

# QUALITY ASSURANCE PROJECT PLAN

## Watershed Toxic Monitoring Program (TMP)



State of Oregon  
Department of  
Environmental  
Quality

DEQ09-LAB-0029-QAPP

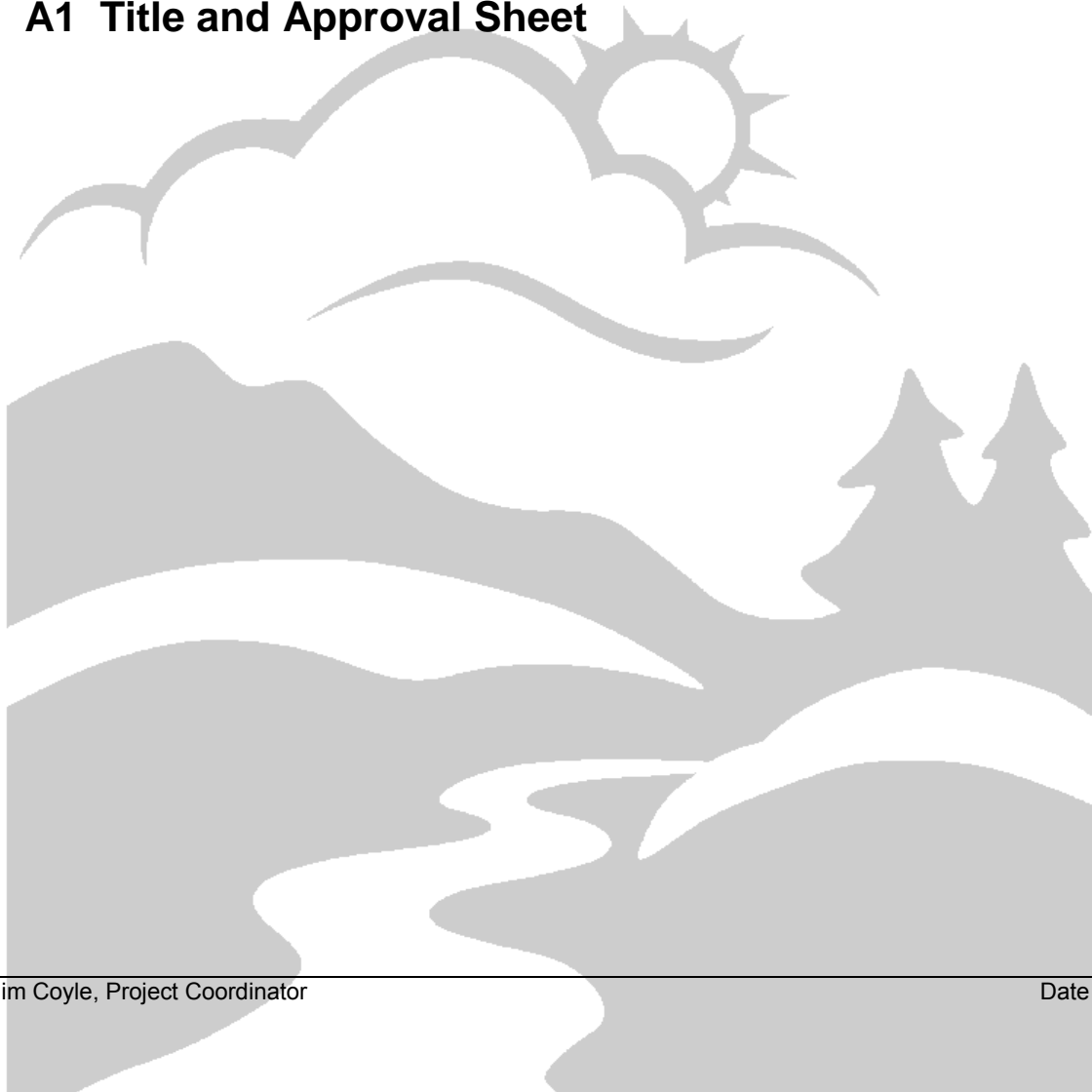
Version 2.0 – July 24, 2009

### Group A Project Management

#### A1 Title and Approval Sheet

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Signed copy on file with DEQ.

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### A3 Project Task/Description

This Quality Assurance Project Plan (QAPP) describes the quality assurance (QA) and quality control (QC) activities/procedures that will be used while collecting and analyzing samples for Watershed Toxic Monitoring studies. It was prepared according to guidance presented in the departments "Quality Management Plan" and the document "EPA Requirements for Quality Assurance Project Plans", EPA QA/R-5 (USEPA 1999).

Sampling and Analysis Plans (SAPs) will be written for well defined geological boundaries, i.e. appropriate HUC level. Each SAP will cite this plan and comply with the Quality Objectives described herein. The Field Operations Coordinator will assist in writing the SAP and coordinate sampling events. SAPs will identify sampling location, the rationale for selecting sampling locations, and the analyses to be conducted on the samples.

### A4 Distribution List

This project primarily resides with services provided by the Oregon Department of Environmental Quality's Laboratory and Environmental Assessment Division (LEAD). It is possible, however that such services may be subcontracted or obtained through volunteers, in which case the Project Coordinator will ensure said parties will receive a copy of this QAPP.

The following DEQ personnel will be emailed regarding all aspects of this QAPP/SAP. This QAPP will be posted on Q-Net (DEQ's internal website) at [deq05/lab/qms/documents.asp](http://deq05/lab/qms/documents.asp). As prescribed by the LEAD's document control procedures, the official signed document will be filed at the LEAD. This project is expected to continue through multiple seasons, thus revisions should be anticipated. The Project Coordinator may make revisions to this plan, which must be approved by the signatories in section A1. The DEQ is not responsible for the control of reprinted copies from web sites or photo copies of the original plan. It is the responsibility of the reader to ensure that they are using the most current QAPP. The QAO will replace posted network files as the plan is revised.

**Table 1 – Distribution List**

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Dennis Ades	(503)-693-5736	ades.dennis@deq.state.or.us

DEQ personnel must ensure that they track their time and expenses spent on this project using "Q-time". DEQ Personnel should confirm they are using the correct code by searching "Q-time"

for “Toxics Monitoring” or abbreviations thereof. The Q-Time ID code (**41150** - WQ Toxics Monitoring-Program Development - 2011 Biennium) is expected to change with each biennium, however project IDs (2026) and document control numbers should not change.

## A5 Project/Task Organization

The project team organization provides the framework for conducting the sample collection task to meet study objectives. The organizational structure and function also facilitate project performance and adherence to QC procedures and QA requirements. Key roles are filled by those persons responsible for ensuring program planning, sample collection, data generation, data verification, as well as the persons responsible for validating data for usability with final products and deliverables.

**The Lead Administrator and LEAD Managers** supervise staff and manage program workloads and budgets. These managers are ultimately responsible to ensure that the project planning, sample collection, sample processing, data management, and data reporting are conducted in accordance to the approved project work plan, QAPP, and other materials developed to support the project.

**The Quality Assurance Officer** will be responsible for reviewing and approving all Quality Assurance Project Plans (QAPPs).

**The Project Coordinator** is responsible for overseeing development and implementation of the TMP and communication of programmatic accomplishments and findings with internal and external stakeholders. The project coordinator is also responsible for ensuring that project monitoring strategies are current and reflect program priorities.

**The Field Operations Coordinator** will ensure that QA/QC protocols are maintained throughout the sample collection and preparation processes. The Field Operations Coordinator will review all field records for accuracy and see that any problems encountered outside normal operating conditions are documented and addressed. The Field Operations Coordinator will also verify all other field QA/QC procedures, which are identified in the QAPP, are followed.

**The Data Coordinator** will review all project data for accuracy and completeness. This project-level review will evaluate data quality after sampling events are approved by the Field Operations Coordinator and LEAD Managers. The Data Coordinator will also facilitate communication among the Sample Coordinator, analytical staff, and the Field Operations Coordinator.

**The Sample Coordinator** will verify samples were logged into LIMS appropriately, ensure analytical report files are complete, and review Data Quality Level validation codes.

**The Sample Custodian** will ensure project and QC samples are logged into LIMS appropriately.

**Table 2 – Project/Task Responsibilities**

Name	Project Title/Responsibility
Jim Coyle	Project Coordinator
Allen Hamel	Field Operations Coordinator
Sarah Rockwell	Data Coordinator
Shannon Swantek	Sample Coordinator

Name	Project Title/Responsibility
Heather Cayton	Sample Custodian
Dan Hickman	Technical Services Manager
Brian Boling	Organic Manager
Raeann Haynes	Inorganic Manager
Chris Redman	Quality Assurance Officer
Greg Pettit	LEAD Administrator

## A6 Problem Definition/Background

### A6-1 Problem Definition:

Until recently, the State of Oregon lacked a statewide, systematic, toxic pollutant monitoring program to quantify the presence of toxics chemicals in its waters and aquatic biota, identify their sources (where possible) and to guide efforts towards their reduction. This document describes the quality assurance project plan for a new Toxics Monitoring Program (TMP) which was initiated in 2008 to document the status (distribution and intensity), measure trends (changes through time), and inform and guide reduction efforts of toxic pollutants in surface waters and aquatic biota.

### A6-2 Background:

The manufacture, use and release of toxic pollutants are regulated under a number of federal and state statutes. However the volume, complexity, and ubiquity of local, regional and global sources of toxic pollutants, combined with significant spatial and temporal information gaps have resulted in increased public concern regarding the presence and potential impacts of these pollutants on environmental quality and human health. The public has consistently expressed a high level of concern regarding the presence of toxic pollutants in the Nation's waters.

The sources of toxic pollutants are many and varied, including: wastewater discharges from industrial and municipal facilities; surface water runoff that contains pollution from roads, parking lots, and urban and rural lands; legacy contamination in sediments, such as Portland Harbor; air pollution from Oregon and around the world; and natural erosion. With so many sources, it's important to focus on developing control and reduction strategies that address the toxics of highest concern (e.g., that are most likely to affect public health) to achieve targeted results. Designing successful control and reductions strategies and assessing their efficacy over time will require long-term, comparable, high-quality monitoring data for selected toxic pollutants.

During the 2007 Legislative session, the Oregon Department of Environmental Quality (DEQ) requested and received Governor and legislative approval of funding that would address increasing public concerns about toxic pollutants in Oregon's waters. Until this funding was provided, Oregon did not have resources to systematically monitor toxics of most concern, determine their sources, or how to best target resources toward solutions. With the funding provided by the Legislature, DEQ will:

- Develop a monitoring and assessment plan focusing on toxic pollutants which are likely to be present in Oregon's surface waters that pose the greatest threat to human health and the environment.

- Collect samples from multiple sources of media, including the water column and fish tissue.
- Analyze and interpret data, determine potential local sources and assess the level of threat to human health and the environment posed by identified pollutants.

Should detected toxic pollutants exceed established water quality criteria or exceed “safe” levels (as determined by recent and/or relevant research for those substances for which criteria are not available), DEQ will work with identified sources and stakeholders to reduce the levels of toxic pollutants and implement pollution prevention efforts to achieve reductions in environmental concentrations.

### **A6-3 Toxic Pollutants of Interest**

The term “toxic pollutant” generally refers to substances, primarily of anthropogenic origin, which are produced or are by-products of industrial, municipal, or agricultural processes whose physical and chemical characteristics have been demonstrated to impair the normal functioning of biological systems at low exposure levels. Adverse effects of resulting from exposure to toxic pollutants include reduced survival, impaired development, genetic damage, tumor promotion or diminished reproductive success.

Numerous regulatory and academic authorities have compiled various lists of what they believe constitute the most toxic pollutants; unfortunately, no generally agreed-to list of toxic pollutants is available. Senate Bill 737, enacted by the Oregon Legislature directs DEQ to: (1) by June 2009, consult with all interested parties to develop a list of priority persistent bioaccumulative toxics (“persistent pollutants”) that have a documented effect on human health, wildlife and aquatic life, and (2) by June 2010, report to the Legislature on the list of priority persistent pollutants; point, nonpoint and legacy sources of priority persistent pollutants "from existing data;" along with source reduction and control recommendations. SB 737 also requires Oregon's 52 large municipal wastewater treatment plants to develop pollution prevention and toxics reduction plans by 2011. Once DEQ finalizes the priority persistent pollutant list, the TMP will incorporate those pollutants (as necessary and feasible) into its operational monitoring.

At this time, the TMP proposes to measure and assess the distribution (status) and changes over time (trends) of following classes of toxic pollutants:

- Volatile and semi volatile organic chemicals (VOCs and SVOCs),
- Poly-aromatic hydrocarbons (PAHs),
- Poly-chlorinated biphenyls (PCBs),
- Poly-brominated diphenyl ethers (PBDEs),
- Dioxins and furans (*budget permitting*),
- Heavy metals,
- Current-use and legacy pesticides, contaminants of emerging concern (i.e., pharmaceuticals, personal care products, and plasticizers).

### **A6-4 Program Scope**

The ultimate spatial scope of the TMP includes all of Oregon’s major river basins. The initial spatial scope of the TMP (2008 – 2010) will be the Willamette River Basin (WRB) where sampling will be conducted at the selected main stem and tributaries reaches in 2008 (refer to [DEQ09-LAB-0039-SAP](#)). Follow-up sampling in the WRB is planned in 2009 and beyond to provide further insights into issues identified in the 2008 sampling. Subsequently, and with input

from stakeholders, the TMP will be implemented in all other major river basins in Oregon on a rotational basis.

Each type of media collected within a basin will require a written Sampling and Analysis Plan (SAP). The SAP will identify sample collection stations, the pollutants to be measured on each sample, and the rationale for selecting them i.e. current 303(d) listings. SAPs are not constrained to major river basins (Figure 1). It will be acceptable to write SAPs for other defined scopes.

