INTEGRATED DISPOSAL FACILITY
APPENDIX DA
QUALITY ASSURANCE PROJECT PLAN
CHANGE CONTROL LOG

Change Control Logs ensure that changes to this unit are performed in a methodical, controlled, coordinated, and transparent manner. Each unit addendum will have its own change control log with a modification history table. The "**Modification Number**" represents Ecology's method for tracking the different versions of the permit. This log will serve as an up to date record of modifications and version history of the unit.

Modification History Table

Modification Date	Modification Number

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APPENDIX DA
QUALITY ASSURANCE PROJECT PLAN

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TERMS

DOE	U.S. Department of Energy
DQI	Data quality indicator
DUP	Laboratory sample duplicate~~Duplicate (laboratory)~~
DWMU	Dangerous waste management unit
EB	Equipment blank
ECO	Environmental Compliance Officer
EPA	U.S. Environmental Protection Agency
FSO	Field Sample Operations
FTB	Full trip blank
FWS	Field Work Supervisor
FXR	Field transfer blank
HEIS	Hanford Environmental Information System
~~LCS~~	~~Laboratory control sample~~
MB	Method blank
MS	Matrix spike
MSD	Matrix spike duplicate
QA	Quality assurance
QAPjP	Quality assurance project plan
QC	Quality control
SMR	Sample Management and Reporting
SPLIT	Field split
SUR	Surrogate
VOC	Volatile organic compound

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DA.1 INTRODUCTION

A quality assurance project plan (QAPjP) establishes the quality requirements for environmental data collection. This QAPjP~~t~~ includes planning, implementation, and assessment of sampling tasks, field measurements, laboratory analysis, and data review. This Appendix describes the applicable environmental data collection quality assurance (QA) elements for this groundwater monitoring plan. This QAPjP is intended to supplement Hanford Site QA requirements and the contractor's environmental QA program plan.

This QAPjP is divided into the following three~~four~~ sections that describe the quality requirements and controls applicable to the dangerous waste management unit (DWMU) groundwater monitoring activities:

- Section DA.2, Project Management.
- Section DA.3, Data Generation and Acquisition.
- Section DA.4, Data Review and Usability.
- ~~Section DA.5, References.~~

DA.2 PROJECT MANAGEMENT

This section addresses the management approaches planned, project goals, and planned documentation.

DA.2.1 Project/Task Organization

Project organization (regarding groundwater monitoring) is described in the following sections and illustrated in Figure DA-1. Titles used in the project organization are for the purposes of discussing the role of the individual in the performance of the work scope. Individuals with different titles but similar/equivalent positions may fulfill these roles.

DA.2.1.1 United States Department of Energy Manager

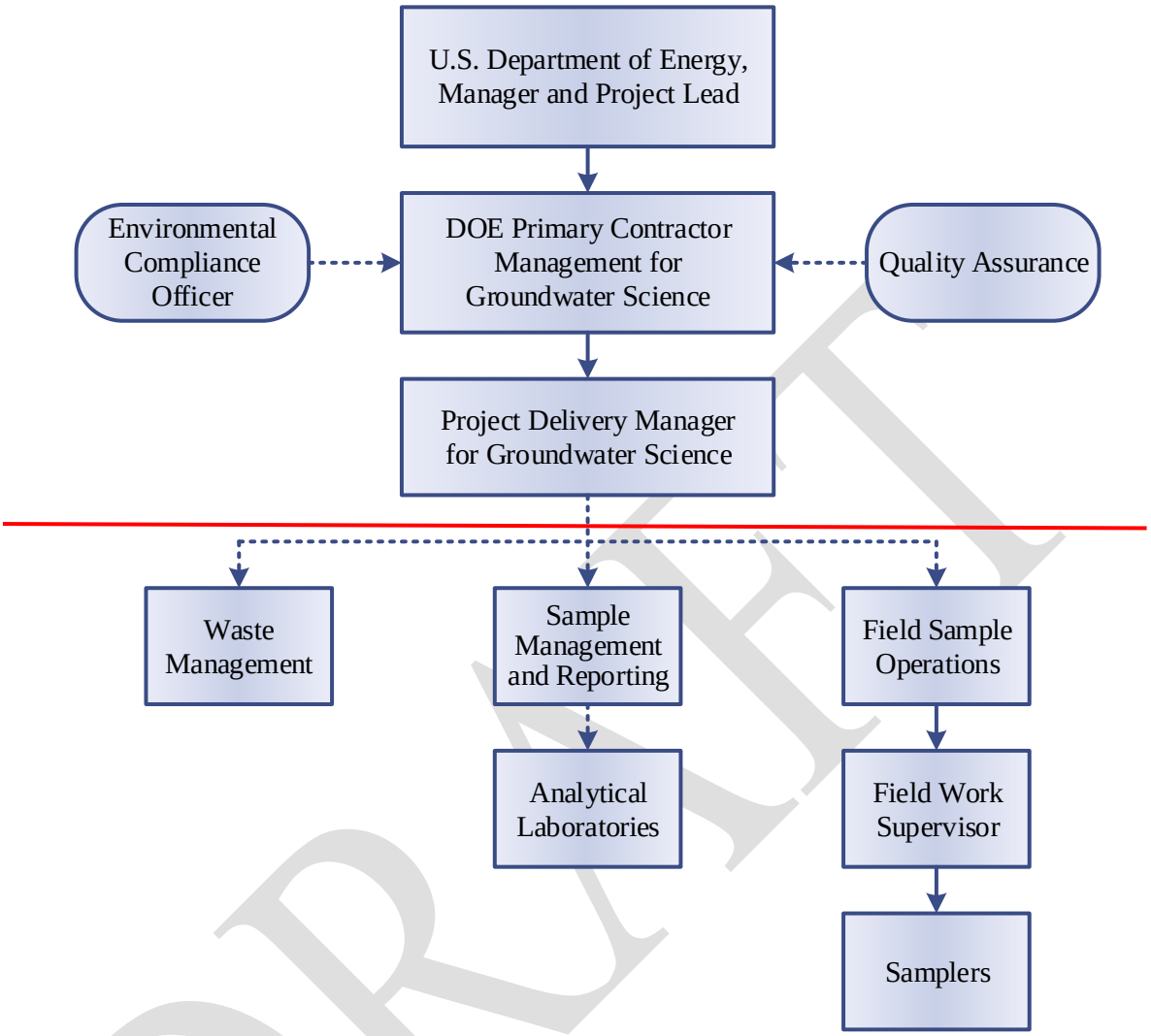
Hanford Site operation is the responsibility of the U.S. Department of Energy (DOE). The DOE Manager is responsible for authorizing the contractor to perform activities at the Hanford Site under the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*; *Resource Conservation and Recovery Act of 1976 (RCRA)*; *Atomic Energy Act of 1954*; and Ecology et al., 1989, *Hanford Federal Facility Agreement and Consent Order*.

DA.2.1.2 United States Department of Energy Project Lead

The DOE Project Lead is responsible for providing day-to-day oversight of the contractor's performance of the work scope, working with the contractor to identify and work through issues, and providing technical input to DOE management.

DA.2.1.3 United States Department of Energy Primeary~~ary~~ Contractor Management ~~for Groundwater Science~~

The DOE Primeary~~ary~~ Contractor Management ~~for Groundwater Science~~ provides oversight and coordinates with DOE in support of sampling and reporting activities. The DOE Primeary~~ary~~ Contractor Management ~~for Groundwater Science~~ also provides support to the Prime Contract Project ~~Delivery~~ Manager ~~for Groundwater Science~~ to ensure that work is performed safely and cost effectively.


