Quality Assurance Project Plan

Spokane River Cadmium, Lead and Zinc Characterization

State of Idaho
Department of Environmental Quality

Coeur d' Alene Regional Office

Version 1.0

March 14, 2014

1 Title and Approval Page

Quality Assurance Project Plan

Title: Spokane River Cadmium, Lead and Zinc Characterization

Region/Division: Coeur d' Alene Regional Office

Version Number: 1.0

Date: March 14, 2014

Approval Signatures

Note: This QAPP becomes effective on the date of the last approval signature.

Program/Regional Manager

Signature: _____ for Thomas Herron 3/14/14

Name: Thomas Herron, Water Quality Manager, Coeur d' Alene Regional Office Date

Project Quality Assurance Officer

Signature: _____ 3-14-2014

Name: Don A. Essig, Standards Manager, State Office Date

*Note: At the time of QAPP signature, the project QAO is required to update the DEQ QAO project document tracker, found at TRIM Record #2012AEB8.

Project Manager

Signature: _____ 3/14/14

Name: Robert Steed, Surface Water Ecologist, Coeur d' Alene Regional Office Date

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3 Distribution List

At a minimum, the following personnel and analytical laboratory contacts will receive either an electronic or hard copy of the final signed quality assurance project plan (QAPP) (Table 1).

Table 1. Project QAPP distribution list.

Name	Project Affiliation	Organization and Address/Location	Contact Number
Mark K. Clough	DEQ Quality Manager	DEQ—Director's Office	(208) 373-0528
Thomas Herron	Program/Regional Manager	DEQ—Coeur d' Alene Regional Office	(208) 769-1422
Don Essig	Project Quality Assurance Officer	DEQ—DEQ State Office	(208) 373-0119
Robert Steed	Project Manager	DEQ—Coeur d' Alene Regional Office	(208) 769-1422
Kristin Larson	Project Staff	DEQ—Coeur d' Alene Regional Office	(208) 769-1422
Craig Nelson	Project Staff	DEQ—Coeur d' Alene Regional Office	(208) 769-1422
Chris Meyer	Analytical Laboratory Quality Manager	SVL Analytical, Inc.	(208) 784-1258
Coeur d'Alene Regional Office Staff	Other Project Staff	DEQ—Coeur d' Alene Regional Office	(208) 769-1422

4 Project/Task Organization

Key project personnel and their responsibilities are defined in Table 2. An organizational chart is provided in Figure 1.

The project staff duties and responsibilities described in Table 2 are not intended to be all inclusive; see sections 1.2.5 through 1.2.7 of the DEQ *Quality Management Plan* (QMP) (DEQ 2012a) for a more detailed description.

Table 2. Key project personnel and associated responsibilities.

Name	Project Title/Responsibility
Thomas Herron	**Program/Regional Manager**: Note: The following description is *not all inclusive*; see section 1.2.7 of the DEQ QMP for a more detailed description. This person is the regional manager or State Office program manager for the project. Duties and responsibilities include: • Assists in the review of the QAPP and signs the final QAPP as an approver. • Confirms the project QAPP meets the needs of the program/region. • Ensures the QAPP is approved prior to the start of project work. • Ensures the program/regional procedures and policies referenced in the QAPP are current and approved for use. • Performs all duties and responsibilities as assigned in the project QAPP. • Selects and assigns a project quality assurance officer (QAO), who meets the criteria for independence defined in the DEQ QMP (see QAO duties below), and obtains approval for this selection from the DEQ quality manager.
Don Essig	**Project Quality Assurance Officer**: Note: The following description is *not all inclusive*; see section 1.2.5 of the DEQ QMP and the project QAPP for a more detailed description. Each project has an assigned QAO, whose duties and responsibilities include: • Assists in the review of the QAPP, verifies the QAPP meets the requirements of the DEQ QMP, and signs the QAPP as an approver. • *All assigned QAOs are required to contact the DEQ quality manager to discuss the project prior to signing any project QAPP for approval. When the project QAO signs the QAPP for approval, the QAO is required to update the DEQ QAO project document tracker found at TRIM record #2012AEB8.* • Performs an annual audit, using the QAO audit checklist located in Appendix A, on all assigned projects to evaluate project compliance with the approved project QAPP. Files the completed audit checklist in TRIM to document the audit. • Provides data validation per the project QAPP, using the appropriate checklist located in Appendix A, and may also participate in final project report review. • Documents all audit and data validation activities in the DEQ TRIM system, per the DEQ QMP and the approved QAPP. • In matters of project quality, this individual has a direct line of communication to the DEQ quality manager. • Must meet the following independence criteria: The QAO shall not be the project manager, program manager, or be otherwise assigned to the project data generation efforts. Neither the project manager nor the QAO may directly report to the other within the DEQ organizational structure, and both of these individuals may not be directly supervised by the same person. • Performs all other duties and responsibilities as assigned in the project QAPP. The duties and responsibilities of the project QAO also apply to any field sampling plan (FSP) generated under the project QAPP, unless an FSP-specific QAO is assigned and approved.
Robert Steed	**Project Manager**: Note: The following description is *not all inclusive*; see section 1.2.6 of the DEQ QMP and the project QAPP for a more detailed description. Each project has an assigned project manager, whose duties and responsibilities include: • Serves as the primary author of the project QAPP, and signs the final QAPP as an approver. • Performs overall project planning, document development and approval, sample planning and coordination, laboratory coordination, reporting functions, project report/summary development, and project file maintenance in TRIM. • Enters the approved and current project QAPP in the TRIM system, including a

	copy of the signed approval page. • Ensures all project work is conducted in accordance with the DEQ QMP, the approved QAPP, and the applicable project operating procedures. • Ensures that personnel assigned to this project are appropriately trained and qualified, with the corresponding training records on file in human resources. • Performs data review and verification per the project QAPP, using the appropriate checklists located in Appendix A. • Reviews the project QAPP/FSP and standard operating procedures (SOPs) annually to determine if revision is necessary. If the project QAPP, FSP, or associated SOPs do require revision, the project manager initiates such action. All such documents will be revised, reviewed, and approved in accordance with the DEQ QMP. • Documents all audit and data review/verification activities in the DEQ TRIM system, per the DEQ QMP and approved QAPP. • Performs all other duties and responsibilities as assigned in the project QAPP. The duties and responsibilities of the project manager also apply to any FSP generated under the project QAPP, unless an FSP-specific project manager is assigned.
Chris Meyer	**Laboratory Contact/Manager**: This person is the primary contact at the laboratory for DEQ project staff
Coeur d'Alene Regional Office Staff	**Trained/Certified Personnel.** These people have been trained to collect samples and/or trained to process samples as outlined in this QAPP. The project manager will make sure they understand what to do and will certify their understanding prior to collection or processing of samples.

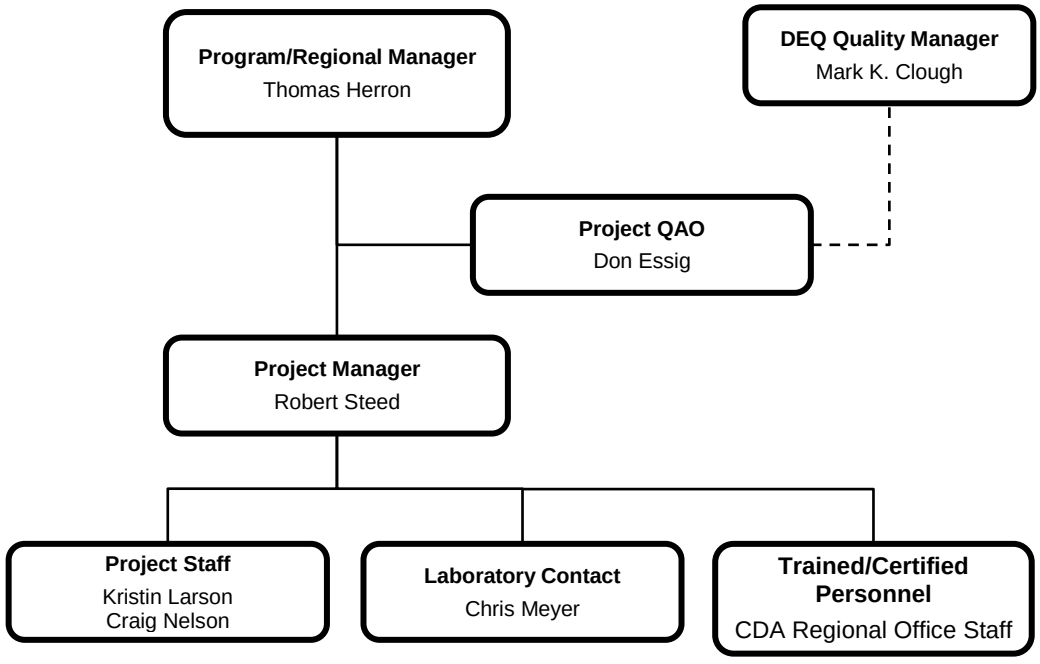

Figure 1. Project organizational chart.

5 Problem Definition/Background

The Spokane River in Idaho from its headwaters to the Idaho/Washington border (AU 17010305PN003_04 and 17010305PN004_04) was listed in 1994 for metals impairment on Idaho's §303(d) list. In 2000, the *Total Maximum Daily Load for dissolved metals in Surface Waters of the Coeur d'Alene Basin* was approved by the EPA. In this Total Maximum Daily Load (TMDL), load allocations and load reductions were written for the metals-impaired surface waters in the Coeur d'Alene basin from the South Fork Coeur d'Alene River downstream through Coeur d'Alene Lake and into the Spokane River to the Idaho/Washington border. In 2000, however, a petition was filed for judicial review and for declaratory judgment claiming the TMDL was invalid for failure to comply with the formal rulemaking requirements under the Idaho Administrative Procedures Act procedure for rulemaking. The district judge ruled the TMDL was invalid for failure to comply with statutory guidelines. According to Idaho Code 39 36-11, DEQ must follow rulemaking provisions for any TMDLs for metals in the Coeur d'Alene River Basin, upstream from the headwaters of the Spokane River. The rulemaking provisions do not apply to the Spokane River from the headwaters at Coeur d'Alene Lake to the Idaho/Washington border.

5.1 Problem Statement

Metals TMDL development has been classified as high priority in Idaho's draft 2012 Integrated Report for the Spokane River (Kootenai County, ID). The TMDL will determine an upper limit on discharge of metals from both point and nonpoint sources to assure both the chronic and acute metals criteria are met in the river (Table 3).

Table 3. Numeric criteria of dissolved metals concentrations - Idaho Water Quality Standards (IDAPA 58.01.02.210).

	Aquatic life		Human health for consumption of	
Compound	[a]**CMC** ug/L	[b]**CCC** ug/L	**Water & Organisms** ug/L	**Organisms Only** ug/L
Cadmium	0.42 c	0.25 c,e	d	d
Lead	14 c	0.54 c	d	d
Zinc	36 c	36 c	7,400	26,000

For metals listed above, aquatic life criteria are expressed as dissolved metals concentrations.

a. Criterion Maximum Concentration
b. Criterion Continuous Concentration
c. Cadmium, lead, and zinc calculated with a hardness of 25 mg/L $CaCO_3$.
d. No numeric human health criteria have been established for these contaminants.
e. Cadmium CCC may be calculated down to a hardness of 10 mg/L $CaCO_3$.

The Idaho Department of Environmental Quality (DEQ) will conduct monitoring for the characterization of total and dissolved Cadmium (Cd), Lead (Pb) and Zinc (Zn) concentrations in and to the Spokane River for the development of a Total Maximum Daily Load (TMDL). This will be through ambient water quality monitoring in the river and tributaries and collection of data from point sources. Monitoring will be conducted over a two-year period. Metals criteria vary with hardness; hence, hardness (including dissolved concentration of calcium and magnesium) will also be determined. DEQ's goal is to collect these metals concentration with known and acceptable levels of accuracy and precision

5.2 Intended Usage of Data

The Idaho Water Quality Standards specify dissolved metals concentrations criteria to protect the beneficial uses of Spokane River. To evaluate compliance with these criteria, DEQ will collect samples over four consecutive days to compare the average concentration to the chronic criteria and instantaneous concentrations, including each of the four consecutive day's samples, to the acute criteria in Idaho Water Quality Standards.

A TMDL is an estimation of the maximum pollutant amount that can be present in a water body and still allow that water body to meet water quality standards (40 CFR Part 130). The TMDL also allocates allowable discharges of individual pollutants among the various sources discharging the pollutant. To meet the data needs of a load duration analysis, monitoring will be conducted during a variety of flow conditions in the river. Total and dissolved Cd, Pb, and Zn loading (mass per unit time) will be calculated by multiplying concentrations by corresponding discharges. The resultant loads will be used in load duration evaluations in the TMDL as a direct measure in order to evaluate sources and calculate appropriate load reductions for total and dissolved Cd, Pb, and Zn.

DEQ will also collect both dissolved and total metals concentrations in order to establish area specific translators.

6 Project/Task Description

Ambient water quality monitoring of total and dissolved Cd, Pb, and Zn data will be conducted in the Spokane River and a tributary stream (Skalan Creek) and from point sources that directly discharge into the Spokane River. Existing point sources that are regulated under National Pollutant Discharge Elimination System (NPDES) permits are:

1. City of Coeur d'Alene wastewater treatment plant (EPA 2007),
2. City of Coeur d'Alene stormwater discharges from municipal separate storm sewer systems (MS4s). (EPA 2008),
3. Hayden Area Regional Sewer Board wastewater treatment plant (EPA 2007b),
4. City of Post Falls wastewater treatment plant (EPA 2007c), and
5. City of Post Falls' stormwater discharges from municipal separate storm sewer systems (MS4s). (EPA 2008b).

To meet the data needs of a load duration analysis, monitoring will be conducted in close proximity to existing USGS gaging stations (Spokane River) and flow will be measured in the tributaries.

Wastewater concentrations will be gathered from each facility and will not be collected by DEQ

6.1 General Overview of Project

Ambient water quality monitoring for total and dissolved Cd, Pb, and Zn will be conducted in the Spokane River at the outlet of Coeur d'Alene Lake and near the Idaho state line. Monitoring will also be conducted in the mouth of the tributary stream (Skalan Creek) upstream from backwater

effects of the Spokane River. To minimize duplication and maximize resources, this project will attempt to partner with those of existing agencies already collecting data.

