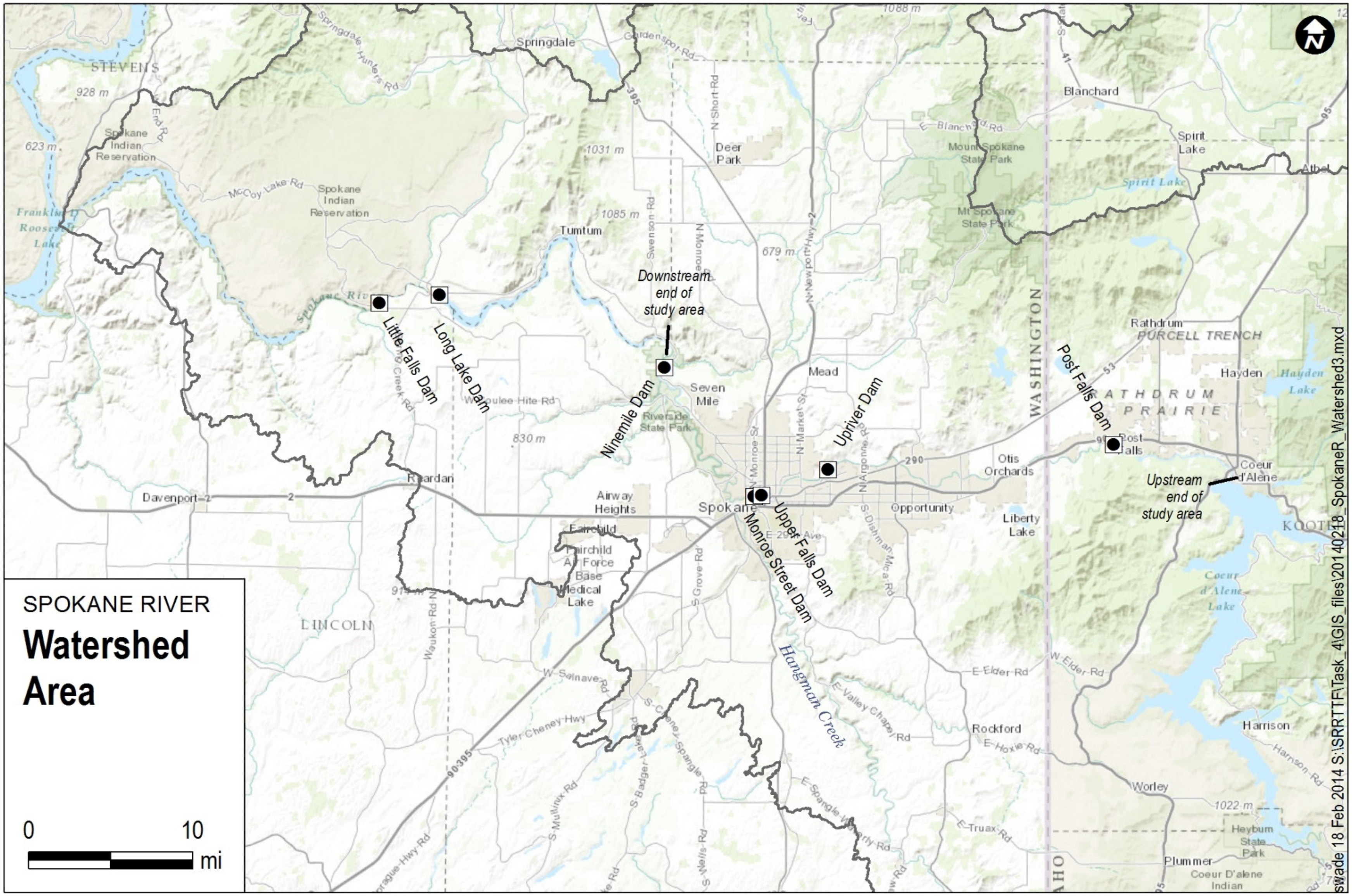

Figure 1. Spokane River Study Area

2.0 PROJECT DESCRIPTION

The Spokane watershed has existing PCB monitoring data, which provide an estimate of the amount of PCBs entering the Spokane River from contributing source area categories (e.g. stormwater, WWTPs). Based on the Spokane River PCB Source Assessment 2004-2007 (Serdar et al., 2011), only 43% of the PCB sources loading to the river between Stateline (RM 96.1) and Long Lake Dam (RM 33.9) could be identified. This is due in part to the uncertainty of the analyses and the high variability in the data. The existing data indicate that sources of PCBs are very diffuse throughout the watershed, such that more data is needed to support the development of a management plan with targeted control actions. Fifteen waterbody segments of the Spokane River and Lake Spokane (also known as Long Lake, herein referred to as Lake Spokane) and one segment of the Little Spokane River are on the 2008 303 (d) list for exceeding human health water quality criteria for PCBs. Primary data gaps include:

- **The magnitude of true sources contributing to stormwater loads:** A robust data set exists characterizing PCB concentration at numerous locations throughout the stormwater system, unfortunately these data indicate that PCB sources are very diffuse and difficult to trace back to their origin.
- **PCB sources upstream of the Idaho/Washington border:** PCBs entering from Idaho were estimated to represent 30% of the overall loading to the Spokane River in Washington.
- **The significance of loading from atmospheric and groundwater sources:** Insufficient data presently exist to define the magnitude of these source categories. The groundwater contribution to the Spokane River is known to be large, and its magnitude can be approximated by taking the difference in observed flows between the Post Falls USGS gage (12419000) and the Spokane gage (12422500). This contribution is plotted in Figure 2 for average August flows from 1968 to the present. The average increase in flow of 400 cfs constitutes more than 30% of the total August flow observed in Spokane. While the magnitude of this groundwater flow is large, the average PCB concentration in groundwater is not well known, meaning that the PCB loading contribution from groundwater is unknown, as well.

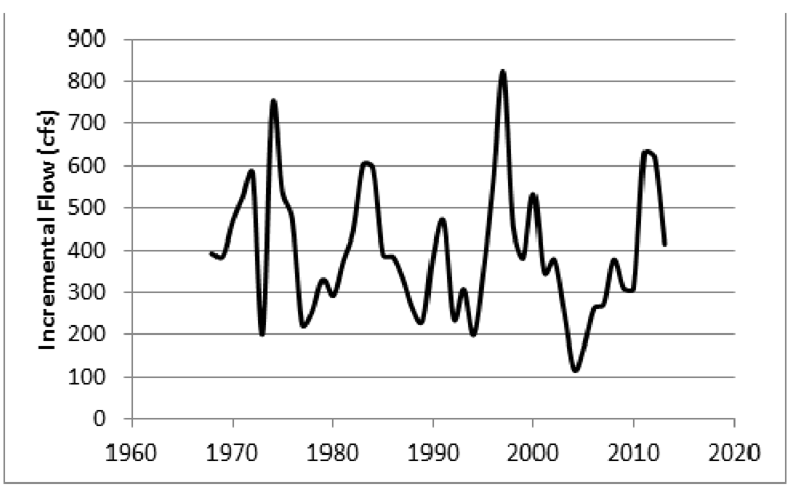

Figure 2. Estimated groundwater contribution to Spokane River calculated as difference between monthly average August flow between Spokane and Post Falls.

The objective of this project is to collect the necessary data to eliminate the data gaps in order to conduct a PCB semi-quantitative mass balance assessment of the Spokane River. Based on the results of the Confidence Interval Testing described below (LimnoTech, 2014c) the project objectives stated in the draft QAPP (5/1/14) have been revised as follows:

a. The data shall be sufficient to support a semi-quantitative mass balance assessment, and be able to identify stream reaches where incremental loads lead to a significant increase in river concentrations.
b. The data shall be sufficient to support an adaptive management approach, where grab sample results can be directly compared to results from other sampling methodologies to allow determination of an improved monitoring approach for future phases of this work.

The first year of monitoring under this study includes the following tasks:

1. **Synoptic Study:** Conducted along the length of the river during the summer low flow period
2. **Seasonally Integrated Sampling:** Conducted at the Lake Coeur d'Alene outlet, during three different flow regimes.

The synoptic survey will consist of dry weather sampling at multiple locations in the Spokane River upstream of Lake Spokane, consisting of:

- River locations with flow gaging stations
- NPDES permitted sources
- Latah (Hangman) Creek Mouth

The Seasonally Integrated Sampling will consist of sampling at the outlet of Lake Coeur d'Alene. The intent of this monitoring is to provide information on the seasonal variability of upstream PCB loading to the Spokane River from Lake Coeur d'Alene, which will provide insight on the atmospheric contribution to the snow pack in the upstream watershed.

The sampling will be conducted on a seasonally integrated basis, with multiple samples taken and composited over each of three different flow regimes:

- Spring high flow
- Summer low flow
- Winter moderate flow

The sampling program is informed by the Confidence Interval Testing that was conducted in May 2014. The Confidence Interval Testing was performed by Ecology as an initial task to confirm the appropriate sample volumes and frequencies. This initial sampling effort is described in the Confidence Interval Testing Memorandum (LimnoTech, 2014b) and was designed to generate information both on the temporal variability of PCB concentrations, as well as estimates of measurement uncertainty for the low PCB concentrations occurring in the Spokane River.

Five sampling events were conducted in May 2014 on the Spokane River at the State Park Parcel at River Mile 87, located between Mirabeau and Sullivan Parks (referred to as the Mirabeau Park site) and three sampling events at the Lake Coeur d'Alene outlet. Samples were collected for both discrete and composite analyses at Mirabeau Park, while discrete samples were collected at the Lake Coeur d' Alene outlet. This information was used to satisfy three objectives:

1. Generate site-specific information on the sources of variability in PCB measurements (i.e. laboratory vs. variability in ambient concentrations)

2. Generate estimates of the confidence limits around the results to be obtained from the upcoming Synoptic Survey.
3. Determine if the proposed sampling methodology will provide data that can be distinguished from the lab blank.