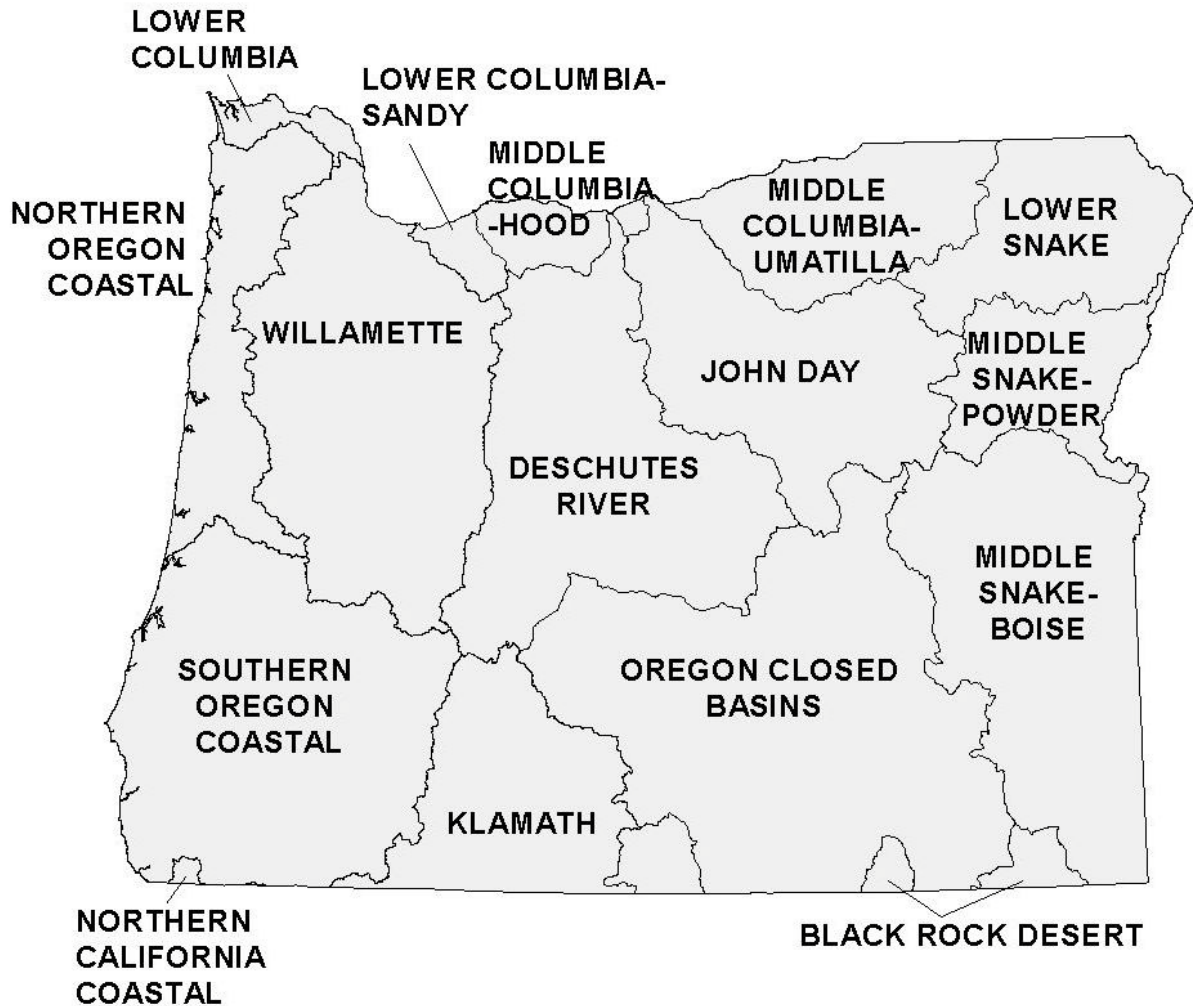


Figure 1 – River Basins (6-digit hydrological accounting units)

## A7 Quality Objectives and Criteria

The LEAD document control procedures ensure the most recently approved Quality Systems documents are available for implementation. These documents are available through Q-Net at ([deq05/Lab/gms/documents.asp](http://deq05/Lab/gms/documents.asp)). Specific Quality Systems documents cited in this QAPP contain a hyperlink to the controlled document for ease of reference. Many of these documents are only available on the department's internal network. Those who do not have access to the department's internal network may contact the Project Coordinator for copies of the referenced

documents.

Samples collected for LEAD analysis will be analyzed following standard DEQ protocol as described in the LEAD's Quality Manual ([DEQ91-LAB-0006-LQM](#)) and the LEAD's analytical SOPs. Procedures for collecting Water Quality samples and conducting field analyses are described in the Watershed Assessment Section Mode of Operations Manual (MOMs: [DEQ03-LAB-0036-SOP](#)).

Environmental data is assumed to be acceptable for use when associated QC data is within established control limits. It is therefore important to define appropriate QC data and how to interpret the QC data as it applies to the reported environmental data.

To establish relationships between environmental data and QC data, EPA's Guidance for the Data Quality Objectives Process (QA/G-4, EPA 2000) was used. As the title implies this document is intended to provide guidance for establishing a plan for data collection efforts and for developing an appropriate data collection design to support decision making, i.e. develop acceptance or performance criteria for the quality of the data collected and for the quality of the decision.

The QA/G-4 guidance document defines two sources of error: Statistical Sampling Error (Field Variability) and Measurement Error (Measurement Variability), which contribute partially to the total error.

- Sampling (field) error – This error is influenced by the inherent variability of the contaminant over space and time, the sample collection design, and the number of samples. It is usually impractical to measure the entire space, and limited sampling may miss some features of the natural variation of the measurement. Sampling design error occurs when the data collection design does not capture the complete variability within the environment, to the extent appropriate for making conclusions. Sampling design error can lead to random error (i.e., variability or imprecision) and systematic error (bias) in estimates of contaminant concentrations.
- Measurement error – This error is influenced by imperfections in the measurement and analysis system. Random and systematic measurement errors are introduced in the measurement process during physical sample collection, sample handling, sample preparation, sample analysis, data reduction, transmission, and storage.

Project Management, cont.

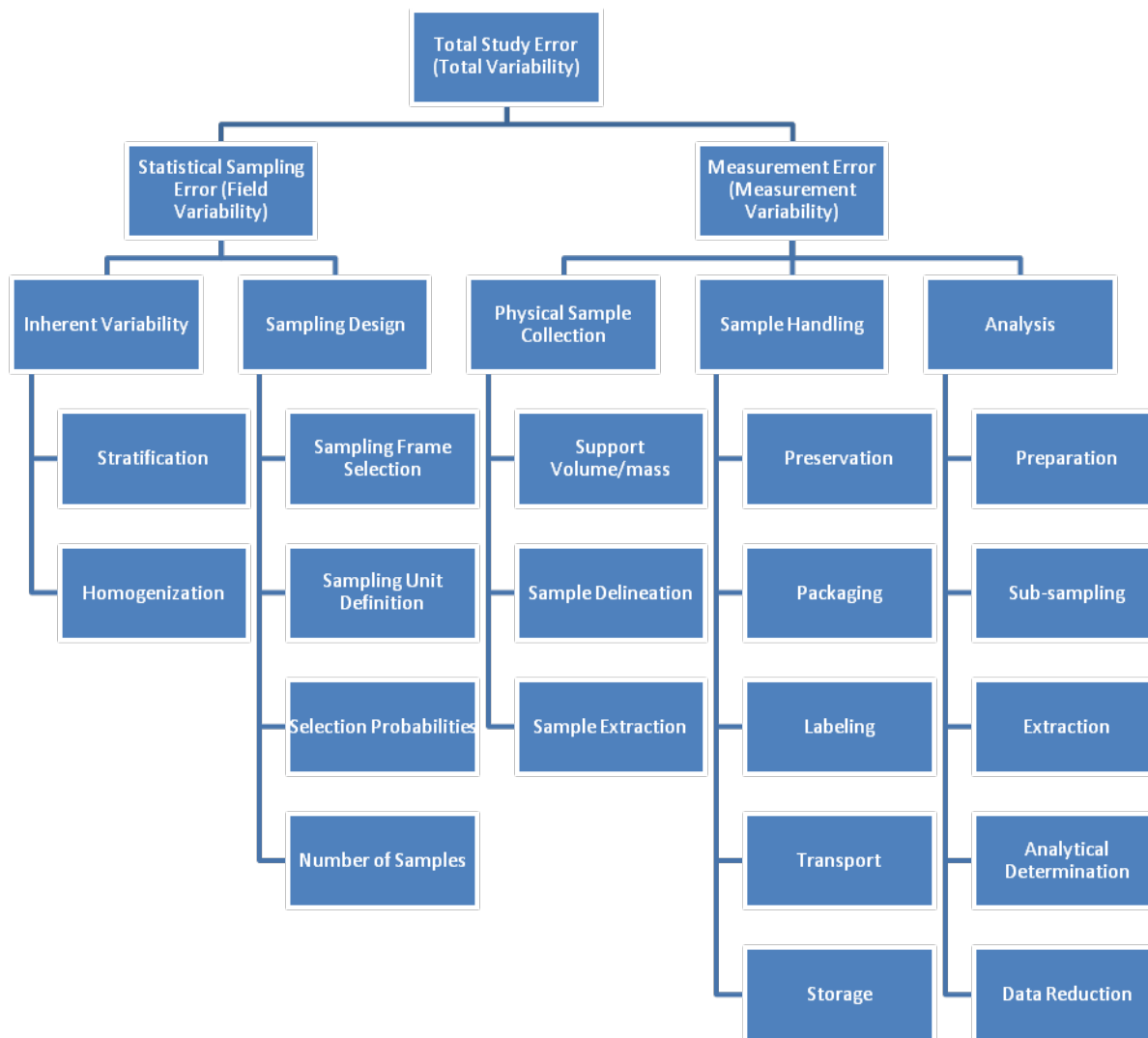


Figure 2 – Sources of Error

Figure 2 illustrates where errors can occur in procedural steps used for generating environmental data. During many of these procedural steps, QC measurements can be taken or QC samples can be introduced into the process thereby making it possible to estimate the error attributable to a specific protocol. With each procedural step that a QC element can be implemented, environmental data will be batched with the QC result in which the samples or data were processed. Section B5 will further define the QC batches to be used for this project. With the knowledge of an unacceptable error in the QC measurement, environmental samples within the QC batch are either reprocessed after improvements are made to minimize the observed error, or the environmental data will be flagged as not meeting the quality control standard. Often it is physically impossible to reprocess samples or it is not cost effective, in which case data must be flagged in a manner that ensures the data user is aware of the data quality anomaly.

Specific QA Objectives for this project are:

- Collect a sufficient number of samples, sample duplicates, and field blanks to evaluate the sampling and measurement error.
- Analyze a sufficient number of QC Standards, blanks and duplicate samples in the Laboratory environment to effectively evaluate results against numerical QA goals established for precision and accuracy.
- Implement sampling techniques in such a manner that the analytical results are representative of the media and conditions being sampled.

Data quality shall be evaluated through the use of the traditional Data Quality Indicators:

- Precision
- Accuracy/Bias
- Sensitivity
- Representativeness
- Comparability
- Completeness

SAPs, which will be written for the specific needs of the water basin, must list the parameters to be measured. The SAP must also list precision, accuracy, and sensitivity control limits for each parameter of concern. Table 3 in section B5 lists parameters likely to be included in SAPs along with the LEAD's Limit of Quantitation (LOQ), which is the lowest value the LEAD will report to unless otherwise stipulated in the SAP.

Only sample results with Data Quality Levels of "A" or "B" will be used for this project.

### **A7-1 Precision**

Precision shall be estimated by measuring the variability of duplicate measurements. The best estimate of precision for the overall monitoring program is the comparison of duplicate samples collected in the field. The variability in the results obtained from field duplicate samples is the sum of the sampling and analytical variability (measurement uncertainty). In general the control limit for duplicate samples collected in the field are +/-20% RPD for samples >5 times the LOQ or +/- the LOQ for the difference between replicates when the concentrations are <5 times the LOQ.

### **A7-2 Accuracy/Bias**

Accuracy is a measure of the error between reported test results and the true sample

concentration. It shall be estimated by measuring the bias of Measurement Error, even though bias is due to both systematic error in sampling and measurement variability.

Systematic error attributable to sampling design shall be minimized and be considered acceptable by following the procedures in described in section B1.

All instruments shall be calibrated using appropriate reference materials. The accuracy of these materials is to be documented and maintained by the laboratory. The instrument's response to the reference material (initial calibration) shall also be documented and fall within method control limits. Immediately following the initial calibration a second source standard will be used to verify the accuracy of the calibration reference material.

The Laboratory Control Samples (LCS) prepared with each batch of samples will be used to estimate accuracy and where applicable matrix spikes will be used in conjunction with the LCS.

### **A7-3 Sensitivity**

This project may require analytical data based on OAR 340-041-0053 [Table 20: Water Quality Toxic Criteria Summary](#) standards. In such cases it may be necessary to report data below the laboratories Limit of Quantitation (LOQ) for a few parameters. SAPs will list the parameters of interest and the target reporting level. A value less than the laboratory's LOQ will be reported as an estimate.

Blanks must be less than the Limit of Quantitation for each analyte listed in Table 3. Laboratory Method Blanks (MB) will be prepared along with each LCS. The MB will be used to assess the sensitivity of the method. If corrective action measures fail to resolve MB errors, results batched with the MB will be flagged with a Data Quality Level of "B".

### **A7-4 Representativeness**

Representativeness is a qualitative term that should be evaluated to determine whether in situ and other measurements are made and physical samples collected in such a manner that the resulting data appropriately reflect the media and phenomenon measured or studied.<sup>1</sup> The intent of this project is to quantify chemical, biological, and physical parameters in the ambient environment.

Representativeness is controlled by using well defined sampling and sample handling SOPs. Sampling procedures are designed so that results are representative of the matrix being sampled. Sample handling protocols for storage, preservation, and transportation have been developed to preserve the representativeness of the collected samples. Proper documentation will establish that protocols have been followed and sample identification and sample integrity assured. If it is determined that sample integrity has been compromised data will be flagged with a Data Quality Level of "B".

Samples that are not representative of the population often occur in judgmental sampling because not all the units of the population have equal or known selection probabilities<sup>2</sup>. The rationale for selecting sampling stations is described in section B1 below.

The location of the sample will be referenced to latitude and longitude using a GPS. Samples will be collected at or near the center of the stream channel where the water is well mixed and

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<sup>1</sup> USEPA 1998. EPA GUIDANCE FOR QUALITY ASSURANCE PROJECT PLANS EPA QA/G-5, pp 76.