U.S. Department of Energy, Manager and Project Lead
Environmental Compliance Officer
DOE Primary Contractor Management for Groundwater Science
Quality Assurance
Project Delivery Manager for Groundwater Science
Waste Management
Sample Management and Reporting
Field Sample Operations
Analytical Laboratories
Field Work Supervisor
Samplers

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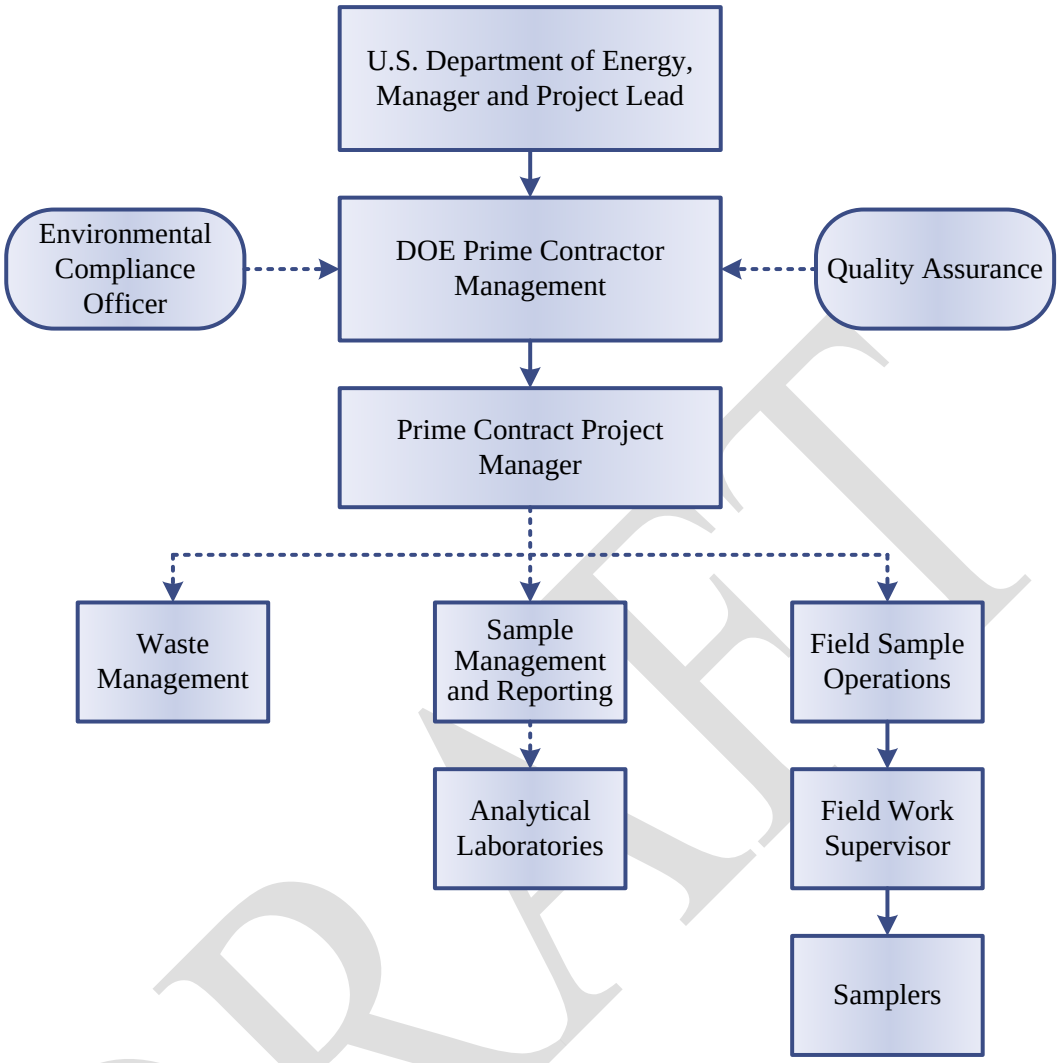

Figure DA-1 Project Organization

DA.2.1.4 Prime Contractor Project ~~Delivery~~ Manager ~~for Groundwater Science~~

The ~~Project Delivery~~ Prime Contractor Project Manager ~~for Groundwater Science~~ is responsible for direct management of activities performed to meet DWMU groundwater monitoring requirements. The Prime Contractor Project ~~Delivery~~ Manager ~~for Groundwater Science~~ coordinates with, and reports to~~,~~ DOE and DOE Prim~~eary~~ Contractor Management ~~for Groundwater Science~~ regarding DWMU groundwater monitoring requirements. The Prime Contractor Project ~~Delivery~~ Manager ~~for Groundwater Science~~ (or designee) works closely with the Environmental Compliance Officer (ECO), QA, and Sample Management and Reporting (SMR) group to integrate these and other technical disciplines in planning and implementing the work scope. The Prime Contractor Project ~~Delivery~~ Manager ~~for Groundwater Science~~ assigns staff to provide technical expertise.

DA.2.1.5 Sample Management and Reporting Group

The SMR group oversees off-site analytical laboratories, coordinates laboratory analytical work with this plan, and verifies that laboratories are qualified for performing Hanford Site analytical work. They generate field sampling documents, labels, and instructions for field sampling personnel and develop sample authorization forms~~, which~~ that provide information and instruction to the analytical laboratories.

The SMR group revises field sampling documents to reflect approved changes. This group's responsibilities include receiving analytical data from the laboratories, performing data entry into the Hanford Environmental Information System (HEIS) database, and arranging for data validation, and recordkeeping. The SMR group is responsible for resolving sample documentation deficiencies or issues associated with Field Sample Operations (FSO), laboratories, or other entities. They SMR group isare responsible for informing the Prime Contractor Project Delivery Manager for Groundwater Science (or designee) of any issues reported by the analytical laboratories.

DA.2.1.6 Field Sample Operations

FSO is responsible for planning and coordinating field sampling resources and provides the Field Work Supervisor (FWS) for routine groundwater sampling operations. The FWS directs the samplers who collect groundwater samples for this groundwater monitoring plan. Samplers collect samples, complete field logbooks, data forms, and chain-of-custody forms, including any shipping paperwork, and assist sample delivery to the analytical laboratory.

DA.2.1.7 Quality Assurance

The QA point of contact provides independent oversight, is responsible for addressing QA issues on the project, and overseeing implementation of the project QA program.

DA.2.1.8 Environmental Compliance Officer

ECOs provide technical oversight, direction, and acceptance of project and subcontracted environmental work, with the goal of minimizing adverse environmental impacts.

DA.2.1.9 Waste Management

Waste Management identifies waste management sampling/characterization activities for regulatory compliance and is responsible for data interpretation to determine waste designations and profiles. Waste Management communicates policies and practices for project compliance for waste storage, transportation, disposal, and tracking in a safe and cost-effective manner.

DA.2.1.10 Analytical Laboratories

The laboratories maintain custody and analyze samples in accordance with established quality systemsmethods and provide data packages containing sample and quality control (QC) results. As requested, Llaboratories provide explanations of results to support data review and resolve analytical issues.

DA.2.2 Problem Definition/Background

The purpose of this groundwater monitoring plan is to satisfy WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion for the Treatment, Storage, and Disposal of Dangerous Waste*, Part II, Condition II.F, which specifies groundwater monitoring under Washington Administrative Code (WAC) 173-303-645, Dangerous Waste Regulations, *Releases from regulated units*, for final status facilities. AdditionalMore specific information on the activities to satisfy these requirements and background information on monitoring is provided in the main text of this monitoring plan.

DA.2.3 Project/Task Description

The focus of this plan is to provide groundwater monitoring in accordance with WAC 173-303-645, evaluate the well network, and interpret analytical results. The constituents and parameters to be monitored, along with the monitoring wells and frequency of sampling, are provided in the main text of this monitoring plan. Information aboutan the collection and analyses of groundwater from the monitoring network is provided in this appendix and in Appendix DB.

DA.2.4 Quality Assurance Objectives and Criteria

The QA objective of this plan is the generation of analytical data of known and appropriate quality. In support of this objective, the process to assess data usability may include data verification, data validation, or a data quality indicator (DQI) evaluation. Principal DQIs are precision, accuracy, representativeness, comparability, completeness, bias, and sensitivity. These DQIs are defined for the purposes of this document in Table DA-1.

The applicable QC guidelines, DQI acceptance criteria, and levels of effort for assessing data quality are dictated by the intended use of the data and the requirements of the analytical method. The process to assess data usability is further discussed in Section DA.4.