The draft QAPP (5/1/14) objectives have been revised based on the results of this sampling effort (LimnoTech, 2014c).

2.1 SCOPE OF WORK

The first year of monitoring under this study includes the following tasks:

1. Synoptic Study: Conducted along the length of the river during the summer low flow period
2. Seasonal Integrated Sampling: Conducted at the Lake Coeur d'Alene outlet, during three different flow regimes.

Sections 3, 4 and 5 of this SAP provide more detail about the monitoring program, and the field methods and procedures, respectively.

Key milestones associated with the project are described below along with their targeted completion dates:

QAPP and SAP approved by Task Force	May, 2014
Select laboratory	April 23, 2014
Sampling Contractor Request for Proposals sent out	April 24, 2014
Select Sampling Contractor	May, 2014
Confidence Interval Testing Sampling	May, 2014
Incorporate Confidence Interval Testing Results into QAPP/SAP	July 31, 2014
Contractor Training	August, 2014
Synoptic Survey	August, 2014
Seasonally Integrated Sampling – 1st Event (in conjunction with Synoptic Survey)	August, 2014
Seasonally Integrated Sampling – 2nd Event	Winter, 2015
Seasonally Integrated Sampling – 3rd Event	Spring, 2015
Draft Report	August 31, 2015
Final Report	October 31, 2015

2.2 QUALITY ASSURANCE PROJECT PLAN

A Quality Assurance Project Plan (QAPP) has been developed for this project. The QAPP includes information on project organization, responsibilities, sampling procedures, quality control checks, data management and reporting. The QAPP is included in Appendix A.

2.3 HEALTH AND SAFETY PLAN

A Health and Safety Plan (HASP) will be developed by the sampling contractor.

2.4 INVASIVE SPECIES PLAN

An Invasive Species Plan will be developed by the sampling contractor to ensure compliance with all required inspections and standard operating procedures related to protecting surface waters in Washington and Idaho from invasive species.

3.0 YEAR ONE MONITORING PROGRAM

The first year of monitoring will focus on the Spokane River upstream of Lake Spokane (between Lake Coeur d'Alene and Nine Mile Dam). This monitoring is designed to supplement/update the mass balance assessment conducted by Ecology and will consist of two components: a synoptic low flow survey and seasonally integrated sampling. These two components will be discussed in detail in the following sections. In addition, the data shall be sufficient to support an adaptive management approach, where grab sample results can be directly compared to results from other sampling methodologies to allow determination of an improved monitoring approach for future phases of this work. A QAPP Addendum (7/15/14) has been prepared to address additional studies that will be conducted.

This monitoring is designed to build upon the existing Ecology mass balance assessment (Serdar et al, 2011) and address data gaps related to groundwater and the nature of upstream sources of PCBs. Collection of data specifically at locations where flow gaging data are available will allow all concentration measurements to be converted to mass loads. While the results of the Confidence Interval Testing show that the planned monitoring may not distinguish differences in concentration between stations of up to 28 pg/l, the monitoring may be sufficient to identify incremental changes in concentration larger than that amount. Being able to identify the existence of larger increases in concentration will help support project objectives of identifying major PCB sources.

3.1 SYNOPTIC SURVEY

The Synoptic Survey will consist of dry weather, low flow sampling at multiple locations in the Spokane River upstream of Lake Spokane, consisting of:

- River locations with flow gaging stations
- NPDES permitted sources
- Latah (Hangman) Creek Mouth

This aspect of the monitoring is designed to address data gaps related to groundwater and the nature of upstream sources of PCBs. Collection of data specifically at locations where flow gaging data are available will allow all concentration measurements to be converted to mass loads. While the results of the Confidence Interval Testing show that the planned monitoring may not distinguish differences in concentration between stations of up to 28 pg/l, the monitoring may be sufficient to identify incremental changes in concentration larger than that amount. Being able to identify the existence of larger increases in concentration will help support project objectives of identifying major PCB sources.

The Synoptic Survey sample locations are summarized in Table 2. River locations are identified as in-stream samples and NPDES permitted sources are identified as discharge samples. The point of discharge is determined to be the location identified in the discharger's NPDES permit or as determined in the field by the sampling team and approved by the project manager. The sample locations are shown in Figure 3.

Sampling will be conducted during the summer low flow period to minimize potential confounding effects of wet weather sources. Multiple river sampling events will be conducted (with some compositing to reduce analytical costs) over a two week sampling period to reduce the uncertainty in in-stream loading estimates caused by day to day variability in concentrations.

The initiation of monitoring is designed with the intent to capture ideal conditions if possible, yet ensure that monitoring be conducted during the low flow period. Monitoring will commence as soon as the following conditions exist between July 15 and August 18:

- Flows in the Spokane River at Spokane (Gage 12422500) are less than 1210 cubic feet per second. This flow represents the median August flow from this gage from the period 1968 to present. It is expected that flows this low have a greater than 50% chance of occurring, as USGS (Hortness and Covert, 2005) have shown a decrease in August flows at this location for the period over the period 1968-2002.
- Two weeks have passed since the last rainfall greater than 0.2" was recorded at Felts Field. Analysis of historical rainfall records shows that the recurrence interval for storms of this magnitude is 13.5 days. This sampling plan recognizes that it will be infeasible to design a monitoring program where the influence of wet weather loading is completely absent. The hydraulic residence time of the river between Lake Coeur d'Alene and Ninemile Dam is approximately 40 days at average summer low flow, which is longer than the expected frequency between storms. The requirement of a two week antecedent dry period balances the desire to minimize the presence of wet weather-driven sources with the desire to ensure that the required conditions will occur during the summer of 2014.
- The local weather forecast contains no days with a predicted likelihood of rainfall greater than 50% for the following three days.

Should the above conditions not occur between July 1 and August 18, sampling will commence on August 18, 2014. This will ensure that low flow monitoring will still be conducted, prior to stream flows increasing in September.

Once sampling is initiated, samples will be taken every other day over a thirteen day period. At each sampling station a single sample will be collected for discrete analysis and another sample to be analyzed as part of a composite of all seven samples collected at that station, for all parameters. Compositing will be conducted by the laboratory.

Wastewater effluents will be sampled as grab samples on three separate dates, spaced evenly over the dry weather sampling period. Each sampling event will collect a single sample for discrete analysis and another sample to be analyzed as part of a composite of all three samples collected at that station.

If a precipitation event occurs during the sampling period the following changes will be made to the sampling frequency:

- Lake Coeur d'Alene outlet: Samples should be collected within two days of the rainfall event, to get samples before runoff-driven conditions appear. If necessary, samples can be collected on the same day.
- All other locations: Samples should be collected two days after the rainfall event, to allow urban stormwater loads to pass downstream.

The schedule for implementing the Synoptic Survey is provided in Table 3.

Further description of the sampling protocol and the samples to be collected is included in Appendix B.