<sup>2</sup> *ibid*, pp 94.

representative of the ambient conditions. The date and time range measurements are made and physical samples collected will be recorded with every sample. All efforts will be made to confirm the accuracy of this sample meta-data.

Since special or unusual sample conditions might affect the accuracy of an analysis, it is helpful to have information about the sample matrix. Results of such matrix tests may give additional insight into the representativeness of the analyses. Tests describing the sample matrix may be requested on a site-specific basis. When appropriate, other QA tools such as ion balance reports, solid balances, conductivity-dissolved solid comparisons, etc., will be used to establish the representativeness of the data.

Quality analytical measurements with poor field duplicate precision may point to sampling problems or heterogeneous samples and thus not representative of ambient conditions. To ensure the representative data quality indicator is correct, field duplicates must be collected within 15 minutes and 15 meters of each other, where the sample matrix is assumed to be homogeneous. Evaluation of field duplicate, lab duplicate, and accuracy data will provide information if there is error in the hypothesis that the sample is homogeneous. If field duplicate data exceeds precision limits but lab duplicate and accuracy data is acceptable, the sampling design may be in error and the data may not represent the environmental conditions for which it was collected. If field duplicate data indicates Representativeness is acceptable, data users may assume other project data meet Representativeness objectives.

If it is determined the field duplicate data is heterogeneous within a fifteen minute period or fifteen foot radius, the subproject/project station data will be flagged with the Data Quality Level code "B", and the data user should use their professional judgment to determine if other project data meets their data quality needs.

If station data is not indicative of the streams normal ambient conditions and the variances are attributable to anomalous environmental conditions, the project station data will be flagged with the Data Quality Level code "F".

### **A7-5 Comparability**

To ensure data will be comparable to similar environmental data, the DEQ will use documented procedures for sampling, sample handling, and sample analysis, which are written to comply with nationally accepted methods. Coordination with other agencies is emphasized to ensure that data are comparable. The LEAD will follow the analytical methods cited in Table 3 and the sampling procedures described in the LEAD's MOMs Manual. DEQ SOPs cite EPA reference methods to which the SOP is comparable, such as those methods promulgated in 40 CFR Part 136.

### **A7-6 Completeness**

It is expected that samples will be collected from all sites described in the Sampling and Analysis Plan (SAP) unless seasonal-related events or safety issues prevent sampling. The Project Coordinator may authorize re-sampling to obtain more information of qualified data.

### **A7-7 Modeling Approach**

Data from this project will be used for assessment purposes and no modeling is expected.

## **A8 Special Training and Certification**

Laboratory services that are outside the scope of the LEAD will be subcontracted. Department

procedures for subcontracting laboratory work through the state's contractual price agreement are available on the intra-net at [http\](http://). If required services are not available through the state's contracted laboratories, services may be acquired through other means. However, it is recommended that subcontracted laboratories be ORELAP accredited. Refer to the ORELAP web page (<http://www.deq.state.or.us/lab/orelap/orelap.htm>) to review the laboratory's accreditation status. The Project Coordinator with assistance from the QAO will approve of all subcontracted work with the approval of SAPs.

## **A9 Documentation and Records**

### **A9-1 Analytical Reports**

Analytical reports will contain sufficient information to unambiguously link sample collection information to the group of analytical parameters.

Laboratories reporting data for this project will send their Analytical Report along with their subcontracted data to the DEQ Project and Field Operations Coordinator within 45 days of the completion of each sampling event. These data, including all QA/QC data results, will be delivered both electronically and in paper form.

The Field Operations Coordinator will enter third party (subcontracted) data by hand or download it into the DEQ's LIMS database, where the Field Operations Coordinator will review and approve data for further processing.

### **A9-2 Sample Receipt and Log-in Procedures**

Separate "Chain of Custody Record" forms and field data sheets (Appendix A: [\\Deqlead02\qa\\_documents\FORM\DEQ06-LAB-0054-FORM.xlsx](\\Deqlead02\qa_documents\FORM\DEQ06-LAB-0054-FORM.xlsx)) will be maintained for each sampling event. The LEAD Sample Coordinator may reject samples for analysis, if the sample "Chain of Custody Record" is not completed properly. The following information will be required for LASAR ID creation: Site name, latitude, longitude, river mile, 3<sup>rd</sup> and 4<sup>th</sup> field HUC, county, and DEQ basin.

Please note that the third party laboratories will, in general, follow similar procedures below. However, specific documentation and custody procedures will be as per their protocol.

The laboratory receiving the samples will verify the information contained on the custody form and check to make certain that samples meet appropriate handling and preservation requirements by:

- Matching actual sample container #'s with those listed on the custody form;
- Checking that appropriate containers were used for the analytes requested;
- Testing pH to determine whether samples requiring acid or base preservation were preserved correctly;
- Consulting technical personnel when field observations raise concern to ensure tests requested are appropriate;
- Consulting this QA Project Plan for to ensure that all tests requested are assigned.

Samples improperly documented, preserved, or exceed holding time upon receipt are either rejected by the Sample Custodian for analysis, or analyzed and the result reported as an "estimate." The sampler is notified and re-sampling is recommended.

The contractor will use laboratory approved sampling forms to be used for tracking the samples and relinquishing sample custody. The DEQ Sample Custodian will retain the original custody

forms and enter the sampling event into the LEAD's Laboratory Information Management System (LIMS).

The DEQ LIMS maintains the history to changes to data in LIMS from log-in through sample release and archival. All biographical information contained on the custody form is entered into LIMS at the time of log-in. Each set of containers collected at a station constitutes a "sample," and each "sample" is linked to the sampling event batch. The DEQ LIMS sample ID numbers are unique. The ID number consists of the sampling event number concatenated with the container number. The Sample Custodian assigns the appropriate tests during log-in. LIMS creates analysis records for each sample and test assigned.

The contract laboratories must maintain an unequivocal link between the custody form, their LIMS database, and analytical reports.

Raw analytical data records must be maintained, which will include the following information, in ink:

- Date of analysis
- Analyst
- Identification of blanks, standards, and controls
- LIMS ID numbers, sample number, treatment such as dilutions, analyte additions, or special calculations and associated information
- Unusual observations
- All instrument readings and final results (including units) may be maintained as electronic data.

### **A9-3 Field Notebook**

A bound field notebook will be maintained by the sampling team to provide a daily record of significant events, observations, and measurements during field investigations. This record would include water level data, field measurements, personnel, weather observations; including temperature, and cloud cover; and physical conditions should they exist such as plankton abundance and conditions of riparian zones. All entries in the field notebooks should be signed and dated. The field notebooks will be kept as a permanent record.

## **Group B Data Generation and Acquisition**

### **B1 Sampling Process Design**

Flows within watersheds and beyond are categorized according to "stream order." Streams that collect precipitation run off or from spring water inputs are designated "first-order" streams. The meeting of two first order streams results in a second order stream; and so on. Stream orders 1 – 3 are considered to be "headwater" streams. In such low-order streams, meteorological, geochemical, topographical characteristics, land use/cover, and anthropogenic processes (including atmospheric, point and non-point contaminant inputs) directly influence water chemistry and quality. Water chemistry and contaminant loading in higher order streams integrate and reflect geology and land uses of the area which they drain. Flows from multiple watersheds join within a sub-basin. In turn, flows from multiple sub-basins constitute the drainage from a basin. The sampling and analysis of data collected through the TMP will span these hydrological scales, from the watershed, sub-basin to the basin.

The flow of surface water has been categorized according to the hierarchical relationships between delineated and interconnected drainages of various sizes by the U.S. Geological

Survey (USGS). For example at the broadest scale, hydrological “Regions” in the United States are assigned 2 digit classification code. The Willamette Basin lies within the “Pacific Northwest Region” which is assigned the code of “17.” The Pacific Northwest Region is further divided according to “Sub-Regions” which are assigned a 4 digit code. The Willamette River Basin is part of the Sub-Region assigned the number “1709”. “Sub-Regions” are further delineated into “Accounting Units” which are assigned a 6 digit code. Accounting Units are also referred to as “Basins.” The “Accounting Unit” assigned to the Willamette River Basin is 170900. “Accounting Units” are in turn divided into “Cataloging Units” and are assigned an 8 digit code. Cataloging Units are also referred to as “sub-basins.” Sub-Basins are further delineated as watersheds and are assigned a 12 digit hydrological unit code (HUC). Twelve sub-basins comprise the Willamette River Basin.

Probabilistic sampling models will not be used to determine specific sampling locations. The hydrological scale to be used will be described in each Sampling and Analysis Plans (SAPs). The SAP will also describe the logic behind selecting the sampling locations. The general rule for selecting a sampling station will be to select sites with the most flow within the 5<sup>th</sup> field HUC. Sites will be primarily integrator sites; they reflect the integrated water quality affects from point and non-point source activities as well as the natural geological, hydrological and biological impacts on water quality for the watershed that they represent. Larger river basins have multiple sites, which may be based upon tributaries, land use changes, topographical changes, ecoregions, point sources, and non-point sources. Sampling frequency is based upon resources, priorities; and statistical needs for trending, determining central tendency, and data distribution characteristics.

Subsequent Sampling and Analysis Plans (SAPs) will list site locations in a table along with sites the LASAR ID number, Site Name, River Mile, Latitude, and Longitude.

## **B2 Sampling Methods**

Sampling will be accomplished using the standard DEQ grab water column, sediment, and electro-fishing protocols as described in the [LEAD's MOMs Manual](#). Where site locations safely allow, water samples should be collected from the center of the main channel, at a depth of one meter or half the total depth, whichever is greater. This ensures a sample representative of environmental conditions. Ropes used to drop grab sampling bucket into the stream should have a knot in it at one meter. If the sample is not collected at one meter, field personnel should record the approximate depth of the sample.

## **B3 Sample Handling and Custody Procedures**

### **B3-1 Sample Collection**

Generally, sampling crews will collect samples using the same procedures and containers as other water quality projects ([DEQ03-LAB-0036-SOP](#)). SAPs will list sample bottles to be used at each site.

To control costs sampling may occur along with other projects (i.e. Ambient Water Quality Monitoring). The SAP will identify which sample containers are to be collected for the TMP samples. TMP and coexisting samples will be recorded on separate COC forms (Appendix A - Field Data Forms). The TMP samples and the samples collected along with the TMP samples will be assigned different sampling event numbers so that TMP data may be validated using this QAPP.

## **B3-2 Sample Handling**

Samples for laboratory analysis will be preserved as identified in subsequent SAPs, stored in an iced cooler, and shipped (UPS/FedEx) or hand carried to the LEAD sample receiving office. Specific sample preservation methods and holding times are to be summarized in the SAPs.

## **B3-3 Sample Receipt**

Samples will be grouped so that each field crews' daily samples will be checked in as a Sampling Event. Routine LEAD sample receipt protocols will be followed. Refer to the LEAD's Sample Receiving SOP ([DEQ06-LAB-0054-SOP](#)).

## **B4 Analytical Methods**

The contaminants of concern must be listed in the SAP. For this project likely contaminants of concern are listed in Table 3. All laboratories involved with this project will make analytical SOPs available upon request. The laboratories' analytical SOPs must cite the methods identified in Table 3. Field analytical methods can be found in the Watershed Assessment Mode of Operations Manual MOMs which is available on the LEAD's website at, [\\deqlead02\QA Documents\SOP\DEQ03-LAB-0036-SOP.pdf](#).

## **B5 Quality Control**

With each procedural step that a QC element can be implemented, environmental data will be batched with the QC result in which the samples or data were processed. With the knowledge of an unacceptable error in the QC measurement, environmental samples within the QC batch are either reprocessed after improvements are made to minimize the observed error, or the environmental data will be flagged as not meeting the quality control standard. If more than one of the same QC is performed in the batch only the environmental data preceding the failed QC is qualified. Batch QC control limits (Calibration Verifications, Laboratory Control Sample, Matrix Spike, and duplicates) are to be summarized in the SAP.

### **B5-1 Quality Management Plan:**

As noted in section A7 above, quality documents are controlled. One such document is the Quality Management Plan itself. The most current QMP is available at [deq05/lab/qms/documents/DEQ03-LAB-0006-QMP.pdf](#). With the approval of the QMP, EPA has granted the LEAD QA section the authority to approve QAPPs, which EPA requires for all projects they fund.

This project will comply with the policy and procedures outlined in the QMP.

### **B5-2 Quality Assurance Project Plan:**

This QAPP complies with the department's QMP. Changes to the QMP that affect the procedures for writing a QAPP may require revisions to this plan. This QAPP should be reviewed with the next revision of the QMP.

The Data Coordinator will flag environmental data collected without an approved Quality Assurance Project Plan or Sampling and Analysis Plan with the Data Quality Level code of "B". The Data Coordinator will review QC summary data at the end of the project and flag project data, if insufficient QC data is collected or there are apparent systematic errors.

### **B5-3 Survey:**

The grouping of all the samples collected for a project during specific time period is called a Survey. The Survey batch often extends over the entire project; however there may be circumstances where the Survey may be broken up over shorter periods (e.g. seasons), and should be defined in the Sampling and Analysis Plan. Control measures applied to the Survey batch should have the expectation that they would be constant within the survey but poses more variability between surveys in one week will make up the survey batch.

Each sampling team will collect at least one equipment blank and one duplicate set of samples for each survey. If laboratory corrective action cannot rectify apparent equipment blank or duplicate error all related environmental data within the survey batch will be qualified with the Data Quality Level code of "B" in LASAR. If the equipment blank or the field duplicate are not collected during the survey all related environmental data within the survey batch will be qualified with the Data Quality Level code of "B" in LASAR.

During the initial survey for the project each sampling team will collect an equipment, transfer, transport, and lab retained blanks with each sampling event. The laboratory will hold the transfer, transport, and lab retained blanks without analysis until after the equipment blank data is reviewed. If the equipment blank exceeds the control limits, the laboratory will analyze the transfer, transport, and lab retained blanks when they are available to assess the source of the error. With the information available the laboratory will advise the QAO and Project Coordinator and assist in the development of quality improvement strategies. If there appears to be no problem with the equipment blank, the Project Coordinator will advise the assessment team to not collect the transfer, transport, and lab retained blanks during subsequent surveys.

