DEQ Program Policy

Quality Assurance Policy for the Environmental Cleanup Programs

(Formerly ECD Policy 760.00)

State of Oregon
Department of Environmental Quality

Operations Division

Environmental Cleanup Program

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DISCLAIMER

This policy supersedes the previous October, 2011 update. This document provides information and technical assistance to the public and DEQ employees about DEQ's Cleanup Program. This information should be interpreted and used in a manner fully consistent with the state's environmental cleanup laws and implementing rules. This document does not constitute rulemaking by the Oregon Environmental Quality Commission and may not be relied on to create a right or benefit, substantive or procedural, enforceable at law or in equity, by any person, including DEQ employees. DEQ may take action at variance with this policy document.

1.0 PURPOSE

DEQ's Cleanup Program requires appropriate sampling approaches and data quality requirements to support its risk assessment and remedy selection processes. To that end, the purpose of this policy statement is to help define environmental data quality assurance (QA) requirements, for environmental sampling conducted in the course of investigation and cleanup of releases of hazardous substances to the environment.

The agency Quality Management Plan (DEQ15-HQ-0014-QMP) outlines an overall quality management system designed to ensure that that all environmental data generated and processed will be scientifically valid and legally defensible. *Scientifically valid and legally defensibl*e means the data should be of known precision and accuracy, and be complete, representative, and comparable. This policy reflects the quality management system and outlines DEQ's Cleanup program's expectations of sufficient QA activities conducted when undertaking sampling and analysis activities.

2.0 OBJECTIVE

The objective of this policy is to establish consistent and uniform criteria and procedures for Project Managers to implement during the investigation and cleanup of sites containing hazardous substances. A list of acronym definitions used in this document is provided in **Appendix A**.

3.0 POLICY ELEMENTS

3.1 Work Plans

All investigation and cleanup activities should be described in a work plan that is completed prior to environmental sampling activities. Work plans are required for all activities involving environmental sampling and analysis, from initial assessment through cleanup confirmation monitoring. As outlined in **Appendix B** of this policy, two essential work plan elements are the Sampling and Analysis Plan (SAP) and the Quality Assurance Project Plan (QAPP).

The SAP presents project information and describes monitoring and assessment activities and their purpose. The SAP can incorporate by reference standard operating procedures or other documents for any of the elements.

The QAPP describes the technical QA/QC elements for a specific data collection effort. The elements addressed by the QAPP include project purpose and objectives, sampling design, analytical methods, data quality indicators, data review procedures, etc.

DEQ's Cleanup Program has developed programmatic QAPPs for preliminary assessment/site investigations (PA/SI), Brownfield assessments, and underground storage tanks (UST) projects. The work plan may reference one of the general program QAPPs, if appropriate, or may incorporate elements of these plans by reference when preparing site-specific SAPs and QAPPs.

These QAPPs should be reviewed approximately every 5 years and updated as necessary. The current programmatic QAPPs include:

- *Brownfield Program Quality Assurance Project Plan*, Oregon Department of Environmental Quality, August 2011, DEQ04-LQ-004-QAPP.
- *EPA PA/SI Investigations Quality Assurance Project Plan*, Oregon Department of Environmental Quality, August 2012, DEQ05-LQ-069-QAPP.
- *Underground Storage Tanks (UST) Program Quality Assurance Project Plan*, Oregon Department of Environmental Quality, September 2010, DEQ02-LQ-0002-QAPP.

Work plans should be developed in accordance with applicable Oregon Administrative Rules, EPA guidance if appropriate, and guidance documents available at DEQ's web site (http://www.deq.state.or.us/pubs/reports.htm#Cleanup). Applicable guidance may include:

- *Human Health Risk Assessment Guidance*, Oregon Department of Environmental Quality, October 2010, DEQ 10-LQ-023.
- *Guidance for Ecological Risk Assessment: Levels I, II, III, IV*, Oregon Department of Environmental Quality, April 1998 (Updated 12/2001).
- *Guidance for Conducting Feasibility Studies*, Oregon Department of Environmental Quality, November 2006, DEQ-08-LQ-088.
- *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final*, USEPA, October 1988, OSWER Directive 9355.3-01.
- *Guidance for Assessing and Remediating Vapor Intrusion in Buildings*, Oregon Department of Environmental Quality, March 2010, DEQ 10-LQ-007.
- *Risk-Based Decision Making (RBDM) for the Remediation of Petroleum-Contaminated Sites*, Oregon Department of Environmental Quality, September 2003.
- *UST Cleanup Manual*, Oregon Department of Environmental Quality, May 2009, 09-LQ-068.
- *Superfund Remedial Design Remedial Action Guidance*, USEPA, 1986, OSWER Directive 9355.0-4A.
- *Guidance on Expediting Remedial Design and Remedial Action*, USEPA, August 1990, OSWER Directive 9355.5-02.

DEQ review and approval of work plans is required prior to implementation of environmental monitoring activities under most cleanup programs or agreements. This review will typically utilize the Project Plan Quality Assurance Review Checklist in **Appendix C**. DEQ encourages responsible parties or contractors to submit work plans for Independent Cleanup and Tank Cleanup projects prior to initiating the work. Prior review and acceptance of work plans helps to reduce problems later and minimize costs. DEQ reviews all work before closing a project to ensure it complies with all rules and regulations including sampling protocol.

3.2 Data Quality Objectives

The intended uses of environmental data must be defined before data collection begins, so that appropriate QA measures can be applied. The level of data quality needed must be determined from defined data needs for all users (i.e., risk assessment, feasibility studies, and cleanup confirmation/compliance). The assigned level of data quality, specific QA activities, and data acceptance criteria, should be explicitly described in each monitoring activity or program QAPP. Data Quality Objectives (DQOs) should be developed utilizing the following guidance:

Data Quality Objective for Remedial Response Activities, EPA/540/G-87/003, OSWER Directive 9355.0-7B, March 1987.