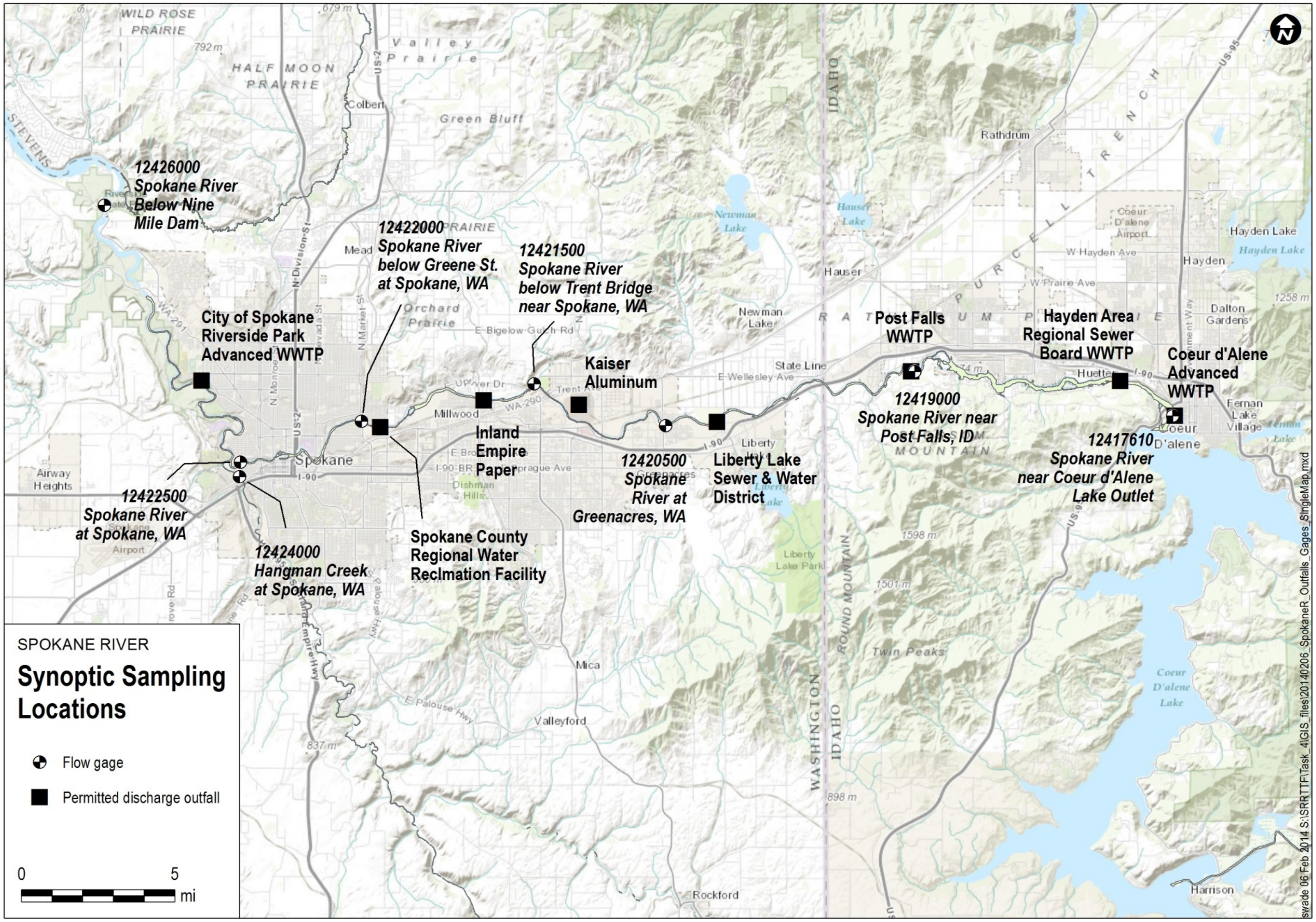

Figure 3. Spokane River monitoring location map

3.2 SEASONALLY INTEGRATED SAMPLING

The Seasonally Integrated Sampling will consist of sampling at the outlet of Lake Coeur d'Alene. The intent of this monitoring is to provide information on the seasonal variability of upstream PCB loading to the Spokane River from Lake Coeur d'Alene, which will provide insight on the atmospheric contribution to the snow pack in the upstream watershed.

The sampling will be conducted on a seasonally integrated basis, with multiple samples taken and composited over each of three different flow regimes, as shown in Figure 4 and described below:

- Spring high flow – Long term flow records indicate that river flows typically begin rising in March, and peak somewhere between April and June.
- Summer low flow – Flows typically decrease from the spring peak to stable summer low flows by mid-July
- Winter moderate flow – Flows during the December – February period are typically in a range much higher than summer low flows yet much less than spring peak flow.

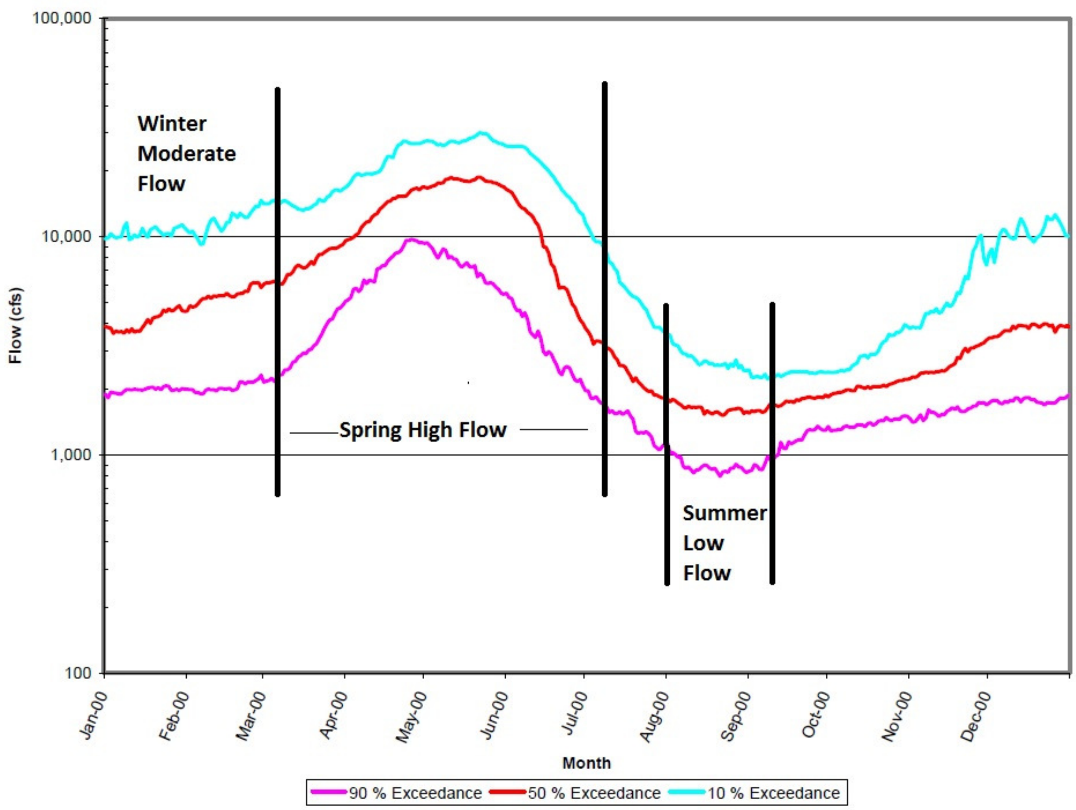

Figure 4. Spokane River flow regime sampling schedule

The initiation of spring high flow sampling will be based upon the Northwest River Forecast Center extended forecast for flows out of Lake Coeur d'Alene (http://www.nwrfc.noaa.gov/). Spring high flow sampling will commence within one week of the time when the predicted daily flow is within ten percent of the predicted maximum spring flow. Sampling will end within one week of the time when the daily flow is predicted to have decreased by ten percent from the peak.

Summer low flow sampling requirements for the Seasonally Integrated Sampling program will be satisfied by the sampling described above in Section 3.1 for the Synoptic Survey.

The initiation of winter moderate flow sampling will be based upon review of the Northwest River Forecast Center extended forecast for flows out of Lake Coeur d'Alene. Sampling will commence within one week of the time when the predicted daily flow is within ten percent of the predicted average December – February flow. Sampling will end within one week of the time when the daily flow is predicted to have increased by ten percent from the average December – February flow.

Samples will be collected on five different days for the Spring and Winter flow regimes over the time periods described above, with at least two days between events. Each sampling event will collect a single sample for discrete analysis and another sample to be analyzed as part of a composite of the five samples collected at that station, for all parameters. Compositing will be conducted by the laboratory.

If a precipitation event occurs during the sampling event, sampling will continue as planned.

The Seasonally Integrated Sampling locations are shown in Figure 3 and summarized in Table 2. The schedule for implementing the Seasonally Integrated Sampling is provided in Table 3.

Further description of the sampling protocol and the samples to be collected is included in Appendix B.

Table 2. Spokane River sampling locations

Site	Location	Type of Sample	USGS Gage	Low Flow Synoptic Survey	Seasonally Integrated Sampling
SR-1	Spokane River Below 9 Mile Dam	In-stream	X	X	
SR-2	City of Spokane Riverside Park Advanced WWTP	Discharge		X	
SR-3	Spokane River at Spokane	In-stream	X	X	
HC-1	Latah (Hangman) Creek	In-stream	X	X	
SR-4	Spokane River at Greene Street Bridge	In-stream	X	X	
SR-5	Spokane County Regional Water Reclamation Facility	Discharge		X	
SR-6	Inland Empire Paper	Discharge		X	
SR-7	Spokane River at Below Trent Bridge	In-stream	X	X	
SR-8	Kaiser Aluminum	Discharge		X	
SR-9	Spokane River at Barker Road Bridge	In-stream	X	X	
SR-10	Liberty Lake Sewer & Water District	Discharge		X	
SR-11	Post Falls WWTP	Discharge	X	X	
SR-12	Spokane River at Post Falls	In-stream		X	
SR-13	Hayden Area Regional Sewer Board WWTP	Discharge		X	
SR-14	Coeur d'Alene Advanced WWTP	Discharge		X	
SR-15	Lake Coeur d'Alene Outlet	In-stream	X	X	X

3.3 PARAMETERS

The study parameters include PCB congeners, total suspended solids (TSS), total dissolved solids (TDS), total organic carbon (TOC) and dissolved organic carbon (DOC). TSS, TOC and DOC will be used to provide information on the distribution of PCBs among various forms (i.e. purely dissolved, adsorbed to solids, sorbed to DOC), which will be needed if a fate and transport model is developed. TDS can be used as a tracer to provide information on groundwater contribution to the river. The parameters included in the Synoptic Survey and the Seasonally Integrated Sampling are listed in Table 4.

3.4 USGS GAGES

The location of the USGS gage stations is provided in Table 5. All of these gage stations is active at the present time with the exception of the station at Barker Road. The SRRTTF is presently working with USGS to activate this gage for the Synoptic Survey to be conducted in the summer of 2014. If this gage is not activated for the Synoptic Survey, Gravity Environmental will collect flow measurements at this location using an Acoustic Doppler Current Profiler.

Table 3. Sampling schedule

Sampling Event	August 2014	Winter 2015	Spring 2015
Synoptic Survey	X		
Seasonally Integrated Sampling	X*	X	X

*To be conducted as part of the August Synoptic Survey

Table 4. Spokane River monitoring parameters

Parameter	Type of Parameter
Polychlorinated Biphenyl (PCB)– 209 Congeners	Laboratory analytical
Dissolved Organic Carbon (DOC)	Laboratory analytical
Total Organic Carbon (TOC)	Laboratory analytical
Total Suspended Solids (TSS)	Laboratory analytical
Total Dissolved Solids (TDS)	Laboratory analytical
Temperature	In-situ measurement
Conductivity	In-situ measurement
pH	In-situ measurement
Dissolved Oxygen (DO)	In-situ measurement
Turbidity	In-situ measurement

Table 5. USGS gage locations

Station Number	Station Name	Gage Status
12422000	Spokane River Below 9 Mile Dam	Active – Real Time Gage?
12422500	Spokane River at Spokane	Active – Real Time Gage
12424000	Hangman Creek	Active – Real Time Gage
12422000	Spokane River at Greene Street Bridge	Active - Operated by Spokane Community College
12421500	Spokane River at Below Trent Bridge	Active - Operated 6/1-9/30 only
12420500	Spokane River at Green Acres	Not active
12419000	Spokane River at Post Falls	Active – Real Time Gage
12417610	Lake Coeur d’Alene Outlet	Active – Real Time Gage

4.0 FIELD METHODS AND PROCEDURES

This section provides a description of the field sampling collection methods, sampling equipment, and decontamination procedures that will be used during the monitoring program. Field sampling methods and procedures will be conducted in accordance with the Standard Operating Procedures (SOPs) provided in Appendix C.