The control limits listed in the SAPs are based lab duplicates and lab blanks. It is anticipated that field blanks and duplicate sample QC measurements (Survey control limits) will exceed set limits more frequently than similar laboratory controls. Thus survey control limits may be adjusted in SAPs. In the mean time the equipment blank control limits are equal to that of the method blank (B5-13) and the duplicate sample control limits are equal to the laboratory replicate control limits (B5-16).

The sampling teams will also measure the turbidity, temperature, pH, and specific conductance on each equipment blank. If necessary the sampling team may request that the laboratory repeat the analysis of the pH, and/or specific conductance.

The Data Coordinator will flag environmental results with the Data Quality Level code of "B", if field duplicate data fail to meet control limits for the entire sampling survey. Unless sufficient evidence is available to establish that the error was isolated to the primary/duplicate sample pair, in which case only the primary sample result will be flagged with the Data Quality Level code of "B".

The Data Coordinator will also flag environmental results for the entire sampling survey with the Data Quality Level code of "B", if the equipment blank data fails to meet control limits and the error may have an effect on environmental results.

### **B5-4 Sampling Event:**

The LEAD defines a "Sampling Event" as the group of samples shipped at the end of the day by each individual sampling team. This project may require multiple collection teams over multiple days, i.e. multiple Sampling Events. During a sampling event, multiple coolers will be filled with samples and transported to the laboratory. The Sample Custodian will attempt to log the samples into LIMS under the same Sampling Event ID number.

The Sample Custodian will randomly select a sample from each Sampling Event, which will be used to repeat field parameters in the laboratory. If the difference between the field and laboratory measurements exceeds routine precision control limits (refer to [DEQ04-LAB-0044-FORM](#)), the laboratory will repeat all of the field parameters within the Sampling Event. The laboratory analyst will E-mail the Field Operations Coordinator of the corrective action, who will assess the error and determine if the field/lab variance is attributable to factors other than the accuracy of the field parameter. If appropriate, the Field Operations Coordinator will ensure the Data Quality Level is set to "B" for all results when the Data Approval Report (DAR) is approved.

The Sample Coordinator will review reports and records and verify that the Field Operations Coordinator and the Analytical Laboratory followed this procedure.

#### **B5-5 Location:**

All environmental data generated from samples collected at a station may be flagged based on observations made by the sampling team and supporting data. The sampling station should appear to be indicative of normal homogeneous ambient conditions.

Access to the sample location within the stream should not be impaired. The sampling team will note on their field sheet if an obstacle prevents collecting the sample at the specified location and alternate sampling should occur within 15 feet of the station ID. The Field Operations Coordinator will flag environmental results not obtained from the scheduled stations with the Data Quality Level code of "B" in LASAR. Analytical data not collected as scheduled due to unforeseen circumstances will be cancelled and assigned the Data Quality Level code of "D".

#### **B5-6 Collection:**

The sample team will collect samples using the techniques described in section B2. If circumstances dictate other sampling techniques the sampling team will make the note on their field form. For techniques that are considered equivalent the data will not be flagged. If, however, the technique is not equivalent the Field Operations Coordinator will flag environmental results with the Data Quality Level code of "B" in LASAR.

#### **B5-7 Transport Container:**

The sampling team will pack the collected samples and the field forms into coolers. The cooler temperature will be checked at the time of sample receipt. If the temperature does not fall between 0° – 6° C and the samples were not received on ice, all measurements requiring thermal preservation will be flagged with the Data Quality Level code of "B" in LASAR.

If the required information recorded on the field forms cannot be read, the Sample Coordinator will flag all data relating to the misinformation with the Data Quality Level code of "B" in LASAR.

#### **B5-8 Bottle/Filter/Probe:**

During sample receipt the Sample Custodian will examine each container. If a container is damaged, mislabeled, or an inappropriate container was used for the requested analysis; the Sample Coordinator will flag all analytical results to be obtained from the container with the Data Quality Level code of "B" in LASAR.

#### **B5-9 Receipt:**

The Sample Custodian must document their inspection of the samples integrity upon receipt. The Sample Coordinator will verify that sample receipt documentation is complete, data are

qualified where appropriate, and the proper analyses are assigned. Personnel reviewing the Sample Custodian's work will sign for their review and will flag results with the Data Quality Level code of "B" in LASAR, if corrective action does not resolve the integrity of the sample.

### **B5-10 Storage:**

The Sample Custodian will transfer samples requiring refrigeration into refrigerators. Technical Services will record the temperature of the refrigerators daily. All analytical data that is measured from samples stored in a faulty refrigerator will be flagged with the Data Quality Level code of "B" in LASAR.

### **B5-11 Work-list:**

The Organic, Inorganic, and the field monitoring Sections of the laboratory will assign staff to peer review data records. Peer review shall verify that calibrations, sample data reduction, and data reporting were accurate. Personnel reviewing the analyst's work will sign for their review and will flag results with the Data Quality Level code of "B" in LASAR, if corrective action does not resolve data integrity errors. This process provides assurances that data is of known quality. The QAO will audit peer review data packets. If data packets do not have documentation of peer review, all data in the work-list will be flagged with the Data Quality Level code of "B" in LASAR.

### **B5-12 Sub-sample:**

Occasionally heterogeneous samples must be split into new containers after receipt at the laboratory. For this project samples containing mixed media should not be split into different containers without first homogenizing the sample. If it is determined during the peer review that the sample was mishandled the analytical results will be flagged with the Data Quality Level code of "B" in LASAR.

### **B5-13 Preparation Batch:**

The preparation batch is defined as the environmental samples that are prepared and/or analyzed together by the same personnel, using the same process and lot(s) of reagents. A preparation batch is composed of one to twenty matrix defined environmental samples with a maximum time of 24 hours between the start of processing of the first sample and the completion of the last sample. An analyst may prepare more than twenty samples during the day; however each group of twenty samples must be identified as a unique batch.

At least one method blank will be prepared with each preparation batch. A method blank is a "clean" water sample (e.g. containing no analyte of concern), which is processed through all the analytical protocols. If the concentration of a targeted analyte in the blank is above the LOQ and is greater than 1/10 of the amount measured in the sample, the analyte will be flagged with the Data Quality Level code of "B" in LASAR.

The laboratory will also prepare a Laboratory Control Sample (LCS) with each preparation batch. The LCS is defined as sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. It is generally used to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system. If the LCS fails to meet the laboratories control limit and samples cannot be re-analyzed, flag all environmental data within the preparation batch. Where possible, the LCS should be traceable to NIST, however standard reference materials may be used as well. The LCS's are typically mid-range

in the calibration curve and used to assess the accuracy of the analysis. Control limits are based on historical data, or limits published in the method. If the LCS fails to meet control limits, the analyst will flag all parameter results within the preparation batch with the Data Quality Level code of "B" in LASAR.

### **B5-14 Calibration:**

All measurement systems must be calibrated meeting specific requirements. Calibration requirements are divided into three parts:

- 1) requirements for analytical **support equipment**,
- 2) requirements for **standardizing the test method titrant**, and
- 3) requirements for **instrument calibration**, which is further divided into
  - a) initial instrument calibration and
  - b) continuing instrument calibration verification

**Support Equipment:** Since support equipment is calibrated quarterly or annually as required by current standards, it is possible for analytical data to be reported using inaccurate support equipment for quite some time after data is reported. If the calibration of support equipment fail to meet control limits, all analytical data generated with the piece equipment prior to the failed calibration up to the last acceptable calibration shall be flagged as "B" data.

**Titrant Standardization:** Dissolved oxygen and alkalinity titrants must be calibrated using primary reference standards. Each batch of sodium thiosulfate used for dissolved oxygen will be standardized with a primary potassium bi-iodate standard and each batch of *0.02 N* sulfuric standard used for alkalinity shall be standardized using a *0.05 N* calcium carbonate primary standard. The calibration batch ID will be recorded on the titrant bottle and transcribed to the field sampling event sheet to ensure results are traceable to NIST.

**Instrument Calibration:** Immediately following the initial "instrument calibration" an Initial Calibration Verification sample (ICV) must be analyzed to verify the accuracy of the calibration standards. If the ICV fails to meet control limits, the analyst must determine the significance of the error and flag all analytical results within the calibration batch with the Data Quality Level code of "B" or "C" in LASAR.

The lowest calibration standard used will be equal to the laboratory's Limit Of Quantitation (LOQ). As noted in section A7-3, some project target levels (refer to SAP) Table 3 analytes are less than the laboratory's LOQ. Such analytes are to be reported to the laboratory's Limit Of Detection (LOD). If the datum is greater than the SAP target level and less than the laboratory's LOQ will be flagged as an estimate. If the analyte is less than the LOD, it will be reported as less than the LOD and flagged as an estimate.

### **B5-15 Analytical Batch:**

The analytical batch is defined as a group of environmental samples that is composed of prepared environmental samples (extracts, digestates, or concentrates) which are analyzed together as a group. If there are no preparation steps the analytical batch definition is the same as the preparation batch definition.

A high to mid-range calibration standard is to be used for a continuing calibration verification (CCV) standard. A CCV is analyzed at the beginning and end of the analytical batch and throughout the batch at a frequency of 5% of the samples. It is acceptable to use the ICV

sample as the first CCV, provided it meets the control limits for both the ICV and CCV. Organic methods that utilize internal standards and a mass spec will only have a CCV at the beginning of every 12 hour period. Organic methods that do not have internal standards will run the CCV at a frequency of beginning, end and every 10 samples. The CCV is used to verify that the initial calibration is still valid and to assess calibration drift. A CCV sample should be run at a concentration that represents the bulk of the samples tested and/or represents regulated levels. The CCV must fall within method specified control limits. All data reported with a trailing CCV that fails to meet the control limit are to be flagged. Each CCV may have different control limits. The first CCV run during the day often has tighter control limits than subsequent CCVs as well as low level CCVs. If the CCV fails to meet control limits, the analyst will flag all analytical results in the Analytical Batch with the Data Quality Level code of "B" in LASAR.

### B5-16 Analyte QC:

Each laboratory will replicate the analysis of an environmental sample with every analytical batch of twenty samples. If the laboratory's control limit is exceeded the sample result must be flagged. When analytes are not detected in the environmental samples and it is feasible to perform a matrix spike, the laboratory will prepare matrix spike/matrix spike duplicate samples to estimate analytical precision.

Matrix spikes are to be analyzed at the frequency of one in every twenty environmental samples. The method-specific criteria for spike recovery are located in the SAP. Spike recoveries are used to determine the analytical accuracy of the test method relative to the sample matrix. Sample dilution may be used to minimize matrix interference. Some methods require the use of an interference check standard, which ensures that corrections for interferences are made.

**Table 3 – Possible Analytical Parameters**

Parameter <sup>ii</sup>	CAS	LOQ <sup>i</sup>		
		Aqueous	Tissue	Sediment
<b>Field Measurements</b>				
Temperature (EPA 170.1)		1 °C		
pH (EPA 150.1)		Sensitivity to 0.1 S.U.		
Dissolved Oxygen (SM 4500-O C)		1 mg/L		
Percent DO Saturation		N/A (%)		
Specific Conductivity (EPA 120.1)		1 µmhos/cm @ 25°C		
Turbidity (SM 2130 B)		1 NTU		
<b>Physical &amp; Aggregate Properties</b>				
Total Solids (2540 B)		10 mg/L		
Total Suspended Solids (2540 D)		1 mg/L		
<b>Metal Cations by ICP, Total Recoverable (200.7)</b>		<b>mg/L</b>		
Aluminum	7429905	0.050		
Boron	7440428	0.020		
Calcium	7440702	0.10		
Iron	7439896	0.050		
Lithium	7439932	0.015		
Magnesium	7439954	0.10		
<b>Manganese</b>	<b>7439965</b>	<b>0.0050</b>		
Potassium	7440097	0.50		

Parameter <sup>ii</sup>	CAS	LOQ <sup>i</sup>		
		Aqueous	Tissue	Sediment
Silicon as Silica (SiO <sub>2</sub> )		0.15		
Sodium	7440235	0.30		
Hardness as CaCO <sub>3</sub>	999990017	0.70		
<b>Priority Pollutant Metals by ICP-MS, Total Recoverable (200.8)</b>		<b>µg/L</b>		
<b>Antimony</b>	<b>7440360</b>	<b>2.0</b>		
<b>Arsenic</b>	<b>7440382</b>	<b>2.0</b>		
<b>Barium</b>	<b>7440393</b>	<b>2.0</b>		
<b>Beryllium</b>	<b>7440417</b>	<b>0.30</b>		
<b>Cadmium</b>	<b>7440439</b>	<b>0.30</b>		
<b>Chromium</b>	<b>7440473</b>	<b>1.0</b>		
<b>Cobalt</b>	<b>7440484</b>	<b>0.20</b>		
<b>Copper</b>	<b>7440508</b>	<b>1.5</b>		
<b>Lead</b>	<b>7439921</b>	<b>0.20</b>		
Molybdenum	7439987	3.0		
<b>Nickel</b>	<b>7440020</b>	<b>1.0</b>		
<b>Selenium</b>	<b>7782492</b>	<b>2.0</b>		
<b>Silver</b>	<b>7440224</b>	<b>0.10</b>		
Thallium	7440280	0.10		
Uranium	7440611	0.10		
Vanadium	7440622	4.0		
<b>Zinc</b>	<b>7440666</b>	<b>3.0</b>		
<b>Inorganic Non-Metals</b>		<b>mg/L</b>		<b>mg/Kg dry</b>
<b>Sulfate by IC (300.0)</b>		<b>0.2</b>		
Dissolved Organic Carbon (5310 B)		1		50
Total Organic Carbon (5310 B)		1		50
<b>Pharmaceuticals and Personal Care Products by LC/MS/MS (1694)</b>		<b>ng/L</b>		
Acetaminophen		500		
Caffeine	58082	125		
<b>Carbamazepine</b>		<b>10</b>		
Codeine		25		
Diphenhydramine		10		
<b>Sulfamethoxazole</b>		<b>10</b>		
<b>Venlafaxine</b>		<b>10</b>		
<b>Phenoxy Herbicides by GC/ECD (6640B / 8151A)</b>		<b>µg/L</b>		<b>mg/Kg dry</b>
2,4,5-T	93765	0.3		0.3
<b>2,4-D</b>	<b>94757</b>	<b>0.1</b>		0.1
2,4-DB	94826	0.6		0.6
3,5-Dichlorobenzoic acid	513655	0.3		0.3
Acifluorfen	72178020	0.2		0.2
Bentazon	25057890	0.6		0.6
Chloramben	133904	0.6		0.6
Dicamba	1918009	0.3		0.3
Dichloroprop	120365	0.3		0.3
Dinoseb	88857	0.3		0.3
MCPA	94746	20		20
MCPP	7085190	50		50
Pentachlorophenol	87865	0.1		0.1
Picloram	1918021	0.6		0.6