Guidance on Systematic Planning using the Data Quality Objectives Process- EPA QA/G-4, EPA/240/B-06/001, USEPA Office of Environmental Information, February 2006

Table 1: 7-Step DQO Process

Step	Activity
1	State the Problem
2	Identify the Goals of the Study (What decisions are to be made)
3	Indentify Information Inputs
4	Define Study Boundaries
5	Develop the Analytic Approach (Develop decision rules)
6	Specify Performance or Acceptance Criteria
7	Develop Plan for Obtaining Data (Optimize the design)

For human health exposure to soil, water and air, DEQ uses risk-based concentrations (RBCs), based on preliminary remediation goal (PRG) and RBC guidance provided by EPA regions 3, 6 and 9, (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm) as screening values in deciding which chemicals of interest (COIs) at a site should be considered chemicals of potential concern (COPCs). RBCs are available for soil (residential and industrial use), water, and air. EPA updates their table of PRGs approximately semiannually. The current DEQ RBC table can be obtained at http://www.deq.state.or.us/lq/pubs/docs/RBDMTable.pdf.

For ecological receptors, DEQ uses screening level values (SLVs) for protection of plants, invertebrates, birds, mammals and aquatic life. SLVs are available for soils and surface water, and can be found in Table 1 in *Guidance for Ecological Risk Assessment: Levels I, II, III, IV*. Table 2 of the same document contains SLVs for freshwater and marine sediment. This document can be found at: http://www.deq.state.or.us/lq/pubs/docs/cu/GuidanceEcologicalRisk.pdf.

The DEQ *Guidance for Assessing Bioaccumulative Chemicals of Concern in Sediment (April 2007)* contains screening level values protective of bioaccumulation from sediment for fish, wildlife and human health exposure, critical tissue levels (CTLs) for protection of aquatic life, and acceptable fish tissue levels (ATLs) protective of wildlife and human health consumption. These values can be found at http://www.deq.state.or.us/lq/pubs/docs/cu/GuidanceAssessingBioaccumulative.pdf.

Laboratory reporting limits should not exceed 10 percent of their DEQ RBC or screening level value (SLV). If the proposed analytical method detection limits exceed 10 percent of the DEQ RBCs, justification should be provided to DEQ supporting the proposed detection limits for the project. A summary of DEQ risk-based concentrations for development of DQOs is provided in **Appendix D**.

3.3 Analytical Requirements

Five (5) levels of analytical support (*Levels I and II: Field Analytical Methods* and *Levels III through V: Laboratory Analytical Methods*) are defined below. The appropriate type of sampling and analysis at a given site depends on numerous factors, the foremost of which are the intended end use of the data and associated data quality requirements. The appropriate data uses for these analytical levels are discussed in detail, in the DQO guidance referenced above.

LEVEL I This refers to field screening or analyses using portable instruments, such as photoionization detector (PID) or flame ionization detector (FID - also sometimes referred to as an organic vapor analyzer (OVA)). Results are not compound-specific or quantitative. Level I is generally used for health and safety monitoring, and locating sample collection points for laboratory analysis.

LEVEL II This refers to field analyses using more sophisticated portable analytical instruments or mobile laboratories on-site. Data generated can range from qualitative to quantitative (e.g., actual contaminant identification is made, but concentrations may or may not be quantified to a high degree of accuracy). Note that this data may or may not be acceptable for compliance purposes and needs to be clarified in the work plan or QAPP.

LEVEL III This refers to standard EPA-approved methods, which may be equivalent to Level IV methods (see below), with the exception of the level of documentation supplied with analytical results.

LEVEL IV This refers to EPA Contract Lab Program (CLP) Routine Analytical Services (RAS) analyses or EPA approved methods (Level III) following rigorous QA/QC protocols and documentation. Documentation allows validation of results against contractual requirements and allows data uses and/or limitations to be identified prior to actual use of data. Requirements for a level IV analysis and full validation of the analytical data will be specified in a site specific QA Plan.

LEVEL V This refers to non-standard methods, which are either modifications of existing standard methods or developed for site specific contaminant identifications and quantitation (e.g., breakdown products of explosives or pesticides).

3.3.1. **Field Analytical Methods**

The specifications for field methods for rapid screening of hazardous materials are contained in Section 7 of *A Compendium of Superfund Field Operations Methods*, EPA/540/P-87/001, OSWER Directive 9355.0-14, December 1987. Appendix 7A of this document outlines general protocols, reporting, and deliverables which should be specified in project Field Sampling Plans (FSPs) or QAPPs.

For a discussion of the field analytical methods available or under development and the available performance specifications (detection limits, precision and accuracy), see *Field Screening Methods Catalog User's Guide*, USEPA, OERR, EPA/540/2-88/005, September 1988.

The primary concern with the Level II method is the wide range of data quality that is generated. To address these concerns, project work plans should include the following criteria:

a) Data quality objectives related to the data uses, (i.e., detection limits vs. critical levels [e.g., drinking water standards], evaluation of false negatives or positives, precision, accuracy and comparability to Level III or IV analyses), should be well defined.

b) Quality control procedures should clearly specify calibration procedures and requirements, and precision and accuracy assessment should be well defined.

c) Analyses should be performed by a qualified chemist or technician with documented experience using the proposed instrumentation under field conditions. This is probably the most important factor in obtaining data of high-quality based on precision and accuracy.

d) Level II data should be supplemented with Level III or IV analytical results to assess the comparability of field data with laboratory results. Duplicate samples should be collected and analyzed by Level II and III, or IV methods, with Level III or IV results used to confirm Level II contaminant identification and/or quantitative results. The number of confirmation samples which should be analyzed depends on the DQO and data uses. The minimum number of confirmation samples should be 5 percent of the total number of samples collected per matrix, for each sampling event.

3.3.2. Laboratory Analytical Methods

The following methods are accepted for use, based on the requirements as described:

a) Aqueous, Soil, Sediment, Sludge, or Concentrated Waste Samples

Test Methods for Evaluating Solid Waste Physical/Chemical Methods, USEPA, SW-846 3rd edition, Update IV, February 2007 (or latest Final Update), available at www.epa.gov/SW-846/.

Approved methods developed for the assessment of petroleum releases include:

Analytical Methods for Petroleum Hydrocarbons, June 1997, Washington Department of Ecology, ECY 97-602 (NWTPH Methods)

Methods for Performance of Toxicity Tests Include:
Aquatic Toxicity – Acute:

Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, 5th Edition, USEPA, EPA/821/R-02/012 (2000 Series Methods), October 2002.

Aquatic Toxicity - Chronic:

Short-term Methods for Estimating the Chronic Toxicity of Effluents and receiving Waters to Freshwater Organisms, 4th Edition, USEPA, EPA/821/R-02/013 (1000 Series Methods), October 2002.