4.1 SAMPLE COLLECTION METHODS

The data that will be collected from the river are obtained either through direct (in-situ) measurements or through analysis of a water sample. This section describes the sampling methods that will be used for water sample analyses.

4.1.1 Initial Site Visit

Prior to initiating the first sampling event initial site visits will be made to all sampling locations by the field manager and the sampling contractor. These visits will be used to determine general site access, river access and sampling locations. At discharger locations the team will meet with personnel to determine the appropriate sampling location and method. This information will be documented in the field log sheet.

4.1.2 Sample Collection

At each sampling location care will be taken to prevent the spread of non-native noxious weeds, pathogens and exotic flora and fauna among water bodies, by following the Invasive Species Plan.

Prior to collecting the surface water grab samples, in-situ measurements of temperature, dissolved oxygen, pH, conductivity and turbidity will be made by lowering a YSI 600 OMS or equivalent below the water surface. The results will be recorded on the field log sheet.

All in stream water quality samples will be collected by wading into the main channel flow, if possible. The best effort will be made without jeopardizing the safety of the sampling crew. If wading is not possible the samples will be collected using a boat. The sample bottles will be filled by direct immersion into the sample bottle as a surface grab at a depth of 0.15 m below the water surface (described below).

It may not be possible to collect samples with direct immersion at the discharger locations. If an alternate sample collection method is required at these locations, such as using a sampling pole with a clean sample bottle attached, it will be documented in the field log sheet.

The general collection procedures for surface water sampling are as follows:

1. One member of the two person sampling team is designated as “dirty hands” and the second member is designated as “clean hands”. All operation involving contact with the sample bottle and transfer of the sample from the sample collection device to the sample bottle are handled by the individual designated as “clean hands”. “Dirty hands” is responsible for preparation of the sampler, operation of any machinery or boat, and for all other activities that do not involve direct contact with the sample.
2. Clean all sampling equipment prior to sample collection according to the procedures in the Standard Operating Procedure for Equipment Cleaning.
3. Don appropriate personal protective equipment (as required by the Health and Safety Plan).
4. Don clean disposable nontalc nitrile gloves, which are worn at all times when handling sampling equipment and sample containers.

5. Record pertinent data on the appropriate field log sheet. The field log sheet is included in Appendix D.
6. If field preservation is required, the appropriate preservative will be placed into the sample container prior by the laboratory. Note the preservative in the preservative column on the sample container and on the field log sheet.
7. Label all sample containers with the date, time, site location, sampling personnel, and other requested information (such as preservative used or filtering if appropriate). An example of a sample bottle label is provided in Appendix D.
8. Whenever possible, samples will be collected facing upstream and upwind to minimize the introduction of contamination.
9. If at all possible, the samples will be collected using a direct grab sampling technique. The principle of the direct grab technique is to fill a sample bottle by rapid immersion in water and capping under water to minimize exposure to airborne particulate matter.
10. Record sample collection information on the field log sheet and store the samples in an iced cooler as described in the Standard Operating Procedure for the Shipping and Handling of Samples.
11. Handle, pack, and ship samples according to the procedures in Standard Operating Procedure for the Shipping and Handling of Samples, including the completion of a Chain of Custody (COC) Form for each cooler containing sample bottles that are shipped to a laboratory for analyses (see Appendix D for an example COC form).

Dip Sampler

A dip sampler can be used to collect samples that require preservatives in the sample bottles or in situations where direct immersion is not feasible. The long handle (or line if sampling from a bridge or other structure directly above the water body) on such a device allows access from a safe location. The sample collection container used on the sampling device will be a laboratory cleaned sample bottle, which will not be reused. A new bottle will be used at all sampling locations requiring the use of a dip sampler. Sampling procedures are as follows:

1. Assemble the device in accordance with the manufacturer's instructions.
2. Extend the device to the sample location and collect the sample by dipping the sampler into the substance.
3. Retrieve the sampler and transfer the sample to the appropriate sample container.
4. Dispose of the sample collection bottle.

Direct Method

The direct method will be used to collect water samples from the below the surface directly into the sample bottle. When using the direct method, do not use pre-preserved sample bottles as the collection method may dilute the concentration of preservative necessary for proper sample preservation. The procedures are as follows:

1. Using adequate protective clothing, access the sampling station by appropriate means.
2. For shallow stream stations, collect the sample under the water surface while pointing the sample container upstream. The container must be upstream of the collector. Avoid disturbing the substrate.

4.2 SAMPLING EQUIPMENT

The sampling equipment required for the Spokane River monitoring is included in Table 6.

Table 6. Sampling equipment list

Equipment	
Calibration materials	Sampling devices
Calibration and DO sheets	Decon equipment-DI water, non-phosphate detergent, acetone, aluminum foil
pH and conductivity standards	SAP
Coolers with ice	QAPP
Hydrolab/YSI	HASP
Backup meters	Labels
Sample bottles	Chain of Custody Forms
Field log sheets	Maps
Pens and pencils	

4.3 CALIBRATION OF FIELD EQUIPMENT

Instantaneous water quality measurements (such as temperature, conductivity, pH, dissolved oxygen, and turbidity) using field instruments will be collected as specified in the following sections of this SAP. The main concern will be the security of the instruments, equipment and generated data. Maintenance, cleaning and/or data download activities for in situ instruments will be performed at a frequency necessary to assure that representative data is generated and all data is recorded for transfer to the project files.

Temperature, conductivity, pH, dissolved oxygen and turbidity will be measured at each sampling station using a Hydrolab/YSI instrument, prior to sample collection. All field instruments will be calibrated at the beginning of the day of sampling, as required by the QAPP. Field instrument calibration and sample measurement data will be recorded on the Calibration Log and Field Log Sheet, respectively (see example forms in Appendix D).

The field instrument calibration must be conducted in accordance with Standard Operating Procedure (SOP) included in Appendix C.

4.4 EQUIPMENT DECONTAMINATION

If sampling equipment, such as the sample pole, etc., is to be reused at more than one location in the field, they must be cleaned prior to collecting the next sample. This equipment may be cleaned between locations. A brush may be used to remove deposits of material or sediment if necessary.

Standard cleaning procedures for equipment decontamination and post-sampling/storage are provided in SOP (included as Appendix C).

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5.0 SAMPLE HANDLING, STORAGE AND SHIPMENT

Sample handling will be performed so as to collect, store, submit to the laboratory and analyze representative samples using methods as specified in this section. Sample containers, volumes, preservatives and holding times are summarized in Table 7. Sample bottles (including those requiring preservative) and coolers will be provided by Axys Analytical Services for PCB and SVL Analytical, Inc. for all other parameters.

Laboratory personnel are listed in Table 1 and contact information is included in Appendix E.

5.1 SAMPLE HANDLING

Sample packaging and shipping procedures are designed to ensure that the samples and the chain-of-custody forms will arrive at the laboratory intact and together.

1. All samples collected will be labeled in a clear and precise way for proper identification in the field and for tracking in the laboratory. Fill in sample label (see example label in Appendix D). Use indelible waterproof marking pen (do not use colored ink) and include:
    - Sample identification code – will include: site designation number-collection date (MMDDYY)-collection time (military). For example, a sample collected at the X site on August 9, 2014 at 2:15PM will have a sample identification code number of “X-080914-1415”.
        - Replicate samples will be labeled with a sample ID of “REPLICATE X”. A blank line will be placed in the location, date and time boxes of the sample label. The replicate number in the replicate sample ID will be assigned in the field and recorded on the field log sheet.
        - Blank samples will be labeled with a normal sample ID. This sample ID will be recorded on the field log sheet and identified as a blank sample.
    - Sample type (e.g., soil, sediment, water, vapor);
    - Analysis required;
    - Date sampled;
    - Time sampled;
    - Name or initials of person who collected the sample;
    - Mode of collection (composite or grab);
    - Preservation added, if applicable.
2. Check the caps on the sample containers so that they are snugly sealed.
3. Cover the label with clear packing tape to secure the label, if necessary.
4. Place sample bottle in a clean ziploc plastic bag.
5. Samples will be placed in coolers for shipping with ice to maintain a maximum temperature of 4 degrees Celsius.

Table 7. Guidelines for water sample container preparation and preservation

Parameter	Container	Volume	Preservative	Holding Time	Lab Filter
Total Suspended Solids	polypropylene	1 L	4^{o} C	7 days	no
Total Dissolved Solids	polypropylene	500 ml	4^{o} C	7 days	no
Total Organic Carbon*	amber glass	40 ml	4^{o} C, H_2SO_4	28 days	no
Dissolved Organic Carbon*	amber glass	40 ml	4^{o} C	28 days	YES
PCB	amber glass	2.36 L	4^{o} C	1 year	no

*Bottles must be filled with zero head space.

5.2 SHIPPING

Table 8 lists the laboratories that will be performing the various analyses. Samples will be properly packaged for shipment to these agencies according to the standard operating procedures, as presented in Appendix C and as summarized below.