DA.2.5 Documents and Records

The Prime Contractor Project ~~Delivery~~ Manager ~~for Groundwater Science~~ (or designee) is responsible for ensuring that the current version of the groundwater monitoring plan is used and providing any updates to field personnel. Actions to address potential updates to the groundwater monitoring plan are discussed in the main text.

Logbooks and data forms are used to document field activities. The logbooks are identified with a unique project name and number. Individuals responsible for the logbooks are identified in the front of the logbook, and only authorized individuals may make entries into the logbooks. Logbooks will be controlled documents. Data forms are also identified with a unique project name and number, may be used to record the same field information as logbooks, and are referenced in the logbooks.

The FWS, SMR group, and field crew supervisors are responsible for alignment of field instructions with the groundwater monitoring plan.

Convenience copies of laboratory analytical results are maintained in the HEIS database. Records may be stored in either electronic (e.g., in the managed records area of the Integrated Document Management System) or hardcopy format (e.g., DOE Records Holding Area). Records of analyses required by WAC 173-303-645(9) and groundwater surface elevations required by WAC 173-303-645(8) are to be maintained throughout the active life of a facility and post-closure care period (if any).

Groundwater monitoring results are reported annually~~in the Hanford Site groundwater monitoring report (e.g., DOE/RL-2017-66, *Hanford Site Groundwater Monitoring Report for 2017*~~.

DA.3 DATA GENERATION AND ACQUISITION

This section addresses data generation and acquisition so that the project's methods for sampling, measurement and analysis, data collection or generation, data handling, and QC activities are appropriate and documented. Instrument calibration and maintenance, supply inspections, and data management are also discussed.

DA.3.1 Analytical Method Requirements

Sample analytical methods are presented in Table DA-2. Equivalent ~~(e.g., U.S. Environmental Protection Agency [EPA] Method 300 and SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*, Third Edition; Final Update VI, Method 9056)~~ or updated ~~(e.g., updates to SW-846)~~ Washington State Department of Ecology-accredited methods may be substituted for the methods identified in Table DA-2. The updated methods will be able to achieve the practical quantitation limit identified in Table DA-2.

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Table DA-1 Data Quality Indicators

Data Quality Indicator (QC Element)[a]	Definition	Determination Methodologies	Possible Corrective Actions
Precision (field duplicates, laboratory sample duplicates, and matrix spike duplicates)	Precision measures the agreement among a set of replicate measurements. Field precision is assessed through the collection and analysis of field duplicates. Analytical precision is estimated by duplicate/replicate analyses, usually on laboratory control samples, spiked samples, and/or field samples. The most commonly used estimates of precision are the relative standard deviation and, when only two samples are available, the relative percent difference.	Use the same analytical instrument to make repeated analyses on the same sample. Use the same method to make repeated measurements of the same sample within a single laboratory. Acquire replicate field samples for information on sample acquisition, handling, shipping, storage, preparation, and analytical processes and measurements.	If duplicate data do not meet objective: • Evaluate apparent cause (e.g., sample heterogeneity). • Request reanalysis or remeasurement. • Qualify the data before use.
Accuracy (laboratory control samples, matrix spikes, and surrogates)	Accuracy is the closeness of a measured result to an accepted reference value. Accuracy is usually measured as a percent recovery. QC analyses used to measure accuracy include laboratory control samples, spiked samples, and surrogates.	Analyze a reference material or reanalyze a sample to which a material of known concentration or amount of pollutant has been added (a spiked sample).	If recovery does not meet objective: • Qualify the data before use. • Request reanalysis or remeasurement. • Determine if follow-up evaluation is needed. • Evaluate instrumentation and recalibrate, if necessary.

Table DA-1 Data Quality Indicators

Data Quality Indicator (QC Element)[a]	Definition	Determination Methodologies	Possible Corrective Actions
Representativeness (field duplicates)	Sample representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. It is dependent on the proper design of the sampling program and will be satisfied by ensuring that the approved plans were followed during sampling and analysis.	Evaluate whether measurements are made and physical samples collected in such a manner that the resulting data appropriately reflect the environment or condition being measured or studied.	If results are not representative of the system sampled: • Identify the reason for results not being representative. • Flag for further review. • Review data for usability. • If data are usable, qualify the data for limited use and define the portion of the system that the data represent. • If data are not usable, flag as appropriate. • Redefine sampling and measurement requirements and protocols. • Resample and reanalyze, as appropriate.
Comparability (field duplicate, field splits, laboratory control samples, matrix spikes, and matrix spike duplicates)	Comparability expresses the degree of confidence with which one data set can be compared to another. It is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the approved plans are followed and that proper sampling and analysis techniques are applied.	Use identical or similar sample collection and handling methods, sample preparation and analytical methods, holding times, and quality assurance protocols.	If data are not comparable to other data sets: • Identify appropriate changes to data collection and/or analysis methods. • Identify quantifiable bias, if applicable. • Qualify the data as appropriate. • Resample and/or reanalyze if needed. • Revise sampling/analysis protocols to ensure future comparability.

Table DA-1 Data Quality Indicators

Data Quality Indicator (QC Element)[a]	Definition	Determination Methodologies	Possible Corrective Actions
Completeness (no QC element; addressed in data usability assessment)	Completeness is a measure of the amount of valid data collected compared to the amount of data planned. Measurements are considered valid if they are unqualified or qualified as estimated data during validation. Field completeness is a measure of the number of samples collected versus the number of samples planned. Laboratory completeness is a measure of the number of valid measurements compared to the total number of measurements planned.	Compare the number of valid measurements completed (samples collected or samples analyzed) with those established by the project's quality criteria (data quality objectives or performance /acceptance criteria).	If data set does not meet the completeness objective: • Identify appropriate changes to data collection and/or analysis methods. • Identify quantifiable bias, if applicable. • Resample and/or reanalyze if needed. • Revise sampling/analysis protocols to ensure future completeness.
Bias (equipment blanks, field transfer blanks, full trip blanks, laboratory control samples, matrix spikes, and method blanks)	Bias is the systematic or persistent distortion of a measurement process that causes error in one direction (e.g., the sample measurement is consistently lower than the sample's true value). Bias can be introduced during sampling, analysis, and data evaluation. Analytical bias refers to deviation in one direction (i.e., high, low, or unknown) of the measured value from a known spiked amount.	Sampling bias may be revealed by analysis of replicate samples. Analytical bias may be assessed by comparing a measured value in a sample of known concentration to an accepted reference value or by determining the recovery of a known amount of contaminant spiked into a sample (matrix spike).	For sampling bias: • Properly select and use sampling tools. • Institute correct sampling and subsampling processes to limit preferential selection or loss of sample media. • Use sample handling processes, including proper sample preservation, that limit the loss or gain of constituents to the sample media. • Analytical data that are known to be affected by either sampling or analytical bias are flagged to indicate possible bias. • Laboratories that are known to generate biased data for a specific analyte are asked to correct their methods to remove the bias as practicable. Otherwise, samples are sent to other laboratories for analysis.

Table DA-1 Data Quality Indicators

Data Quality Indicator (QC Element)[a]	Definition	Determination Methodologies	Possible Corrective Actions
Sensitivity (method detection limit, practical quantitation limit, and relative percent difference)	Sensitivity is an instrument's or method's minimum concentration that can be reliably measured (i.e., instrument detection limit or limit of quantitation).	Determine the minimum concentration or attribute to be measured by an instrument (instrument detection limit) or by a laboratory (limit of quantitation). The lower limit of quantitationb is the lowest level that can be routinely quantified and reported by a laboratory.	If detection limits do not meet objective: • Request reanalysis or remeasurement using methods or analytical conditions that will meet required detection or limit of quantitation. • Qualify/reject the data before use.

Note: Based on SW-846 Compendium (July 2014). Available at: https://www.epa.gov/hw-sw846/sw-846-compendium.

[a]Acceptance criteria for QC elements are provided in Table DA-4.

[b]For purposes of this groundwater monitoring plan, the lower limit of quantitation is interchangeable with the practical quantitation limit.