Parameter <sup>ii</sup>	CAS	LOQ <sup>i</sup>		
		Aqueous	Tissue	Sediment
Silvex	93721	0.1		0.1
<b>Triclopyr</b>	<b>55335063</b>	<b>0.3</b>		
<b>Steroids and Hormones by HRGC/HRMS (1698)</b>		<b>ng/L</b>		
17a-Estradiol	57910	5		
<b>Estrone</b>	<b>53167</b>	<b>5</b>		
<b>17β-Estradiol</b>	<b>50282</b>	<b>2</b>		
<b>17a-Ethynyl Estradiol</b>	<b>57636</b>	<b>2</b>		
<b>Estriol</b>	<b>50271</b>	<b>2</b>		
Coprostanol	360689	5		
Cholesterol	57885	75		
<b>Organic compounds by LC/MS/MS (8321)</b>		<b>ng/L</b>		
Oxyamyl		1.0		
Aminocarb	2032599	1.0		
Methomyl	16752775	1.0		
Imazapyr		20		
<b>Imidacloprid</b>		<b>10</b>		
<b>Simazine</b>	<b>122349</b>	<b>2.0</b>		
Metribuzin	21087649	2.0		
Baygon	114261	1.0		
<b>Carbofuran</b>	<b>1563662</b>	<b>1.0</b>		
<b>Carbaryl</b>	<b>63252</b>	<b>2.5</b>		
Fluometuron		2.0		
Simetryn	1014706	2.0		
<b>Atrazine</b>	<b>1912249</b>	<b>2.0</b>		
<b>Diuron</b>	<b>330541</b>	<b>2.0</b>		
Prometon	1610180	2.0		
<b>DEET</b>	<b>134623</b>	<b>2.5</b>		
Mexacarbate		1.0		
Ametryn	834128	1.0		
<b>Azinphos Methyl</b>	<b>86500</b>	<b>10</b>		
Siduron	1982496	1.0		
Methiocarb	2032657	2.0		
Propazine	139402	2.0		
Linuron	330552	2.0		
Terbutylazine		1.0		
Prometryn		1.0		
Terbutryne		1.0		
Acetochlor		5.0		
Alachlor	15972608	5.0		
Neburon	555373	2.5		
<b>Metolachlor</b>	<b>51218452</b>	<b>5.0</b>		
Propiconazole		10		
Pyraclostrobin		2.0		
<b>Pesticides by HRGC/HRMS (EPA 1699)</b>			<b>ng/Kg dry wt</b>	
Hexachlorobenzene	118741		750	
alpha-BHC	319846		75.0	
gamma-BHC (Lindane)			300	
beta-BHC	319857		75.0	
<b>Heptachlor</b>	<b>76448</b>		<b>300</b>	
delta-BHC	319868		150	
<b>Aldrin</b>	<b>309002</b>		<b>75.0</b>	

Parameter <sup>ii</sup>	CAS	LOQ <sup>i</sup>		
		Aqueous	Tissue	Sediment
<b>Oxychlorane</b>			<b>37.5</b>	
Heptachlor epoxide	1024573		75.0	
gamma-Chlordane	5566347		75.0	
<b>trans-Nonachlor</b>	<b>39765805</b>		<b>150</b>	
<b>alpha Chlordane</b>			<b>75.0</b>	
Endosulfan I	959988		75.0	
<b>2,4'-DDE</b>	<b>3424826</b>		<b>37.5</b>	
<b>4,4'-DDE</b>			<b>75.0</b>	
<b>Dieldrin</b>	<b>60571</b>		<b>75.0</b>	
<b>2,4'-DDD</b>	<b>53190</b>		<b>37.5</b>	
Endrin	72208		75.0	
<b>cis-Nonachlor</b>	<b>297789</b>		<b>37.5</b>	
<b>2,4'-DDT</b>	<b>789026</b>		<b>37.5</b>	
<b>4,4'-DDD</b>			<b>75.0</b>	
Endosulfan II	33213659		75.0	
<b>4,4'-DDT</b>			<b>300</b>	
Endrin Aldehyde	7421934		37.5	
Endosulfan sulfate	1031078		300	
Methoxychlor	72435		NA	
Mirex	2385855		37.5	
Endrin Ketone	53494705		150	
<b>PCB Congeners by HRGC/HRMS (EPA 1668B)</b>			<b>ng/Kg dry wt</b>	
BZ-1 (2-MoCB)	2051-60-7		37.5	
BZ-2 (3-MoCB)	2051-61-8		18.8	
BZ-3 (4-MoCB)	2051-62-9		37.5	
BZ-10/BZ-4 (BZ-10/BZ-4)			37.5	
BZ-9/BZ-7 (BZ-9/BZ-7)			37.5	
BZ-6 (2,3'-DiCB)	25569-80-6		18.8	
BZ-5 (2,3-DiCB)	16605-91-7		18.8	
<b>BZ-8 (2,4'-DiCB1)</b>	<b>34883-43-7</b>		<b>150</b>	
BZ-14 (3,5-DiCB)	34883-41-5		18.8	
BZ-11 (3,3'-DiCB)	2050-67-1		75	
BZ-12 (3,4-DiCB)	2974-92-7		18.8	
BZ-13 (3,4'-DiCB)	2974-90-5		18.8	
BZ-15 (4,4'-DiCB)	2050-68-2		150	
BZ-19 (2,2',6-TrCB)	38444-73-4		18.8	
BZ-30 (2,4,6-TrCB)	35693-92-6		18.8	
<b>BZ-18 (2,2',5-TrCB1)</b>	<b>37680-65-2</b>		<b>37.5</b>	
BZ-17 (2,2',4-TrCB)	37680-66-3		18.8	
BZ-27 (2,3',6-TrCB)	38444-76-7		18.8	
BZ-24 (2,3,6-TrCB)	55702-45-9		18.8	
BZ-16 (2,2',3-TrCB)	38444-78-9		37.5	
BZ-32 (2,4',6-TrCB)	38444-77-8		18.8	
BZ-34 (2',3,5-TrCB)	37680-68-5		18.8	
BZ-23 (2,3,5-TrCB)	55720-44-0		18.8	
BZ-29 (2,4,5-TrCB)	15862-07-4		18.8	
BZ-26 (2,3',5-TrCB)	38444-81-4		18.8	
BZ-25 (2,3',4-TrCB)	55712-37-3		18.8	
BZ-31 (2,4',5-TrCB)	16606-02-3		37.5	
<b>BZ-28 (2,4,4'-TrCB1)</b>	<b>7012-37-5</b>		<b>75</b>	

Data Generation and Acquisition, cont.

Parameter <sup>ii</sup>	CAS	LOQ <sup>i</sup>		
		Aqueous	Tissue	Sediment
BZ-20/BZ-21/BZ-33 (BZ-20/BZ-21/BZ-33)			37.5	
BZ-54 (2,2',6,6'-TeCB)	15968-05-5		18.8	
BZ-50 (2,2',4,6'-TeCB)	62796-65-0		18.8	
BZ-53 (2,2',5,6'-TeCB)	41464-41-9		18.8	
BZ-51 (2,2',4,6'-TeCB)	68194-04-7		18.8	
BZ-22 (2,3,4'-TrCB)	38444-85-8		37.5	
BZ-36 (3,3',5-TrCB)	38444-87-0		18.8	
BZ-39 (3,4',5-TrCB)	38444-88-1		18.8	
BZ-38 (3,4,5-TrCB)	53555-66-1		18.8	
BZ-35 (3,3',4-TrCB)	37680-69-6		18.8	
BZ-37 (3,4,4'-TrCB)	38444-90-5		37.5	
BZ-45 (2,2',3,6'-TeCB)	70362-45-7		18.8	
BZ-46 (2,2',3,6'-TeCB)	41464-47-5		18.8	
BZ-73 (2,3',5',6'-TeCB)	74338-23-1		18.8	
BZ-69 (2,3',4,6'-TeCB)	60233-24-1		18.8	
<b>BZ-52/BZ-43 (BZ-52/BZ-43)</b>			<b>75</b>	
BZ-49 (2,2',4,5'-TeCB)	41464-40-8		18.8	
BZ-48 (2,2',4,5'-TeCB)	70362-47-9		18.8	
BZ-47 (2,2',4,4'-TeCB)	2437-79-8		150	
BZ-75/BZ-65 (BZ-75/BZ-65)			18.8	
BZ-62 (2,3,4,6-TeCB)	54230-22-7		18.8	
<b>BZ-44 (2,2',3,5'-TeCB1)</b>	<b>41464-39-5</b>		<b>37.5</b>	
BZ-59 (2,3,3',6-TeCB)	74472-33-6		18.8	
BZ-42 (2,2',3,4'-TeCB)	36559-22-5		18.8	
BZ-71 (2,3',4',6-TeCB)	41464-46-4		18.8	
BZ-41/BZ-72 (BZ-41/BZ-72)			18.8	
BZ-64 (2,3,4',6-TeCB)	52663-58-8		18.8	
BZ-68 (2,3',4,5'-TeCB)	73575-52-7		18.8	
BZ-40 (2,2',3,3'-TeCB)	38444-93-8		18.8	
BZ-57 (2,3,3',5-TeCB)	70424-67-8		18.8	
BZ-67/BZ-58 (BZ-67/BZ-58)			18.8	
BZ-104 (2,2',4,6,6'-PeCB)	56558-16-8		18.8	
BZ-96 (2,2',3,6,6'-PeCB)	73575-54-9		18.8	
BZ-103 (BZ-103)			18.8	
BZ-94 (2,2',3,5,6'-PeCB)	73575-55-0		18.8	
BZ-100 (2,2',4,4',6-PeCB)	39485-83-1		18.8	
BZ-63 (2,3,4',5-TeCB)	74472-34-7		18.8	
BZ-61 (2,3,4,5-TeCB)	33284-53-6		18.8	
BZ-76 (2',3,4',5-TeCB)	70362-48-0		18.8	
BZ-74 (2,4,4',5-TeCB)	32690-93-0		37.5	
BZ-70 (2,3',4',5-TeCB)	32598-11-1		37.5	
<b>BZ-66 (2,3',4,4'-TeCB1)</b>	<b>32598-10-0</b>		<b>37.5</b>	
BZ-80 (3,3',5,5'-TeCB)	33284-52-5		18.8	
BZ-55 (2,3,3',4-TeCB)	74338-24-2		18.8	
BZ-56 (2,3,3',4'-TeCB)	41464-43-1		18.8	
BZ-60 (2,3,4,4'-TeCB)	33025-41-1		18.8	
BZ-79 (3,3',4,5'-TeCB)	41464-48-6		18.8	
BZ-78 (3,3',4,5-TeCB)	70362-49-1		18.8	
BZ-81 (3,4,4',5-TeCB2)	70362-50-4		18.8	
<b>BZ-77 (3,3',4,4'-TeCB1,2)</b>	<b>32598-13-3</b>		<b>18.8</b>	

Data Generation and Acquisition, cont.

Parameter <sup>ii</sup>	CAS	LOQ <sup>i</sup>		
		Aqueous	Tissue	Sediment
BZ-102 (2,2',4,5,6'-PeCB)	68194-06-9		18.8	
BZ-98 (2,2',3',4,6-PeCB)	60233-25-2		18.8	
BZ-93 (2,2',3,5,6-PeCB)	73575-56-1		18.8	
BZ-95 (2,2',3,5',6-PeCB)	38379-99-6		37.5	
BZ-88/BZ-91 (BZ-88/BZ-91)			18.8	
BZ-121 (2,3',4,5,6-PeCB)	56558-18-0		18.8	
BZ-89 (2,2',3,4,6'-PeCB)	73575-57-2		18.8	
BZ-84 (2,2',3,3',6-PeCB)	52663-60-2		18.8	
BZ-92 (2,2',3,5,5'-PeCB)	52663-61-3		18.8	
BZ-90 (2,2',3,4',5-PeCB)	68194-07-0		18.8	
<b>BZ-101/BZ-113 (BZ-101/BZ-113)</b>			<b>75</b>	
BZ-99 (2,2',4,4',5-PeCB)	38380-01-7		37.5	
BZ-83 (2,2',3,3',5-PeCB)	60145-20-2		18.8	
BZ-119/BZ-112 (BZ-119/BZ-112)			18.8	
BZ-108 (2,3,3',4,5'-PeCB)	70362-41-3		18.8	
BZ-125/BZ-86 (BZ-125/BZ-86)			18.8	
BZ-97 (2,2',3',4,5-PeCB)	41464-51-1		37.5	
BZ-116 (2,3,4,5,6-PeCB)	18259-05-7		18.8	
BZ-117/BZ-87 (BZ-117/BZ-87)			37.5	
BZ-115/BZ-111 (BZ-115/BZ-111)			18.8	
BZ-85 (2,2',3,4,4'-PeCB)	65510-45-4		18.8	
BZ-82 (2,2',3,3',4-PeCB)	52663-62-4		18.8	
<b>BZ-110 (2,3,3',4',6-PeCB)</b>	<b>38380-03-9</b>		<b>75</b>	
BZ-120 (2,3',4,5,5'-PeCB)	68194-12-7		18.8	
BZ-124 (2',3,4,5,5'-PeCB)	70424-70-3		18.8	
BZ-107 (2,3,3',4',5-PeCB)	70424-68-9		18.8	
BZ-109/BZ-123 (BZ-109/BZ-123)			18.8	
BZ-155 (2,2',4,4',6,6'-HxCB)	33979-03-2		18.8	
BZ-150 (2,2',3,4',6,6'-HxCB)	68194-08-1		18.8	
BZ-152 (2,2',3,5,6,6'-HxCB)	68194-09-2		18.8	
BZ-145 (2,2',3,4,6,6'-HxCB)	74472-40-5		18.8	
BZ-136 (2,2',3,3',6,6'-HxCB)	38411-22-2		18.8	
BZ-148 (2,2',3,4',5,6'-HxCB)	74472-41-6		18.8	
BZ-154 (2,2',4,4',5',6-HxCB)	60145-22-4		18.8	
BZ-151 (2,2',3,5,5',6-HxCB)	52663-63-5		18.8	
BZ-135 (2,2',3,3',5,6'-HxCB)	52744-13-5		18.8	
BZ-144 (2,2',3,4,5',6-HxCB)	68194-14-9		18.8	
BZ-147 (2,2',3,4',5,6-HxCB)	68194-13-8		18.8	
BZ-149 (2,2',3,4',5',6-HxCB)	38380-04-0		75	
BZ-139 (2,2',3,4,4',6-HxCB)	56030-56-9		18.8	
BZ-140 (2,2',3,4,4',6'-HxCB)	59291-64-4		18.8	
BZ-143 (2,2',3,4,5,6'-HxCB)	68194-15-0		18.8	
BZ-106 (2,3,3',4,5-PeCB)	70424-69-0		18.8	
<b>BZ-118 (2,3',4,4',5-PeCB1,2)</b>	<b>31508-00-6</b>		<b>75</b>	
BZ-122 (2',3,3',4,5-PeCB)	76842-07-4		18.8	
BZ-114 (2,3,4,4',5-PeCB1,2)	74472-37-0		18.8	
<b>BZ-105 (2,3,3',4,4'-PeCB1,2)</b>	<b>32598-14-4</b>		<b>18.8</b>	
BZ-127 (3,3',4,5,5'-PeCB)	39635-33-1		18.8	
<b>BZ-126 (3,3',4,4',5-PeCB1,2)</b>	<b>57465-28-8</b>		<b>18.8</b>	
BZ-134 (2,2',3,3',5,6-HxCB)	52704-70-8		18.8	