1. Using packaging tape, secure the outside and inside the drain plug at the bottom of the cooler that is used for sample transport.
2. Wrap each container in bubble wrap.
3. Place the sealed container upright in the cooler.
4. Place additional cushioning material around the sides of each sample container as needed.
5. Place ice or blue ice on top of sample containers. Do not pack ice so tightly that it may prevent the addition of sufficient cushioning material. Ensure that bottle caps will not be submerged in water if ice melts. Ice may also be placed in gallon ziplock bags before placing in the cooler.
6. Fill the remaining space in the cooler with cushioning material if the coolers are being shipped.
7. Place the chain-of-custody forms (see Appendix D) in a large Ziploc type bag and tape the forms to the inside of the cooler lid.
8. Close the cooler lid and fasten with packaging tape.
9. Wrap strapping or packaging tape around both ends of the cooler at least twice.
10. Place custody seal (see Appendix D) over front right and back left of the cooler lid and cover with clear plastic tape.

All shipments will be accompanied by the chain-of-custody form identifying the contents. It is preferred that a separate chain-of-custody form be completed for and placed in each shipping container. The original form will accompany the shipment and copies will be retained by the sampler for the sampling office records.

If sample containers are sent by common carrier (i.e., by Federal Express or United Parcel Service), the carrier need not sign the chain-of-custody form. In such cases, the chain-of-custody form should be sealed inside the sample container. The bill of lading (i.e., Federal Express label) serves as the custody documentation for the shipment so long as the container remains unopened until arrival at the laboratory. Copies of the bill of lading should be retained as part of the permanent documentation of the project.

Table 8. Laboratories performing analysis of sample parameters

Parameter	AXYS Analytical Services	SVL Analytical
TSS		X
TDS		X
TOC		X
DOC		X
PCB	X	

5.2.1 Communication

Contact information for all of the involved parties and personnel for this project are included in Appendix E.

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6.0 SAMPLE DOCUMENTATION

6.1 FIELD DATA COLLECTION FORMS

Field log sheets will serve as a daily record of events, observations and measurements during all field activities. All information pertinent to sampling activities will be recorded on the field log sheets. The field log sheets will be submitted to LimnoTech from the sampling team following the sampling event, and placed in a notebook. Entries on the field log sheet will include:

- Names of field crew
- Date and time of entry and exit
- Location of sampling activity
- Sampling method
- Sampling equipment used
- Date and time of collection
- Sample identification numbers
- Type of sample
- Preservatives used
- Field measurements
- Field observations and details related to analysis or integrity of samples (e.g., weather conditions, noticeable odors, colors, etc.)

Field meters will be calibrated daily in accordance with the manufacturer's recommendations. Standards, solutions used, concentrations and readings taken will be recorded daily in field calibration logs.

The field log sheet is included in Appendix D.

6.2 PHOTOGRAPHS

Photographs will be taken at the sampling locations. They will serve to verify information entered into the log sheets. For each photograph taken, the following information will be recorded on the field log sheet or in a separate field photography log:

- Time, date, location, weather conditions
- Description of the subject photographed
- Name of person taking photograph
- Photograph identification numbers

6.3 SAMPLE CHAIN-OF-CUSTODY FORMS

Completed chain of custody forms will be required for all samples to be analyzed. Chain of custody forms will be initiated by the sampling crews in the field during the sampling events. The chain of custody form will contain the sample's unique identification number, sample date and time, sample description, sample type, sample preservation, and analyses required. The original chain of custody form will accompany the samples to the laboratory. Copies will be made prior to shipment for field documentation. An example chain of custody form is included in Appendix D. The chain of custody forms will remain with the samples at all times. The samples and signed chain of custody form will remain in the possession of the sampling crew until samples are either delivered to the lab or placed in the custody of personnel responsible for their delivery to the laboratory.

6.4 DATA SUBMITTAL

In accordance with Section 2.10.1 of the QAPP, equipment calibration logs and field log sheets will be turned over to the Field Manager following each monitoring event. Following review by the Field Manager, these field log sheets shall be transmitted to the Project Manager.

Following each sampling event, the sampling crews must send (via fax, mail, or email) all field logs, photographs and chain of custody forms to the Field Manager for inclusion in the project database.

7.0 QUALITY CONTROL

The monitoring information that will be collected to support the toxics reduction strategy for the Spokane River will meet the quality assurance objectives presented in the QAPP. Data quality will be measured in terms of the Data Quality Indicators (DQIs); accuracy and precision, completeness, representativeness, comparability, and the required detection limits for the analytical methods.

The frequency of the quality control (QC) samples and the measurement performance criteria for each QC sample for each type of analysis are provided in Tables 9 and 10.

Table 9. Quality control requirements for laboratory analyses – TSS, TDS, TOC, and DOC

Parameter	Lab Control Sample	Replicate Samples	Matrix Spikes	Matrix Spike Duplicates	Reference Method	Detection Limit
	% recovery limits	RPD	% recovery limits	RPD		
DOC	80-120%	30%	80-120%	20%	SM 5310B	1 mg/L
TOC	80-120%	30%	80-120%	20%	SM-5310B	1 mg/L
TSS	80-120%	30%	--	--	SM-2540D	1 mg/L
TDS	80-120%	30%	--	--	SM-2540C	1 mg/L

Table 10. Quality control requirements for laboratory analyses - PCBs

	Daily Calibration Verification	Sample and MB Standard Recovery	LCS Recovery	Lab Blanks (Method Blank, Instrument Blank, Calibration Blank	Detection Limit (Level at which non-detects are reported)
	% recovery limits	% recovery limits	% recovery limits	Concentration (pg/L)	Concentration (pg/L)
PCB Congeners EPA Method 1668C	50-145%	25-150%	50-150%	Maximum = 127 pg/L (total) Laboratory will B-qualify congeners results < 3x the concentration in an associated blank	1-20 (per congener)

Trip Blanks – Trip blanks will be used to evaluate whether contaminants have been introduced into the samples due to exposure to ambient conditions or from the sample containers themselves. A trip blank is a controlled water sample, with minimal concentrations of contaminants of concern, which is produced by the laboratory. The trip blank accompanies the sampling equipment into the field and is stored with the analytical samples. If transfer blanks are required, they will be obtained by pouring deionized water into the sample container in the field, preserved and shipped to the laboratory with the field samples. Trip/transfer blanks will be collected at a frequency of 10% or one blank per sampling round.

Trip/transfer blanks will be preserved, packaged, and sealed in the same manner described for the surface water samples. A separate individual sample ID will be assigned to each blank. The samples will be submitted as "blind" samples to the laboratory for analysis. If target analytes are found in the blanks above the criteria, sampling and handling procedures will be reevaluated and corrective actions taken. These may consist of, but are not limited to, obtaining sampling containers from new sources, training of personnel, discussions with the laboratory, invalidation of results, greater attention to detail during the next sampling event, or other procedures considered appropriate.

Field Replicate Samples – Field replicate samples will be collected to evaluate the precision of sample collection through analysis. Field replicates will be collected at designated sample locations by filling two distinct sample containers for each analysis. Field replicate samples will be preserved, packaged, and sealed in the same manner described for the surface water samples. The replicate sample will be labeled with a sample ID of "REPLICATE X" and a blank line placed in the location, date and time boxes of the sample label. The samples will be submitted as "blind" samples to the laboratory for analysis.

Field replicates will be collected for each analytical parameter at a frequency of 10% or one field replicate per sampling round. The replicate samples will be collected at random locations for each sampling event. If the acceptance criteria are exceeded, field sampling and handling procedures will be evaluated, and problems corrected through greater attention to detail, additional training, revised sampling techniques, or whatever appears to be appropriate to correct the problem.

7.1 QC SAMPLING METHODS

Replicate samples will be collected immediately after the first sample is collected. Blind replicate samples are specified in the QAPP, therefore the replicate sample should be labeled so that it does not identify the other sample of the replicate pair to the laboratory on the chain-of-custody (COC). For example, one sample of the replicate pair would be labeled following the normal protocol, while the second would be labeled with a sample ID of "REPLICATE X" and a blank line placed in the location, date and time boxes of the sample label. The replicate number in the replicate sample ID will be assigned in the field and recorded on the field log sheet. It is important that the replicate pair samples are identified separately in the field notes with information including location, sample ID (as entered on the sample container label and COC), sample date and time so that analytical results can be paired after they are received from the laboratory.

Trip blanks will be used to evaluate whether contaminants have been introduced into the samples due to exposure to ambient conditions or from the sample containers themselves. A trip blank is a controlled water sample, with minimal concentrations of contaminants of concern, which is produced by the laboratory. The trip blank accompanies the sampling equipment into the field and is stored with the analytical samples. If transfer blanks are required, they will be obtained by pouring deionized water into the sample container in the field, preserved and shipped to the laboratory with the field samples. The water will be received from the laboratory for all blank samples. The blank sample will be given a normal sample ID.

7.2 TRAINING

All field staff will receive training covering the QAPP, HASP and SAP. The training will be conducted by LimnoTech and will include proper procedures for sample collection and documentation, as well as health and safety information related to the specific sampling activities. The training will also cover the operation, maintenance, and calibration of field equipment including multi-parameter probes, and all other on-site equipment used throughout the field program.

The SOPs for all program elements will be distributed to the field staff.

8.0 REFERENCES

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Hortness, J.E., and Covert, J.J., 2005, Streamflow trends in the Spokane River and tributaries, Spokane Valley/Rathdrum Prairie, Idaho and Washington: U.S. Geological Survey Scientific Investigations Report 2005-5005, 17 p.