QC = Quality Control

1

Table DA-2 Analytical Methods for Integrated Disposal Facility Constituents

CAS Number	Waste Constituent (Alternate Name)	Analytical Method[a]	PQL ~~ractical Quantitation Limit~~ (µg/L)
~~Wet~~General Chemistry			
ALKALINITY	Alkalinity, total as CaCO3	310.1, Standard Method 2320, Standard Methods 4500	5250
57-12-5	Cyanide (total)	335.4, 9012, 9014, Standard Method 4500	15.75
57-12-5[~~b~~]	Cyanide (free)	9014	4
18496-25-8	Sulfide (total)	376.1, Standard Methods 4500S	2100
Anions[b]			
16887-00-6	Chloride	300, 9056	400
14797-55-8	Nitrate, as NO3	300, 9056	525
14808-79-8	Sulfate	300, 9056	1050
Field Measurements			
--	pH	150.1, 9040, Standard Methods 4500 H+	N/A
--	Dissolved oxygen	360.1, Standard Methods 4500 O	N/A
--	Specific conductance	120.1, 9050, Standard Methods 2520 B-97	N/A
--	Temperature	170.1	N/A
--	Turbidity	180.1, Standard Methods 2130 B	N/A
Metals			
7440-36-0	Antimony	6020	5.25
7440-38-2	Arsenic	6020	10.5
7440-39-3	Barium	6020	5.25
7440-41-7	Beryllium	6020	1.05
7440-43-9	Cadmium	6020	2.1
7440-70-2	Calcium	6010	1050
7440-47-3	Chromium	6020	10.5
7440-48-4	Cobalt	6020	5.25
7440-50-8	Copper	6020	~~12.6~~10
7439-89-6[c]	Iron	6010	105
7439-92-1	Lead	6020	3.15
7439-95-4	Magnesium	6010	1050
7439-96-5[c]	Manganese	6020	~~5.25~~10.5

Table DA-2 Analytical Methods for Integrated Disposal Facility Constituents

CAS Number	Waste Constituent (Alternate Name)	Analytical Method[a]	PQL ~~ractical Quantitation Limit~~ (µg/L)
7439-97-6	Mercury	7470	0.5
7439-98-7[c]	Molybdenum	6020	5.25
7440-02-0	Nickel	6020	21
7440-09-7	Potassium	6010	5250
7782-49-2	Selenium	6020	~~10.5~~9.5
7440-22-4	Silver	6020	5.25
7440-23-5	Sodium	6010	1050
7440-28-0	Thallium	6020	2.1
7440-31-5	Tin	6020	10.5
7440-62-2	Vanadium	6010	52.5
7440-66-6	Zinc	6010	21
Volatile Organic Compounds			
75-34-3	1,1-Dichloroethane	8260	10
75-35-4	1,1-Dichloroethene (1,1-Dichloroethylene)	8260	10
71-55-6	1,1,1-Trichloroethane	8260	5
630-20-6	1,1,1,2-Tetrachloroethane	8260	2.1
79-00-5	1,1,2-Trichloroethane	8260	5
79-34-5	1,1,2,2-Tetrachloroethane	8260	5
96-12-8	1,2-Dibromo-3-chloropropane	8260	5.25
106-93-4	1,2-Dibromoethane (Ethylene dibromide [EDB])	8260	5
107-06-2	1,2-Dichloroethane	8260	5
78-87-5	1,2-Dichloropropane	8260	5
156-60-5	trans-1,2-Dichloroethylene	8260	5
96-18-4	1,2,3-Trichloropropane	8260	5
10061-01-5	cis-1,3-Dichloropropene	8260	5
10061-02-6	trans-1,3-Dichloropropene	8260	5
110-57-6	trans-1,4-Dichloro-2-butene	8260	50
78-93-3	2-Butanone (Methyl ethyl ketone [MEK])	8260	10.5
67-64-1	2-Propanone (Acetone)	8260	20
591-78-6	2-Hexanone (Methyl butyl ketone [MBK])	8260	20

Table DA-2 Analytical Methods for Integrated Disposal Facility Constituents

CAS Number	Waste Constituent (Alternate Name)	Analytical Method[a]	PQL ~~ractical Quantitation Limit~~ (µg/L)
108-10-1	4-Methyl-2-Pentanone (Methyl isobutyl ketone [MIBK])	8260	10.5
75-05-8	Acetonitrile (Methyl cyanide)	8260	100
107-02-8	Acrolein	8260	100
107-13-1	Acrylonitrile	8260	100
107-05-1	Allyl chloride	8260	10.5
71-43-2	Benzene	8260	5
75-27-4	Bromodichloromethane	8260	5
75-25-2	Bromoform	8260	5
75-15-0	Carbon disulfide	8260	~~10.5~~5
56-23-5	Carbon tetrachloride	8260	3
108-90-7	Chlorobenzene	8260	5
75-00-3	Chloroethane	8260	10
67-66-3	Chloroform	8260	5
126-99-8	Chloroprene (chloro-1,3-butadiene; 2-)	8260	10
124-48-1	Dibromochloromethane	8260	5
106-46-7	P-Dichlorobenzene (1,4-Dichlorobenzene)	8260	4
75-71-8	Dichlorodifluoromethane	8260	10
141-78-6	Ethyl acetate	8260	5000
100-41-4	Ethylbenzene	8260	4
60-29-7	Ethyl ether (Diethyl ether)	8260	5
97-63-2	Ethyl Methacrylate	8260	10.5
78-83-1	Isobutanol (Isobutyl alcohol)	8260	500
126-98-7	Methacrylonitrile (2-propenenitrile, 2-methyl-)	8260	10.5
74-83-9	Methyl bromide (Bromomethane)	8260	10
74-87-3	Methyl chloride (Chloromethane)	8260	10
74-88-4	Methyl iodide (Iodomethane)	8260	10.5

Table DA-2 Analytical Methods for Integrated Disposal Facility Constituents

CAS Number	Waste Constituent (Alternate Name)	Analytical Method[a]	PQL ~~ractical Quantitation Limit~~ (µg/L)
80-62-6	Methyl methacrylate (2-Propenoic acid, 2-methyl-, methyl ester)	8260	10.5
74-95-3	Methylene bromide (Dibromomethane)	8260	10
75-09-2	Methylene chloride (Dichloromethane)	8260	5.25
71-36-3	n-Butyl alcohol (1-Butanol)	8260	262.5
107-12-0	Propionitrile (Ethyl cyanide)	8260	21
100-42-5	Styrene	8260	5
127-18-4	Tetrachloroethene (Tetrachloroethylene;~~,~~ ~~p~~Perchloroethylene)	8260	5
108-88-3	Toluene	8260	5
79-01-6	Trichloroethylene (Trichloroethene [TCE])	8260	2.1
75-69-4	Trichlorofluoromethane	8260	10
108-05-4	Vinyl acetate	8260	50
75-01-4	Vinyl chloride (Chloroethene, chloroethylene)	8260	~~2.1~~10
1330-20-7	Xylene (Total)(Mixed isomers)	8260	10
Semivolatile Organic Compounds			
134-32-7	1-Naphthylamine	8270	25
95-50-1	1,2-Dichlorobenzene (o-Dichlorobenzene)	8270	10.5
120-82-1	1,2,4-Trichlorobenzene	8270	13
95-94-3	1,2,4,5-Tetrachlorobenzene	8270	20
123-91-1	1,4-Dioxane (1,4-Diethylene dioxide)	8270	21
130-15-4	1,4-Naphthoquinone	8270	52.5
53-96-3	2-Acetylaminofluorene	8270	~~100~~105
91-58-7	2-Chloronaphthalene (Beta-chloronaphthalene)	8270	10.5
95-57-8	2-Chlorophenol	8270	10.5
95-48-7	2-Methylphenol (o-Cresol)	8270	10.5
91-57-6	2-Methylnaphthalene	8270	10.5