The City of Coeur d'Alene has five storm water outfalls that discharge into the Spokane River. This stormwater is discharged from municipal separate storm sewer systems (MS4s) and are not part of a combined sewer system. Under the City's MS4 NPDES permit, they must monitor total lead and zinc from two outfalls. Only one percent (28.6 acres) of the City of Post Falls' impervious surface contributes to runoff that discharges into the Spokane River. The Post Falls' MS4 outfalls are monitored for total lead and zinc under the City's MS4 NPDES discharge permit. Monitoring methodology is defined in their individual QAPPs.

Stormwater monitoring QAPPs and data collected from the monitored outfalls described above will be acquired and evaluated against the Data Quality Objectives of the project QAPP prior to inclusion in the TMDL development. Dissolved metals concentrations from these storm water outfalls have not yet been characterized and require additional monitoring by DEQ. Additional samples may be collected and the data used to better characterize loads from storm water into the Spokane River.

The stormwater monitoring characterization that is needed is the concentrations that occur during episodic weather events. Current stormwater loading concentrations appear to under-represent the changes in concentrations that occur during a storm event. DEQ will work with the City of Coeur d' Alene and City of Post Falls to improve the understanding of concentrations during and storm event through the use of an automatic sampler. DEQ or each city will process and submit these samples to the laboratory following the same methods as other Spokane River monitoring. DEQ will also ask for splits from the stormwater discharger's current monitoring program to process for total Cadmium, and dissolved Cadmium, Lead and Zinc.

Monthly dissolved metals monitoring is being conducted at waste water treatment plants (WWTP) by the City of Coeur d'Alene, the Hayden Area Regional Sewer Board, and the City of Post Falls as a requirement under their National Pollutant Discharge Elimination System (NPDES) permits. The data is collected from the end of pipe at each of the three WWTPs that discharge to the Spokane River. Monitoring methodology is defined in their individual QAPPs. Concentrations and flow data from the WWTP sources and copies of QAPPs will be acquired and evaluated against the Data Quality Objectives of this QAPP prior to inclusion in the TMDL development.

Samples will be collected at each location for analysis of one or more of the following, as required for the specific sampling campaign:

- Major cations, calcium and magnesium (dissolved)
- Metals cadmium, lead, zinc (total and dissolved)
- Discharge (effluent)

Each Spokane River sample will be collected by two staff members (clean hands/dirty hands) placed in a stable temperature carrier and immediately returned the Coeur d' Alene Regional Office for sample preparation laboratory for filtration. Once samples have been filtered and preserved they will be staged in Coeur d' Alene Regional Office sample refrigerator. Batches of ten or fewer samples will be submitted laboratory for analysis.

6.2 Project Timetable

To meet the objectives of the project sampling design (as defined in the Spokane River Metals TMDL Strategy Paper (2013)), a monitoring schedule was determined to serve as guidance for this project (Table 4). This schedule was developed assuming flow would be similar to flows observed in 2010, as predicted in January 2013 by the Natural Resources Conservation Service (NRCS 2013). Should flows deviate from this schedule, the frequency of monitoring events will change within the months to capture the necessary number of samples during the various flow regimes.

Table 4. Spokane River TMDL monitoring schedule for state fiscal years 2014 and 2015.

Spokane River TMDL Monitoring Schedule			
Dates in both SFY 2014 and SFY 2015	**Frequency of Monitoring Events**	**Estimated Number of Monitoring Events**	**Number of QA Events**
November 1-15	1 event per week	2	1
November 16-30	3 events every 2 weeks	3	1
December 1-15	3 events every 2 weeks	3	1
December 15-30	2 events every week	5	2
January	3 events every 2 weeks	7	2
February	3 events every 2 weeks	6	2
March	3 events every 2 weeks	6	2
April	2 events per week	9	3
May	2 events per week and every day Q>15,900	10	4
June	2 events per week and every day Q>15,900	11	4
July 1 - 15	3 events every 2 weeks	3	1
July 16-30	1 event per week, and every day Q<1,040	5	2
August 1-15	1 event per week, and every other day Q<1,040	2	1
August 16-31	every other day Q<1,040	6	2
September 1-15	no events	0	0
September 15-30	1 event per week	3	1
October	1 event per week	4	1

7 Quality Objectives and Criteria

This section of the project QAPP defines the project data quality objectives (DQOs), essentially defining the requirements to support the qualitative or quantitative design of the data collection effort. DQOs are also used to assess the adequacy of the data (new or existing) in relation to their intended use. Data quality indicators (DQIs) are used to describe, in part, the specific

measurement elements to be used when evaluating data in support of the project DQOs. Project staff can find additional information and guidance concerning the DQO process and DQI selection and definition in the following reference materials:

- EPA *Guidance on Systematic Planning Using the Data Quality Objectives Process* (EPA 2006c)
- EPA *Guidance for Quality Assurance Project Plans* (EPA 2002a)
- EPA *Requirements for Quality Assurance Project Plans* (EPA 2001).
- EPA *Guidance on Environmental Data Verification and Data Validation* (EPA 2002b)

The objective of quality assurance and quality control (QA/QC) is to ensure that analytical results obtained by sample analyses are representative of the actual surface water. Field QA/QC will consist of following a standard protocol for sample collection and collecting and analyzing sample duplicates and field blanks. The duplicates are used to determine field precision. The field blank is used to check the integrity of sample collection and handling. Both the duplicate and field blank samples are stored and handled in the same manner as the normal samples. Project goals and sampling conditions may require additional field QC samples, including equipment blanks or spiked samples. Field QC samples will be submitted "blind" (i.e., not identified as a QC sample). Ideally, at least one set of field QC samples will accompany each sample shipment.

Field QC samples for this project will comprise at least 10% of all samples (as defined by unique sample ID number, not individual bottles).

The concept of *analytical data support* is generally described as having five levels, where Level I is considered minimal QA/QC control/documentation, and Level V is considered the highest available QA/QC control/documentation.

The appropriate type of sampling and analysis for a given project or at a given site depends on numerous factors, the foremost of which are the intended end use of the data and associated data quality requirements. The project manager, in consultation with appropriate regional and state office management, will determine the appropriate "level" of analytical data support.

Issues to consider when setting these requirements with the project-specific laboratory include the level of QC that the laboratory will employ when analyzing the samples, and equally important, what documentation will accompany the returned results.

The analytical data support level determined to be necessary and appropriate for each project is clearly stated in this section of the project QAPP.

The five levels of analytical support (Levels I and II, field analytical methods, and Levels III through V, laboratory analytical methods) are described below in general terms.

Included in the general description of the analytical data support level is the generally associated and/or corresponding "stage" of data verification and validation to be applied upon receipt of data and documentation by the project from the laboratory. The verification and validation "stages" are described in detail in EPA's *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (EPA 2009).

While a given laboratory may or may not recognize various descriptions of analytical data support levels, the laboratory will likely be able to support the needs of the data user if the "stage" of data verification and validation is also described to laboratory staff. For these reasons, it is strongly suggested that the project manager communicate this information directly to the laboratory during the planning phase to determine the necessary analytical data support (level or package) that the laboratory will provided to the project.

Level I: This refers to field screening or analyses using portable instruments and results are commonly not compound-specific or quantitative. Generally, Level I data are related to activities such as locating sample collection points for laboratory analysis and are associated with instruments such as photoionization detectors (PIDs).

- **Generally associated verification/validation stage:** Level I may be associated, depending on data user requirements, with "Stage 1" verification and validation checks as described in Appendix A, Section 1.1, of EPA's *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (EPA 2009).

Level II: This refers to field analyses using more sophisticated portable analytical instruments or mobile laboratories onsite. Data generated can range from qualitative to quantitative (e.g., actual contaminant identification is made, but concentrations may or may not be quantified to a high degree of accuracy). Note that this data may or may not be acceptable for compliance purposes. Restrictions or limitations on the use of such data, if applicable, are stated below. Many types of field equipment—such as a mercury vapor analyzers and/or an X-ray fluorescence (XRF) units—generate data that may (or may not) qualify as Level II data.

- **Generally associated verification/validation stage:** Level II may be associated, depending on data user requirements, with "Stage 1" or "Stage 2A" verification and validation checks as described in Appendix A, Sections 1.1 and 1.2, respectively, of EPA's *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (EPA 2009).

Level III: This level refers to standard EPA-approved methods that may be equivalent to Level IV methods (see below), with the exception that the level of documentation supplied with analytical results is frequently less robust.

- **Generally associated verification/validation stage:** Level III may be associated, depending on data user requirements, with "Stage 2A" or "Stage 2B" verification and validation checks as described in Appendix A, Sections 1.2 and 1.3, respectively, of EPA's *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (EPA 2009).

Level IV: This refers to EPA Contract Lab Program (CLP) Routine Analytical Services (RAS) analyses, or EPA approved methods (Level III), with the exception that additional rigorous QA/QC protocols are employed and full documentation is provided by the laboratory to the project. Documentation allows validation of results against specific contractual requirements and allows for detailed data use, restriction, and/or limitations to be identified prior to use of data. Requirements or limitations for a Level IV analysis and full validation of the analytical data, if necessary, are specified below.

- **Generally associated verification/validation stage:** Level IV may be associated, depending on data user requirements, with "Stage 4" verification and validation checks as described in Appendix A, Section 1.5, of EPA's *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (EPA 2009).

Level V: This refers to nonstandard methods that are considered to be more rigorous than Level IV methods. This analytical data level is very seldom used and must be accompanied by significant evidence substantiating the validity of the nonstandard methods employed. Level V is generally used when extremely accurate/precise measurements and quality documentation, far beyond standard EPA methods, are deemed necessary for site-specific contaminant identifications and quantitation.

- **Generally associated verification/validation stage:** Level V may be associated, at a minimum, with the "Stage 4" verification and validation checks as described in Appendix A, Section 1.5, of EPA's *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (EPA 2009).

Discharge measurements taken from the field and acquired from the USGS gaging station are considered Level III data. A Doppler flow meter will be used following the USGS standard methodology. Flow data from the Spokane River is collected by the USGS at a standard gaging station.

Laboratory analytical data (i.e., data from samples submitted to a laboratory for analysis) are at data quality Level III (standard laboratory procedures and data reviewed by standard QA protocols).

7.1 Data Accuracy, Precision, and Measurement Range

Accuracy is a measure of the agreement between a "true" or reference value and the associated measured value. A sampling campaign may include spiked samples with a known matrix submitted blind to the laboratory or may rely on reported recoveries for laboratory control samples (LCS). The recoveries of LCS, matrix spikes, and surrogate spikes will be used to evaluate the accuracy of the measurements. These recoveries are typically calculated as "percent recovery" (%*R*) represented by Equation 1 and Equation 2.

$$\%R = C_M / C_T \times 100$$

Equation 1. Spiked sample or LCS percent recovery.

Where: C_M = measured spike/LCS concentration
C_T = true spike/LCS concentration

$$\%R = (C_S - C_{US}) / C_T \times 100$$

Equation 2. Matrix spike and surrogate recoveries.

Where: C_S = measured concentration of spiked sample
C_{US} = measured concentration of unspiked sample
C_T = true concentration of spike added

Laboratory accuracy for each analysis is determined through statistical analysis of the laboratory equipment by the laboratory; the acceptable accuracy range for the laboratory equipment will be

indicated in the laboratory sheets. Any outliers from the acceptable range in percent recovery, as determined by the laboratory, will be flagged by the laboratory. Accuracy requirements for this project are ±25%.

Precision is a measure of agreement between two measurements of the same property under prescribed conditions. Sampling campaigns may include duplicate samples (field replicates or split samples—see section 14) or may rely on LCS split sample results. The relative percent difference (RPD) of duplicate samples will be used to assess data precision. For laboratory duplicates, field duplicates, and matrix spike duplicates, Equation 3 will be used to calculate RPD:

$$RPD = \frac{(C_1 - C_2)}{(C_1 + C_2)/2} \times 100$$

Equation 3. Relative percent difference (RPD).

Where: C_1 = concentration in first sample
C_2 = concentration in the second/duplicate sample
Where one or both C_1 and C_2 are < 2.5 times the Reporting Limit, the results will be considered within control limits.

Precision will be based on field, LCS, and, if used, matrix spike duplicates, with an RPD goal of ±20%. The maximum RPD allowed for this project is ±25%.

Appropriate **measurement range** is determined by reviewing results with comparison to the laboratory reporting levels or MDLs. Reporting requirements are determined prior to sampling through review of historical data for the analytes in previous Spokane River samples and reflected in choice of analytical laboratories, analysis methods, and requested reporting levels or MDLs.

7.2 Data Representativeness

Representativeness is the degree to which the sample data accurately and precisely represent site conditions. The representativeness criterion is best satisfied by confirming that sampling locations are properly selected, sample collection procedures are appropriate and consistently followed, a sufficient number of samples are collected, and analytical results meet data quality objectives. All sampling procedures will follow the sampling procedure in Appendix B. Representativeness is evaluated during data review, verification, validation, and reconciliation efforts by comparing the combination of data accuracy, precision, measurement range, and methods and assessing other potential sources of bias, including sample holding times, reported results of blank samples, and laboratory QA review. Spokane River stations will be vetted for representativeness by comparing grab samples to width and depth integrated composites.

7.3 Data Comparability

Comparability is the confidence with which one data set can be compared to another data set. Using standard sampling and analytical procedures will maximize comparability. To ensure data comparability, sample collection procedures (included in Appendix B) will be consistently followed, the same analytical procedures will be used.

7.4 Data Completeness

Completeness is the percentage of valid data relative to the total possible data points. For data to be considered valid, it must meet all of the acceptance criteria, including accuracy and precision, and any other criteria specified by the analytical method used. The overall data quality objective for completeness for the project sampling conducted under this QAPP is 40 samples within each of the five flow regimes as identified in the Spokane River Metals TMDL Strategy Paper (DEQ 2013). Spokane flow regimes are: 1) high flows are greater than 15,900 cfs, 2) non-regulated flows are between 4,814 and 15,900 cfs, 3) mid-range flows are between 2,460 and 4,814 cfs, 4) regulated flows are between 1,040 and 2,460, and 5) low flows are less than 1,040 cfs. Additionally it is intended that three day average concentrations be used to compare to the chronic criteria in Idaho Water Quality Standards. Most (more than 50%) of the sampling events will be conducted in three day pulses. If the sampling event does not meet this quality assurance goal the data will be discussed with the program manager and a course of action agreed upon. Any required departure from this goal will be justified and explained in the project records in accordance with the QMP.