Short-term Methods for Estimating the Chronic Toxicity of Effluents and receiving Waters to Marine and Estuarine Organisms, 3rd Edition. USEPA, EPA/821/R-02/014 (1000 Series Methods), October 2002.

b) Aqueous Samples Only

EPA-Approved methods under 40 CFR Part 136.3 or comparable SW846 method.

40 CFR Part 136.3 referenced procedures are approved for the National Pollution Discharge Elimination System (NPDES) program of the Clean Water Act.

EPA-Approved methods under 40 CFR Part 141, Subpart C.

These methods should be used for samples of ground and/or surface water, which are a drinking water source (e.g., samples from private well-owners' taps used for drinking water).

c) Ambient Air and Soil Gas Monitoring

a. *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air* (TO Methods), EPA/625/R-96/010b, January 1999

i. *Generally TO-03, TO-13, TO-15, TO-17*

ii. *Screening may be performed by a modified method 8260, however this would not be suitable for compliance testing*

d) Fish and Other Aquatic Organisms

a. SW846 as listed above

b. EPA 1600 series methods

3.4 Quality Control Requirements

3.4.1. Field QA/QC Samples

QA/QC samples are intended to provide control over the collection of environmental measurements and subsequent review, interpretation, and validation of generated analytical data. The various types of QA/QC samples to be collected are discussed below. Transport and equipment blanks generally apply to aqueous samples.

(a) Field Transport (trip) Blanks

[1] *Purpose*:

To detect additional sources of volatile organic contamination related to transporting the sample.

[2] *Potential Contaminant Sources*:

a. Laboratory reagent water.

b. Sample containers.

c. Cross-contamination in shipment of samples.

d. External environment

[3] *Preparation*:

Transport blanks (also called trip blanks) are prepared by the laboratory with laboratory reagent water (analyte-free water) transported to the field with sample containers and returned to the laboratory with samples for subsequent analysis. A transport blank should be prepared for each sampling event when VOCs are requested.

[4] *Frequency*:

One transport blank should be prepared for each shipment of samples, or two-day sampling event. *An additional note on sample shipment*: Separate matrices should be shipped separately. If possible, ship soil samples in one cooler and aqueous samples in a second. This will provide an additional quality control measure.

(b) Sampling Rinsate Blanks (also called Equipment Blanks)

[1] *Purpose*:

Sampling equipment blanks are used to provide a check on possible contamination from the environment and/or sampling equipment. Sampling equipment blanks are an effective tool in identifying contamination sources only if used in conjunction with transport blanks.

[2] *Potential Contaminant Sources*:

a. Sample containers.

b. Cross-contamination in shipment of samples.

c. Ambient field environment.

d. Cross-contamination from reuse of sampling equipment.

e. Reagents used in the cleaning of field equipment (typically solvents).

[3] *Preparation*:

Sampling equipment blanks are prepared by placing deionized or distilled water into the sampling device after decontamination and transferring into the sampling containers following the same protocol of sample transfer. The blanks should be handled, transported and analyzed in the same manner as the samples collected that day. For soil gas: Equipment blanks are collected by taking a sample of ambient air through the decontaminated sampling apparatus.

[4] *Frequency*:

One equipment blank should be prepared daily regardless of whether samples will be shipped daily.

NOTE: Positive detections in laboratory, transport, or equipment blanks may suggest, but cannot positively identify, possible sources of the additional contamination (i.e., sampling equipment decontamination, sample handling and transport, or lab reagents or environment). Once the general contaminant source is identified, additional investigations are necessary to identify and correct the actual source. Determination of the source of contamination aids in assessing the potential impact on site data.

(c) Duplicate Samples

There are two types of duplicate samples which can be collected, each of which has a purpose.

[1] *Co-Located Samples (Field Duplicates)*:

a. *Purpose.* Co-located duplicates are collected to determine the overall precision of the monitoring program. The variability in the results obtained from co-located samples is the sum of the sampling and analytical variability, and is the most meaningful measure of uncertainty in the individual samples obtained.

b. *Procedure.* Co-located duplicates are collected as independent samples using the same sampling procedures (i.e., separate grab samples with a bailer or separate core samples of soils). For soil gas and ambient air, duplicate samples should be collected in separate sample containers, at the same location and depth immediately after the original sample. Samples are handled, preserved, transported and analyzed using the same protocols.

c. *Frequency.* Duplicates are to be included for each matrix at a minimum rate of 5 percent. If fewer than 20 samples are being collected for a particular sampling episode, at least one duplicate should be collected.

[2] *Split Samples*:

a. *Purpose.* Split samples are usually collected to evaluate inter-laboratory data comparability (relative analytical precision of two labs). However, splits can also be used to assess the analytical precision of a single laboratory.

b. *Procedure.* Samples are "split" from a single sample to create two independent samples for analysis.

For an aqueous matrix, duplicates are obtained by alternately filling two sample containers from the same sampling device for each parameter. Samples of volatile organics from monitoring wells should be the first set of containers filled and, whenever possible, should be filled from the same bailer full of water. If insufficient water is contained in the sampling device to fill both containers, then a new sample should be collected for that parameter set.

Obtaining duplicate samples in a soil or a sediment matrix requires homogenization of the sample aliquot, prior to filling the sample containers. However, volatile organic samples must always be collected as discrete samples, to prevent loss of volatile constituents during homogenization.

(d) Matrix Spikes

[1] *Purpose*:

Matrix spikes are used to assess the accuracy of an analysis by identifying matrix effects that could account for a positive or negative bias to the analytical result.

Determination of accuracy should not be based on QC sample performance alone. Calibration and QC check standards are prepared with laboratory deionized or distilled water, which is free of these interferences, resulting in an accuracy assessment which may or may not be correct.

[2] *Procedure*:

Environmental samples are collected in duplicate (splits) and one of the samples is "spiked" with an aliquot of a standard solution containing all analytes of interest. Accuracy is determined by subtracting the unspiked sample result from the spiked sample result. Some EPA methods specify control limits for matrix spike recovery and correction procedures for matrix interferences. Where EPA does not specify control limits, laboratories are expected to develop in-house limits based on historical performance of the method.