Table DA-2 Analytical Methods for Integrated Disposal Facility Constituents

CAS Number	Waste Constituent (Alternate Name)	Analytical Method[a]	PQL ~~ractical Quantitation Limit~~ (µg/L)
91-59-8	2-Naphthylamine	8270	10.5
88-75-5	2-Nitrophenol (o-Nitrophenol)	8270	10.5
109-06-8	2-Picoline	8270	21
58-90-2	2,3,4,6-Tetrachlorophenol	8270	52.5
120-83-2	2,4-Dichlorophenol	8270	10.5
105-67-9	2,4-Dimethylphenol (2,4-Xylenol)	8270	10.5
51-28-5	2,4-Dinitrophenol	8270	~~50~~52.5
121-14-2	2,4-Dinitrotoluene	8270	10.5
95-95-4	2,4,5-Trichlorophenol	8270	10.5
88-06-2	2,4,6-Trichlorophenol	8270	10.5
87-65-0	2,6-Dichlorophenol	8270	10.5
606-20-2	2,6-Dinitrotoluene	8270	10.5
56-49-5	3-Methylcholanthrene	8270	21
108-39-4[d]	3-Methylphenol (m-Cresol)	8270	--
106-44-5[d]	4-Methylphenol (p-Cresol)	8270	--
91-94-1	3,3′-Dichlorobenzidine	8270	~~52.5~~105
119-93-7	3,3′-Dimethylbenzidine	8270	50
92-67-1	4-Aminobiphenyl	8270	52.5
101-55-3	4-Bromophenyl phenyl ether	8270	10.5
59-50-7	4-Chloro-3-methylphenol (p-Chloro-m-cresol)	8270	10.5
7005-72-3	4-Chlorophenyl phenyl ether	8270	10.5
56-57-5	4-Nitroquinoline 1-oxide	8270	105
534-52-1	4,6-Dinitro-O-cresol (4,6-Dinitro-2-methyl phenol)	8270	52.5
99-55-8	5-Nitro-o-toluidine (methyl-5-nitroaniline; 2-)	8270	21
57-97-6	7,12-Dimethylbenz[a]anthracene	8270	21
83-32-9	Acenaphthene	8270	10.5
208-96-8	Acenaphthylene	8270	10.5
98-86-2	Acetophenone	8270	10.5
62-53-3	Aniline	8270	10.5

Table DA-2 Analytical Methods for Integrated Disposal Facility Constituents

CAS Number	Waste Constituent (Alternate Name)	Analytical Method[a]	PQL ~~ractical Quantitation Limit~~ (µg/L)
120-12-7	Anthracene	8270	10.5
140-57-8	Aramite	8270	20
56-55-3	Benz[a]anthracene (Benzo[a]anthracene)	8270	10.5
205-99-2	Benz[e]acephenanthrylene (Benzo[b]fluoranthene)	8270	10.5
207-08-9	Benzo[k]fluoranthene	8270	10.5
191-24-2	Benzo[ghi]perylene	8270	10.5
50-32-8	Benzo[a]pyrene	8270	10.5
100-51-6	Benzyl ~~A~~alcohol	8270	10.5
111-91-1	Bis(2-chloroethoxy)methane	8270	10.5
111-44-4	Bis(2-chloroethyl)ether	8270	10.5
108-60-1	Bis(2-chloro-1-methylethyl)ether (2,2'-Oxybis[1-chloropropane])	8270	10.5
117-81-7	Bis(2-ethylhexyl)phthalate	8270	~~10.5~~15.7
85-68-7	Butyl benzyl phthalate (Benzyl butyl phthalate)	8270	10.5
106-47-8	p-Chloroaniline (4-Chloroaniline)	8270	10.5
218-01-9	Chrysene	8270	10.5
53-70-3	Dibenz[a,h]anthracene (Dibenz~~n~~anthracene, 1,2,5,6-)	8270	10.5
132-64-9	Dibenzofuran	8270	10.5
541-73-1	m-Dichlorobenzene (1,3-Dichlorobenzene)	8270	10.5
84-66-2	Diethyl phthalate	8270	10.5
297-97-2	O,O-Diethyl O-2-pyrazinyl phosphorothioate (Thionazin)	8270	52.5
60-11-7	p-(Dimethylamino)azobenzene	8270	21
122-09-8	alpha, alpha-Dimethylphenethylamine	8270	52.5
131-11-3	Dimethyl phthalate	8270	10.5
84-74-2	Di-n-butylphthalate (Dibutyl ~~P~~phthalate)	8270	10.5
99-65-0	m-Dinitrobenzene (1,3-Dinitrobenzene)	8270	10.5
117-84-0	Di-n-octylphthalate	8270	10.5

Table DA-2 Analytical Methods for Integrated Disposal Facility Constituents

CAS Number	Waste Constituent (Alternate Name)	Analytical Method[a]	PQL ~~ractical Quantitation Limit~~ (µg/L)
122-39-4	Diphenylamine	8270	10.5
62-50-0	Ethyl methanesulfonate	8270	10.5
206-44-0	Fluoranthene	8270	10.5
86-73-7	9H-Fluorene (Fluorene)	8270	10.5
118-74-1	Hexachlorobenzene	8270	10.5
87-68-3	Hexachlorobutadiene	8270	10.5
77-47-4	Hexachlorocyclopentadiene	8270	10.5
67-72-1	Hexachloroethane	8270	10.5
70-30-4	Hexachlorophene	8270	525
1888-71-7	Hexachloropropene	8270	105
193-39-5	Indeno(1,2,3-~~C~~cd)~~P~~pyrene	8270	10.5
78-59-1	Isophorone	8270	10.5
120-58-1	Isosafrole	8270	21
91-80-5	Methapyrilene	8270	52.5
66-27-3	Methyl methanesulfonate	8270	10.5
91-20-3	Naphthalene	8270	10.5
98-95-3	Nitrobenzene	8270	10.5
88-74-4	o-Nitroaniline (2-Nitroaniline)	8270	21
99-09-2	m-Nitroaniline (3-Nitroaniline)	8270	21
100-01-6	p-Nitroaniline (4-Nitroaniline)	8270	21
100-02-7	p-Nitrophenol (4-Nitrophenol)	8270	21
924-16-3	~~N~~n-Nitrosodi-n-butylamine	8270	10.5
55-18-5	~~N~~n-Nitrosodiethylamine	8270	10.5
62-75-9	~~N~~n-Nitrosodimethylamine (Dimethyl nitrosamine)	8270	10.5
86-30-6~~ed~~	~~N~~n-Nitrosodiphenylamine	8270	--
621-64-7	n-Nitroso-di-n-dipropylamine (~~N~~n-Nitrosodipropylamine; Di-n-propylnitrosamine)	8270	10.5
10595-95-6	~~N~~n-Nitrosomethylethalamine (Ethanamine, ~~N~~n-methyl-~~N~~n-nitroso-)	8270	10.5

Table DA-2 Analytical Methods for Integrated Disposal Facility Constituents

CAS Number	Waste Constituent (Alternate Name)	Analytical Method[a]	PQL ~~ractical Quantitation Limit~~ (µg/L)
59-89-2	n-Nitrosomorpholine	8270	10.5
100-75-4	~~N~~n-Nitrosopiperidine	8270	10.5
930-55-2	~~N~~n-Nitrosopyrrolidine	8270	10.5
608-93-5	Pentachlorobenzene	8270	10.5
76-01-7	Pentachloroethane	8270	52.5
82-68-8	Pentachloronitrobenzene	8270	52.5
87-86-5	Pentachlorophenol	8270	52.5
62-44-2	Phenacetin	8270	21
85-01-8	Phenanthrene	8270	10.5
108-95-2	Phenol	8270	10.5
106-50-3	p-Phenylenediamine	8270	525
129-00-0	Pyrene	8270	10.5
110-86-1	Pyridine	8270	21
94-59-7	Safrole	8270	21
3689-24-5	Tetraethyl dithiopyrophosphate (Sulfotep~~p~~)	8270	50
95-53-4	o-Toluidine (~~m~~Methylaniline; 2-)	8270	20
126-68-1	O,O,O-Triethyl phosphorothioate	8270	52.5
99-35-4	sym-Trinitrobenzene (T~~t~~rinitrobenzene; 1,3,5-)	8270	52.5
Polychlorinated Biphenyls			
12674-11-2	Aroclor 1016	8082	1.05
11104-28-2	Aroclor 1221	8082	1.05
11141-16-5	Aroclor 1232	8082	1.05
53469-21-9	Aroclor 1242	8082	1.05
12672-29-6	Aroclor 1248	8082	1.05
11097-69-1	Aroclor 1254	8082	1.05
11096-82-5	Aroclor 1260	8082	1.05
Herbicides			
94-75-7	2,4-D (2,4-Dichlorophenoxy acetic acid)	8151	20
93-76-5	2,4,5-T (2,4,5-Trichlorophenoxyacetic acid)	8151	1.05
2303-16-4	Diallate	8270	21