8 Special Training/Certification

All specialized or non-routine training, qualifications, or certifications necessary for project and/or laboratory staff is listed below.

The project manager is responsible for ensuring that personnel assigned to this project are appropriately trained and qualified, with the appropriate training records on file with DEQ human resources.

All work performed by DEQ personnel will be conducted in accordance with the *Idaho General Safety and Health Standards* (Division of Building Safety 2006).

- Training for surface water sample collection associated with this project is required; staff will have previous surface water sampling experience and/or have on-the-job training. Project staff will also be familiar with the applicable SOPs referenced in this QAPP.

9 Documentation and Records

Project documents will be filed electronically in TRIM in accordance with applicable program filing procedures. The project manager is responsible for ensuring that a copy of the current approved (and signed) project QAPP, and standard operating procedures (SOPs), is available in the DEQ TRIM electronic records management system. A copy of the signed signature page for the project QAPP and FSP (if used) is to be filed in the TRIM system by the project manager. Preferably, the approved document, including the signed signature page, is attached to the TRIM record in PDF format.

Field personnel shall use the Coeur d' Alene Regional Office sample tracking booklets located in Appendix C to document each day’s activities. Information is to be recorded as follows:

- Project data must be recorded directly, promptly, and legibly.

- Field logbook or field sheet entries must be made in black or blue permanent ink and must be signed/initialed and dated by the person making the entry.
- Changes or corrections to field logbook notes and/or data must be indicated with a single line through the original entry. Changes must be initialed, dated, and explained.

In addition to Coeur d' Alene Regional Office sample tracking booklet (as identified in Appendix C), field books may be used to track information and conditions beyond those contained in the Coeur d' Alene Regional Office sample tracking booklet.

All documentation necessary to support the objectives of the project and the validity of project data—sample tracking booklet, chain-of-custody forms, audit reports, laboratory reports, field notes, field logbooks, etc.—shall be entered into the project TRIM system files. Annual project audit and assessment documentation, per the DEQ QMP, shall also be entered into the TRIM system by the project QAO and/or the project manager, as applicable.

All project documentation and records shall be retained in the TRIM system in accordance with the current approved DEQ records retention schedule (TRIM record #2010AIC3).

10 Sampling Process Design

This section describes the project data collection activities, assumptions, sampling site selection, general descriptions of the number of samples to be taken, the number of sampling locations, if samples are to be individually handled or composited, and any other relevant project-specific information.

10.1 Rationale for Selection of Sampling Sites

Ambient monitoring efforts will be designed to provide data to construct load duration curves in the TMDL analysis. Load duration curves are based on collection of a statistically significant number of water quality samples that represent a true value during different flow regimes to accurately represent the ambient metals concentrations in the river at various flows. To determine the frequency in monitoring events, variability in flow in the river was evaluated using historical data from the USGS gaging stations. Details of this evaluation are described in the Spokane River Metals TMDL Strategy Paper (DEQ 2013). Collection of data from point sources that directly discharge into the Spokane River will be to develop waste load allocations in the TMDL.

10.2 Sample Design Logistics

The ambient monitoring network will consist of two fixed stations on the Spokane River, upstream and downstream -, and tributaries to the Spokane River:

- The downstream station (STL) is as close to the Idaho/Washington State line as possible while having safe, year-round access and permitting collection from the thalweg portion of the stream. This station has been selected to represent the cumulative contributions of all Idaho sources of dissolved Cd, Pb and Zn to the Spokane River.

- The upstream station (NIC) is as close to the Coeur d' Alene Lake sill as possible while having safe, year round access and permitting collection from the thalweg portion of the stream. Collection always upstream of swimmers, bathers, waders. This station has been selected to represent the ambient upstream conditions prior to direct contributions from Idaho sources of Cd, Pb and Zn into the Spokane River.
- Skalan Creek is the only known perennial tributary along the Idaho portion of the Spokane River. Monitoring will be near the mouth of Skalan Creek, but upstream of any backwater effects from the Spokane River. Based on preliminary data, it is anticipated that Skalan creek is not a measureable source of dissolved Cd, Pb and Zn. Limited sample collection will be performed in order to validate Skalan Creek's contributions.

Other Spokane River Stations (between STL and NIC) and/or unknown tributaries may be sampled if discovered during project for better Cd, Pb and Zn characterization. The USGS defines the national standards for collection of water quality samples in a flowing water body (USGS 1999). Unless a river is completely mixed, either the equal-width-increment (EWI) or equal-discharge-increment (EDI) sampling methods are required. If the section of river is well-mixed vertically and laterally with respect to concentrations of target analytes, the single vertical at centroid-of-flow (VCF) method is used (USGS 1999). DEQ will conduct evaluations of flow in the Spokane River to determine whether the reaches of the Spokane River at each of the monitoring locations are well-mixed. If vertical and lateral mixing is occurring, a grab sample taken from the mixed zone will be taken from each location on the Spokane River. Grab samples will be collected from the tributaries using a dipper or directly into inverted sample bottle. See Figure 2 for a schematic of discharges and sampling locations.

Monitoring frequency is based on collection of data under a statistically representative sampling design to collect data from a range of flow regimes (Table 5). The sampling design is described in the Spokane River Metals TMDL Strategy Paper (DEQ 2013). Under the sampling design, it is necessary to collect a sample size of 50 within each flow regime, or a sample size of 25 in each flow regime per year.

Table 5. Range of flows for different flow regimes in the Spokane River.

Flow Regime	Range of Flows (cfs)	Time Period
High Flows	Above 15,900	Mid-April to mid-June
Non-Regulated Flows	4,814 – 15,900	December to mid-July
Mid-Range Flows	2,460 – 4,814	Mid-June to end of July Nov – Mid March
Regulated Flows	1,040 – 2,460	July, Sept to mid-November
Low Flows	Less than 2,460	August to mid-September

Station locations, agencies involved in collection of data, and the GPS coordinates are listed in Table 6.

Table 6. Stream monitoring station locations.

Stn. ID	Station Name	Agency collecting data	Latitude	Longitude
NIC	Headwaters of Spokane River	DEQ, USGS†	47° 40’55.17”	-116° 47’54.79”
STL	Upstream of Idaho State Line	DEQ	47° 40’39.00”	-117° 00’13.32”
SKL	Skalan Creek	DEQ	47° 41’ 29.70”	-117° 00’ 23.82”

†See section 18.2 for description of USGS monitoring

Wastewater Treatment Facility contributions to the Spokane River are collected by each discharger: City of Coeur d’Alene, Hayden Area Regional Sewer Board (HARSB), and the City of Post Falls. There may be circumstances that arise whereby supplemental monitoring is necessary. Such monitoring will be documented in the appropriate field notes and other documentation.

Stormwater contributions to the Spokane River are collected by each discharger: City of Coeur d’Alene and the City of Post Falls. Stormwater samples are taken four or more times each year by the discharger during significant storm events of 0.1 inch or greater. from the following stormwater outfalls. Station locations, agencies involved in collection of data, and the GPS coordinates are listed in Table 7

1. The City of Coeur d’Alene’s storm water outfall that drains 222 acres to the north and south of I-90 primarily along Northwest Boulevard and discharges to the Spokane River (Figure 3). It is downstream of the City of Coeur d’Alene’s wastewater treatment outfall. During high water conditions in the Spokane River, the MS4 outfall is submerged; however, stormwater can be monitored from a nearby manhole.
2. The City of Post Falls stormwater outfall that discharges into the Spokane River near Centennial Trail and 4th Avenue (Figure 4).

Table 7. Station location for dissolved metals monitoring in the Spokane River.

Stn. ID	Station Name	Agency collecting Data	Latitude	Longitude
CD1	City of Coeur d’Alene stormwater outfall #1	DEQ, City of Coeur d' Alene	47° 41’25.77”	-116° 48’23.69”
PF4	City of Post Falls 4th Ave Stormwater Outfall	DEQ, City of Post Falls	47° 42’39.70”	-116° 57’11.72”

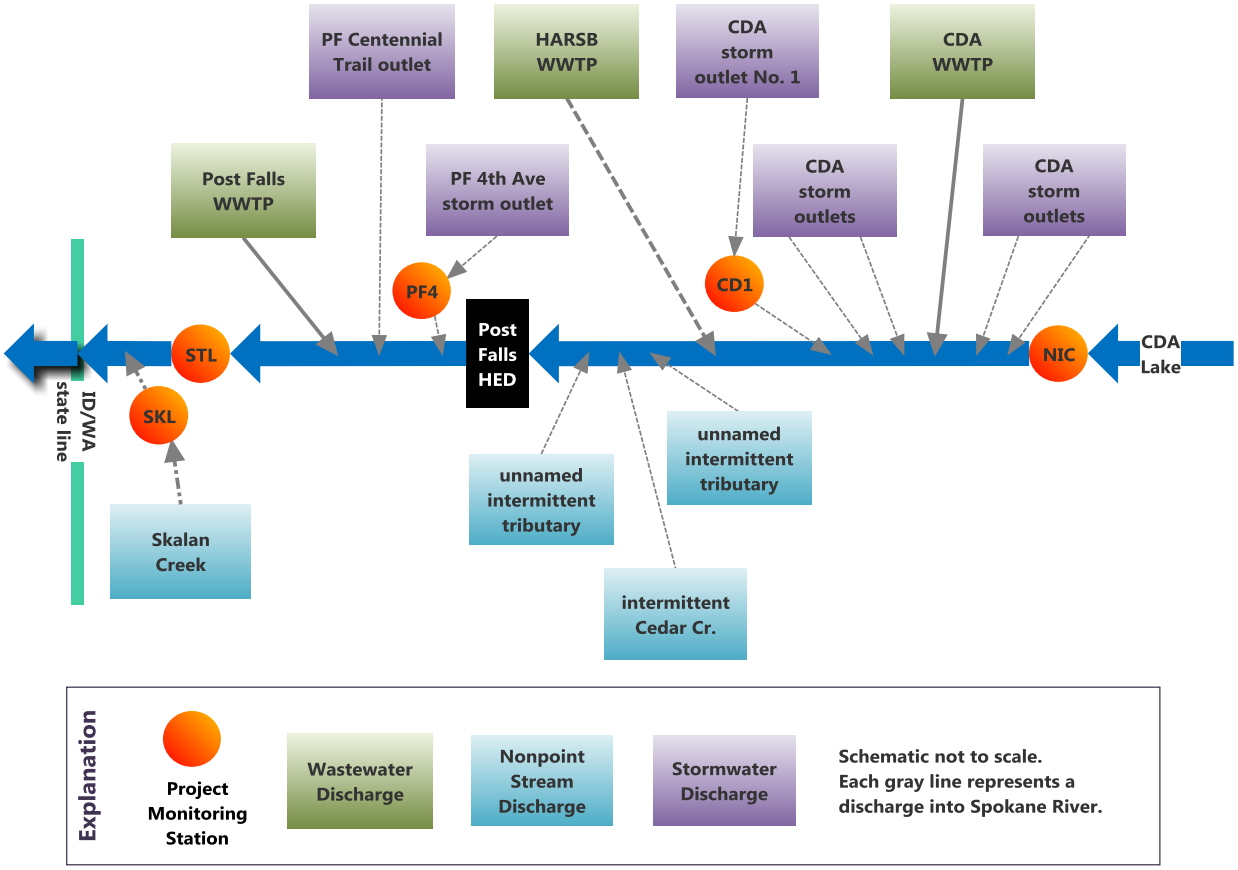

Figure 2. Schematic of Discharges and Monitoring Stations.

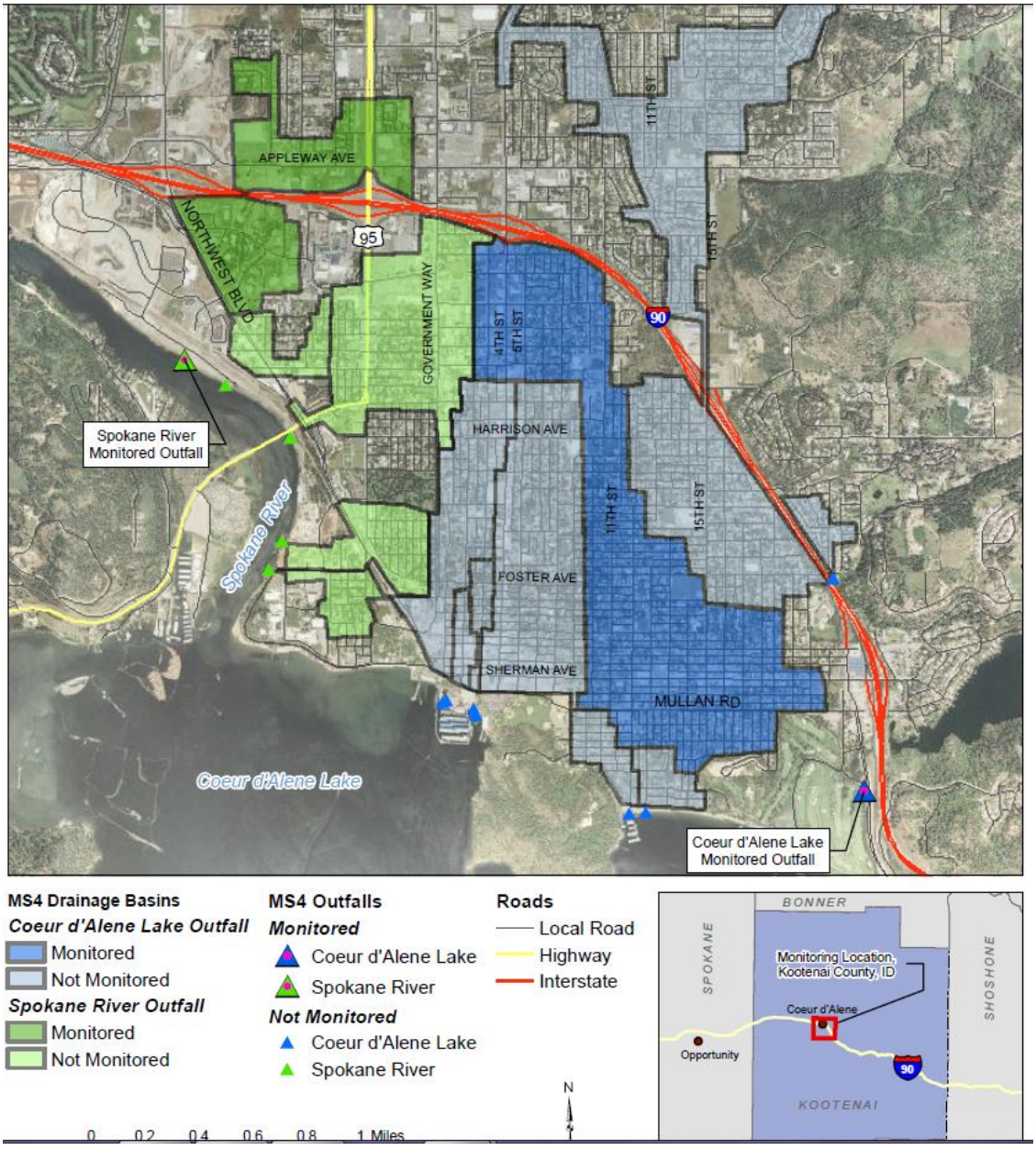

Figure 3. Location of City of stormwater outfalls of the City of Coeur d'Alene that discharge into the Spokane River.