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LimnoTech, 2014b. Sampling Recommendations for Spokane River PCB Confidence Testing – Draft. Memorandum from Dave Dilks to the Spokane River Regional Toxics Task Force. April 7, 2014.

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Serdar, D., B. Lubliner, A. Johnson, D. Norton, 2011. Spokane River PCB Source Assessment 2003-2007. Publication No. 11-03-013.

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APPENDIX A

QUALITY ASSURANCE PROJECT PLAN

This document can be found on the Spokane River Regional Toxics Task Force website located at:

http://srrttf.org/

APPENDIX B

SAMPLING SUMMARY DETAILS

SYNOPTIC SURVEY DETAILS	
Riverine Sampling Events **(seven sampling events every other day)**	**Point Source Sampling** **(three non-sequential sampling events distributed during riverine sampling period)**
<u>Locations</u> Lake Coeur d'Alene Outlet Spokane River at Post Falls Spokane River a Barker Road Bridge Spokane River Below Trent Avenue Bridge Spokane River a t Greene Street Bridge Hangman Creek Spokane River a Spokane Spokane River Below Nine Mile Dam	<u>Locations</u> Coeur d'Alene Advanced WWTP Hayden Area Regional Sewer Board WWTP Post Falls WWTP Liberty Lake Water Reclamation Facility Kaiser Aluminum Inland Empire Paper Spokane County Water Reclamation Facility City of Spokane Advanced WWTP
<u>Samples</u> 1 sample from each riverine location = 56 samples 1 replicate sample from each riverine location = 56 samples 1 sample from each riverine location for compositing = 8 1 random riverine location sample for replicate analysis/sampling day = 7 samples 1 trip blank sample/sampling day = 7 trip blanks	<u>Samples</u> 1 sample from each point source location = 24 samples 1 replicate sample from each point source location = 24 samples 1 sample from each point source location for compositing = 8 1 random point source location sample for replicate analysis/sampling day = 3 samples 1 trip blank sample/sampling day = 3 trip blanks

SEASONALLY INTEGRATED SAMPLING DETAILS
Riverine Sampling Events **(five sampling events every other day)**
<u>Location</u> Lake Coeur d'Alene Outlet
<u>Samples</u> 1 sample from the riverine location = 5 samples 1 sample from the riverine location for compositing = 1 sample 1 random riverine location sample for replicate analysis/sampling day = 5 samples 1 trip blank sample/sampling day = 5 trip blanks

APPENDIX C

STANDARD OPERATING PROCEDURES

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Equipment Cleaning SOP

Introduction

Equipment cleaning areas will be located within or adjacent to a specific work area or as specified in the Health and Safety Plan. The equipment cleaning procedures described in this document include pre-field, in-field, and post-field cleaning of sampling equipment. The sampling equipment consists of surface water sampling devices, water testing instruments, and other activity-specific sampling equipment. All non-disposable sampling equipment will be cleaned after completion of each sampling event. If appropriate, cleaning procedures will be monitored through the analysis of rinse blank samples as described in the project work plan or QAPP.

Materials

The following materials will be available during equipment cleaning, as needed:

- Personal protection equipment (as required in the Health and Safety Plan);
- Distilled/de-ionized water;
- Non-phosphate detergent (Alconox, Liquinox, or equivalent);
- Tap water;
- Appropriate cleaning solvent (e.g., methanol, hexane, nitric acid);
- Wash basins;
- Brushes;
- Polyethylene sheeting;
- Aluminum foil;
- Plastic overpack drum, storage tub, or other suitable storage unit (for bladder or other pumps);
- Large heavy-duty garbage bags;
- Spray bottles (to hold tap water, distilled/de-ionized water, methanol, hexane, or nitric acid); and
- Disposable and/or heavy-duty reusable (PVC, latex or nitrile) gloves.

Storage of Equipment

All cleaned sampling equipment will be stored in a clean environment and, where appropriate, the equipment will be covered/sealed with aluminum foil.

Safety Procedures During Equipment Cleaning

1. Personnel will wear the following personal protection equipment at a minimum, when cleaning sampling equipment:

- Safety glasses, goggles, or a splash shield; and
- Nitrile outer gloves,
- Coated Tyvek® or Saranex® disposable coveralls or rainsuit, optional for small equipment cleaning; and
- Chemical resistant over boots, optional for small equipment cleaning.

2. All solvent rinsing if required, will be conducted in an adequately ventilated area.
3. All solvents transported into the field will be stored and packaged in appropriate containers with care taken to avoid exposure to extreme heat.
4. Handling of solvents will be consistent with the manufacturer's Material Safety Data Sheets (MSDS).

Field Cleaning Procedures

Cleaning of Smaller Sampling Equipment

Cleaning of smaller sampling equipment (e.g., water quality sampling devices) will be conducted according to the following sequential procedure:

- Non-phosphate detergent (Alconox, Liquinox, or equivalent) and tap water wash;
- Tap water rinse;
- Solvent rinse, if required (e.g., methanol or hexane for organic constituent analysis, nitric acid for inorganic constituent analysis); and
- Triple distilled/de-ionized water rinse.

The first step in decontamination is physical removal, where gross contaminants such as dust, soils and sediments can be removed through physical means such as wiping and scraping. Non-phosphate detergent and tap water scrub is intended to remove all visible particulate matter, residual oil and grease, and most but not all contaminants. Surfactants or detergents accumulate at the water to gas, solid, and oils interface, break the adhesive forces between the contaminant and the surface being cleaned, making the contaminants more soluble, allowing the contaminants to be washed away. The tap water rinse is necessary to remove all soapy residues and wash away loosened contaminants. The need for a specific solvent used for the solvent rinse, if required in the work plan or QAPP, will depend upon what the sample will be analyzed for and what contaminants are expected to be present. Some contaminants such as PCBs adhere to surfaces so tightly that a methanol or hexane rinse is required to break the adhesive bonds and adequately decontaminate the sampling equipment. Caution should be used when using solvent rinses to make sure that the chosen solvent is compatible with the sampling equipment and any PPE it will be used upon. It should be noted that most PPE constructed of organic materials could be damaged or dissolved by organic solvents such as alcohols, ethers, ketones, aromatics, straight chain alkanes and common petroleum products. The final rinse of distilled/de-ionized water will be repeated three times. Rinsing removes any remaining contaminants through dilution, physical attraction, and solubilization. The equipment will then be allowed to air dry.

Collection and Disposal of used Solvents, Residuals and Rinse Solutions

All solvents, residuals, and rinse waters generated during the cleaning of equipment on-site will be collected, containerized, and stored on-site until arrangements can be made for proper disposal.

Sample Handling, Packing and Shipping SOP

Handling

1. Fill in sample label (see Appendix D). Use indelible waterproof marking pen and include:

- Sample Identification code (if possible, should reflect site name, sample location and sample interval)
- Sample type (e.g., soil, sediment, water, vapor);
- Project code;
- Analysis required;
- Date sampled;
- Time sampled;
- Name or initials of person who collected the sample;
- Mode of collection (composite or grab); and
- Preservation added, if applicable.

2. Check the caps on the sample containers so that they are snugly sealed.
3. Cover the label with clear packing tape to secure the label onto the container, if necessary.

Packing

1. If using a laboratory supplied transpack, follow the laboratory's instructions for packing. Generally, repack the transpack in the same way in which the empty containers were received. If using a standard cooler, follow the instructions below.
2. Using packaging tape, secure the outside and inside the drain plug at the bottom of the cooler that is used for sample transport.
3. Place 1 to 2 inches of cushioning material at the bottom of the cooler.
4. Place the sealed container upright in the cooler.
5. Place additional cushioning material around the sides of each sample container.
6. Place frozen gel cold packs on top of sample containers. If ice is used, repackage ice in small Ziploc® -type plastic bags and place loosely in the cooler. Do not pack cold packs or ice so tightly that it may prevent the addition of sufficient cushioning material.
7. Fill the remaining space in the cooler scushioning material.
8. Place the chain-of-custody forms (see Appendix D) in a large Ziploc® type bag and tape the forms to the inside of the cooler lid.
9. Close the cooler lid and fasten with packaging tape.
10. Wrap strapping or packaging tape around both ends of the cooler at least twice.
11. Mark the cooler on the outside with the following information: return address, "Fragile" labels (see attachment) on the top and on one side, and arrows indicating "This Side Up" (see attachment) on two adjacent sides.
12. Place custody seal evidence tape (see Appendix D) over front right and back left of the cooler lid and cover with clear plastic tape.

Shipping

1. Environmental samples will be shipped according to 40 CFR 761.65 (i)(3) and in accordance with current and applicable D.O.T. standards.

2. All samples will be delivered by an express carrier, allowing for sufficient time for analysis to be performed within the applicable holding time periods.

3. The following chain-of-custody procedures will apply to sample shipping:

- Relinquish the sample containers to the laboratory via express carrier. The signed and dated forms should be taped inside the top of the cooler. The express carrier will not be required to sign the chain-of-custody forms.
- When the samples are received by the laboratory, the laboratory personnel shall complete the chain-of-custody forms by signing and dating to acknowledge receipt of samples. The internal temperature of the shipping container is measured and recorded. The sample identification numbers on the containers are then checked to insure that they are consistent with the chain of custody forms

Surface Water Sampling SOP

Introduction

This standard operating procedure (SOP) is applicable to the collection of representative liquid samples from streams, rivers, lakes, and ponds. It includes samples collected from depth, as well as samples collected from the surface. These typically applicable procedures have been adapted from the U.S. EPA Surface Water Sampling SOP No. 2013, dated 11/17/94 and may be varied or changed as required, dependent upon site conditions or equipment and procedural limitations. The actual procedures used should be documented on the field log sheet, especially if changes are made.