Table DA-2 Analytical Methods for Integrated Disposal Facility Constituents

CAS Number	Waste Constituent (Alternate Name)	Analytical Method[a]	PQL ~~ractical Quantitation Limit~~ (µg/L)
88-85-7	Dinoseb (2-sec-Butyl-4,6-dinitrophenol)	8270	21
23950-58-5	Pronamide	8270	21
93-72-1	Silvex (2,4,5-TP)	8151	1.05
Pesticides			
72-54-8	4,4′-DDD	8081	0.1
72-55-9	4,4′-DDE	8081	0.1
50-29-3	4,4′-DDT	8081	0.1
309-00-2	Aldrin	8081	0.0525
319-84-6	alpha-BHC (Hexachlorocyclohexane; alpha)	8081	0.0525
319-85-7	beta-BHC (Hexachlorocyclohexane; beta-)	8081	0.0525
319-86-8	delta-BHC (Hexachlorocyclohexane; delta-)	8081	0.0525
58-89-9	gamma-BHC (Lindane; Hexachlorocyclohexane)	8081	0.0525
57-74-9	Chlordane	8081	1.05
510-15-6	Chlorobenzilate	8270	10.5
60-57-1	Dieldrin	8081	0.0525
60-51-5	Dimethoate	8270	21
298-04-4	Disulfoton	8270	52.5
959-98-8	Endosulfan I	8081	0.0525
33213-65-9	Endosulfan II	8081	0.1
1031-07-8	Endosulfan sulfate	8081	0.1
72-20-8	Endrin	8081	0.1
7421-93-4	Endrin aldehyde	8081	0.1
52-85-7	Famphur	8270	105
76-44-8	Heptachlor	8081	0.0525
1024-57-3	Heptachlor epoxide	8081	0.0525
465-73-6	Isodrin	8270	10.5
143-50-0	Kepone	8270	100
72-43-5	Methoxychlor	8081	0.5

Table DA-2 Analytical Methods for Integrated Disposal Facility Constituents

CAS Number	Waste Constituent (Alternate Name)	Analytical Method[a]	PQL ~~ractical Quantitation Limit~~ (µg/L)
298-00-0	Methyl parathion (O,O-Dimethyl O-P-nitrophenyl, phosphorothioate)	8270	10.5
56-38-2	Parathion	8270	52.5
298-02-2	Phorate (Phosphorodithioic acid, O,O-diethyl S-(ethylthio) methyl ester)	8270	52.5
8001-35-2	Toxaphene	8081	2.625
Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans (Totals and Congeners)			
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzodioxin	8290	5.25E-05
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran	8290	5.25E-05
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran	8290	5.25E-05
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran	8290	5.25E-05
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	8290	5.25E-05
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran	8290	5.25E-05
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	8290	5.25E-05
72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran	8290	5.25E-05
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	8290	5.25E-05
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran	8290	5.25E-05
40321-76-4	1,2,3,7,8-Pentachlorodibenzo-p-dioxin	8290	5.25E-05
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran	8290	5.25E-05
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran	8290	5.25E-05
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran	8290	1.05E-05
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin	8290	1.05E-05
38998-75-3	Total Heptachlorodibenzofurans	8290	5.37E-05

Table DA-2 Analytical Methods for Integrated Disposal Facility Constituents

CAS Number	Waste Constituent (Alternate Name)	Analytical Method[a]	PQL ~~ractical Quantitation Limit~~ (µg/L)
37871-00-4	Total Heptachlorodibenzo-p-dioxins	8290	5.25E-05
55684-94-1	Total Hexachlorodibenzofurans	8290	5.25E-05
34465-46-8	Total Hexachlorodibenzo-p-dioxins	8290	1.05E-04
39001-02-0	Total Octachlorodibenzofurans	8290	1.05E-04
3268-87-9	Total Octachlorodibenzo-p-dioxins	8290	1.07E-04
30402-15-4	Total Pentachlorodibenzofurans	8290	5.25E-05
36088-22-9	Total Pentachlorodibenzo-p-dioxins	8290	5.25E-05
55722-27-5	Total Tetrachlorodibenzofurans	8290	1.05E-05

[a]For EPA Methods ~~120.1, 150.1, 170.1,~~ 180.1, 300, and 335.4~~360.1~~, see EPA/600/R-93/100, *Methods for the Determination of Inorganic Substances in Environmental Samples*. For EPA Method 120.1, 150.1, 170.1, 310.1, 360.1, and 376.1, see EPA/600/4-79/020, *Methods for Chemical Analysis of Water and Wastes*. For four-digit EPA methods, see SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*, ~~Third Edition; Final Update VI~~Compendium. For Standard Methods, see APHA/AWWA/WEF, ~~2012,~~ *Standard Methods for the Examination of Water and Wastewater*. ~~For EPA Method 1650, see EPA 1997, *Method 1650 Adsorbable Organic Halides by Adsorption and Coulometric Titration.*~~

~~[b]Analyzed and reported as free cyanide.~~

~~[c]Analyzed and reported for corrosion product information only; not included in statistical evaluations.~~

[b~~d~~]Dilutions for certain ion chromatography constituents may be necessary, potentially raising the PQL above the limits provided. ~~Analyzed and reported as 3 & 4 Methylphenol (CAS Number 65794-96-9). PQL for 3 & 4 Methylphenol is 20 µg/L.~~

[c]Analyzed and reported as 3 & 4 methylphenol (CAS Number 65794-96-9). PQL for 3 & 4 methylphenol is 20 µg/L.

[e~~d~~]Analyzed and reported as d~~D~~iphenylamine+n~~N~~-n~~N~~itrosodiphenylamine. PQL for d~~D~~iphenylamine+n~~N~~-n~~N~~itrosodiphenylamine is 10.5 µg/L.

CAS = Chemical Abstracts Service

EPA = U.S. Environmental Protection Agency

N/A = Not applicable

PQL = Practical quantitation limit

DA.3.2 Field Analytical Methods

Field screening and survey data will be measured in accordance with applicable work practices. Field analytical methods may also be performed in accordance with manufacturer manuals. Appendix DB provides further discussion on field measurements.

DA.3.3 Quality Control

Field QC samples will be collected to evaluate the potential for cross-contamination and to provide information pertinent to sampling variability. Laboratory QC samples estimate the precision, bias, and matrix effects on the analytical data. Field and laboratory QC samples, and their typical frequencies, are summarized in Table DA-3. Acceptance criteria for field and laboratory QC are shown in Table DA-4. Data will be qualified and flagged in the HEIS database, as appropriate.