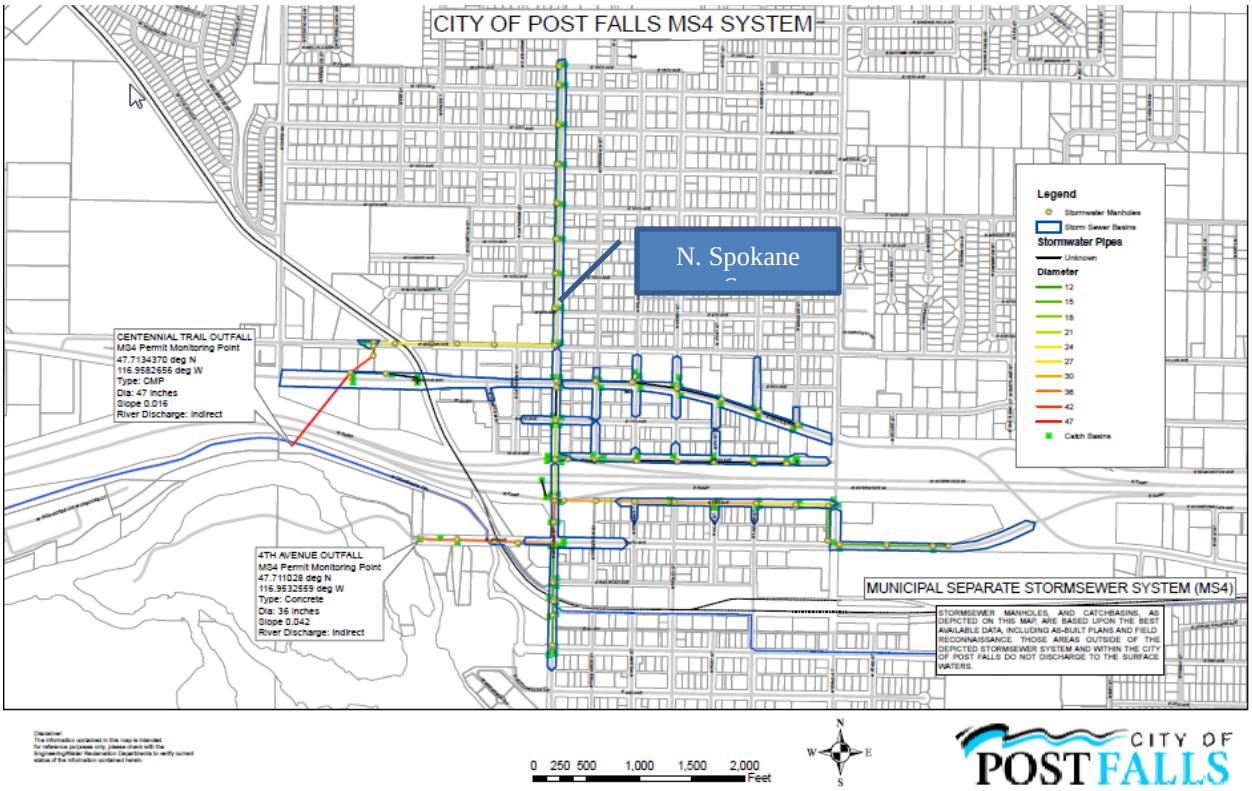

Figure 4. Location of the City of Post Falls stormwater outfalls that discharge (indirectly) into the Spokane River.

11 Sampling Methods

Information needed for this project include dissolved Cd, Pb and Zn concentrations. Dissolved metals concentration sampling is especially challenging because the sampling requires immediate filtration and is susceptible to contamination out in the field. For this project we have chosen to collect a sample, stabilize its temperature (as best as possible), then rush (less than 20 min) the sample back to Coeur d' Alene DEQ Regional Office prep lab for clean filtration. Then we can go back out and collect another sample.

We have selected a maximum amount of water (125mL) to be filtered for the dissolved Cd, Pb, and Zn samples for a single filter paper. The reason for this is to minimize the amount of water that passes through each 47mm diameter, 0.45um filter paper. Forcing more water through these filters has the potential to increase the colloidal Zn in the sample and bias the dissolved Zn data.

Lab certified "clean" bottles will be used for this project. While dipper for collecting sample needs to be decontaminated and triple rinsed, the sample bottles do not.

11.1 Equipment Required for Sample Collection

The following supplies are needed for each monitoring event. Appendix B provides a field supply checklist to use prior to going out in the field.

- ☐ analyte free (blank) water
- ☐ bag for trash
- ☐ camera
- ☐ cell phone
- ☐ decontaminated metal-free water dipper
- ☐ envelope/package clear tape strips
- ☐ field book
- ☐ first-aid equipment
- ☐ GPS receiver
- ☐ insulated (metalized biaxially-oriented polyethylene terephthalate) bags
- ☐ powder-free nitrile or vinyl gloves
- ☐ sample containers (see field supply checklist)
- ☐ sample cooler and ice (warm weather)
- ☐ sample tracking booklet (contains sample labels)
- ☐ wading boots
- ☐ water-proof pens and markers
- ☐ zip-top baggies

11.2 Equipment Required for Coeur d' Alene Regional Office Lab

The following supplies are needed in the DEQ Coeur d'Alene Regional Office lab to process samples taken during each monitoring event.

- ☐ 5% HNO_3 solution for decontamination
- ☐ analyte free (blank) water
- ☐ envelope/package clear tape strips
- ☐ eye protection
- ☐ field book
- ☐ filter holder(s)
- ☐ filter paper (0.45 ug)
- ☐ HNO_3 dispenser
- ☐ lab coats
- ☐ preservative (HNO_3)
- ☐ refrigerator
- ☐ sample containers (see field supply list)
- ☐ Sample tracking booklet (contains sample labels)
- ☐ vacuum filtration apparatus (Figure 5)
- ☐ vacuum pump
- ☐ water-proof pens and markers

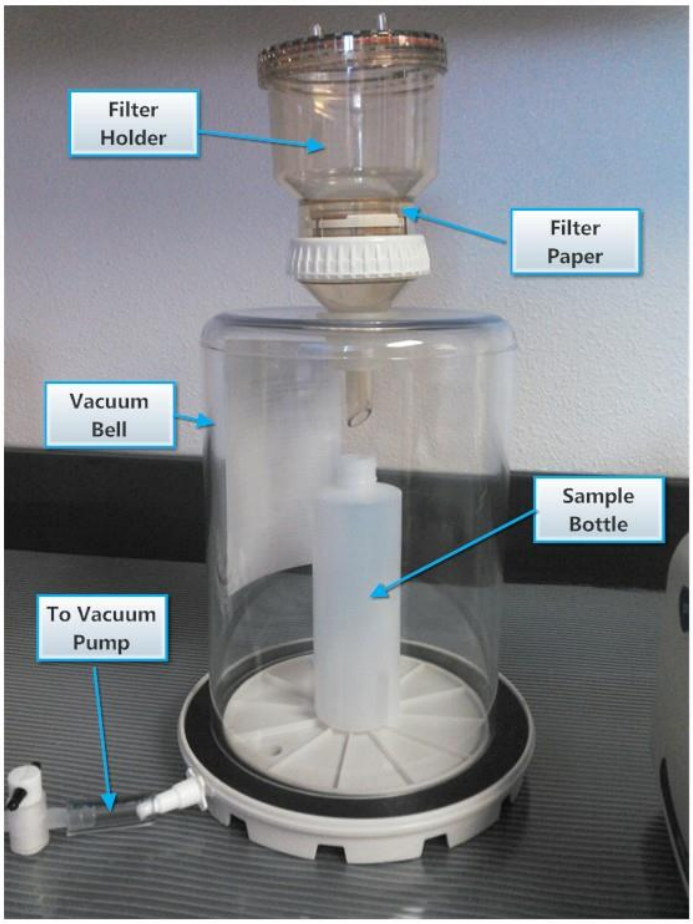

Figure 5. Filtration Station Set-Up.

11.3 Pre-Monitoring Preparation

The Coeur d' Alene Regional Office DEQ prep laboratory is to be made ready to process samples prior to leaving the office collecting samples.

1. Metal-free water dipper and laboratory filtration apparatus will be washed with laboratory soap, rinsed with 5 percent HCL and then rinsed in deionized water.
2. Place bucket part of dipper in a zip-top bag.
3. Set up filtration station with appropriate sized sample bottles and 0.45 um filter (Figure 5).
4. Check NNO_3 dispenser to make sure it is ready to deliver 0.80 mL of acid for each pump. Use the following Table 8 to determine how many pumps are needed for each different type of sample bottle.

11.4 Sample Collection Procedure: Spokane River

The following procedure should be followed each sampling event at each sampling location:

In the vehicle:

1. Fill out sample tracking booklet tab and individual sample labels with date, projected sample collection time, and sample preservation information, and then attach label from sample tracking booklet (Appendix C) to the sampling bottle(s).
2. Secure label on the bottle with envelope/package clear tape strips
3. Place labeled sample bottle(s), 2 pair nitrile gloves inside zip-top bag. Place zip-top bag and garbage bag into the backpack.

At sample location:

1. Walk (with backpack and cooler) to appropriate sample location where it is safe, not in the vicinity of recreationists, animals or other disturbances, and where the Thalweg of the channel is accessible.
2. Record any additional information in field book.
3. Take pictures facing upstream and downstream at sample location
4. Wade to appropriate sampling location (if necessary)
5. Attach the dipper to the dipper extender.
6. Put on nitrile gloves (clean-hands person).
7. Triple-rinse dipper with water from the sampling location, being careful not to disturb the bottom sediments (dirty-hands person).
8. Collect sample from the sampling location, being careful not to disturb the bottom sediments (dirty-hands person)
9. Quickly pour the sample into the pre-labeled sample containers held by clean hands person.
10. Immediately cap the sample bottle, and then place the sample into the metalized biaxially-oriented polyethylene terephthalate bag.
11. Immediately place metalized biaxially-oriented polyethylene terephthalate bag with the sample into the cooler and walk to the vehicle.

Quality Assurance: Duplicates and Blanks

For each batch (5 ambient sampling events or less or 10 samples or less) quality control sampling will be conducted. Typically there are two parts to the quality control sampling and it is suggested to perform the part A at one station and part B at the other station. Part A involves collecting samples, duplicate samples, and field blank samples. Please see Appendix D for the bottle schedule. Part B involves collecting a larger dissolved sample (500 mL) to allow the lab enough matrix to perform laboratory quality control for each batch. The 500 mL sample needs to be filtered with three (3) filter papers with no more than 125mL going through each filter paper. The filter holder must be decontaminated between each piece of filter paper.

11.5 Sample Collection Procedure: Stormwater

Stormwater samples will be collected for the following purposes:

1. To add both total and dissolved cadmium as analytes to the samples currently being collected by the dischargers per NPDES permit.
2. To add dissolved lead and dissolved zinc as analytes to the samples currently being collected by the dischargers per NPDES permit.
3. To collect data to develop dissolved vs. total translators for stormwater metals.
4. To better characterize storm event concentration profiles to improve loading estimates.

Sampling will be coordinated with dischargers in order to take sample splits for the missing analytes. DEQ will be available to meet dischargers when they take samples as required by their NPDES permit. These samples will be prepared and submitted to the lab for the following analysis: total Cd, dissolved Cd, dissolved Pb, dissolved Zn, dissolved Ca, and dissolved Mg.

Sampling will also be coordinated with dischargers in order to acquire automatic collected samples to better characterize storm events. The following is a potential schedule for the samples collected during a storm event.

Automatic sampler with flow detection capabilities detects a significant increase in flow. Automatic sampler collects a composite sample that represents "first flow" which is the first 30 minutes of run-off for this specific storm. Automatic sampler then collects composite samples that represents each hour for the next 6 hours. Automatic sampler then collects composite samples as long as flow continues at 6 hour intervals. If the storm qualifies as significant then samples will be process and submitted to lab for total metals analysis. A grab sample will be taken while processing automatic sampler collected samples for dissolved vs. total translator development. This sample will be processed and submitted to the lab for dissolved metals as well as total metals.

11.6 Sample Handling and Custody

DEQ personnel will oversee proper storage and handling of all samples collected until transferred to the analytical laboratory or properly discarded by DEQ. Once the first sample is collected, the sample will be transported to the DEQ Coeur d'Alene Regional Office laboratory. The sample, along with the sample tracking booklet, will be handed off to certified/trained laboratory personnel who will immediately filter the sampling using the vacuum filtration apparatus. Before leaving for the next site, the metal-free water dipper will be washed with 5 percent HNO_3 and then with de-ionized water (3 times). Before leaving to the next site, the sample tracking booklet will be obtained after lab personnel have appropriately labeled filtrate bottles.

11.7 Sample Handling

11.7.1 Sample Filtration Procedure (at DEQ Coeur d'Alene Regional Office Laboratory)

Once the sample is dropped off at the lab, the following procedure should be immediately implemented by trained/certified personnel. It is important that filtration occurs prior to any temperature changes in the sample, because changes in temperature may affect the solubility of the dissolved metals that are being characterized. While handling these samples wear a laboratory coat and protective eye wear.