There are two primary interferences or potential problems with representative surface water sampling. These include cross contamination of samples and improper sample collection. Following proper decontamination procedures and minimizing disturbance of the sample site will eliminate these problems as follows:

- Cross contamination problems can be eliminated or minimized through the use of dedicated sampling equipment. If this is not possible or practical, then decontamination of sampling equipment is necessary. Refer to the Equipment Cleaning SOP.
- Improper sample collection can involve using contaminated equipment, disturbance of the stream or impoundment substrate, and sampling in an obviously disturbed area.

In order to collect a representative sample, the hydrology and morphometrics of a stream or impoundment should be determined prior to sampling. This will aid in determining the presence of flow patterns in streams, and appropriate sampling locations and depths.

Materials

The following materials shall be available, as required, during surface water sampling. Back-up field instruments/equipment should be available, if required.

- Personal protective equipment (as required by the Health and Safety Plan);
- Cleaning equipment (as required in the Standard Operating Procedure for Equipment Cleaning);
- Appropriate sampling apparatus and accessories (e.g., Dip sampler);
- Appropriate sample bottles, preservatives (if required) and sample bottle labels;
- ZiplocR-type bags;
- Insulated coolers, ice, and appropriate packing material;
- Chain of Custody records and custody seals;
- Field log sheets, waterproof pen, camera;
- Maps, stakes, flagging.

Preparations

- Determine the extent of the sampling effort, the sampling methods to be employed, and the types and amounts of equipment and supplies needed.
- Obtain the necessary sampling and monitoring equipment to suit the task. Consider sample volume, depth, deployment circumstances (shore, wading, boat, currents), type of sample, sampler composition materials, and analyses to be conducted.
- Decontaminate or pre-clean equipment and ensure that it is in working order, as required.
- Prepare scheduling and coordinate with staff, clients, and regulatory agency, if appropriate.
- Perform a general site survey prior to site entry, in accordance with the site specific Health and Safety Plan.

- Use stakes, flagging, or buoys to identify and mark all sampling locations. If required, the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions. If also collecting sediment samples, this procedure may disturb the bottom and cause interferences with collection of representative water samples.

General Sample Collection Procedures

1. Record pertinent data on the field log sheet (see attached Field Log Sheet, or equivalent).
2. Label all sample containers with the date, time, site location, sampling personnel, and other requested information.
3. Don appropriate personal protective equipment (as required by the Health and Safety Plan).
4. Clean all sampling equipment prior to sample collection according to the procedures in the Standard Operating Procedure for Equipment Cleaning, as required.
5. If field preservation is required, place appropriate preservative into the sample container prior to sample collection. Note the preservative and preservative column on the sample container and field log sheet.
7. If any quality control samples are specified in the work plan, they will be collected in the following manner:
   - Duplicate samples should be collected at the same time or immediately following one another in accordance with the above procedures. If blind duplicate samples are specified in the work plan, one of the duplicate samples should be labelled so that it does not identify the other sample of the duplicate pair to the laboratory on the chain-of-custody (COC). For example, one sample of the duplicate pair would be labelled following the normal protocol, while the second would be labelled with a sample ID of "DUPLICATE" and a blank line placed in the location, date and time boxes of the sample label. It is important that the duplicate pair samples are identified separately in the field notes with information including location, sample ID (as entered on the sample container label and COC), sample date and time so that analytical results can be paired after received from the laboratory.
   - Trip blanks should be prepared by the laboratory and shipped with the sample bottles. Trip blanks are not to be opened at any time, except by the laboratory for analysis, and must accompany the other samples/sample bottles at all times. Be sure to log the trip blank samples on the COC before shipping samples back to the laboratory.
   - Rinse (or equipment) blanks should be collected from a final distilled/deionized water rinse of the specified sampling equipment after that piece of equipment has been cleaned in accordance with appropriate specified cleaning procedures.
   - Field blanks, such as samples of water or reagents used to clean sampling equipment, should be collected directly into the sample bottle from the appropriate source container.
8. Record sample collection information on the field log sheet and store the samples in an iced cooler as described in the Standard Operating Procedure for the Shipping and Handling of Samples.
9. Handle, pack, and ship samples according to the procedures in Standard Operating Procedure for the Shipping and Handling of Samples.

Equipment-Specific Sample Collection Procedures

Dip Sampler

A dip sampler is useful in situations where a sample is to be recovered from locations (e.g., outfall pipe, sump manhole, along a pond or lagoon bank) where direct access is limited. The long handle (or line if sampling from a bridge or other structure directly above the water body) on such a device allows access from a safe location.

Dip Sampler

Sampling procedures are as follows:

1. Assemble the device in accordance with the manufacturer's instructions.
2. Extend the device to the sample location and collect the sample by dipping the sampler into the substance.
3. Retrieve the sampler and transfer the sample to the appropriate sample container.

Direct Method

For streams, rivers, lakes, and other surface waters, the direct method may be used to collect water samples from the surface directly into the sample bottle. When using the direct method, do not use pre-preserved sample bottles as the collection method may dilute the concentration of preservative necessary for proper sample preservation. The procedures are as follows:

1. Using adequate protective clothing, access the sampling station by appropriate means.
2. For shallow stream stations, collect the sample under the water surface while pointing the sample container upstream. The container must be upstream of the collector. Avoid disturbing the substrate.

Disposal Methods

If required, all water generated during equipment cleaning procedures will be collected and contained on site for determination of proper treatment or disposal. In addition, personal protective equipment (e.g., gloves, disposable clothing) and other disposable equipment resulting from cleaning and sampling procedures will be placed in plastic bags and appropriately contained for proper disposal.

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Field Water Quality Measurement SOP

Introduction

Water quality parameters, such as temperature, specific conductance, pH, dissolved oxygen, and turbidity, are usually measured in the field during surface water monitoring. All parameters will be monitored using a multi-parameter sonde and attached digital display, such as the YSI 6920 with a YSI 650 handset or similar. The YSI 6920 sonde is also equipped with a depth sensor for surface water applications. No maintenance beyond factory calibration is necessary for this sensor. The calibration and maintenance log for the YSI 6920 is included as an attachment to this Standard Operating Procedure.

Materials

The following materials, as required, shall be available during field measurement of water quality:

- Personal protective equipment (as specified in the Health and Safety Plan);
- Clean container;
- YSI 6920 multi-parameter sonde with YSI 650 display handset (or equivalent);
- Manufacturer's operating manuals for each instrument;
- Conductivity Calibration Standard, (1413 uS/cm (or equivalent);
- pH buffers 7.00 and 10.00;
- Turbidity standards (YSI 126 NTU and De-Ionized water for 0 NTU);
- Multi-parameter sonde maintenance kit;
- Cleaning equipment (as required in the Standard Operating Procedure for Equipment Cleaning);
- Extra batteries for the meters;
- Appropriate forms and field log sheet.

Procedures for Calibrating Multi-Parameter Sonde (YSI 6920)

Dissolved Oxygen Calibration Procedure (YSI 6920)

1. Verify there is a small amount of water in the bottom of the YSI 6920 storage cup. The cup only needs to provide a moist environment for the sensors.
2. Allow YSI 6920 to stand in storage cup for 10 to 15 minutes prior to calibration of dissolved oxygen. Loosen threads on storage cup slightly to establish connection with atmospheric pressure.
3. Using the YSI 650 display unit, which contains an internal barometer, verify that percent dissolved oxygen is within 95% to 100% saturation. If not within this range within 30 minutes, replace DO membrane if applicable.
4. Calibrate dissolved oxygen sensor.

Specific Conductance Calibration Procedures (YSI 6920)

Conductivity is the ability of a solution to pass an electric current. This current is carried by inorganic dissolved solids. The measurement of conductivity is useful to relate the chemical purity of the water and the amount of dissolved solids in a solution.

1. Invert YSI 6920, remove black cap from end of storage cup. Rinse probes with tap water.
2. Fill calibration/storage cup with conductivity standard (1413 uS/cm).
3. Allow time for reading to stabilize.

3. Calibrate for Specific Conductance.

pH Calibration Procedures (YSI 6920)

1. Invert YSI 6920, remove black cap from end of storage cup. Rinse probes with tap water.
2. Determine range of pH values that will be measured in the field. Use buffer solutions that encompass this value. Typical buffer solutions are 4.0, 7.0 and 10.0.
3. Fill calibration/storage cup with first pH standard (4.0 or 7.0). Select "2-point calibration" for pH.
4. Allow time for reading to stabilize.
5. Calibrate for pH.
6. Fill calibration/storage cup with second pH standard (7.0 or 10.0).
7. Allow time for reading to stabilize.
8. Calibrate for pH.

Turbidity Calibration Procedures (YSI 6920)

1. Invert YSI 6920, remove black cap from end of storage cup. Rinse probes with tap water.
2. Determine range of turbidity values that will be measured in the field. Use YSI calibration standard that encompass this value. Typical standards are 0.0, 12.7, 126, and 1000 NTU. Deionized water is used for the 0.0 standard.
3. If multiple sondes are used on a project, the sonde turbidity readings will be compared using a water sample from the project site to confirm that there is no discrepancy between sondes.
4. Fill calibration/storage cup with first turbidity standard (0.0). Select "2-point calibration" for Turbidity.
5. Allow time for reading to stabilize.
6. Calibrate for turbidity.
7. Fill calibration/storage cup with second turbidity standard (12.7, 126 or 1000 NTU).
8. Allow time for reading to stabilize.
9. Calibrate for turbidity.

Maintenance Procedures (YSI 6920)

1. Replace batteries on a regular basis.
2. Store electrode in protective casing when not in use.
3. Keep records of usage, maintenance, calibration, problems, and repairs.
4. After use, the meter will be inspected and any problems recorded in the field notebook.
5. A replacement meter will be available onsite or ready for overnight shipment.