Table DA-3 Quality Control Samples

Sample Type	Frequency	Characteristics Evaluated
Field QC		
Equipment blanks	~~As needed~~ ~~If only disposable equipment is used or equipment is dedicated to a particular well, then an equipment blank is not required; otherwise,~~ 1 ~~for every~~in 20 samples when nondedicated equipment is used[a]	Contamination from nondedicated sampling equipment
Field duplicates	1 in 20 well trips[b]	Reproducibility/sampling precision
Field splits	As needed ~~When needed, the minimum is one for every analytical method, for analyses performed~~	Interlaboratory comparability
Field transfer blanks	One each day VOCs are sampled; additional field transfer blanks are collected if VOC samples are acquired on the same day for multiple laboratories	Contamination from sampling site
Full trip blanks	1 in 20 well trips[b]	Contamination from containers preservative reagents, storage, or transportation
Analytical QC[c]		
Laboratory control samples	One per analytical batch[d]	Method accuracy
Laboratory sample duplicates	One per analytical batch[d]	Laboratory reproducibility and precision
Matrix spikes	One per analytical batch[d]	Matrix effect/laboratory accuracy
Matrix spike duplicates	One per analytical batch[d]	Laboratory reproducibility, and method accuracy and precision
Method blanks	One per analytical batch[d]	Laboratory contamination
Surrogates	Added to each sample and QC sample	Recovery/yield for organic compounds

Note: ~~The information in this table does not create Washington State Department of Ecology or Hanford Sitewide Permit requirements; it is intended solely as guidance.~~

[a]For portable pumps, equipment blanks are collected ~~(~~1 for every 20~~10~~ well trips~~)~~. Whenever a new type of nondedicated equipment is used, an equipment blank will be collected each time sampling occurs until it can be shown that less frequent collection of equipment blanks is adequate to monitor the decontamination methods for the nondedicated equipment.

[b]A "well trip" is defined as any time a well is accessed for sampling. ~~For groundwater monitoring, f~~Field duplicates and full trip blanks are run at a frequency of 1 in 20 well trips (i.e., 5% of the well trips) for all groundwater monitoring wells sampled within any given month (~~not just those restricted to a single treatment, storage, and disposal unit~~for all groundwater monitoring programs). ~~For example, if a month has 181 wells scheduled, then 10 field duplicates will be collected.~~

[c]A batch is a group of up to 20 samples that behave similarly with respect to the sampling or testing procedures being employed and that are processed as a unit. Batching across projects is allowed for similar matrices (e.g., Hanford Site groundwater).

[d]Unless not required by, or different frequency is called out, in laboratory analysis method.

QC = Quality control

VOC = Volatile organic compound

Table DA-4 Field and Laboratory Quality Control Elements and Acceptance Criteria

Analyte[a]	Quality Control Element	Acceptance Criteria	Corrective Action
Wet Chemistry			
Alkalinity	MB	<MDL or <5% sample concentration	Flag with "C"
	LCS	80% to 120% recovery	Flag with "o"[b]
	DUP[c] or MS/MSD[d]	≤20% RPD	Review data[e]
	MS/MSD[d]	75% to 125% recovery	Flag with "N"
	EB, FTB	<MDL or <5% sample concentration	Flag with "Q"
	Field duplicate[c]	≤20% RPD	Review data[e]
Cyanide (free and total)	MB	<MDL or <5% sSample concentration	Flag with "C"
	LCS	80% to 120% rRecovery	Flag with "o"[b]
	DUP[c] or MS/MSD[d]	≤20% RPD	Review data[e]
	MS/MSD[d]	75% to 125% rRecovery	Flag with "N"
	EB, FTB	<MDL or <5% sSample concentration	Flag with "Q"
	Field duplicate[c]	≤20% RPD	Review data[e]
Sulfide	MB	<MDL or <5% sSample concentration	Flag with "C"
	LCS	80% to 120% rRecovery	Flag with "o"[b]
	DUP[c] or MS/MSD[d]	≤20% RPD	Review data[e]
	MS/MSD[d]	75% to 125% rRecovery	Flag with "N"
	EB, FTB	<MDL or <5% sSample concentration	Flag with "Q"
	Field duplicate[c]	≤20% RPD	Review data[e]
Anions			
Anions by ion chromatography	MB	<MDL or <5% sample concentration	Flag with "C"
	LCS	80% to 120% recovery	Flag with "o"[b]
	DUP[c] or MS/MSD[d]	≤20% RPD	Review data[e]
	MS/MSD[d]	75% to 125% recovery	Flag with "N"
	EB, FTB	<MDL or <5% sample concentration	Flag with "Q"
	Field duplicate[c]	≤20% RPD	Review data[e]

Table DA-4 Field and Laboratory Quality Control Elements and Acceptance Criteria

Analyte[a]	Quality Control Element	Acceptance Criteria	Corrective Action
Metals			
Metals by inductively coupled plasma/atomic emission spectrometry	MB	<MDL or <5% sSample concentration	Flag with "C"
	LCS	80% to 120% rRecovery	Flag with "o"[b]
	DUP[c] or MS/MSD[d]	≤20% RPD	Review data[e]
	MS/MSD[d]	75% to 125% rRecovery	Flag with "N"
	EB, FTB	<MDL or <5% sSample concentration	Flag with "Q"
	Field duplicate[c]	≤20% RPD	Review data[e]
Metals by inductively coupled plasma/mass spectrometry	MB	<MDL or <5% sSample concentration	Flag with "C"
	LCS	80% to 120% rRecovery	Flag with "o"[b]
	DUP[c] or MS/MSD[d]	≤20% RPD	Review data[e]
	MS/MSD[d]	75% to 125% rRecovery	Flag with "N"
	EB, FTB	<MDL or <5% sSample concentration	Flag with "Q"
	Field duplicate[c]	≤20% RPD	Review data[e]
Mercury by cold-vapor atomic absorption	MB	<MDL or <5% sSample concentration	Flag with "C"
	LCS	80% to 120% rRecovery	Flag with "o"[b]
	DUP[c] or MS/MSD[d]	≤20% RPD	Review data[e]
	MS/MSD[d]	75% to 125% rRecovery	Flag with "N"
	EB, FTB	<MDL or <5% sSample concentration	Flag with "Q"
	Field duplicate[c]	≤20% RPD	Review data[e]
Volatile Organic Compounds			
Volatile organics by gas chromatography/mass spectrometry	MB	<MDL[f] or <5% sSample concentration	Flag with "B"
	LCS	70% to 130% rRecovery or % recovery statistically derived[g]	Flag with "o"[b]
	DUP[c] or MS/MSD[d]	≤20% RPD	Review data[e]
	MS/MSD[d]	70% to 130% rRecovery	Flag with "T"
	SUR	70% to 130% rRecovery	Review data[e]
	EB, FTB, FXR	<MDL[f] or <5% sSample concentration	Flag with "Q"
	Field duplicate[c]	≤20% RPD	Review data[e]

Table DA-4 Field and Laboratory Quality Control Elements and Acceptance Criteria

Analyte[a]	Quality Control Element	Acceptance Criteria	Corrective Action
Semivolatile Organic Compounds			
Phenols gas chromatography/mass spectrometry	MB	<MDL or <5% sSample concentration	Flag with "B"
	LCS	70% to 130% rRecovery or % recovery statistically derived[g]	Flag with "o"[b]
	DUP[c] or MS/MSD[d]	≤20% RPD	Review data[e]
	MS/MSD[d]	% rRecovery statistically derived[g]	Flag with "T"
	SUR	% rRecovery statistically derived[g]	Review data[e]
	EB, FTB	<MDL or <5% sSample concentration	Flag with "Q"
	Field duplicate[c]	≤20% RPD	Review data[e]
Semivolatiles by gas chromatography/mass spectrometry	MB	<MDL[f] or <5% sSample concentration	Flag with "B"
	LCS	70% to 130% rRecovery or % recovery statistically derived[g]	Flag with "o"[b]
	DUP[c] or MS/MSD[d]	≤20% RPD	Review data[e]
	MS/MSD[d]	% rRecovery statistically derived[g]	Flag with "T"
	SUR	% rRecovery statistically derived[g]	Review data[e]
	EB, FTB	<MDL[f] or <5% sSample concentration	Flag with "Q"
	Field duplicate[c]	≤20% RPD	Review data[e]
Polychlorinated Biphenyls			
Polychlorinated biphenyls by gas chromatography	MB	<MDL <5% sample concentration	Flag with "B"
	LCS	70% to 130% recovery or % recovery statistically derived[g]	Flag with "o"[b]
	DUP[c] or MS/MSD[d]	<20% RPD	Review data[e]
	MS/MSD[d]	% recovery statistically derived[g]	Flag with "N"
	SUR	% recovery statistically derived[g]	Review data[e]
	EB, FTB	<MDL <5% sample concentration	Flag with "Q"
	Field duplicate[c]	<20% RPD	Review data[e]