1. Fill out filtrate bottle with date, time, and sample preservation information (taken from field sample book), and then attach label from field sampling book to the sampling bottle(s).
2. Secure label on the bottle with envelope/package clear tape strip.
3. Place bottle in vacuum filtration bell (see Figure 5), and align bottle so it will capture all of the filtrate.
4. Take sample bottle out of cooler and metalized biaxially-oriented polyethylene terephthalate bag, do not shake.
5. Pour sample into filter tower reservoir, entire 125mL when processing 125mL sample. Only 125mL at a time when processing a 500mL sample.
6. Connect vacuum and turn it on, do not exceed -3 lbs/sq. in.
7. Once all of the filtrate has been aspirated through the filter, turn off the vacuum and release pressure from within the apparatus by disconnecting the vacuum hose from the filter tower.
8. Remove sample from filtration vacuum bell.
9. Preserve sample with HNO_3 from the pre-calibrated HNO_3 dispenser (0.8mL/pump), see Table 8 below for schedule.

Table 8. Preservation Schedule

Analyte	Bottle size	Number of pumps
dissolved Cd, Pb, Zn, Ca, Mg	125 mL	1
total Cd, Pb, Zn	250 mL	2
lab QC samples: • dissolved Cd, Pb, Zn, Ca, Mg • total Cd, Pb, Zn	500 mL	4

10. Cap and invert several times to mix sample.
11. Place sample in designated area of the refrigerator.
12. Clean filtration equipment with laboratory soap, 5 percent HCL, then de-ionized water (3 times).

11.7.2 Sample Storage

Samples will be stored in the DEQ Coeur d'Alene Regional Office laboratory refrigerator until a full batch is completed. One batch equals 5 ambient events of two samples each, or less. One batch will comprise of 10 samples (or less), 1 blank, and 1 duplicate. One of the samples will be in a 500 mL bottle. Once a batch is completed, the samples will be placed in a cooler and sent to the analytical laboratory. Chain-of-custody forms will be used to document sample custody and transfer.

11.8 Chain of Custody

All samples will be submitted following chain of custody methods. An example chain-of-custody forms are found in Appendix E. Chain-of-custody forms will accompany the samples from sample collection throughout the shipping process and shall be filed in the project TRIM system files by the project manager.

Analytes, laboratories, and shipping addresses are included in Table 9. Analytical methods, sample containers, preservation methods, and holding times are identified in section 12 and Table 10. SVL Analytical, Inc. or other EPA certified laboratory will perform the analyses.

Table 9. Analytes and laboratories.

Analytes	Analyzing Laboratory	Shipping Address
Ca, Mg (dissolved) Cd, Pb, and Zn (total and dissolved)	SVL Analytical, Inc. or other EPA certified laboratory	delivered to: Coeur d' Alene Lab 2195 Ironwood Ct Coeur d' Alene, ID 83844

12 Analytical Methods

Table 10 lists the analytical method, container type, preservative, and holding time applicable to all samples obtained under this project. All sample containers, labels, and preservatives will be obtained from the analytical laboratory, laboratory supplier, or laboratory equipment provider. Samples must be preserved and analyzed within the holding times. The laboratory will be notified by the project manager prior to sample shipment to ensure the holding time is not exceeded. All sample collection and preparation instructions provided by the analytical laboratory will be followed throughout the duration of each project.

Table 10. Analytical method, container types, preservation method, and sampling holding times.

Parameter	Reporting Limits (mg/L)	Analytical Method	Sample container	Preservative	Holding Time
total Zn	0.0050	EPA 200.8	250 mL HDPE plastic wide-mouthed bottle (Certified, No. 05-719-353)	HNO_3 will be added at the Coeur d' Alene Regional Office prep lab, stored at 4 °C.	6 months
total Cd	0.00020				
total Pb	0.000250*				
dissolved Ca	0.040	EPA 200.7	125 mL HDPE plastic wide-mouthed bottle (Certified, No. 05-719-351) (one 300mL per batch for laboratory QC)	HNO_3 will be added at the Coeur d' Alene Regional Office prep lab, stored at 4 °C.	
dissolved Mg	0.200				
dissolved Zn	0.0050	EPA 200.8			
dissolved Cd	0.00020				
dissolved Pb	0.000200*				
* SVL lowest limit that can be reported, MDL is 0.000048					

13 Quality Control

Generally speaking, quality control is a means of measuring or estimating the potential variability involved with sample collection, analysis, or measurement activities in the field and in the laboratory. This section will discuss the various QC activities associated with this project.

13.1 Field QC Checks

Field QC samples, which are for this project duplicates and blanks, will be submitted blind (not identified as a QC sample) for analysis. The overall field QC frequency will be at least 10% of the samples (at a minimum of one duplicate and one field blank for every 10 samples). Submission of QC samples will be scheduled to ensure that at least two QC samples (one duplicate, one field blank, and one large 500mL sample) will be included with each batch of samples submitted to each laboratory. The large 500mL, or greater, will be used for laboratory control checks. Field QC sample collection will be as evenly distributed as project conditions allow.

Duplicates

Duplicate samples are two samples collected from the same location, representing the same sampling event, and carried through all assessment and analytical procedures in an identical manner. Duplicates can be “replicates” (samples taken one immediately after the other, separated only by the actual time required to fill the sample container) or “splits” (subsamples drawn from the same initial volume of matrix). Sampling procedures outlined in section 11 will be followed for each sampling event to ensure consistency in sample collection. All relevant information will be recorded for the duplicates, just like the normal samples, in the sample booklet (see Appendix C) or field sheet. Results from the field duplicate analysis will be included in the analytical report.

Field and Equipment Blanks

A blank is a sample of known matrix where the specific constituents requested for analysis are known to be absent or are present at concentrations less than the laboratory minimum limit of detection. The primary purpose of blanks is to trace sources of artificially introduced contamination. The diagram below (Figure 6) shows how the comparison of different blanks sample results can be used to identify and isolate the source of contamination introduced in the field or the laboratory for this project.

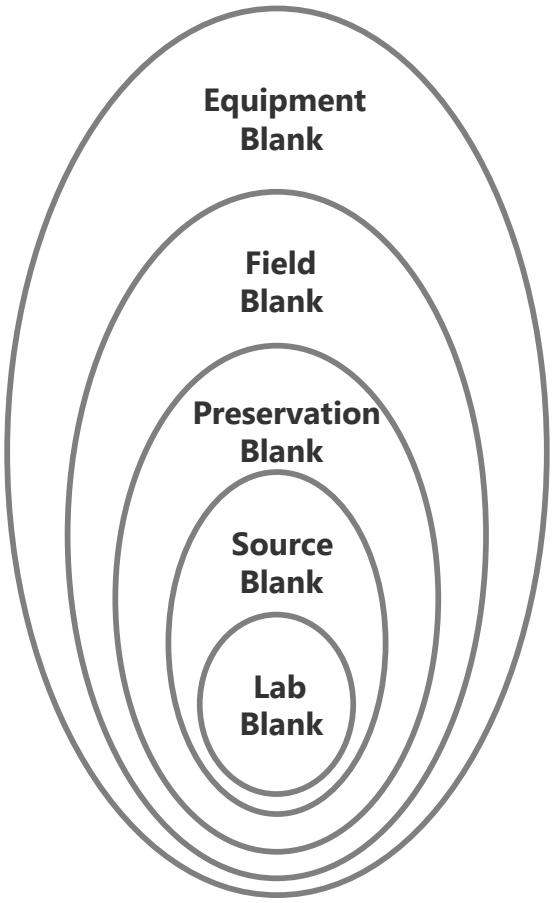

Figure 6 . Comparison of Different Blanks.

Field blanks are samples of blank matrix, analyte free water (Ultra-pure, Type 1), prepared in the field under identical conditions, processed the same, and included for analysis as a regular sample. Field blanks are a QC check to identify potential problems with the sample collection, handling, and analysis process. One field blank will be utilized per batch submitted to the lab (at a minimum of one field blank for every 10 samples). The purpose of field blanks is to assess contamination from field conditions during sampling. Blank matrix will be carried to field in a clean, clearly identified bottle. Field blanks will be filtered and preserved following the same procedures as samples.

Equipment blanks are blank sample matrix passed through or over non-dedicated sampling equipment to check the decontamination process between samples or sample sites. Equipment blanks may be collected when sampling equipment requires decontamination (e.g., filter towers, filter paper, and filter tweezers). When collected, equipment blanks will also be submitted blind for analysis and may be included in the overall 10% QC sample calculation. One equipment blank per month will be required for this project. Additional equipment blanks will be required when concentrations in field blanks are analyzed to be above reporting limit for any analyte. The purpose of equipment blanks is to assess the adequacy of the decontamination process. Field blanks will be filtered and preserved following the same procedures as samples.

Preservation blanks are samples of analyte-free water poured into container in Coeur d' Alene Regional Office Laboratory which is preserved and delivered to the laboratory with field samples. The purpose of preservation blanks is to assess the presence of analytes in the preservation reagent (HNO3) and preservation process. Preservation blanks will be collected once a month, or whenever the preservation reagent or process has been modified, whichever is more frequent. Preservation blanks will be run directly without preservation or laboratory digestion. Additional preservation blanks will be required when concentrations in field blanks are analyzed to be above reporting limit for any analyte.

Source blanks are samples of analyte free water (Ultra-pure, Type 1) poured into container directly from Millipore Q-POD at Coeur d' Alene Regional Office Laboratory and delivered to the laboratory with field samples. The purpose of source blanks is to assess if analyte free water is truly analyte free. Source blanks will be collected once per month or when source has been modified, whichever is more frequent. Source blanks will be run directly without preservation or laboratory digestion. Additional source blanks will be required when concentrations in field blanks are analyzed to be above reporting limit for any analyte

13.2 Laboratory Quality Control Checks

Laboratory QC checks are routinely performed as part of the analysis process. Upon start of the project, DEQ will provide a project name (Spokane River TMDL) and request QC limits for sample analysis. The frequency and type of QC samples are often analysis method-dependent and include reagent blanks, matrix spikes, and internal laboratory splits. Analyzing laboratories will report any variance from QC limits impacting the quality of sample results and may report details of internal laboratory QC if requested. The analytical laboratory may provide appropriate sample containers, chain-of-custody forms, sample labels, and any necessary container seals. Laboratory QA/QC and data reports will be filed in TRIM following applicable filing protocols.

Laboratory QC checks include internal checks for sample analysis activities, duplicate samples, and blanks. The following paragraphs describe common components of laboratory QA/QC programs.

Laboratory Blanks

A laboratory blank is a sample of known matrix where the specific constituents requested for analysis are known to be absent or are present at concentrations less than the laboratory minimum limit of detection. The laboratory blank is analyzed to evaluate the accuracy of the analysis. One 500mL sample will be collected, and filtered with three filters (125mL per filter) and submitted with each in order to have enough matrix to conduct laboratory blanks tests.

Laboratory control samples (LCSs) are samples that contain a known concentration of analytes and are analyzed to assess the overall method performance. They undergo the same preparatory and determinative procedures as the project samples and are the primary indicator of laboratory performance. LCS recoveries are used to measure accuracy. The RPD for duplicate LCS recoveries is used to measure precision.

A **laboratory duplicate sample** is a sample that is split by the laboratory into two separate and identical samples. The two samples are analyzed and a comparison of the results (RPD) is used to assess laboratory precision.

A **matrix spike** (MS) sample has a known amount of the target analyte added to project matrix before analysis to assess possible matrix interferences on the analysis. Percent recoveries on MS samples should be compared to percent recoveries of LCS samples. A MS/**matrix spike duplicate** (MSD) pair can be used to assess precision.

13.3 Data Analysis Quality Control Checks

The QC check data may be checked/reviewed for quality by the project manager or the project QAO at any time during the project and must be checked after all of the data are collected. A goal of this project is to capture definitive concentrations of Cd, Pb and Zn in the project area. The project is designed to have a large number of samples in order to best determine the true value that represents each analyte at each flow period. Dismissing questionable data is preferred to the excess use of data qualifiers (flagged data) when data significantly exceeds DQO.

The laboratory will follow their SOP for the handling of laboratory control samples.

Should field blanks have metals concentrations above the reporting limit for an analyte, the batch of samples results will be closely examined and a corrective action plan will be initiated by the project manager and reviewed by quality assurance officer. The corrective action plan should include an evaluation of equipment, preservation and source blanks (Quality Control Part C) prior to additional sampling. The corrective action plan will identify whether the batch results are retained and flagged or dismissed from the data set for the analyte in question.

Should a field duplicate not meet the precision goal DQO (relative percent difference RPD > ±20%), the batch of samples results will be closely examined and a corrective action plan will be initiated by the project manager and reviewed by the quality assurance officer. The corrective action plan should include requesting the lab to re-analyze both samples. The corrective action plan will identify whether the batch results are retained and flagged or dismissed from the data set. Should a field duplicate not meet the absolute DQO for precision (RPD > ±25%) the correction action plan will require the dismissal of the batches results for that analyte.

Should total Cd, Pb, or Zn concentration be less than the respective dissolved metal in the sample, and the results were within DQO for precision, the batch of samples results will be closely examined and a corrective action plan will be initiated by the project manager and reviewed by the quality assurance officer. The evaluation of total concentrations vs. dissolved concentrations will be performed by the project manager. The correction action may identify that the lab will be requested to re-analyze the sample for both dissolved and total metals of concern. The corrective action plan will identify whether the batch results are retained and flagged or dismissed from the data set for the analyte in question.

The lab will provide the project manager with reports as processed. The project manager will evaluate both laboratory control and field control following the format in (Appendix F). The report results will be forwarded to the QAO for concurrence on initial acceptance of data and quality assurance actions described in report.

14 Instrument/Equipment Testing, Inspection, and Maintenance

Laboratory instrument/equipment testing, inspection, and maintenance are performed and documented by the laboratory if/as required by the State of Idaho laboratory certification process. Procedures and schedules for preventive maintenance of sampling equipment are the responsibility of the laboratory. Each instrument or item of laboratory equipment will be

maintained periodically to ensure accuracy. These procedures and frequency of performance are designated in the individual instrument manuals.

Project field instrument/equipment testing, inspection, and maintenance will be performed in accordance with the individual instrument/equipment manual.

15 Instrument/Equipment Calibration and Frequency

Laboratory instrument calibration is conducted and documented by the laboratories if/as required by the State of Idaho laboratory certification process.