Matrix spikes are not typically prepared in the field because of the high-level of accuracy necessary in their preparation, which may be difficult to achieve under field conditions. Inaccurately prepared field spikes may lead to incorrect conclusions of matrix interferences, or poor accuracy lab results. Therefore, it is recommended that matrix spikes be performed at the lab by qualified analysts, in a controlled environment.

[3] *Frequency*:

Matrix spikes should be performed for each group of samples of a similar matrix:

- Once for each group of samples analyzed per day, or
- Once for every 20 samples analyzed per day, *whichever is greatest*.

Note: Matrix spikes should be performed on a site specific basis. A matrix spike that was used as generic laboratory batch QC (spiked an unrelated sample) is of limited or no benefit for making project decisions

(e) Leak Testing for Soil Gas Sample Collection

[1] *Purpose*:

Leak tests are conducted to help ensure that a soil gas sample is representative of subsurface vapors and assess the potential for leakage of ambient air into the sample.

[2] *Procedure*:

A soil gas sampling point may be tested for leaks by covering the sampling point and filling an enclosure with a conservative tracer gas (e.g., helium) and testing the tubing where the collection device (usually a Summa canister) will be placed for the tracer gas. Be sure to check in with the DEQ project manager and/or laboratory prior to sampling to resolve any questions about a proposed leak detection compound. For on-site leak detection, more than 5% contribution from leakage of ambient air should be considered unacceptable and fittings should be adjusted, the hole resealed, or, if necessary, the hole should be abandoned and a new sample site should be installed.

[3] *Frequency*:

Leak testing should be conducted prior to collection of each soil gas sample.

3.4.2. **Laboratory QA/QC Requirements**

(a) <u>Quality Assurance Program</u>.

DEQ and/or Contractors should only use laboratories which have a documented Quality Assurance Program in conformance with the requirements of National Environmental Accreditation Program (NELAP) or International Standards Organization (ISO) laboratory standard (ISO 17025) and described in a quality assurance program plan (QA manual). Methods that will be used at a site for the purposes proposed and QA/QC procedures must be approved by EPA and or/DEQ.

If the laboratory is not accredited under NELAP, through Oregon DHS or another accreditation body, accredited under ISO 17025, or approved through a Federal environmental program (e.g. DOD, DOE, or EPA-CLP) for the project methods and analytes, the contractor must otherwise be able to demonstrate, to DEQ's satisfaction, that each laboratory it uses is qualified to conduct the proposed work. This may be accomplished through a contractor evaluation of the laboratory QA program and document the evaluation. DEQ may require that the contractor submit detailed information to demonstrate that the laboratory is qualified to conduct the work, including information on personnel qualifications, equipment and material specifications. The contractor will provide assurances that DEQ has access to laboratory personnel, equipment and records for sample collection, transportation and analysis.

This evaluation would include a review of a lab-wide quality management system and use of methods and analytical protocols for the chemicals of concern in the media of interest within detection and quantification limits consistent with both QA/QC procedures and DQOs approved in the QAPP for the site by DEQ.

The lab assessment checklist to the NELAC 2003 standard or the TNI 2009 standardshould be considered in the evaluation of a contract laboratory's quality assurance plan for completeness. The 2003 NELAC checklist is available on the ORELAP Website at http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx. You must contact The NELAC Institute (http://www.nelac-institute.org/) directly to obtain a copy of the 2009 TNI lab assessment checklist due to copyright requirements.

Re-evaluation of the contract lab's QA Manual should be performed annually. The Quality Assurance Manual should address the elements outlined in **Appendix E** of this policy.

For this policy, a *Contract Lab* means any commercial laboratory performing analyses for a potentially responsible party (PRP) or DEQ and its contractors, and is not referring to a laboratory participating in the EPA Contract Laboratory Program (CLP).

(b) Quality Control Procedures.

The mandatory and recommended QA/QC procedures are outlined in the Approved Methods and in **Chapter 1** of *EPA Test Methods SW-846, 3rd Edition, Final Updates I-IV, February 2007 or most recent final update.* Appropriate QA/QC requirements to meet site specific DQOs should be defined in the QA Project plan.

These procedures are necessary in order for the contract laboratory to satisfy the reporting and documentation requirements specified in **Appendix F** of this policy.

(c) Maintenance of Raw Data Records.

The laboratory must retain and have available for review all raw data such as chromatograms, strip charts, or computer printouts documenting calibrations, method blank analysis, QC samples, and the environmental samples. For data retained on tape, results must be traceable to the case and the sample for future validation, should this information be required in the future. When submitting raw data to DEQ, the data should be in a format to allow for reconstruction of the analytical activities and QA/QC for data validation, in accordance with *Chapter 1, Section 4.6 (Laboratory Records) of EPA's SW-846.*

(d) Performance Evaluations.

For investigations or cleanups under a Consent Order, or in cases where Critical Data Points are necessary, include the following:

[1] QA samples, at a suggested 5 percent frequency, may be submitted to a second laboratory for data comparability confirmation. Additional labs can also be considered, depending on the data quality needs of the project.

Some examples of Critical Data Points are:

- Data used to confirm or fingerprint contaminants to a PRP.
- Sampling a drinking water supply that contains contaminants at or near the drinking water standard.
- Determination of background levels, pursuant to *OAR 340-122-0400(2(d).*

—OR—

[2] A blind QC audit sample may be submitted to the PRP's Laboratory for each matrix of interest (soil or water) which contains target compounds of interest for the project (i.e., metals, PCBs, volatiles, semi-volatiles). The blind QC audit sample will be prepared by DEQ Laboratories and submitted with the environmental samples to the PRP's Laboratory. DEQ's Laboratory QA Officer should be notified to coordinate preparation of blind QC samples.

[3] On a project specific basis, DEQ may require a percentage of laboratory data packages to be validated by third party (qualified contractor, or data validation organization)

3.5 Analytical Data Package Deliverables

Analytical Data Package Deliverables include:

1. Analytical Results for the environmental samples collected for the project.

   NOTE: Specific requirements for the Data Package Deliverables are defined in **Appendix F** of this policy.

2. A Data Validation Report that documents the data quality being reported and evaluates the results against the Data Quality Objectives defined in the DEQ-approved QAPP.