Parameter <sup>ii</sup>	CAS	LOQ <sup>i</sup>		
		Aqueous	Tissue	Sediment
BZ-133/BZ-131/BZ-142 (BZ-133/BZ-131/BZ-142)			18.8	
BZ-132 (2,2',3,3',4,6'-HxCB)	38380-05-1		18.8	
BZ-146 (2,2',3,4',5,5'-HxCB)	51908-16-8		18.8	
BZ-161 (2,3,3',4,5',6-HxCB)	74472-43-8		18.8	
BZ-165 (2,3,3',5,5',6-HxCB)	74472-46-1		18.8	
BZ-168 (2,3',4,4',5',6-HxCB)	59291-65-5		37.5	
<b>BZ-153 (2,2',4,4',5,5'-HxCB1)</b>	<b>35065-27-1</b>		<b>37.5</b>	
BZ-141 (2,2',3,4,5,5'-HxCB)	52712-04-6		18.8	
BZ-137 (2,2',3,4,4',5-HxCB)	35694-06-5		18.8	
BZ-130 (2,2',3,3',4,5'-HxCB)	52663-66-8		18.8	
BZ-164 (2,3,3',4',5',6-HxCB)	74472-45-0		18.8	
BZ-163/ <b>BZ-138</b> (BZ-163/BZ-138)			<b>37.5</b>	
BZ-160 (2,3,3',4,5,6-HxCB)	41411-62-5		18.8	
BZ-158 (2,3,3',4,4',6-HxCB)	74472-42-7		18.8	
BZ-129 (2,2',3,3',4,5-HxCB)	55215-18-4		18.8	
BZ-166 (2,3,4,4',5,6-HxCB)	41411-63-6		18.8	
BZ-159 (2,3,3',4,5,5'-HxCB)	39635-35-3		18.8	
BZ-188 (2,2',3,4',5,6,6'-HpCB)	74487-85-7		18.8	
BZ-184 (2,2',3,4,4',6,6'-HpCB)	74472-48-3		18.8	
BZ-179 (2,2',3,3',5,6,6'-HpCB)	52663-64-6		18.8	
BZ-176 (2,2',3,3',4,6,6'-HpCB)	52663-65-7		18.8	
BZ-186 (2,2',3,4,5,6,6'-HpCB)	74472-49-4		18.8	
BZ-178 (2,2',3,3',5,5',6-HpCB)	52663-67-9		18.8	
BZ-175 (2,2',3,3',4,5',6-HpCB)	40186-70-7		18.8	
BZ-182 (2,2',3,4,4',5,6'-HpCB)	60145-23-5		18.8	
<b>BZ-187 (2,2',3,4,5,5',6-HpCB1)</b>	<b>52663-68-0</b>		<b>37.5</b>	
BZ-183 (2,2',3,4,4',5',6-HpCB)	52663-69-1		18.8	
<b>BZ-128/BZ-162</b> (BZ-128/BZ-162)			<b>18.8</b>	
BZ-167 (2,3,4,4',5,5'-HxCB2)	52663-72-6		18.8	
BZ-156 (2,3,3',4,4',5-HxCB2)	38380-08-4		18.8	
BZ-157 (2,3,3',4,4',5'-HxCB2)	69782-90-7		18.8	
BZ-169 (3,3',4,4',5,5'-HxCB1,2)	32774-16-6		18.8	
BZ-185 (2,2',3,4,5,5',6-HpCB)	52712-05-7		18.8	
BZ-174 (2,2',3,3',4,5,6'-HpCB)	38411-25-5		18.8	
BZ-181 (2,2',3,4,4',5,6-HpCB)	74472-47-2		18.8	
BZ-177 (2,2',3,3',4',5,6-HpCB)	52663-70-4		18.8	
BZ-171 (2,2',3,3',4,4',6-HpCB)	52663-71-5		18.8	
BZ-173 (2,2',3,3',4,5,6-HpCB)	68194-16-1		18.8	
BZ-172 (2,2',3,3',4,5,5'-HpCB)	52663-74-8		18.8	
BZ-192 (2,3,3',4,5,5',6-HpCB)	74472-51-8		18.8	
<b>BZ-180/BZ-193</b> (BZ-180/BZ-193)			<b>18.8</b>	
BZ-191 (2,3,3',4,4',5',6-HpCB)	74472-50-7		18.8	
<b>BZ-170 (2,2',3,3',4,4',5-HpCB1)</b>	<b>35065-30-6</b>		<b>18.8</b>	
BZ-190 (2,3,3',4,4',5,6-HpCB)	41411-64-7		18.8	
BZ-202 (2,2',3,3',5,5',6,6'-OxCB)	2136-99-4		18.8	
BZ-201 (2,2',3,3',4,5',6,6'-OxCB)	40186-71-8		18.8	
BZ-204 (2,2',3,4,4',5,6,6'-OxCB)	74472-52-9		18.8	
BZ-197 (2,2',3,3',4,4',6,6'-OxCB)	33091-17-7		18.8	
BZ-200 (2,2',3,3',4,5,6,6'-OxCB)	52663-73-7		18.8	
BZ-198 (2,2',3,3',4,5,5',6-OxCB)	68194-17-2		18.8	

Parameter <sup>ii</sup>	CAS	LOQ <sup>i</sup>		
		Aqueous	Tissue	Sediment
BZ-199 (2,2',3,3',4,5,5',6'-OocCB)	52663-75-9		18.8	
BZ-196 (2,2',3,3',4,4',5,6'-OocCB)	42740-50-1		18.8	
BZ-203 (2,2',3,4,4',5,5',6-OcCB)	52663-76-0		18.8	
BZ-189 (2,3,3',4,4',5,5'-HpCB2)	39635-31-9		18.8	
<b>BZ-195 (2,2',3,3',4,4',5,6-OcCB1)</b>	<b>52663-78-2</b>		<b>18.8</b>	
BZ-194 (2,2',3,3',4,4',5,5'-OocCB)	35694-08-7		18.8	
BZ-205 (2,3,3',4,4',5,5',6-OcCB)	74472-53-0		18.8	
BZ-208 (2,2',3,3',4,5,5',6,6'-NoCB)	52663-77-1		18.8	
BZ-207 (2,2',3,3',4,4',5,6,6'-NoCB)	52663-79-3		18.8	
<b>BZ-206 (2,2',3,3',4,4',5,5',6-NoCB1)</b>	<b>40186-72-9</b>		<b>18.8</b>	
<b>BZ-209 (DeCB1)</b>	<b>2051-24-3</b>		<b>18.8</b>	
Total Mono PCBs (Total Mono PCBs)			93.8	
Total Di PCBs (Total Di PCBs)			545	
Total Tri PCBs (Total Tri PCBs)			585	
Total Tetra PCBs (Total Tetra PCBs)			975	
Total Penta PCBs (Total Penta PCBs)			975	
Total Hexa PCBs (Total Hexa PCBs)			825	
Total Hepta PCBs (Total Hepta PCBs)			450	
Total Octa PCBs (Total Octa PCBs)			225	
Total Nona PCBs (Total Nona PCBs)			56.3	
Total Deca PCBs (Total Deca PCBs)			18.8	
Total PCB (Total PCB)			4750	
<b>PBDE Congeners by HRGC/HRMS (EPA 1614)</b>		<b>ng/L</b>	<b>ng/Kg dry wt</b>	
PBDE-1 (2-Bromodiphenyl)			37.5	
PBDE-3 (4-Bromodiphenyl)			37.5	
PBDE-2 (3-Bromodiphenyl)			37.5	
PBDE-10 (2,6-Dibromodiphenyl)			15	
PBDE-7 (2,4-Dibromodiphenyl)			15	
PBDE-15 (4,4'-Dibromodiphenyl)			15	
Hexabromobenzene (Hexabromobenzene)			37.5	
Pentabromoethylbenzene (Pentabromoethylbenzene)			15	
PBDE-49 (2,2',4,5'-Tetrabromodiphenyl)			15	
PBDE-71 (2,3',4',6'-Tetrabromodiphenyl)	189084626		15	
<b>PBDE-47 (2,2',4,4'-Tetrabromodiphenyl)</b>	<b>5436431</b>		<b>150</b>	
<b>PBDE-66 (2,3',4,4'-Tetrabromodiphenyl)</b>	<b>189084615</b>		<b>15</b>	
PBDE-77 (3,3',4,4'-Tetrabromodiphenyl)			15	

Parameter <sup>ii</sup>	CAS	LOQ <sup>i</sup>		
		Aqueous	Tissue	Sediment
<b>PBDE-100 (2,2',4,4',6-Pentabromodiphenyl)</b>	<b>189084648</b>		<b>37.5</b>	
PBDE-119 (2,3',4,4',6-Pentabromodiphenyl)			15	
<b>PBDE-99 (2,2',4,4',5-Pentabromodiphenyl ether (PBDE 99))</b>	<b>60348609</b>		<b>150</b>	
<b>PBDE-85 (2,2',3,4,4'-Pentabromodiphenyl ether (PBDE 85))</b>	<b>32534819</b>		<b>15</b>	
PBDE-126 (3,3',4,4',5'-Pentabromodiphenyl)			15	
<b>PBDE-154 (2,2',4,4',5,6'-Hexabromodiphenyl)</b>	<b>207122154</b>		<b>37.5</b>	
<b>PBDE-153 (2,2',4,4',5,5'-Hexabromodiphenyl)</b>	<b>68631492</b>		<b>37.5</b>	
PBDE-139 (2,2',3,4,4',6-Hexabromodiphenyl)			15	
PBDE-140 (2,2',3,4,4',6'-Hexabromodiphenyl)			15	
PBDE-138 (2,2',3,4,4',5'-Hexabromodiphenyl)	182677301		15	
PBDE-156/169 (2,3,3',4,4',5-Hexabromodiphenyl/3,3',4,4',5,5'-Hexabromodiphenyl)			30	
BB 153 (2,2',4,4',5,5'-Hexabromobiphenyl)			37.5	
BTBPE (1,2-Bis(2,4,6-Tribromophenoxy)ethane)			37.5	
PBDE-184 (2,2',3,4,4',6,6'-Heptabromodiphenyl)			15	
<b>PBDE-183 (2,2',3,4,4',5',6-Heptabromodiphenyl)</b>	<b>207122165</b>		<b>15</b>	
PBDE-191 (2,3,3',4,4',5',6-Heptabromodiphenyl)			15	
PBDE-180 (2,2',3,4,4',5,5'-Heptabromodiphenyl)			15	
PBDE-171 (2,2',3,3',4,4',6-Heptabromodiphenyl)			15	
PBDE-201 (2,2',3,3',4,5',6,6'-Octabromodiphenyl)			NA	
PBDE-204 (2,2',3,4,4',5,6,6'-Octabromodiphenyl)			NA	
PBDE-197 (2,2',3,3',4,4',6,6'-Octabromodiphenyl)			NA	
PBDE-203 (2,2',3,4,4',5,5',6-Octabromodiphenyl)			NA	
PBDE-196 (2,2',3,3',4,4',5,6'-Octabromodiphenyl)			NA	
PBDE-205 (2,3,3',4,4',5,5',6-Octabromodiphenyl)			NA	