Procedures for collecting Water Quality Measurements

Determine the cable length needed from the 650 handset to the YSI 6920 for the anticipated application.

Operation Procedure (YSI 6920)

1. Turn meter on. Confirm that instrument was recently calibrated.

2. Remove storage cup from sensors, install protective guard used during deployment.
3. Lower YSI 6920 to desired depth in water column.
4. Record readings on field log sheet, lower or raise 6920 to another measurement depth.
5. If measurements are complete at current location, re-coil cable between YSI 650 handset and YSI 6920.
6. Remove deployment guard and replace storage cup.

Maintenance Procedures (YSI 6920)

1. Replace batteries on a regular basis.
2. Store electrode in protective casing when not in use.
3. Keep records of usage, maintenance, calibration, problems, and repairs.
4. After use, the meter will be inspected and any problems recorded in the field log sheet and/or calibration/maintenance log.
5. A replacement meter will be available onsite or ready for overnight shipment.

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Appendix D

Example Documentation

(Chain of Custody, Sample Label, Custody Seal Label, Calibration Logs and Field Log Sheet)

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EXAMPLE - Sample Bottle Label

Client/Source:	☐ **Grab** ☐ **Composite**
Site Name:	**Date:**
Sample #	**Time:**
Analysis:	**Preservatives:**
	Collected by:

Example - Sample Custody Seal Label

Sealed by: ___________________________
Date: ___________Time: _______________

LimnoTech
Water | Environment | Scientists | Engineers

Check Originating Office

☐ Corporate Office
501 Avis Drive
Ann Arbor, MI 48108
(734) 332-1200 (phone)
(734)332-1212 (fax)

☐ Kalamazoo Field Office
2980 Business One Drive
Kalamazoo, MI 49001
(269) 226-0190 (phone)
(269) 226-0192 (fax)

CHAIN OF CUSTODY RECORD

Proj. No.	Project Name												
Samplers: *(Signature)*													
Sta. No.	Date	Time	COMP	GRAB	Station Location	Number of Containers							Remarks

Relinquished by: *(Signature)*	Date	Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date	Time	Relinquished by: *(Signature)*
Relinquished by: *(Signature)*	Date	Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date	Time	Relinquished by: *(Signature)*
Relinquished by: *(Signature)*	Date	Time	Received for Laboratory by: *(Signature)*	Date	Time	Remarks:	

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

EXAMPLE - EQUIPMENT CALIBRATION LOG

DATE:				START TIME:	
PERSONNEL:				END TIME:	
LOCATION:				PROJECT:	
INSTRUMENT CALIBRATED:				SERIAL NUMBER:	
		D. O. %			
		WATER SATURATED AIR CALIBRATION			
D.O. AIR SATURATION TIME		min	PERCENT SATURATION		100
CALIBRATION PRESSURE		mmHg	CALIBRATION TEMPERATURE		
PRE-CALIBRATION READING	%,	mg/l	CALIBRATED READING		%,
DO CHARGE / DO GAIN					(ACCEPTABLE RANGE: 50 +/- 25,
CALIBRATION SUCCESSFUL		MAINTENANCE			
		SPECIFIC CONDUCTIVITY			
COND, STANDARD USED	YSI CONDUCTIVITY STANDARD	1000 uS/cm	YSI 3167	(1.00 mS/cm)	
DATE BOTTLE OPENED			EXPIRATION DATE		
PRE-CALIBRATION READING		mS/cm	CALIBRATION NUMBER USED		
CALIBRATED READING		mS/cm	CALIBRATION TEMPERATURE		
CAL. CONSTANT					(ACCEPTABLE RAN
CALIBRATION SUCCESSFUL		MAINTENANCE			
		pH			
		2 POINT CALIBRATION			
pH 7.00 STANDARD USED	YSI BUFFER SOLUTION pH 7.00	pH 7.00 +/- 0.01 @ 25'C	YSI 3822		
DATE BOTTLE OPENED			EXPIRATION DATE		
PRE-CALIBRATION READING		s.u.	CALIBRATION NUMBER USED		
CALIBRATED READING		s.u.	CALIBRATION TEMPERATURE		
BUFFER 7.00 mV					(ACCEPTABLE RAN
pH 10.00 STANDARD USED	YSI BUFFER SOLUTION pH 10.00	pH 10.00 +/- 0.01 @ 25'C	YSI 3823		
DATE BOTTLE OPENED			EXPIRATION DATE		
PRE-CALIBRATION READING		s.u.	CALIBRATION NUMBER USED		
CALIBRATED READING		s.u.	CALIBRATION TEMPERATURE		
BUFFER 10.00 mV					(ACCEPTABLE RANGE

TURBIDITY

2 POINT CALIBRATION

TURBIDITY STANDARD # 1	YSI 608000 TURBIDITY STANDARD 0.0 NTU		
DATE BOTTLE OPENED		EXPIRATION DATE	
PRE-CALIBRATION READING	ntu	CALIBRATION NUMBER USED	
CALIBRATED READING	ntu	CALIBRATION TEMPERATURE	
TURBIDITY STANDARD # 2	YSI 607300 TURBIDITY STANDARD 100 NTU		
DATE BOTTLE OPENED		EXPIRATION DATE	
PRE-CALIBRATION READING	ntu	CALIBRATION NUMBER USED	
CALIBRATED READING	ntu	CALIBRATION TEMPERATURE	
CALIBRATION SUCCESSFUL		MAINTENANCE	
NOTES:			

Example - Field Log Sheet

Project Name: Page ___ of ___

Field Log Sheet

StationID: _____________	Personnel	Photo Descriptions
Date: _________________	(initials):	
ArrivalTime :___________		
DepartureTime: ________		
GPS Device: ______________________________		
DATUM: **NAD83** **WGS84** **Other** **:** __________		
Accuracy (**ft** / **m**): ______		
Lat (dd.ddddd): ____________________________		
Long (ddd.ddddd): __________________________		
Associated Flow Gage ID: _______________________		
Gage Flow (cfs): _____________________________		
Gage Location (in relation to sample location): _______________		
____		

Habitat Observations

SKY CODE:	**NA** **Clear** **Partly Cloudy** **Overcast** **Fog** **Smoky** **Hazy**
PRECIPITATION:	**NA** **None** **Fog** **Drizzle** **Rain** **Snow**
WATERCOLOR:	**Colorless** **Green** **Yellow** **Brown** **Other** **:**___________________
WATERODOR:	**None** **Sulfides** **Sewage** **Petroleum** **Mixed** **Decay** **Other** **:**_______________
SITE ODOR:	**None** **Sulfides** **Sewage** **Petroleum** **Smoke** **Other** **:**___________________
OTHER OBSERVATIONS:	____

Field Measurements

PARAMETER	Water Temp (°C)	pH	Specific Conductivity (uS/cm)	Turbidity (ntu)	DO (mg/L)	DO % Saturation	Water Depth (ft)	Depth of sample from water surface (ft)	Velocity (fps)
Measurement									
Instrument:									
Calib. Date:									

Sample Location Description:

Notes: ____
____
____
____

StationID:_____________
Date:________________

Sample Info

SAMPLE MATRIX: **Riverine water** **WW effluent** **Other :**_____________________________

Time	Sample ID	Parameter	Sample Type*	Equipment Used/Method	Grab (G) or Composite (C)	Preservative	Comments
		PCB					
		TSS					
		TDS					
		TOC					
		DOC					
		PCB					
		TSS					
		TDS					
		TOC					
		DOC					
		PCB					
		TSS					
		TDS					
		TOC					
		DOC					
		PCB					
		TSS					
		TDS					
		TOC					
		DOC					
		PCB					
		TSS					
		TDS					
		TOC					
		DOC					

* Archive, Replicate, Blank

Notes: ____
____
____
____

Data Recorder Initials: _______

APPENDIX E

CONTACT LIST

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CONTACT LIST

Name	Project Role	Organization	Location	Phone Number
Bud Leber	SRRTF-ACE, Administrator	Kaiser Aluminum Trentwood	Spokane Valley, WA	(509) 927-6554
David Dilks	Project Manager	LimnoTech	Ann Arbor, MI	(734) 332-1200
Adriane Borgias	Advisor	Washington State Department of Ecology	Spokane, WA	(509) 329-3515
Arianne Fernandez	Advisor	Washington State Department of Ecology	Spokane, WA	(509) 329-3498
Robert Steed	Advisor	Idaho DEQ	Coeur d'Alene, ID	(208) 769-1422
Cathy Whiting	Field Manager	LimnoTech	Ann Arbor, MI	(734) 332-1200
Carrie Turner	Project QA Officer	LimnoTech	Ann Arbor, MI	(734) 332-1200
Shea Hewage	Laboratory Operations Director	AXYS Analytical Services	Sidney, BC Canada	(250) 655-5800
Cynthia Tomey	Laboratory Project Manager	AXYS Analytical Services	Sidney, BC Canada	(250) 655-5800
Dale Hoover	Laboratory QA Manager	AXYS Analytical Services	Sidney, BC Canada	(250) 655-5800
John Kern	Laboratory Director	SVL Analytical, Inc.	Coeur d'Alene, ID	(208) 784-1258
Michael Desmarais	Laboratory QC Manager	SVL Analytical, Inc.	Coeur d'Alene, ID	(208) 784-1258
Christine Meyer	Client Service Manager	SVL Analytical, Inc.	Coeur d'Alene, ID	(208) 784-1258
Shawn Hinz	Project Manager	Gravity Environmental	Fall City, WA	(425) 281-1471