   The following elements should be addressed in the report:

   (a) Chain-Of-Custody Documentation

   (b) Holding Times

   (c) Instrument Calibration

   (d) Method Detection Limits

   (e) Blank Analysis
   - Field (Trip and Equipment)
   - Method

   (f) Quality Control
   - Accuracy
     - Spike Recovery
   - Precision
     - Field Duplicates
     - Laboratory Duplicates

   (g) Data Use and Limitations

   NOTE: Include tables or narratives that clearly identify all data where DQOs were not met and a discussion of the significance of each case. Data flags must be used to qualify data that does not meet quality requirements to indicate potential bias. Qualifying flags must be clearly defined in the laboratory report.

Appendix A LIST OF ACRONYMS AND DEFINITIONS

Acronym	Definition	Acronym	Definition
%R	% Recovery	NPDES	National Pollution Discharge Elimination System
BNA	Base Neutral and Acids (Category or Semi-Volatile Organic Compounds)	NWTPH	Northwest Total Petroleum Hydrocarbons
CCC	Calibration Check Compound	Ops	Operations Division
CCV	Continuing Calibration Verification	ORELAP	Oregon Environmental Laboratory Accreditation Program
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (Superfund)	OSWER	Office of Solid Waste and Emergency Response (EPA)
CFR	Code of Federal Regulations (US)	OVA	Organic Vapor Analysis
CLP	Contract Laboratory Program (EPA)	PA	Preliminary Assessment
CN	Cyanide	PCB	Polychlorinated Biphenyls
COPC	Chemical of Potential Concern	PID	Photoionization Detector
DCS	Dilution Check Sample	PRG	Preliminary Remediation Goal
DEQ	Department of Environmental Quality (Oregon)	PRP	Potentially Responsible Party
DHS	Department of Health Services (Oregon)	QA	Quality Assurance
DOD	Department of Defense (US)	QAPP	Quality Assurance Project Plan
DOE	Department of Energy (US)	QC	Quality Control
DQO	Data Quality Objective	RAS	Routine Analytical Services
ECD	(former) Environmental Cleanup Division	RBC	Risk Based Concentration
EPA	Environmental Protection Agency (also USEPA)	RCRA	Resource Conservation Recovery Act
EP-TOX	Extraction Procedure Toxicity Test Method (EPA 1310B)	RD/RA	Remedial Design and Remedial Action
GC	Gas Chromatograph (or Chromatography)	RF	Response Factor
GCMS	Gas Chromatograph Mass Spectrometer (or Spectrometry)	RI/FS	Remedial Investigation / Feasibility Study
IC	Ion Chromatography	ROD	Record of Decision
ICP	Inductively Couple Plasma	RSD	Relative Standard Deviation (expressed as a %)

Acronym	Definition	Acronym	Definition
ICS	Interference Check Solution	SAP	Sampling and Analysis Plan
LQAP	Laboratory Quality Assurance Program (Manual)	SLV	Screening Level Value
LQD	(former) Land Quality Division (also just LQ)	SPLP	Synthetic Precipitation Leaching Procedure (EPA 1312)
MDL	Method Detection Limit	TCLP	Toxicity Characteristic Leaching Procedure (EPA 1311)
MS	Matrix Spike	TNI	The NELAC Institute
MSD	Matrix Spike Duplicate	TOX	Total Organic Halogen
NELAC	National Environmental Laboratory Accreditation Conference	UST	Underground Storage Tank
NELAP	National Environmental Laboratory Accreditation Program	VOC	Volatile Organic Compounds
NIST	National Institute of Standards and Technology (Formerly National Bureau of Standards (NBS)		

Appendix B RECOMMENDED SAMPLING AND ANALYSIS AND QA PLAN CONTENT

Sampling and Analysis Plan (SAP)

Site-specific SAPs must describe field activities, including the following elements:

- A description of the project and purpose with relevant background information.
- A list of project members, their responsibilities, and contact information.
- A description of the sampling plan, including the location, number, and type (i.e., soil, water, air, etc.) of samples to be collected.
- Sampling procedures.
- Field documentation and procedures.
- Field equipment calibration and analyses.
- The number and type of QC samples to be collected and submitted for analysis (e.g., trip and rinsate blanks, duplicate samples, etc.). The collection rate for rinsate blanks and field duplicates may not be less than 5% (one blank and one duplicate for every 20 samples). Regardless of the number of samples collected, at least one rinsate blank and one field duplicate should be collected for each media sampled for each field event.
- The analytical methods and minimum reporting limits that laboratories analyzing the samples must achieve.
- The analytical QC elements (e.g., laboratory blanks, laboratory replicates, fortified samples, etc.) and assessment criteria that the laboratories must meet, if these differ from those described in the laboratories' quality systems manual or analytical methods.
- Reporting requirements and formats for laboratory data (e.g., reporting units, electronic or printed deliverable and formats, data flagging, etc.); all laboratory data must be accompanied by supporting batch QC data.
- Special safety or cautionary information.
- Any additional sampling, analytical, or QA/QC requirements that deviate from those established in this QAPP.

Quality Assurance Project Plan (QAPP)

Most projects will reference one of the program QAPPs (e.g. UST, Brownfield, PA/SI) and only need a SAP, however if a site-specific QAPP is needed it should contain the following information as outlined in *EPA Requirements for Quality Assurance Project Plans (EPA QA/R-5), USEPA, March 2001*:

1. Title Page
2. Table of contents
3. Project Management
    a. Project Description
    b. Project Organization and Responsibilities
    c. Data Quality Objectives in terms of precision, accuracy, representativeness, completeness, and comparability

   d. Special Training needs/Certifications – If applicable
   e. Documents and Records
4. Data Generation and Acquisition
   a. Sampling Process Design
   b. Sampling Methods/Procedures
   c. Sample Handling and Custody
   d. Analytical Methods
   e. Quality Control
      i. Field QA/QC
      ii. Laboratory QA/QC
   f. Calibration Procedures
      i. Field and Laboratory equipment/instruments (may be combined into *Quality Control*)
   g. Preventative Maintenance
      i. Field and Laboratory Equipment
   h. Data Management (may be combined in *Documents and Records*)
5. Assessments and Response Actions
   a. Performance and System Audits
   b. Reports to Agency or EPA
6. Data Validation and Usability
   a. Data Review, Verification, Validation, and Reporting and Data Assessment procedures
   b. Reconciliation with Requirements (Corrective Actions)

NOTES: Detailed descriptions of each element of the QA plan can be obtained from:

Requirements for Quality Assurance Project Plans (EPA QA/R-5), USEPA, EPA/240/B-01/003, March 2001.

Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final, USEPA, OSWER Directive 9355.3-01, October 1988.

The QAPP and SAP can be combined into a single plan provided all elements outlined above are included.

Appendix C PROJECT PLAN QUALITY ASSURANCE REVIEW CHECKLIST

This checklist covers the basic elements from *EPA Requirements for QA Project Plans (QA/R-5)* (EPA, 2001a). DEQ project managers or QA officers should use this checklist when reviewing a QA Project Plan for approval. Project managers can also use this checklist as a tool to aid in the development of QA project plans. The completed checklist should be maintained with the approved plan.

PROJECT TITLE:_____

Preparer: _____ **Date Submitted for Review:** _____

Reviewer: _____ **Date of Review:** _____

Part 1

Basic Questions	Y / N	Comments
Is the purpose of the project clearly stated?		
Does the plan clearly identify the decisions to be made (or questions to be answered) from this project?		
Is the sampling plan comprehensive/representative enough for project decision making (number of samples, sampling method, sample locations, etc.)?		
Is the analyte list complete?		
Are the test methods appropriate and approved?		
Is the laboratory required to be accredited?		
Is guidance provided on steps to follow in case things don't go as planned (scoping, sampling, analysis, data validation, etc.)?		
Is the plan in accordance with the DEQ Program QA Policy or Program QAPP?		
Can decisions be properly made if the Plan is followed as written?		

Part 2

Element	Y /N	Comments
A1. Problem Definition/Background		
Identifies regulatory information, applicable criteria, action limits, etc. necessary to the project		
Summarizes work to be performed, for example, measurements to be made, data files to be obtained, etc., that support the project goals		
A2. Quality Objectives and Criteria		

Element	Y /N	Comments
Identifies performance/measurement criteria for all information to be collected and acceptance criteria for information obtained from previous studies, including project action limits and laboratory detection limits, quality control types and frequency, range of anticipated concentrations of each parameter of interest		
Describes project-specific quality control sampling (matrix spikes, duplicates, blanks)		
B1. Sampling Process Design (Experimental Design)		
Describes and justifies design strategy, indicating size of the area, volume, or time period to be represented by a sample		
Details the type and total number of sample types/matrix or test runs/trials expected and needed		
Indicates where samples should be taken, how sites will be identified/located		
Specifies what information is critical and what is for informational purposes only		
Identifies sources of variability and how this variability should be reconciled with project information		
B2. Sampling Methods		
Indicates how each sample/matrix type should be collected		
Indicates how field instruments should be deployed and operated to avoid contamination and ensure maintenance of proper data		
Indicates how samples are to be homogenized, composited, split, or filtered, if needed		
Indicates what sample containers and sample volumes should be used		
Identifies whether samples should be preserved and indicates methods that should be followed		
Indicates whether sampling equipment and samplers should be cleaned and/or decontaminated, identifying how this should be done and by-products disposed of		

Element	Y /N	Comments
B3. Sample Handling and Custody		
States maximum holding times allowed from sample collection to extraction and/or analysis for each sample type and, for in-situ or continuous monitoring, the maximum time before retrieval of information		
Identifies how samples or information should be physically handled, transported, and then received and held in the laboratory or office (including temperature upon receipt)		
Identifies chain-of-custody procedures and includes form to track custody		
B4. Analytical Methods		
Identifies all analytical procedures/methods (field, laboratory and/or office) that should be followed indicating options or modifications to be taken, such as sub-sampling and extraction procedures		
Provides method validation information and SOPs for nonstandard methods (if applicable)		
B5. Quality Control		
Identifies QC activities and criteria which should be used for each type of sampling, analysis, or measurement technique; for example, blanks, spikes, duplicates, etc., and at what frequency (Field and Laboratory QC specific)		
C1. Assessments and Response Actions		
Lists the number, frequency, and type of assessment activities that should be conducted, with the approximate dates (e.g., site inspections, field assessments, etc.)		
D1. Data Review, Verification, and Validation		
Describes criteria that should be used for accepting, rejecting, or qualifying project data		
D2. Verification and Validation Methods		
Describes process for data verification and validation		
D3. Reconciliation with User Requirements		
Describes procedures to evaluate the uncertainty of the validated data		
Describes how limitations on data use should be reported to the data users		

Appendix D DEQ RISK BASED CONCENTRATIONS FOR DEVELOPMENT OF DQOs

DEQ Risk Based Concentrations (RBCs)

Year 2009 edition (available with hard copy version only) or most recent DEQ version can be found at http://www.deq.state.or.us/lq/pubs/docs/RBDMTable.pdf

Bioaccumulation Guidance in Sediments – April 2007

http://www.deq.state.or.us/lq/pubs/docs/cu/GuidanceAssessingBioaccumulative.pdf

Guidance for Ecological Risk Assessment: Levels I, II, III, IV

Soil, Sediment and Water SLVs are provided in Tables 1 and 2 for protection of ecological receptors

http://www.deq.state.or.us/lq/pubs/docs/cu/GuidanceEcologicalRisk.pdf

Please check the EPA web page for current information

http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm

Appendix E ESSENTIAL ELEMENTS OF LABORATORY QA PROGRAM

1. Laboratory Organization and Personnel

- 1.1 QA Policy and Objectives
- 1.2 QA Organization
- 1.3 Personnel Training and Qualifications

2. Facilities and Equipment

- 2.1 Facilities Description
- 2.2 Major Equipment Listing and Capabilities
- 2.3 Preventative Maintenance Procedures

3. Analytical Methodologies

- 3.1 Analytical Methods Employed
- 3.2 Detection Limits

4. Sample Custody

- 4.1 Chain-of-Custody Procedures
- 4.2 Sample Custodian and Sample Tracking
- 4.3 Sample Handling and Storage

5. Quality Control

- 5.1 QC Procedures and Frequency
  - 5.1.1 Method Blanks
  - 5.1.2 Laboratory Control Samples (spiked with all target analytes)
  - 5.1.3 Duplicates/Matrix Spike Duplicates
  - 5.1.4 Matrix Spikes (spiked with all target analytes)
- 5.2 Control Checks and Frequency
  - 5.2.1 Reference Material Analysis
  - 5.2.2 Performance Evaluations
  - 5.2.3 Internal Audits