All field monitoring equipment for the measurement of field parameters will be calibrated and maintained as recommended by the manufacturer, or as found in individual instrument/equipment manuals, to ensure accuracy within specified limits. Calibration details will be recorded in the field logbook or field sheet. Field equipment used to collect samples will be calibrated according to manufacturers' procedures or internal guidelines at the start of each field day (at a minimum) and/or at intervals recommended by the manufacturer or found in individual instrument/equipment manuals. Each instrument or item will be visually inspected by field sampling personnel for damage and operability prior to each sampling event.

16 Inspection/Acceptance of Supplies and Consumables

The supplies and consumable items required for monitoring projects will be clean and protected from contamination. All sample containers will be obtained from the analytical laboratory, laboratory supplier, or laboratory equipment provider. All sampling supplies and consumable items will be new, inspected for acceptance by the project manager prior to use, and used once during each sample collection event.

17 Nondirect Measurements and Data Acquisition

17.1 Flow Measurements

Nondirect measurements and data acquisition refer to data obtained *for use by the project* from existing data sources, not directly measured or generated in the scope of this project. This type of data is often referred to as “existing data.” Examples of this type of data include data obtained from existing sources or databases (either from within or from outside DEQ) and data obtained by others and offered or presented to DEQ for use.

Discharge measurements/estimates will be made on Skalan Creek and storm water discharges. Discharge measurements/estimates and resulting calculations shall follow rules for significant figures. Four acceptable methods of the acquisition of discharge data follow:

1. National Water Information System (Spokane River flow)

United States Geological Survey (USGS) National Water Information System discharge and stage information shall be utilized whenever it is available. These data can be found at: http://waterdata.usgs.gov/nwis.

2. Cross section flow measurement (tributary flow)

Where USGS data are not available, cross section flow measurements may be taken. Discharge is the volume of water moving down a stream or river per unit of time, commonly expressed in cubic feet per second or gallons per day. In general, river discharge is computed by multiplying the area of water in a channel cross section by the average velocity of the water in that cross section

$$discharge_{total} = \sum area_{subsection} \times velocity_{subsection}$$

The method to be used by DEQ for measuring discharge is the mechanical current-meter method. In this method, the stream channel cross section is divided into numerous vertical subsections. In each subsection, the area is obtained by measuring the width and depth of the subsection, and the water velocity is determined using a current meter. The discharge in each subsection is computed by multiplying the subsection area by the measured velocity. The total discharge is then computed by summing the discharge of each subsection.

3. Discharge calculation from partially full circular culvert (with flow velocity check) (stormwater)

Where USGS data are not available, discharge calculations from partially full circular culvert may be used where conditions are appropriate. Calculation using online calculator (e.g. http://onlinechannel.sdsu.edu/onlinechannel03.php) and field measurements to estimate discharge. Inputs needed include: 1) Pipe diameter (ft.), 2) Flow depth (ft.), 3) Bottom slope (ft./ft.), Manning's n (in range of 0.020), 4) Velocity measured with flow meter (ft./sec). Calculator to be run and results validated with flow velocity measurement. Adjust input data to match flow velocity within one (1) ft./sec.

4. Direct measure (stormwater)

Where USGS data are not available, direct measure of discharge may be utilized. For smaller discharges, if possible, the amount of time it takes to fill a container may be measured and conversions can be made to determine discharge (ft^3/sec or m^3/sec)

The development of an accurate stage-discharge relation requires numerous discharge measurements at all ranges of stage and streamflow. Stage-discharge relationships may be developed if determined appropriate by project manager. Water level data logger or equivalent methods may be used to record depth of stage.

17.2 Metals Data

Outside sources (e.g. BEMP and Washington Department of Ecology) of dissolved Ca, Cd, Mg, Pb and Zn may be ascertained as long data collection and data handling is guided by a QAPP (with similar DQO) and is approved and released by the collecting entity.

Basin Environmental Monitoring Plan (BEMP) (conducted by USGS in cooperation with the U.S. Environmental Protection Agency Region 10) data set includes a station (USGS 12417598 SPOKANE RIVER AT LAKE OUTLET AT COEUR D ALENE ID) in the immediate vicinity of the upstream Spokane River station (NIC) and a station (USGS 12419495 SPOKANE RIVER AT STATELINE BR NR GREENACRES, WA) in the vicinity of the downstream Spokane River station (STL) described in this QAPP. The BEMP provides long-term data that helps the EPA and other decision makers evaluate and adjust the ongoing cleanup efforts. With EPA funding, the Idaho Water Science Center collects specific types of water data at 16 monitoring sites located along more than 160 river miles. These data can be found at: http://id.water.usgs.gov/projects/cda_qw/data.html

Washington Department of Ecology (Ecology) conducts a River and Stream Water Quality Monitoring Program that includes dissolved Ca, Cd, Mg, Pb, and Zn. The Ecology data set includes a station (57A150 – Spokane R @ Stateline Bridge) that is in the vicinity of the downstream Spokane River station (STL) described in this QAPP. The Ecology River and Stream Water Quality Monitoring Program data has good long term results for this station going back to 1994. The Department of Ecology (Ecology) has conducted monthly water quality monitoring at hundreds of streams throughout Washington State for more than 50 years. The current program consists of 62 long-term and 20 basin (one-year) stations. The goal of the program is to provide timely and accurate water quality data to clients within Ecology, other agencies, and interested citizens. These data help people assess current water quality conditions and long-term water quality changes (trends). These data can be found at: www.ecy.wa.gov/programs/eap/fw_riv/rv_main.html

Cd, Pb, and Zn monitoring is being conducted by the City of Coeur d'Alene, the Hayden Area Regional Sewer Board, and the City of Post Falls as a requirement under their National Pollutant Discharge Elimination System (NPDES) permits. Monthly data is collected from the end of pipe at each of the wastewater discharge facilities under the guidance of their individual Quality Assurance Project Plans.

Monitoring for total lead and total zinc is required under the City of Coeur d'Alene and the City of Post Falls' MS4 NPDES permits. As defined in the permits and by their Quality Assurance Project Plans, at least one storm event should be monitored during March – April, May – June, July – August, September – October. Sampling is done by taking a grab sample within the first 30-60 minutes of storm events. A storm event may include rain or snow melt off. No monitoring is required if there are no storm events.

The laboratories shall provide DEQ with a data package that includes the analytical results of the submitted samples, the QA/QC report for the analyses, and a copy of the chain-of-custody record. Laboratories may be requested to provide results and reports in an electronic format.

No other nondirect data are expected to be acquired or used by this project.

18 Data Management and Processing

Electronic copies of all field notes and laboratory reports will be kept in TRIM. Hard copies of field notes and laboratory data reports will be kept at least until data review and reporting is complete. Additional document retention requirements may apply per project-specific, program, state, or federal requirements. It is the responsibility of the project manager to ensure all document retention requirements are met.

For comparing to chronic conditions, duplicate values will not be used, only the original value will be used. For comparing to acute criteria, both original and duplicate values will be used.

Data from each batch meeting DQO will be entered into the project spreadsheet or database. The analytical results for the project will be uploaded to DEQ project files and annually uploaded to DEQ's Environmental Data and Analysis System (EDAS), after review by the project manager and QAO.

19 Assessment and Response Actions

Assessment of the project QAPP will be performed by reviewing field notes and laboratory reports and by conducting field and laboratory audits where possible and resources allow. This assessment will be completed by the project manager on a batch-by-batch basis and directed by and approved by the QAO. Any errors or inconsistencies identified in the field notes will be investigated and corrected to ensure the integrity of the data and conformance to the QAPP. Results of internal laboratory QA review, audits, surveillances, or other types of laboratory assessments will also be taken into account. If unexpected analytical results are reported for any reason, the project manager will contact the laboratory to perform an additional quality review of the data in question. The QAO will perform assessment of the project independently of the project manager.

A note to the file will be included with the field notes and laboratory reports if any follow-up QA activities regarding field notes or laboratory reports are required and conducted.

The QAO shall audit the QAPP annually, per the DEQ QMP, to determine if revision is necessary. The project manager should also review the project QAPP on an annual basis to ensure that the document continues to meet the needs of the data user(s). Audits and reports shall utilize the appropriate checklist forms located in Appendix A and will be documented in TRIM, indicating the date of the audit and listing identified issues or concerns in accordance with the QMP. If the project QAPP requires revision as a result of this audit or review, these actions will be taken and the revised QAPP submitted for approval prior to implementation, per the DEQ QMP (DEQ 2012a).

20 Reports to Management

Project and sample results for the Spokane River Cadmium, Lead and Zinc Characterization monitoring project will be presented in the Total Maximum Daily Load (TMDL) Water Quality Improvement Plan.

21 Data Review, Verification, and Validation

Data review is conducted (ideally by the project manager or project technical staff) to ensure that project data have been recorded, transmitted, and processed correctly. Data review is normally performed by the unit/staff generating the data.

Data verification is generally conducted (ideally by the project manager or project technical staff) following data review and is performed to evaluate the completeness, correctness, conformance, and compliance of the data against the QAPP-specified method, procedural, or contractual requirements. The purpose of data verification is to evaluate the extent to which the sample collection requirements, analytical processes prescribed in the QAPP, and specified project procedures were followed. Data verification essentially evaluates the actual project performance against the requirements established in the QAPP. The output from this process is considered and evaluated during the reconciliation with user requirements (assessment) phase. Data verification is normally performed by the unit/staff generating the data.

Data validation shall be conducted by the project QAO or a subject matter expert not otherwise assigned to the project or unit generating data. This process shall follow data review and verification and is an analyte- and sample-specific process that extends the data evaluation beyond method, procedure, or contractual compliance to determine the quality of a specific data set relative to the end use. This effort should focus on the project-specific data needs and note any potentially unacceptable departures from the QAPP. The output from this process is considered and evaluated during the reconciliation with user requirements (assessment) phase. Data validation is generally performed by an independent entity not closely associated with the unit generating the data.

The level of documentation required for a specific project data review, verification, validation, and reconciliation effort is specified below. This level of documentation is determined by the project manager, in consultation with the regional or program manager, consistent with the "graded approach" used by DEQ in implementing the quality management system (QMS).

Those assigned to perform project data review, verification, and validation *shall use the associated checklist provided in the appendices to perform and document* the effort in the associated project TRIM file system.

22 Review, Verification, and Validation Methods

Data review, verification, and validation efforts are based on the analytical support determined to be necessary in the planning stages of the project. DEQ personnel performing data verification and validation are encouraged to review the following guidance documents:

- EPA QA/G-8 (EPA 2002b) for guidance on methods for this task.
- Appendix A of EPA's *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (EPA 2009)
- *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (EPA 2004).

- *USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review* (EPA 2008).

Data review for data and information collected under this QAPP shall be performed by the project manager using the data review checklist found in Appendix A. This review will also include evaluation of supplied laboratory data reports. Data review will include the following activities, at a minimum:

- An examination of project data, identifying errors in data entry, storage, calculation, reduction, transformation, or transcription.
- An examination to ensure all required sample information is documented and available, in preparation for the verification, validation, and assessment process. This includes pertinent project information concerning blanks, matrixes, temperature requirements, duplicates, preservatives, shipping dates, holding times, chain-of-custody records, etc.
- An examination to identify if all required nondirect measurement data (existing data) information *and supporting documentation*, as required by the project QAPP, have been received and are available for the verification and validation process.
- A completeness check to determine if any data deficiencies exist, such as missing data or compromised data integrity, due to issues such as loss in acquisition, storage, or processing.
- An examination to ensure all necessary analytical laboratory support documentation, as set forth and stipulated in the project QAPP, have been received from the applicable laboratories.
- An examination to identify programming and/or software related errors, if applicable to the project.

Data verification for data and information collected under this QAPP shall be performed by the project manager using the data verification and event quality assessment checklists found in 0. The general focus of the process is to identify if all requirements specified in the project QAPP, associated procedures, and project contractual requirements (if applicable), have been met, and if not, to determine the extent to which requirements failed to be achieved. Data verification will include the following activities, at a minimum:

- Verification that all data completeness criteria, as stated in the project QAPP, have been satisfied. This shall include items such as the number of samples, number of QC samples such as spikes and duplicates, and chain-of-custody record continuity.
- Verification that the values of individual data points, and/or comparison calculations such as RPD, meet the criteria specified in the QAPP.
- Verification that the required analytical methods, as listed in the project QAPP, correspond to the analytical methods employed by the laboratory, as recorded in laboratory reports.
- Verification that QAPP requirements relative to laboratory analytical support documentation have been satisfied by the reporting laboratory, including the correct application of data qualifiers.
- Verification that all supporting information and documentation for nondirect measurement data (existing data) meet the requirements of the QAPP. If not, identify any limitations or restriction on the use of such data.

- Verification that data and sample collection practices adhered to procedural requirements, to include a review of project logs and field notes, as applicable.
- Verification that sample handling activities conform to QAPP requirements. Examples include sample shipment timelines, sample holding times, preservatives, number of samples obtained, duplicate or split sample frequency, and chain-of-custody documentation.
- Verification that data calculation and handling activities conform to QAPP requirements. Examples include correct use of mathematical formulas and numerical methods, correct use of programs and programing, and correct application of database information transfers.
- Verification that any remaining or unique project QAPP or procedural requirements have been met, and if not, determine the extent to which these requirements failed to be achieved.
- Determine and document any limitations on the use of the project data.

Data validation for data and information collected under this QAPP shall be performed by the project QAO using the data validation and event quality assessment checklists found in 0. The general focus of the process is to identify if the quality of the project data meets the needs of the data user and the associated decision makers. The data validation effort for this project shall include a minimum of 10% of all project data with a goal of 20%, except as noted specifically below. Data validation will include the following activities, at a minimum:

- An evaluation and examination of all (100%) of obtained field QC sample results, such as duplicates and trip blanks, etc., followed by assignment (if necessary) of appropriate data qualifiers to these data based on project criteria.
- A review of project analytical laboratory reports and data, including the assigned data qualifiers, to evaluate the data quality with respect to the project DQOs. Assign data qualifiers to individual data values as necessary and appropriate.
- A review of the outcome of the data verification effort to evaluate the impact on data quality with respect to the DQOs.
- A determination, when necessary and where possible, of the reasons for any failure to meet methodological, procedural, or contractual requirements and an evaluation of the impact of such failure on the overall data.
- A comparison of the project DQOs, as defined in the project QAPP, to the data obtained by the project to assess the adequacy of the data (new or existing) in relation to their intended use.
- A determination of the extent to which any nondirect measurement data (existing data), and the accompanying supporting information and documentation, meet the requirements of the data user. Specifically, does the quality of the existing data adequately support the needs of the project and support the intended use of the data for the project.
- Determine and document any limitations on the use of the project data.
- Determine the adequacy of the data to proceed on to the data assessment and reconciliation with user requirements phase.