Parameter <sup>ii</sup>	CAS	LOQ <sup>i</sup>		
		Aqueous	Tissue	Sediment
PBDE-208 (2,2',3,3',4,5,5',6,6'-Nonabromodiphenyl)			NA	
PBDE-207 (2,2',3,3',4,4',5,6,6'-Nonabromodiphenyl)			NA	
PBDE-206 (2,2',3,3',4,4',5,5',6-Nonabromodiphenyl)			NA	
<b>PBDE-209 (Decabromodiphenyl)</b>			<b>NA</b>	
DBDPE (Decabromodiphenylethane)			NA	
<b>Dioxin and Furans by HRGC/MS (EPA 1613)</b>		<b>ng/L</b>	<b>ng /Kg dry wt</b>	
2,3,7,8-Tetrachlorodibenzofuran	51207319		3.8	
1,2,3,7,8-Pentachlorodibenzofuran	57117416		18.8	
2,3,4,7,8-Pentachlorodibenzofuran	57117314		18.8	
1,2,3,4,7,8-Hexachlorodibenzofuran	70648269		18.8	
1,2,3,6,7,8-Hexachlorodibenzofuran	57117449		18.8	
2,3,4,6,7,8-Hexachlorodibenzofuran	60851345		18.8	
1,2,3,7,8,9-Hexachlorodibenzofuran	72918219		18.8	
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562394		18.8	
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673897		18.8	
OCDF	39001020		37.5	
2,3,7,8-Tetrachlorodibenzodioxin (TCDD)	1746016		3.8	
1,2,3,7,8-Pentachlorodibenzodioxin	40321764		18.8	
1,2,3,4,7,8-Hexachlorodibenzodioxin	39227286		18.8	
1,2,3,6,7,8-Hexachlorodibenzodioxin	57653857		18.8	
1,2,3,7,8,9-Hexachlorodibenzodioxin	19408743		18.8	
1,2,3,4,6,7,8-Heptachlorodibenzodioxin	35822469		18.8	
OCDD	3268879		37.5	
TEQ			37.6	
<b>Semi-volatile Organic Compounds by GC/MS – Toxics (8270 C)</b>		<b>ng/L</b>		
Dichlorvos	62737	20		
EPTC (Eptam)	759944	20		
Phosdrin (Mevinphos)	7786347	30		
Butylate	2008415	30		
Vernolate	1929777	20		
Pebulate	1114712	20		
Tebuthiuron	34014181	20		
Molinate	2212671	20		
<b>DEET</b>	<b>134623</b>	<b>20</b>		
Propachlor	1918167	20		
Ethoprophos		30		
Cycloate	1134232	20		
Chlorpropham	101213	20		
Trifluralin	1582098	20		

Parameter <sup>ii</sup>	CAS	LOQ <sup>i</sup>		
		Aqueous	Tissue	Sediment
Dimethoate	60515	20		
<b>Atrazine</b>	<b>1912249</b>	<b>100</b>		
Propazine	139402	40		
Terbufos	13071799	40		
Pronamide	23950585	20		
<b>Diazinon</b>	<b>333415</b>	<b>100</b>		
Disulfoton	298044	45		
Methyl paraoxon	950356	20		
Terbacil	5902512	40		
Metribuzin	21087649	30		
Methyl Parathion		20		
Alachlor	15972608	30		
Bromacil	314409	20		
<b>Malathion</b>	<b>121755</b>	<b>30</b>		
<b>Metolachlor</b>	<b>51218452</b>	<b>20</b>		
<b>Chlorpyrifos (Dursban)</b>		<b>40</b>		
Cyanazine	21725462	25		
Triadimefon		20		
Diphenamid		20		
MGK-264	113484	50		
Pendimethalin	40487421	20		
Tetrachlorvinphos	961115	25		
Butachlor	23184669	20		
Napropamide	15299997	20		
Fenamiphos	22224926	30		
Tricyclazole	41814782	20		
Carboxin	5234684	25		
Norflurazon	27314132	20		
<b>Hexazinone</b>	<b>51235042</b>	<b>40</b>		
Imidan (Phosmet)	732116	20		
<b>Azinphos Methyl</b>	<b>86500</b>	<b>40</b>		
Pyriproxyfen	95737681	200		
Fenarimol	60168889	20		
Fluridone	59756604	20		
Etridiazole	2593159	40		
Chloroneb	2675776	25		
<b>Simazine</b>	<b>122349</b>	<b>40</b>		
alpha-BHC	319846	20		
Fenvalerate+Esfenvalerate		400		
beta-BHC	319857	20		
Lindane	-99999	20		
Chlorothalonil	-99999	20		
delta-BHC	319868	20		
Heptachlor	76448	20		
Aldrin	309002	20		
Dacthal	1861321	20		
Heptachlor epoxide	1024573	30		
trans-Chlordane	5103742	20		
Endosulfan I	959988	30		
cis-Chlordane	-99999	20		
trans-Nonachlor	39765805	20		

Parameter <sup>ii</sup>	CAS	LOQ <sup>i</sup>		
		Aqueous	Tissue	Sediment
4,4'-DDE	72559	20		
Dieldrin	60571	20		
Endrin	72208	60		
Endosulfan II	33213659	20		
Chlorobenzilate(a)		20		
4,4'-DDD	72548	20		
Endrin Aldehyde	7421934	40		
Endosulfan sulfate	1031078	20		
4,4'-DDT	50293	20		
Methoxychlor	72435	20		
<b>Permethrin</b>	<b>52645531</b>	<b>40</b>		
Isophorone	78591	20		
Hexachlorocyclopentadiene	77474	30		
Dimethylphthalate	131113	300		
2,4-Dinitrotoluene	121142	40		
Acenaphthylene	208968	20		
PCB-1 (2-Chlorobiphenyl)	2051607	25		
2,6-Dinitrotoluene	606202	20		
<b>Diethylphthalate</b>	<b>84662</b>	<b>300</b>		
Fluorene	86737	20		
PCB-5 (2,3-Dichlorobiphenyl)	16605917	20		
Hexachlorobenzene	118741	20		
Pentachlorophenol	87865	80		
Phenanthrene	85018	20		
<b>Anthracene (PAH)</b>	<b>120127</b>	<b>20</b>		
PCB-29 (2,4,5-Trichlorobiphenyl)	15862074	20		
PCB-47 (2,2',4,4'-Tetrachlorobiphenyl)	2437798	30		
PCB-98 (2,2',3',4,6-Pentachlorobiphenyl)		20		
Fluoranthene	206440	20		
<b>Pyrene (PAH)</b>	<b>129000</b>	<b>20</b>		
PCB-154 (2,2',4,4',5,6'-Hexachlorobiphenyl)		20		
Bis(2-ethylhexyl)adipate	103231	400		
Benzo(a)anthracene	56553	20		
PCB-171 (2,2',3,3',4,4',6-Heptachlorobiphenyl)	52663715	20		
<b>Chrysene (PAH)</b>	<b>218019</b>	<b>20</b>		
PCB-200 (2,2',3,3',4,5',6,6'-Octachlorobiphenyl)		20		
Bis(2-ethylhexyl)phthalate	117817	400		
Butylbenzylphthalate	85687	300		
Benzo[b]fluoranthene	205992	20		
Benzo[k]fluoranthene	207089	20		
<b>Benzo (a) pyrene (PAH)</b>	<b>50328</b>	<b>20</b>		
Indeno[1,2,3-cd]pyrene	193395	20		
Dibenz[a,h]anthracene	53703	20		
Benzo[g,h,i]perylene	191242	20		
PBDE-17	147217752	20		
PBDE 28	41318756	20		

Parameter <sup>ii</sup>	CAS	LOQ <sup>i</sup>		
		Aqueous	Tissue	Sediment
PBDE 47	5436431	20		
PBDE 66	189084615	20		
PBDE-85	32534819	20		
PBDE-99	60348609	20		
PBDE 100	189084648	20		
PBDE 138	182677301	20		
PBDE 153	68631492	20		
PBDE 154	207122154	20		
PBDE 183	207122165	20		
Volatile Organic Compounds by GC/MS (8260 B)		mg/L		µg/Kg dry
Dichlorodifluoromethane	75718	0.0005		250
Chloromethane	74873	0.0005		250
Vinyl Chloride	75014	0.0005		250
Bromomethane	74839	0.0005		250
Chloroethane	75003	0.0005		250
Trichlorofluoromethane	75694	0.0005		250
Acetone	67641	0.002		2000
1,1-Dichloroethylene	75354	0.0005		250
Carbon Disulfide	75150	0.002		1000
Methylene Chloride	75092	0.0005		250
trans-1,2-Dichloroethylene	156605	0.0005		250
MtBE	1634044	0.002		100
1,1-Dichloroethane	75343	0.0005		250
2,2-Dichloropropane	594207	0.0005		250
cis-1,2-Dichloroethylene	156592	0.0005		250
2-Butanone (MEK)	78933	0.05		25000
Bromochloromethane	74975	0.0005		250
Chloroform	67663	0.0005		250
1,1,1-Trichloroethane	71556	0.0005		250
Carbon Tetrachloride	56235	0.0005		250
1,1-Dichloropropene	563586	0.0005		250
<b>Benzene</b>	<b>71432</b>	<b>0.0005</b>		250
1,2-Dichloroethane	107062	0.0005		250
<b>Trichloroethylene</b>	<b>79016</b>	<b>0.0005</b>		250
1,2-Dichloropropane	78875	0.0005		250
Dibromomethane	74953	0.0005		250
Bromodichloromethane	75274	0.0005		250
cis-1,3-Dichloropropene	10061015	0.0005		250
4-Methyl-2-Pentanone (MIBK)	108101	0.0013		625
<b>Toluene</b>	<b>108883</b>	<b>0.0005</b>		250
trans-1,3-Dichloropropene	10061026	0.0005		250
1,1,2-Trichloroethane	79005	0.0005		250
<b>Tetrachloroethylene</b>	<b>127184</b>	<b>0.0005</b>		250
1,3-Dichloropropane	142289	0.0005		250
Dibromochloromethane	124481	0.0005		250
1,2-Dibromoethane (EDB)	106934	0.0005		250
Chlorobenzene	108907	0.0005		250
1,1,1,2-Tetrachloroethane	630206	0.0005		250
<b>Ethyl Benzene</b>	<b>100414</b>	<b>0.0005</b>		250

Parameter <sup>ii</sup>	CAS	LOQ <sup>i</sup>		
		Aqueous	Tissue	Sediment
1,4/1,3-Dimethylbenzene	106423 / 108383	0.001		500
1,2-Dimethylbenzene	95476	0.0005		250
Styrene	100425	0.0005		250
Bromoform	75252	0.0005		250
Isopropylbenzene (Cumene)	98828	0.0006		250
Bromobenzene	108861	0.0005		250
1,1,2,2-Tetrachloroethane	79345	0.0005		250
1,2,3-Trichloropropane (TCP)	96184	0.0005		250
n-Propylbenzene	103651	0.0005		250
2-Chlorotoluene	95498	0.0005		250
4-Chlorotoluene	106434	0.001		500
1,3,5-Trimethylbenzene	108678	0.0005		250
tert-Butylbenzene	98066	0.0005		250
1,2,4-Trimethylbenzene	95636	0.0005		250
sec-Butylbenzene	135988	0.001		500
1,3-Dichlorobenzene	541731	0.0005		250
1,4-Dichlorobenzene	106467	0.0005		250
4-isopropyltoluene	99876	0.0005		250
1,2-Dichlorobenzene	95501	0.0005		250
n-butylbenzene	104518	0.0005		250
1,2-Dibromo-3-chloropropane (DBCP)	96128	0.001		500
1,2,4-Trichlorobenzene	120821	0.0005		250
Hexachloro-1,3-Butadiene	87683	0.0005		250
Naphthalene	91203	0.0005		250
1,2,3-Trichlorobenzene	87616	0.0005		250
<b>Metals: Mercury<sup>iii</sup></b>		<b>µg/L</b>		
<b><i>Total Mercury by EPA (1361 E)</i></b>		<b><i>0.5 ng/L</i></b>		
<b>Pharmaceuticals and Personal Care Products<sup>iii</sup></b>				
Cotinine				
<b>Cleaners and VOCs<sup>iii</sup></b>				
4-nonylphenol				
Triclosan				
<b>Phosphate-based Fire Retardants<sup>iii</sup></b>				
Tri (2-chloroethyl) Phosphate				
Tri(dichlorisopropyl)phosphate				
<b>Other<sup>iii</sup></b>				
Bisphenol-A				

<sup>i</sup> LOQs (Limit of Quantitation) are subject to change based on sample matrix, sample volume, and laboratory instrument conditions. LOQs may also be revised after review of historical data and missing LOQs may be added as methods are developed. SAPs will list target reporting level and denote reporting to the LOD when needed. The units of the values listed are in the header of the multi-analyte methods.

<sup>ii</sup> Shaded cells with bold text are either broad categories of the parameters listed below it or are the “Standard Parameter Names”, which sample receiving will use to enter information into LIMS. SAPs should reference the “Standard Parameter Name” to ensure samples are logged into LIMS correctly. Parameters in ***bold/italic*** text were identified in the 2008 Toxic Monitoring Project work plan as

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parameters of concern. The LEAD routinely reports the additional parameters not in bold/italic text for the selected method.

- iii The TMP work plan identified the following contaminants as being a concern; however the LEAD does not currently test for them.

## **B6 Instrument/Equipment Testing, Inspection, and Maintenance**

All analytical equipment will be maintained and inspected in accordance with the procedures test method SOPs. All DEQ test method SOPs are controlled documents and are available on Q-net at [deq05/lab/qms/documents.asp](http://deq05/lab/qms/documents.asp). Field parameter SOPs are outlined in DEQ's MOMs manual.

The laboratories will keep maintenance logs on all analytical equipment. Laboratories are expected to conduct routine maintenance procedures and follow the manufacturer's advice. Personnel conducting peer review will find it helpful to use maintenance logs during corrective action procedures.

## **B7 Instrument Calibration and Frequency**

All analytical equipment will be calibrated in accordance with the procedures test method SOPs. Field parameter SOPs are outlined in the MOMs manual.

If instruments cannot be calibrated as required and sample analysis is to be continued, the analyst will flag data as appropriate (refer to section B5-14).

## **B8 Inspection/Acceptance of Supplies and Consumables**

The analyst will be responsible for maintaining records of traceability for all reagents and standards. The procedure used to maintain traceability is described in the Laboratory Quality Manual ([DEQ91-LAB-0006-LQM](http://deq05/lab/qms/documents.asp)). The analyst must validate the usability of standards and reagents upon receipt and when expiration dates are exceeded.

## **B9 Non-direct Measurements**

Historical data collected at monitoring sites may be used for this project. Historical data were assigned Data Quality Level codes when they were loaded into LASAR. Data Quality Levels may have changed since the data were loaded; however, no additional acceptance criteria will be required for this data and will not be further evaluated by LEAD staff.