6. Data Handling

- 6.1 Data handling, Reporting and Recordkeeping Procedures
- 6.2 Data Validation
  - 6.2.1 Instrument Tuning and Conditions
  - 6.2.2 Calibrations and Calibration Verifications
  - 6.2.3 Statistical Tests (e.g., tests to determine data points which are "outliers")

A checklist for the NELAC 2003 standard is available for reference purposes:

http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx

Appendix F ANALYTICAL REPORTING AND DATA VALIDATION REQUIREMENTS

I. INTRODUCTION

The DEQ Cleanup programs perform oversight of hazardous substances site investigations (e.g. PAs, SIs and RI/FSs) and cleanup actions (e.g. removal, remedial action or corrective action). These investigations may be undertaken by Potentially Responsible Parties (PRPs) through a Voluntary or DEQ-Enforcement process, or by DEQ and its contractors in the case of Orphan (sites where PRPs are unknown, unwilling or unable to conduct cleanup work), Dry Cleaner Program (industry response fund administered by DEQ), Brownfield (EPA grant funding), and LUST trust funded sites.

Studies are conducted under Consent Orders or Letter Agreements with PRPs or, in the case of DEQ funded sites, on a task assignment basis. The contractor Task Order defines the sampling and analysis methods to be employed. These Consent Orders and Task Orders specify the general requirements for sampling, analysis, and quality assurance. Work conducted for independent cleanups should meet the same level of data quality.

Each will require the preparation of a site-specific SAP[1] and, where applicable, a site-specific QAPP referencing the contractor's approved Laboratory QA Manual. One of the elements addressed in these QAPPs or SAPs is Data Reduction, Validation and Reporting. This appendix was written to establish uniform requirements for analytical data validation and reporting. They should be followed by all contractors, and should be referenced in the appropriate section of the QAPP.

The purpose of this appendix is to help ensure that legally defensible data which meets U.S. Environmental protection Agency (EPA) criteria, will be generated in cases where the full EPA contract Laboratory program (CLP) protocols are not followed. To facilitate review and audit of all QA/QC data generated values, these guidelines more precisely define requirements for storage (filing) of analytical raw data, field, and custody records, and QA/QC "non-reportables." This data should be available for auditing by DEQ personnel or their contractors, upon 30-days notice, for the prescribed life of the records.

II. LABORATORY REPORTING LEVEL

The analytical laboratory data required by site investigations must meet the general QA requirements for the Analytical Requirement (Section 3.3) Level III classification (this level of data quality is generally accepted as qualitative, quantitative and legally defensible). Each laboratory will perform internal data validation according to the LQAP. For each analytical parameter per batch, per matrix, the test results will be validated by recalculating at least 5 percent, selected on a random basis, and by the application of all other pertinent QA/QC criteria (blanks, duplicates, spikes, etc.). Split-samples may be included in some tasks at the discretion of the DEQ Project Manager.

The minimum QA/QC data to be included in each laboratory analysis report is defined below. The QA report should include any additional remarks about the validity (or quality) of the analytical data. The list of items to be reported includes:

1. Sample Data. Matrix, field identification number, lab identification number, date of sampling, date of extraction, and date of analysis should be specified for each piece data reported.
2. Parameter, result and test method identification.
3. Method reporting limits for each parameter. For most RBCs, laboratory reporting limits should not exceed one tenth (0.1) of their DEQ RBC without approval from DEQ Project Manager. If laboratory

[1] In some cases a site-specific work plan is sufficient.

cannot achieve one tenth of the RBC as a reporting level, then the laboratory must report to their method detection limit (MDL) and their MDL must be one tenth of RBC or approved by DEQ Project manager. **Note:** Laboratories should verify the validity of all MDLs after they are calculated to minimize the potential for false positive results. MDLs are often simply a statistical calculation based on the standard deviation of replicate analyses and may not reflect an achievable value.

4. Results of blanks (i.e., trip, equipment, and lab blanks).
5. Results of field duplicates identified as such.
6. Results of laboratory control data for replicates and spikes (and surrogate spikes). Calculated as Percent Relative Standard Deviations (%RSD) or replicates and Percent Recovery (%R) of spikes, and the control limits values utilized for each parameter/matrix.
7. Results of field spikes, if any, identified as such.
8. Copy of the chain of custody.

The above list, which applies to both inorganic and organic analysis, will ensure that the Project Managers are apprised of the quality level of the analytical data through each laboratory report. The validation of field data (pH, temperature, conductivity, etc.) and the storage requirements for these and the lab non-reportables are addressed in the following sections.

III. FIELD DATA VALIDATION

All field information should be recorded in sequentially numbered, bound notebooks, using non-erasable, waterproof ink. The notebook pages must themselves be sequentially numbered from one through the end. The use of standardized forms (e.g., Field Trip Approval form, Field-Sampling Request form, Field Data Sheet, Well-Sampling Data Log, Equipment, Calibration forms, etc.), is permitted, but these forms should be assembled prior to field use. The Field Sample Custody Record must also be kept in the project files along with the other notebooks and field documents. For archive purposes, a single project file divided by task and containing the above information, should be maintained by the contractor and/or PRP.

The field data validation process should evaluate the following items:
1. That properly-calibrated instruments have been used;
2. That appropriate Standard Operating Procedures (SOPs) have been followed; and
3. That accurate and complete records of field activities have been maintained.

Final validation of field data is conducted by the Project Managers or Task Managers.

IV. LABORATORY DATA VALIDATION

The in-house data validation process begins with the analyst at the bench-level and concludes with the Lab QA Officer, who is responsible for the 5-Percent Random Data Verification (Appendix D Section II of this policy). The list of laboratory reportables is also specified in Appendix D Section II. A list of "non-reportable" items is given below separately, for inorganic and organic parameters. These items are not required in routine reports however, they would be necessary for a full validation when requested (See Section V Third Party Validation.). Non-reportable data/records must be maintained by the laboratory (along with reportable data) organized by project/batch. Active files must be maintained for a period of at least one (1) year from data generation. Archived files must be maintained for the prescribed life of records specified in the DEQ Consent Order (if applicable) or for five (5) years, whichever is greater. Record retention should be specified in the site work plan or QA Plan. Laboratory QA Officers are often responsible for the completeness of these file; however, a laboratory may have this assigned to other responsible staff.