Any potentially unacceptable departures from the requirements of the project QAPP will be noted during the data review, verification, and validation process. If the project manager or the project QAO determines the data do not meet the needs of the project or the DQOs of the QAPP

and/or if the conclusions drawn from the data do not appear to be reasonable, the project manager and the QAO shall immediately report such findings to the appropriate regional manager and/or State Office program manager to determine the necessary corrective actions. Documentation of such findings and activities shall be maintained in accordance with the DEQ QMP.

23 Reconciliation with User Requirements

Data quality assessment (DQA) will be performed in accordance with this QAPP and the DEQ QMP (DEQ 2012a). Additional guidance for conducting data assessment can be found in EPA QA/G-9R or EPA QA/G-9S (EPA 2006a, b).

The DQA will be performed (at a minimum) by the project manager and the project QAO to determine if the project data set is of the right type, quality, and quantity to achieve the objectives of the project and can confidently be used to make an informed decision.

Information and findings associated with the project data review, verification, and validation efforts shall be considered during the data assessment process.

When DQOs are not met, the project manager will discuss appropriate corrective actions with project staff, project management, and with the analytical laboratory. Corrective actions may be initiated to suggest improvements to data collection activities, data and sample handling techniques, internal laboratory quality procedures, etc., to solve quality issues.

If the project manager or the QAO decide the project data do not meet the project needs or the QAPP quality objectives and/or if the conclusions drawn from the data do not appear to be reasonable, the project manager and the QAO shall immediately report such findings to the appropriate regional manager and/or State Office program manager to determine and document the necessary corrective actions.

If sampling activities require revision, the project QAPP will be revised as necessary. Following revision and prior to implementation, the revised project QAPP must be re-approved in accordance with the DEQ QMP (DEQ 2012a).

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Appendix A. Project Checklists

All checklists in this appendix are available for download and use by project staff as standalone electronic documents, from either the DEQ TRIM system or the DEQ Quality System website: http://insidedeq.deq-intra/director/quality.htm.

Prior to using an activity checklist, project staff should review the applicable requirements listed in the project QAPP and the QMP.

The following checklists are included in this appendix:

- Data Review—TRIM record #2012AEB2
- Data Verification—TRIM record #2012AEB3
- Data Validation—TRIM record #2012AEB4
- Project QAO Annual Audit—TRIM record #2012AEB5

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DEQ QAPP Checklist—Data Review

The individual assigned in the project QAPP to perform project **data review** *shall complete and file this checklist in the appropriate project TRIM system files.* Project personnel are encouraged to expand this standard list, as project conditions warrant.

Printed Name of Staff Performing Data Review	Date Completed
Project QAPP Title	QAPP TRIM Record #

Check the following review boxes following completion of each listed task.

Check *yes* if the task was completed without any noted discrepancies. Otherwise, check *no* and include a description of the discrepancy in the space provided. Use additional sheets as necessary.

Yes	No	
☐	☐	Verify that the approved current project QAPP, including a copy of the signed approval signature page, is currently filed in the TRIM system. Also, verify the project information has been entered into the QAO project tracker found at TRIM record #2012AEB8. If the QAPP is not filed in TRIM, or the QAO tracker is not current, immediately inform the DEQ QA manager.
☐	☐	If the project utilizes an FSP, verify that the approved project FSP, including a copy of the signed approval signature page, is currently filed in the TRIM system. Also, verify the project information has been entered into the QAO project tracker found at TRIM record #2012AEB8. If the FSP is not filed in TRIM, or the QAO tracker is not current, immediately inform the DEQ QA manager.
☐	☐	Examination and review the project QAPP (and FSP, if used) to determine if additional project-specific data *review* requirements apply. Update this checklist to include all such items.
☐	☐	Examine project data, identifying errors in data entry, storage, calculation, reduction, transformation, or transcription.

Yes	No	
☐	☐	Ensure all required sample information is documented and available, in preparation for the verification, validation, and assessment process. This includes pertinent project information concerning blanks, matrixes, temperature requirements, duplicates, preservatives, shipping dates, holding times, chain-of-custody records, etc.
☐	☐	Identify if all required nondirect measurement data (existing data) information *and supporting documentation*, as required by the project QAPP (and FSP, if used), have been received and are available for the verification and validation process.
☐	☐	Determine if any data deficiencies exist, such as missing data or compromised data integrity, due to issues such as loss in acquisition, storage, or processing.
☐	☐	Ensure all necessary analytical laboratory support documentation, as set forth and stipulated in the project QAPP (and FSP, if used), have been received from the applicable laboratories.
☐	☐	Identify programming and/or software related errors, if applicable to the project.
☐	☐	Ensure that all deficiencies and/or conditions adverse to quality determined during the project data *review* process have been communicated to project management and are listed on this checklist or attached for inclusion in the TRIM record system.
☐	☐	Verify that a copy of this data review checklist has been provided to the project manager for deficiency resolution and placed in the project TRIM file system. Note that additional data review actions may be required based on the checklist findings, such as a corrective action plan/reports, etc. The project manager shall consult the DEQ QMP and proceed accordingly.

Please list any additional comments below. Attach additional sheets as necessary.

DEQ QAPP Checklist—Data Verification

The individual assigned in the project QAPP to perform project **data verification** *shall complete and file this checklist in the appropriate project TRIM system files.* Project personnel are encouraged to expand this standard list, as project conditions warrant.

Printed Name of Staff Performing Data Verification	Date Completed
Project QAPP Title	QAPP TRIM Record #

Check the following review boxes following completion of each listed task.

Check *yes* if the task was completed without any noted discrepancies. Otherwise, check *no* and include a description of the discrepancy in the space provided. Use additional sheets as necessary.

Yes	No	
☐	☐	Examine and review the project QAPP (and FSP, if used) to determine if additional project specific data *verification* requirements apply. Update this checklist to include all such items.
☐	☐	Verify that all data completeness criteria, as stated in the project QAPP (and FSP, if used), have been satisfied. This shall include items such as the number of samples, number of QC samples such as spikes and duplicates, and chain-of-custody record continuity.
☐	☐	Verify that the values of individual data points, and/or comparison calculations such as RPD, meet the criteria specified in the QAPP (and FSP, if used).
☐	☐	Verify that the required analytical methods, as listed in the project QAPP (and FSP, if used) correspond to the analytical methods employed by the laboratory, as recorded in laboratory reports.
☐	☐	Verify that QAPP (and FSP, if used) requirements relative to laboratory analytical support documentation have been satisfied by the reporting laboratory, including the correct application of data qualifiers.
☐	☐	Verify that all supporting information and documentation for nondirect measurement data (existing data) meet the requirements of the QAPP (and FSP, if used). If not, identify any limitations or restriction on the use of such data.

Yes	No	
		_____ _____ _____
☐	☐	Verify that data and sample collection practices adhered to procedural requirements, to include a review of project logs and field notes, as applicable. _____ _____ _____
☐	☐	Verify that sample handling activities conform to QAPP (and FSP, if used) requirements. Examples include sample shipment timelines, sample holding times, preservatives, number of samples obtained, duplicate or split sample frequency, and chain-of-custody documentation. _____ _____ _____
☐	☐	Verify that data calculation and handling activities conform to QAPP (and FSP, if used) requirements. Examples include correct use of mathematical formulas and numerical methods, correct use of programs and programing, and correct application of database information transfers. _____ _____ _____
☐	☐	Verify that any remaining or unique project QAPP (and FSP, if used) or procedural requirements have been met, and if not, determine the extent to which these requirements failed to be achieved. _____ _____ _____
☐	☐	Determine and document any limitations on the use of the project data. _____ _____ _____
☐	☐	Ensure that all deficiencies and/or conditions adverse to quality determined during the project data *verification* process have been communicated to project management and are listed on this checklist or attached for inclusion in the TRIM record system. _____ _____ _____
☐	☐	Verify that a copy of this data verification checklist has been provided to the project manager for deficiency resolution and placed in the project TRIM file system. Note that additional data verification actions may be required based on the checklist findings, such as a corrective action plan/reports, etc. The project QAO shall consult the DEQ QMP and proceed accordingly. _____ _____ _____

Please list any additional comments below. Attach additional sheets as necessary.

_____
_____
_____
_____

DEQ QAPP Checklist—Data Validation

The individual assigned in the project QAPP to perform project **data validation** *shall complete and file this checklist in the appropriate project TRIM system files.* Project personnel are encouraged to expand this standard list as project conditions warrant.

Printed Name of Staff Performing Data Validation	Date Completed
Project QAPP Title	QAPP TRIM Record #

Check the following review boxes following completion of each listed task.

Check *yes* if the task was completed without any noted discrepancies. Otherwise, check *no* and include a description of the discrepancy in the space provided. Use additional sheets as necessary.

Yes	No	
☐	☐	Verify that the approved current project QAPP, including a copy of the signed approval signature page, is currently filed in the TRIM system. Also, verify the project information has been entered into the QAO project tracker found at TRIM record #2012AEB8. If the QAPP is not filed in TRIM, or the QAO tracker is not current, immediately inform the DEQ QA manager.
☐	☐	If the project utilizes a FSP, verify that the approved project FSP, including a copy of the signed approval signature page, is currently filed in the TRIM system. Also, verify the project information has been entered into the QAO project tracker found at TRIM record #2012AEB8. If the FSP is not filed in TRIM, or the QAO tracker is not current, immediately inform the DEQ QA manager.
☐	☐	Examine and review the project QAPP (and FSP, if used) to determine if additional project-specific data *validation* requirements apply. Update this checklist to include all such items.
☐	☐	Evaluate and examine all (100%) of obtained field QC sample results, such as duplicates and trip blanks, etc., followed by assignment (if necessary) of appropriate data qualifiers to these data based on project criteria.
☐	☐	Review project analytical laboratory reports and data, including the assigned data qualifiers, to evaluate the data quality with respect to the project DQOs. Assign data qualifiers to individual data values as necessary and appropriate.

Yes	No	
☐	☐	Review the outcome of the data verification effort to evaluate the impact on data quality with respect to the DQOs.
☐	☐	Determine, when necessary and where possible, the reasons for any failure to meet methodological, procedural, or contractual requirements and evaluate the impact of such failure on the overall data.
☐	☐	Compare the project DQOs, as defined in the project QAPP (and FSP, if used), to the data obtained by the project to assess the adequacy of the data (new or existing) in relation to their intended use.
☐	☐	Determine the extent to which any nondirect measurement data (existing data), and the accompanying supporting information and documentation, meet the requirements of the data user. Specifically, does the quality of the existing data adequately support the needs of the project and support the intended use of the data for the project?
☐	☐	Determine and document any limitations on the use of the project data.
☐	☐	Determine the adequacy of the data to proceed on to the data assessment and reconciliation with user requirements phase.
☐	☐	Ensure that all deficiencies and/or conditions adverse to quality determined during the project data *validation* process have been communicated to project management and are listed on this checklist or attached for inclusion in the TRIM record system.
☐	☐	Verify that a copy of this data validation checklist has been provided to the project manager for deficiency resolution and placed in the project TRIM file system. Note that additional data validation actions may be required based on the checklist findings, such as a corrective action plan/reports, etc. The project QAO shall consult the DEQ QMP and proceed accordingly.

Please list any additional comments below. Attach additional sheets as necessary.

DEQ QAPP Checklist—Annual QAO Project Audit

The individual assigned in the project QAPP as the project quality assurance officer (QAO) shall audit the project on at least an annual basis. The QAO *shall complete this checklist as part of the audit process and file the completed form in the appropriate project TRIM system files.* Project QAOs are encouraged to expand this standard list as project conditions warrant.

Printed Name of Staff Performing the QAO Audit	Date Completed
Project QAPP Title	QAPP TRIM Record #

Check the following review boxes following completion of each listed task.

Check *yes* if the task was completed without any noted discrepancies. Otherwise, check *no* and include a description of the discrepancy in the space provided. Use additional sheets as necessary.

Yes	No	
☐	☐	Verify that the approved current project QAPP (and FSP, if used), including a copy of the signed approval signature page, is currently filed in the TRIM system. Also, verify the project information for the QAPP (and FSP, if used) has been entered into the QAO project tracker found at TRIM record #2012AEB8. If the QAPP (and FSP, if used) are not filed in TRIM, or the QAO tracker is not current, immediately inform the DEQ QA manager.
☐	☐	Verify that the approved and current project documents, such as the project QAPP (and FSP, if used), SOPs, etc., are available to project staff and are in use per project requirements.
☐	☐	Determine through review and observation if the project has performed and documented project activities as described and required by the project QAPP (and FSP, if used) such that the needs of the data user are satisfied.
☐	☐	Determine if the project QAPP (and FSP, if used) adequately document and describe the actual project requirements such that the needs of the data user are satisfied. If necessary, in coordination with the project manager, initiate project document revision, review, and approval efforts in accordance with the DEQ QMP.

Yes	No	
☐	☐	Determine if the project analytical requirements are adequately met by the selected laboratory, including use of proper analytical methods and sufficient analytical data support documentation.
☐	☐	Determine if project sample handling activities are in compliance with the requirements of the project QAPP (and FSP, if used).
☐	☐	Determine if project field activities are in compliance with the requirements of the project QAPP (and FSP, if used).
☐	☐	Determine if all nondirect data acquisition associated with the project has been addressed and properly documented in the project QAPP (and FSP, if used).
☐	☐	Compare actual project documents available in the DEQ TRIM record system against the document filing requirements contained in the project QAPP (and FSP, if used). Identify existing deficiencies in the project TRIM system files, such as missing field note pages and missing chain-of-custody forms, and provide this information to the project manager for immediate resolution.
☐	☐	Ensure that all deficiencies and/or conditions adverse to quality determined during the project QAO audit process are listed on this checklist or attached for inclusion in the TRIM record system.
☐	☐	Verify that a copy of this annual QAO audit report has been provided to the project manager for deficiency resolution and placed in the project TRIM file system. Note that additional audit administrative actions may be required based on audit findings, such as a corrective action plan/reports, etc. The project QAO shall consult the DEQ QMP and proceed accordingly.