To control costs sampling may occur along with other projects (i.e. Ambient Water Quality Monitoring). TMP sample data will be validated using this QAPP, however the data quality objectives of other data collected along with the TMP samples will be validated using the other projects' QAPP. Since this project will be using the data collected for other projects, it is important for subsequent SAPs to reference the related QAPPs.

## **B10 Data Management**

Data management will be provided through the LEAD LIMS and LASAR databases.

Separate field data sheets will be maintained for each sampling event. Information recorded on data sheets is to include Project name, data and time of sampling events, water body name,

basin name, LASAR numbers, general weather conditions, and names of field staff, time of each sample or measurement, results and equipment ID numbers. All data are to be entered into the LEAD Analytical Storage And Retrieval (LASAR) database.

The Field Operations Coordinator will coordinate with the LEAD technical services staff to enter field data and third party data into the DEQ LIMS and LASAR databases.

Final reports from third party laboratories will be faxed/emailed and mailed to the Project Coordinator and the Field Operations Coordinator. Final Reports from the LEAD will also be emailed to the Project Coordinator and Field Operations Coordinator.

## Group C Assessment and Oversight

The elements in this group address the activities for assessing the effectiveness of project implementation and associated QA and QC activities. The purpose of assessment is to ensure that the QA Project Plan is implemented as prescribed.

### C1 Assessment and Response Actions

During the Data Review Processes discussed in Group D below, personnel will use this QAPP and the relevant SAP to determine adherence to the plans and Data Quality Levels. Personnel must communicate to the QAO whenever the QAPP or SAP fails to provide sufficient guidance in conducting their work, at which point the QAO will revise the QAPP or SAP.

In addition, the QAO will randomly select sampling events to conduct internal audits. Results of these audits are stored at [\\Deqlead01\qa\Audits\Internal Assessments\Case Assessments Workbook...xlsx](#). Corrective action for a systemic problem unearthed in an internal audit will be entered into the "[Issue Tracker NRCA](#)". Response actions will be developed as data becomes available. Any stop work orders or change in project scope will come from the Project Coordinator with assistance from the QAO and/or Data Coordinator. Corrective actions will be documented as addendums or revisions to this QAPP and/or SAPs.

### C2 Reports to Management

This section of the QAPP should identify the frequency and distribution of reports issued to inform management of the project status; for examples, reports on the results of performance evaluations and system audits; results of periodic data quality assessments; and significant quality assurance problems and recommended solutions. Identify the preparer and the recipients of the reports, and any specific actions the recipients are expected to take as a result of the reports.

The LEAD routinely conducts a Manager/QAO/Sample Coordinator meeting ("*Monday Morning Meeting*") to review work status. The "*LIMS Status Tracking*" and "*Issue Tracker Open NRCA*" reports are used for discussing the status of quality assurance issues.

In addition the following reports will be sent to the personnel listed in Table 4 for approval and/or review. Technical Services will file all Table 4 reports and records in a sampling event file; except for the LIMS Status Report, Issue Tracker Open NRCA, and Data Approval Reports, which are retained by the originator. Technical Services may make these reports available to the public upon request.

**Table 4 – LEAD Reports**

	<i>Report created by:</i>	<i>Division Administrator</i>	<i>QAO</i>	<i>Project Coordinator (PM)</i>	<i>Water Quality Monitoring Manager (WQM)</i>	<i>Data Coordinator (DC)</i>	<i>Field Operations Coordinator</i>	<i>Technical Services Manager (TS)</i>	<i>Sample Coordinator (SC)</i>	<i>Inorganic Manager (Inorg)</i>	<i>Organic Manager (Org)</i>
Project Summary Report	PM	✓	✓	✓	✓	✓	✓				
Official Analytical Report	SC	✓		✓		✓	✓		✓		
QA Summary Report	DC	✓	✓	✓	✓	✓	✓				
Original Field Data Records	WQM	✓		✓		✓	✓		✓		
<a href="#">Sample Receipt Checklist</a>	SC	✓				✓			✓		
<a href="#">Sample Preservation Summary</a>	Inorg	✓				✓			✓	✓	✓
<a href="#">Laboratory Audit of Field Measurements</a>	Inorg	✓				✓			✓	✓	
Field vs. Laboratory Analysis comparisons	SC	✓				✓			✓		
Laboratory Analysis of Field Duplicates	SC	✓				✓			✓		
Analytical QC Summaries	Inorg, Org	✓				✓			✓	✓	✓
Parameter Batch QC summaries	Inorg, Org	✓				✓			✓	✓	✓
<a href="#">Solids Balance/QC Form</a>	Inorg	✓				✓			✓	✓	
<a href="#">Ion Balance Report</a>	Inorg	✓				✓			✓	✓	
<a href="#">Technical Corrective Action</a>	Inorg	✓				✓			✓	✓	✓
Data Approval Report (DAR)	Inorg, Org				✓		✓		✓	✓	✓
LIMS Status Tracking	SC	✓	✓		✓			✓	✓	✓	✓
<a href="#">Issue Tracker Open NRCA</a>	QAO	✓	✓		✓			✓	✓	✓	✓

No additional reporting to management is planned at this time.

## Group D Data Validation and Usability

The data review process will be monitored through the use LIMS sample status codes. Throughout the review process, Data Quality Levels are assigned to the sample results based on the guidance in *Data Validation Guidance for the LASAR Database* ([DEQ09-LAB-0006-QAG](#)).

### D1 Data Review, Verification and Validation

Data Quality Level codes defined in Table 5, are stored in LIMS and LASAR to simplify database queries of quality data. Data not meeting Data Quality Indicator control limits will receive a code other than “A”. If a QC measure fails to meet control limits, personnel evaluating the QC must flag all results associated with the control. The Data Quality Level will be set to “B” or the analyst may void the result and set the Data Quality Level code to “C”. Comments will be linked to the results explaining QC failures.

The Data Coordinator will review sampling event data as it becomes available. Questionable data will be brought to the Project and QAOs attention. Decisions to accept, qualify, or reject questionable data will be made by the Data Coordinator, Project Coordinator, Field Sampling Coordinator, and QAO.

The Data Coordinator will ensure sampling event Data Quality Levels are consistent with [DEQ09-LAB-0006-QAG](#). The Data Coordinator will also verify that all data were reported as requested, to the requested target levels, with the appropriate units, and with sufficient QC as described in sections A7 and B5. If data are reported incorrectly, the Data Coordinator will be responsible for ensuring corrections to the database are made.

If the Data Coordinator determines the data does not meet the data quality objectives described in section A7 the Data Quality Level codes of all affected results will be adjusted to the appropriate code defined in Table 5.

**Table 5 – Current LIMS Data Quality Level Codes**

Code	Definition	Description
A+	DEQ data of known quality.	Data of known and acceptable quality. Presented by DEQ meeting current QC limits as established by the Laboratory's Quality Systems Manual.
A	Non-DEQ data of known quality.	Data of known and acceptable quality. Submitted by entities outside of DEQ meeting current QC limits for external data as established by the DEQ Laboratory.
B	Data of suspect Quality.	Data may not meet established QC but is within marginal acceptance criteria or data value may be accurate, however controls used to measure Data Quality Objective elements failed i.e. batch failed to meet blank QC limit.
C	Data of unacceptable quality.	Values are discarded (Void) typically due to analytical failure.
D	No sample collected or no reportable results.	Typically due to sampling failure, however sample was scheduled and resources were expended attempting to collect the sample.

Code	Definition	Description
E	Data of unknown quality.	Insufficient QA/QC information is available; data could be valid however there is no evidence to prove either way (Educational Only, Very Questionable or Poor QA/QC).
F	Exceptional Event.	Data may be of "A" quality but not representative of sampling conditions as required by the project plan or heterogeneous with respect to typical environmental sample of the same matrix.

Data qualified with the Data Quality Level code of "B" may be used for this project.

Precision requirements for the Watershed Assessment field parameters (conductivity/salinity & turbidity meters, etc.) are consistent with the Data Quality Matrix in Chapter 4, "Data Quality" of the Oregon Plan for Salmon and Watersheds Water Quality Monitoring Guidebook, (2001).

## D2 Verification and Validation Methods

The analyst will enter data, review their data, and flag results not meeting test method SOP defined QC standards (B5-12 through B5-16). A second qualified analyst will review B5-12 through B5-16 QC batch data and sign off on data in LIMS as having been reviewed.

Documentation of the peer review will be maintained using an Analytical Data Review Checklist ([\\Deglead02\qa\\_documents\TMPL\DEQ07-LAB-0055-TMPL.xls](#)) laboratory sections will review data grouped together in the same sampling event (B5-4) as it relates to the test results reported by their section. This level of review will include the review of the peer review checklist (B5-11), inter-parameter comparisons, history comparisons, LIMS comments, laboratory QC checks on field measurements, correspondences with sampling teams, and compliance with QAPP requirements B5-11 through B5-16 and Table 3.

The Field Operations Coordinator will review Sampling Event batch data (B5-4) in LIMS and ensure that field data was transcribed and qualified correctly in LIMS. During this review the Field Operations Coordinator will ensure batch data described in B5-4 through B5-6 meets control limits and that samples were flagged with appropriate data qualifiers and corresponding results were flagged with the appropriate Data Quality Level code. The Field Operations Coordinator will verify the accuracy of LIMS data by comparing the DAR data to that of the original field data sheets, refer to section B5-3. The Field Operations Coordinator will verify QC elements are met and reset Data Quality Level codes if necessary. This validation process will be documented through the LIMS DAR approval process.

After the monitoring and analytical sections have completed their reviews, the Sample Coordinator will print and evaluate the "SC" reports listed in Table 4. The Sample Coordinator will send data back to analytical or monitoring sections for further review or adjust Data Quality Level codes, when data quality objectives described in this plan are not met (also refer to [DEQ09-LAB-0006-QAG](#)). The Sample Coordinator will also review records to ensure the control measures described in sections B5-7 through B5-10 are acceptable and reset Data Quality Level codes if necessary. The Sample Coordinator then compiles the various QC reports, prints the analytical report, and forwards the report packet on for QA Review.

For this project the Data Coordinator will perform the QA Review, prepare QA Summary reports (Table 4), and sign the analytical reports. The QA Summary report should:

- reference the QAPP and SAP to which data are evaluated,
- provide comments on the effectiveness of the QAPP/SAP,

- provide interpretations to problems identified in the sampling event QC reports (listed in Table 4),
- contain a tabulation of the number of samples, field duplicates, and blanks collected for the project over the biennium, and
- list failed QC and summarize project corrective action

The final draft of this report should be stored in LASAR with the analytical reports so that it can be retrieved with the analytical reports. The draft version of the report should be retained locally so that as sampling event are completed and reviewed, the Data Coordinator can add their synopsis of the project to the report. A copy of the final draft should be made for each new sampling event that is added to it. Name the copy of the electronic report with the sampling event number concatenated with QA (i.e. YYYY####QA.pdf).

Once the LIMS sampling event is released into LASAR, the Project Coordinator, Sample Collection Team, and Field Operations Coordinator will receive an email notice of its availability. Errors in data entry should have been corrected during the DAR approval process, if however; errors, outliers, and inconsistencies were not flagged, the Field Operations Coordinator must initiate the *Data Correction Process* ([DEQ03-LAB-0002-SOP](#)).

### **D3 Reconciliation with User Requirements**

As soon as possible after each sampling event, calculations, and determinations for precision, completeness, and accuracy will be made and corrective action implemented if needed. If data quality indicators do not meet the project's specifications, data may be discarded and re-sampling may occur. The cause of the failure will be evaluated. If the cause is found to be equipment failure, calibration and/or maintenance techniques will be reassessed and improved. If the problem is found to be sampling team error, team members will be retrained. Any limitations on data use will be detailed in both interim and final reports, and other documentation as needed. If failure to meet project specifications is found to be unrelated to equipment, methods, or sample error, specifications may be revised for the next sampling season. Revisions will be submitted to the QA section of the LEAD for review and/or approval.

Corrective action is initiated whenever an "out of control" condition is identified (e.g. either control limits or holding time has been exceeded). The analyst is responsible for initiating corrective action, which generally consists of:

- Analytical system recalibrated or verified and analysis repeated, if holding time permits.
- Documentation of "out of control" condition and corrective action taken in an Incident Report, which is reviewed by the section manager and QAO, who investigate the "out of control" condition, along with the analyst, and decide on a course of corrective action.
- If corrective action procedures do not rectify "out of control" conditions the analytical data may be reported as an estimate and the Data Quality Level will be set to "B". A comment explaining the "B" flag must be attached to all "B" level data.

If time for reanalysis exceeds the allowable holding time for the analyte, the following procedure is followed:

- Sampler is notified and resampling is requested, or
- If resampling is not feasible, and the particular analytical results are not critical, initial analytical results are flagged and reported as an "estimate", indicating all QC criteria have not been met.

Data identified as violating the data quality objective criteria will be reviewed by the QAO, the appropriate Laboratory Manager (organic or inorganic), and the Field Operation Coordinator and a recommendation will be made to the Project Coordinator. The Project Coordinator will make a decision on the suitability and use of the data. Situations requiring corrective action for sample collection will be dealt with immediately, such as equipment malfunction. Sample collection events requiring corrective action that cannot occur immediately will be considered a long-term corrective action. The corrective actions will be detailed in the field sampling notebook and reviewed by the Field Operation Coordinator.

If corrective action procedures do not mitigate the error, associated environmental data must be flagged. Table 5 lists the QC codes used to identify flagged data in LASAR. For this project "B" data may prove to be acceptable for use. The Project Coordinator should review flagged data and use their professional judgment to either omit or include non- "A" level data from the data analysis.



## Appendix B - Revision History

The plan author must increment the revision number with each approved revision. A new document is assigned a revision number of 1.0. The revision number of a plan that receives routine or minor editing is updated by incrementing the minor number by one (i.e., 1.0 becomes 1.1) The revision number of a document that has undergone major revisions is updated by incrementing the major number by one and setting the minor number to zero (i.e., 1.1 becomes 2.0). Revisions to documents should be clearly identified in a "Revision History" section of the document. The Revision History documents the specific changes made to the controlled document, who made the changes, and the date (month and year) the changes were made.

**Table 6 – Revision History**

Revision	Date	Changes	Editor
		Original Plan was not submitted to QA.	
2.0		Created QAPP using Work Plan as guidance.	