A. GENERAL NON-REPORTABLES

The following information must be included for each project and/or task:

1. Chronological Master List Of Laboratory Tracking Sample ID Numbers correlated with field sample ID numbers (per batch) and sample analysis batch identification to correlate QA/QC samples to the applicable analysis batch;

2. Copies of the Chain-Of-Custody Forms, signed by the field sampling representative and laboratory sample custodian; and

3. A Narrative Summary identifying any QA or sample problems encountered and the corrective actions taken (must be prepared for project QA reports).

B. INORGANIC PARAMETER NON-REPORTABLES

For analysis involving the use of Atomic Absorption (flame or furnace) Spectrometry (AAS), Inductively Coupled Plasma (ICP), Ion Chromatography (IC), light (visible and UV) spectrometry, other turbidimetric, gravimetric, and autoanalyzing procedures, the following data should be on file:

1. Calibration curve data, including calibration standard concentrations and statistical data (e.g., linear correlation coefficients) and quality control limits;
2. Results of batch applicable Continuing Calibration Verification Standards (CCVS), Percent Recovery (%R), and statistical control limits by concentration or %R;
3. Results of batch applicable Laboratory Control Samples (LCS) or QC check sample recovery results and statistical control limits by concentration or %R;
4. Results of method (lab control) blank analyses;
5. Results of Interference Check Sample (ICS) analysis and quality control limits (ICP only);
6. Results of Dilution Check Sample (DCS) analysis and Quality Control Limits (ICP only);
7. Results of lab replicates;
8. Results of lab matrix digestive spikes;
9. Sequential measurement readout records, digestion logos, and raw data calculation worksheets;
10. Sample preparation documentation, including sample weights and final volumes, spike additions, acid additions, digestion conditions, etc.; and
11. Standard preparation information.

C. ORGANIC PARAMETER NON-REPORTABLES

1. **Gas Chromatography (GC).** For analyses by GC, the following information/data should be on file where applicable:

   a. Initial calibration data and internal standard compounds used and their concentrations;

   b. Chromatograms for all samples, including confirmations, standards and QC samples (blanks, duplicates, spikes), all manual integrations must be identified in the raw data;

   c. Results of independent QC sample (EPA, A2LA, National Institute of Standards and Technology (NIST), etc.) analyses, compare with expected values, and percent recoveries;

   d. Results of Matrix Spikes (MS), Calculated Percent Recoveries, and statistical quality control limits by concentration or %R;

e. Results of MS Duplicates (MSD), Calculated Percent Recoveries, and Percent Relative Standard Deviation (%RSD) of the MS/MSD duplicates, and statistical quality control limits;

f. Results of laboratory duplicates, calculated %RSD and statistical quality control limits;

g. Results of surrogate spikes, %R and statistical quality control limits;

h. Sample preparation documentation – including sample weights and final volumes, spike additions, solvent additions, digestion conditions, etc.; and

i. Standard preparation information.

2. **Gas Chromatograph Mass Spectrometry (GCMS)**. For analysis by GCMS, the following information/data should be on file where applicable:

a. GCMS tuning and mass calibration summary for 4-bromofluorobenzene (BFB) and decafluorotriphenyl phosphine (DFTPP) tuning standard compounds indicating compliance with acceptance criteria;

b. Initial calibration data and internal standard compounds used and their concentrations;

c. The ability to reproduce from tape, all chromatograms and mass spectra for samples, standards, and QC samples (blanks, duplicates, spikes), with all manual integrations be identified in the raw data;

d. Results of continuing calibration standards System Performance Check Compounds (SPCC) and Calibration check Compounds (CCC) and quality control limits for these standards;

e. Response Factors (RFs) for all compounds at five (5) standard concentrations spanning the sample's concentration range and at least squares fit to determine linear variance;

f. Results of reagent water, extraction and field blank analyses;

g. Results of MS, calculated percent recoveries, and statistical quality control limits by concentration or %R;

h. Results of MSD, calculated percent recoveries, and %RSD, of the MS/MSD duplicates, and statistical quality control limits;

i. Results of laboratory duplicates, calculated %RSD, and statistical quality control limits;

j. Results of surrogate spikes, percent recoveries and statistical quality control limits; and finally,

k. Results of independent QC samples (EPA, NIST, commercially available, etc.), expected values, and percent recoveries;

l. Sample Preparation documentation – including sample weights and final volumes, spike additions, solvent additions, digestion conditions, etc.; and

m. Standard preparation information.

V Third Party Validation

When required by the project, full data validation should be performed in general accordance with EPA *National Functional Guidelines for Superfund Organic Methods Data Review* (USEPA-540-R-08-01, June 2008, http://www.epa.gov/superfund/programs/clp/download/somnfg.pdf) and *National Functional Guidelines for Inorganic Data Review* (EPA 540-R-04-004, October 2004, http://www.epa.gov/superfund/programs/clp/download/inorgfg10-08-04.pdf). The *Functional Guideline* documents are written specifically for use with CLP methods. If SW846 methods are used rather than CLP methods, the guidelines need to be adapted for SW846 methods and project specific QA/QC criteria but following the basic concepts that are established in the *Functional Guideline* documents. Applicable to projects that require Level IV analytical requirements as stated in Section 3.3 above.

Appendix G REVISION HISTORY

Revision	Date	Changes	Editor
	9/11/1990	Policy 760.00 first approved version	Michael Downs
	4/3/2001	Policy 760.00 Updated	
3.0	10/10/2011	Generally updated the document to reflect the consolidation of the Cleanup Program and to reference current method references. Many editorial edits throughout. 3.1 Clarified the use of work plans, QAPPs and SAPs. Also added references to available resources to aid in the preparation of work plans. 3.2 Updated References 3.3 Updated method references and added Ambient Air and Soil gas monitoring methods. 3.4 Added language to include Soil gas testing 3.4.2 Added language to use accredited laboratories or contractor must verify laboratory capabilities Appendix A Added list of definitions to acronyms Appendix D Clarified that QC spikes must include all target analytes.	SCH, ACD
4.0	7/31/2015	Updated document to reflect agency reorganization (Operations Division rather than Land Quality Division). Miscellaneous editorial changes and updated reference to the NELAP program. Added new Project Plan Quality Assurance Review Checklist.	SCH, ACD