Please list any additional comments below. Attach additional sheets as necessary.

Appendix B. Surface Water Sampling Procedures

Equipment required for field work:

- ☐ analyte free (blank) water
- ☐ bag for trash
- ☐ camera
- ☐ cell phone
- ☐ decontaminated metal-free water dipper
- ☐ envelope/package sealing tape strips
- ☐ field book
- ☐ first-aid equipment
- ☐ GPS receiver
- ☐ insulated bags
- ☐ powder-free nitrile or vinyl gloves
- ☐ sample booklet (sample labels)
- ☐ sample containers (see Appendix D)
- ☐ sample cooler and ice (warm weather)
- ☐ wading boots
- ☐ water-proof pens and markers
- ☐ zip-top baggies

Equipment required for Coeur d' Alene Regional Office lab work:

- ☐ 5% HNO_3 solution for decontamination
- ☐ analyte free (blank) water
- ☐ COC forms
- ☐ envelope/package sealing tape strips
- ☐ eye protection
- ☐ field book
- ☐ filter holder(s)
- ☐ filter paper (0.45 ug)
- ☐ lab coats
- ☐ preservative (HNO_3)
- ☐ refrigerator
- ☐ sample booklet (sample labels)
- ☐ sample containers (see Appendix D)
- ☐ vacuum bell(s)
- ☐ vacuum pump
- ☐ water-proof pens and markers

1.0 Sample location selection

The most appropriate location for collecting a sample should be determined at each station depending on water level and the public's recreation use at the station

1. The sample should be taken from the thalweg portion of the stream away from the shore or any back-eddy. The sampler may need to wade into deeper water prior to using the dipper to reach further into the stream.

2. The sample should be taken upstream from recreation use.

3. Observed upstream disturbances should be noted in field book.

2.0 Field Parameter Measuring Procedures

Measurements of field parameters is limited to discharge measurements of wadeable streams (i.e. Skalan Creek) using a Doppler flow meter with the following process:

1. Establish a cross section: string a measuring tape across the stream perpendicular to flow. Divide the channel width into segments so that each of the segments has no more than 10 percent of the flow.

2. Measure depth (in ft) in the center of each segment, then measure water velocity (in ft/sec) in the center of the segment at 0.6 of the total depth below the water surface. For depths of 2.5 feet or more, the average velocity of 0.2 and 0.8 should be measured.

3. Calculate discharge using the stream discharge calculation spreadsheet (TRIM reference #2013AJY4).

All measurements will be taken to a single digit of estimation. Significant figures shall be conserved throughout the calculation of discharge from velocity and area.

3.0 Sample Collection Procedures

Sampling equipment and laboratory filtration apparatus will be rinsed with 5 percent HCL and then rinsed in deionized water. Sample collection will follow the methodology outlined in the project FSP.

4.0 Decontamination Procedures

Between sites, the sampling dipper will be rinsed with 5 percent HCL and deionized water.

5.0 Field Sampling Sheets

- Field sampling booklets will be completed for each sampling event at each site. An example field sample booklet is included in Appendix C. At a minimum, the following information, as available, will be documented for each site visited during each sampling event:
  - Identification sample location
  - Date and time of sample collection
  - Sample identification numbers and analytes requested
  - Field parameter measurements and methods
  - Field observations and remarks
  - Name of collectors
  - Weather conditions

6.0 Chain-of-Custody Forms

Once the samples have been collected, they will be placed in a metalized biaxially-oriented polyethylene terephthalate bag, then in ambient-temperature equilibrated cooler while in the field. Once samples are filtered and processed in the DEQ lab, they will be stored in a designated sample refrigerator until delivered or shipped to the lab. A chain of custody form (see example in Appendix E) will accompany each ice chest during shipment to the lab. The chain of custody form will include the following information:

- Project name: Spokane River TMDL
- Laboratory name and address: SVL Analytical, One Government Gulch, Kellogg ID
- Sample identification number: use sample booklet numbering
- Date and time of collection:
- Type of sample, number of containers, and analysis requested
- Sample preservation methods
- Signature of sample collector(s)/shipper

- Date and time of release to shipper/common carrier

7.0 Quality Assurance/Quality Control

The objective of quality assurance and quality control (QA/QC) is to make certain that the water analytical results represent the actual chemical and physical composition of the water at the site. Components of the QA/QC program are as follows:

Laboratory: The analytical laboratories will provide or assist in the sampling containers, preservatives, chain of custody, and labels. A laboratory QA/QC report with continuing calibration checks will accompany each data report and will be kept on file by DEQ.

Sample Collection: QA/QC procedures for sample collection will be accomplished by the sampling personnel. A standardized field booklet will record each sampling event following the format described above. It will include documentation of all QA/QC procedures related to sample collection.

Field Blank: Field blanks will be collected at the rate of at least 10 percent.

Duplicate Samples: Duplicate samples will be collected at the rate of at least 10 percent.

Field QC Sample Goals: Field QC samples (duplicates and blanks) will constitute between 10% of samples submitted to the analyzing laboratories.

Preservation Blank: will be collected once a month or whenever the preservation reagent or process has been modified.

Equipment Blank: will be collected once a month and when concentrations in field blanks are analyzed to be above the reporting limit.

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Appendix C. DEQ Sample Booklets—Coeur d' Alene Regional Office

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Appendix D. Sample Bottle Schedule

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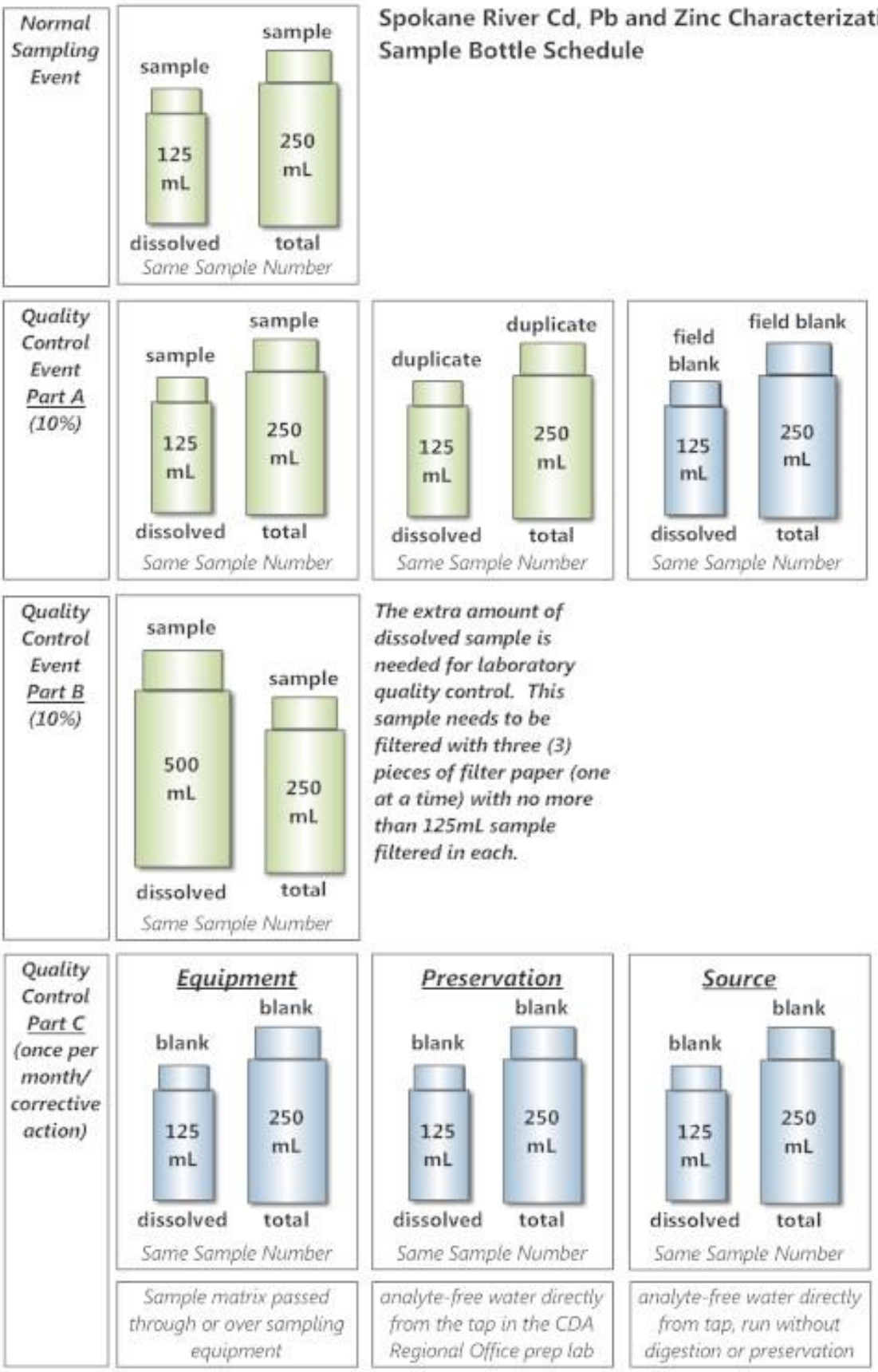
Spokane River Cd, Pb and Zinc Characterization Sample Bottle Schedule



Appendix E. Chain-of-Custody Record

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CHAIN OF CUSTODY RECORD

Page ___ of ___

SVL Analytical, Inc. • One Government Gulch • Kellogg, ID 83837 • (208) 784-1258 • FAX: (208) 783-0891

FOR SVL USE ONLY
SVL JOB #

TEMP on Receipt:

Table 1. – Matrix Type
1 = Surface Water, 2 = Ground Water
3 = Soil/Sediment, 4 = Rinsate, 5 = Oil
6 = Waste, 7 = Other_____

Report to Company: Idaho DEQ
Contact: R. Steed
Address: 2110 Ironwood Pkway CDA, ID 83814
Phone Number: (208) 769-1422
FAX Number: (208) 769-1404
E-mail: robert.steed@deq.idaho.gov

Invoice Sent To: Idaho DEQ
Contact: F. Beller
Address: 2110 Ironwood Pkway CDA, ID 83814
Phone Number: (208) 769-1422
FAX Number: (208) 769-1404
PO#:

Project Name: Spokane River TMDL

Sampler's Signature:

Indicate State of sample origination: Idaho

USACE? ☐ Yes ☒ No

Sample ID	Collection			Misc.		Preservative(s)							Analyses Required										Rush Instructions (Days)	Comments
Please take care to distinguish between: 1 and I, 2 and Z, 5 and S, Ø and O. Thanks!	Date	Time	Collected by: (Init.)	Matrix Type (From Table 1)	No. of Containers	Unpreserved	HNO_3 Filtered	HNO_3 Unfiltered	HCl	H_2SO_4	NaOH	Other (Specify)	total Cd EPA 200.8	diss Cd EPA 200.8	total Pb (low) EPA 200.8	diss Pb (low) EPA 200.8	total Zn EPA 200.8	diss Zn EPA 200.8	diss Ca EPA 200.7	diss Mg EPA 200.7				
1																								
2																								
3																								
4																								
5																								
6																								
7																								
8																								
9																								
10																								

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:

* Sample Reject: ☐ Return ☐ Dispose ☐ Store (30 Days)

White: LAB COPY Yellow: CUSTOMER COPY

SVL-COC 9/05

Appendix F. Spokane Assessment Report

Spokane River Cd, Pb, and Zn Event Quality Assessment Report *date:* _____/_____/_____

Assessment Report TRIM: _____

To be completed by the project manager upon receipt of sample results from the laboratory for each batch of samples

Batch Identifier (work order): _____ *date(s) of monitoring event:* _____

Delivery of Samples *COC TRIM:* _____ *Results TRIM:* _____

Yes	No	
☐	☐	Is Chain of Custody Record complete and on file?
☐	☐	Did laboratory qualify data at time of receipt? (e.g. temperature, condition of sample)

Laboratory Quality Control Assessment

Yes	No	
☐	☐	Are reporting limits of results consistent with those in QAPP?
☐	☐	Are laboratory blank concentrations all below reporting limits for each analyte?
☐	☐	Are laboratory control samples percent recovery more than 75% and less than 125%?
☐	☐	Are matrix spike samples percent recovery more than 75% and less than 125%?
☐	☐	Are the matrix spike duplicate sample's RPD less than 20?

Field Contamination Bias (Blank(s))

Yes	No		
☐	☐	*number of field blanks:* _____	*number of samples:* _____
☐	☐	Were enough field blanks taken? (e.g. #field blanks/#samples ≥ 10%)	
☐	☐	Are field blank(s) concentrations all below reporting limits for each analyte?	

Yes	No	N/A	
☐	☐	☐	Are equipment blank(s) concentrations all below reporting limits for each analyte?
☐	☐	☐	Are preservation blank(s) concentrations all below reporting limits for each analyte?
☐	☐	☐	Are source blank(s) concentrations all below reporting limits for each analyte? (see following)

Field Blank Evaluation	*Total*			*Dissolved*				
	Cd	Pb	Zn	Cd	Pb	Zn	Ca	Mg
Reporting Limits (mg/L)	0.00020	0.000250	0.0050	0.00020	0.000200	0.0050	0.040	0.200
1st Field Blank								
2nd Field Blank								

Approval

_____ *Project Manager*

_____ *Quality Assurance Officer*

1

Spokane River Cd, Pb, and Zn Event Quality Assessment Report *date:* _____/_____/_____

Field Precision (Duplicate(s))

Yes No *number of field duplicates:* _____ *number of samples:* _____

☐ ☐ Were enough field duplicates taken? (e.g. #field duplicates/#samples ≥ 10%)

☐ ☐ Did field duplicates meet DQO for precision for each analyte? (see following)

Field Duplicate Evaluation		*Total*			*Dissolved*				
		Cd	Pb	Zn	Cd	Pb	Zn	Ca	Mg
1st	Original								
	Duplicate								
	RPD (%)								
2nd	Original								
	Duplicate								
	RPD (%)								

Corrective Actions

Yes No *Corrective Action Plan TRIM (if available)* _____

☐ ☐ Are correction actions necessary?

Brief description of corrective actions:

Approval

_____ _____

Project Manager *Quality Assurance Officer*

2