Table DA-4 Field and Laboratory Quality Control Elements and Acceptance Criteria

Analyte[a]	Quality Control Element	Acceptance Criteria	Corrective Action
Herbicides			
Herbicides by gas chromatography	MB	<MDL <5% sample concentration	Flag with "B"
	LCS	70% to 130% recovery or % recovery statistically derived[g]	Flag with "o"[b]
	DUP[c] or MS/MSD[d]	<20% RPD	Review data[e]
	MS/MSD[d]	% recovery statistically derived[g]	Flag with "N"
	SUR	% recovery statistically derived[g]	Review data[e]
	EB, FTB	<MDL <5% sample concentration	Flag with "Q"
	Field duplicate[c]	<20% RPD	Review data[e]
Pesticides			
Pesticides by gas chromatography	MB	<MDL <5% sample concentration	Flag with "B"
	LCS	70% to 130% recovery or % recovery statistically derived[g]	Flag with "o"[b]
	DUP[c] or MS/MSD[d]	<20% RPD	Review data[e]
	MS/MSD[d]	% recovery statistically derived[g]	Flag with "N"
	SUR	% recovery statistically derived[g]	Review data[e]
	EB, FTB	<MDL <5% sample concentration	Flag with "Q"
	Field duplicate[c]	<20% RPD	Review data[e]
Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans (Totals and Congeners)			
Dioxins/furans by high-resolution gas chromatography/high-resolution mass spectrometry	MB	<PQL <5% sample concentration	Flag with "B"
	LCS	% recovery statistically derived[g]	Flag with "o"[b]
	DUP[c]	<20% RPD	Review data[e]
	SUR	60%-140% recovery	Review data[e]
	EB, FTB	<PQL <5% sample concentration	Flag with "Q"
	Field duplicate[c]	<20% RPD	Review data[e]

Table DA-4 Field and Laboratory Quality Control Elements and Acceptance Criteria

Analyte[a]	Quality Control Element	Acceptance Criteria	Corrective Action

Notes: ~~The information in this table does not create Washington State Department of Ecology or Hanford Site-wide Permit requirements; it is intended solely as guidance.~~This table applies only to laboratory analyses. Field measurements (e.g., specific conductance, pH, dissolved oxygen ~~[if applicable]~~, temperature, and turbidity) are not listed because they are measured in the field.

[a]See Table DA-2 for constituent list and analytical methods.

[b]The reporting laboratory will apply the "o" flag with ~~Sample Management and Reporting~~SMR group concurrence.

[c]Applies when at least one result is greater than the laboratory PQL.

[d]Either a DUP or a MS/MSD is to be analyzed to determine measurement precision. ~~(~~If there is insufficient sample volume, an LCS~~laboratory control sample~~ duplicate is analyzed with the acceptance criteria defaulting to the ≤20% RPD criteria).

[e]After review, corrective actions are determined on a case-by-case basis. Corrective actions may include a laboratory recheck or flagging the data.

[f]For common laboratory contaminants such as acetone, methylene chloride, 2-butanone, toluene, and phthalate esters, the acceptance criteria is <5 times the MDL.

[g]Laboratory determined, statistically derived control limits based on historical data are used here. Control limits are reported with the data.

DUP = Laboratory sample duplicate
EB = Equipment blank
FTB = Full trip blank
FXR = Field transfer blank
LCS = Laboratory control sample
MB = Method blank
MDL = Method detection limit
MS = Matrix spikes
MSD = Matrix spike duplicate
PQL = Practical quantitation limit
QC = Quality control
RPD = Relative percent difference
SMR = Sample Management and Reporting
SUR = Surrogate

Data Flags

B, C = Possible laboratory contamination: analyte was detected in the associated ~~method blank~~MB – laboratory applied. The B flag is used for organic analytes. The C flag is used for general chemical and inorganic analytes.

~~o = Result may be biased: associated laboratory control sample result was outside the acceptance limits – laboratory applied.~~

N = Result may be biased: associated ~~matrix spike~~MS result was outside the acceptance limits (except gas chromatograph/mass spectrometry) – laboratory applied.

o = Result may be biased: associated LCS result was outside the acceptance limits – laboratory applied.

Q = Problem with associated field QC blank: results were out of limits – SMR review.

T = Result may be biased: associated ~~matrix spike~~MS result was outside the acceptance limits (gas chromatograph/mass spectrometry only) – laboratory applied.

DA.3.3.1 Field Quality Control Samples

Field QC samples are used to monitor the integrity of field samples during sample collection, transportation, storage, and laboratory analysis. Field QC samples are submitted to the analyzing laboratories as field samples. Field QC samples are analyzed for the same set of analytes as their corresponding field samples. Field QC samples include field duplicates, field split (SPLIT) samples, and three types of field blanks (equipment blanks [EBs], field transfer blanks [FXRs], and full trip blanks [FTBs]). Field blanks are typically prepared to match the sample matrix as closely as possible using high-purity water[1]. The following describe the QC samples in more detail:

[1]High-purity water is generally defined as water that has been distilled, deionized, or any combination of distillation, deionization, reverse osmosis, activated carbon filtration, ion exchange, particulate filtration, or other polishing techniques.

- **Equipment blanks:** EBs are used to monitor the effectiveness of the decontamination process for reusable sampling equipment. They are samples of high-purity water contacted with the sampling surfaces of equipment used to collect samples prior to using that equipment for field sampling. EBs are collected from each type of reusable sampling equipment to ensure that the decontamination procedures are effective for the specific equipment types. EBs will be analyzed for the same analytes as samples collected using that equipment. EB samples are not required for disposable sampling equipment.
- **Field duplicates:** Field duplicates provide information regarding the homogeneity of the sample matrix and the precision of the sampling and analysis processes. Field duplicates are two samples that are intended to be identical and are collected as close as possible in time and location. Each sample in the sample-duplicate pair receives its own unique sample number.
- **Field splits:** SPLITs are two samples that are intended to be identical and are collected as close as possible in time and location. SPLITs will be stored in separate containers and analyzed by different laboratories for the same analytes. SPLITs are interlaboratory comparison samples used to evaluate comparability between laboratories.
- **Field transfer blanks:** FXRs are used to document possible contamination during field acquisition of VOC samples. FXRs are sample bottles (already containing any required sample preservative) filled at the sample collection site with high-purity water. The blank is sealed at the sampling site and becomes part of the sample set sent to the laboratory. FXRs are prepared daily for sites sampling for VOC analysis. Typically, one set of FXRs is prepared each day that VOC field samples are collected. If VOC samples are collected on the same day and shipped to multiple laboratories, a set of FXRs is collected for each analyzing laboratory.
- **Full trip blanks:** FTBs are used to monitor for potential sample contamination from the sampling container, preservation reagents, or storage conditions. FTBs are prepared high-purity water and sealed prior to traveling to the sampling site, transported to the sampling site (not opened in the field), and then shipped as part of the sample set to the laboratory. The bottle set is either for volatile organic analysis only or identical to the set that will be collected in the field. Collected FTBs are typically analyzed for the same constituents as the samples from the associated sampling event.

DA.3.3.2 Laboratory Quality Control Samples

Internal QA/QC programs are maintained by laboratories used by the project and include the use of LCSs, DUPs, MSs, MSDs, MBs, and SURs. These QC analyses follow EPA methods (e.g., those in the SW-846 Compendium). QC checks outside of control limits are documented in analytical laboratory reports and during a DQI evaluation, if performed. Descriptions of the various types of laboratory QC samples are as follows:

- **Laboratory control sample:** A control matrix (e.g., reagent water) spiked with analytes representative of the target analytes or a certified reference material that is used to evaluate laboratory accuracy.
- **Laboratory sample duplicate:** A second aliquot of a sample that is taken through the entire sample preparation and analytical process. DUPs are used to evaluate the precision of a method in a given sample matrix.
- **Matrix spike:** An aliquot of a sample spiked with a known concentration of target analyte(s) that is then taken through the entire sample preparation and analytical process. An MS is used to assess the bias of a method in a given sample matrix. Thus, MS results are an indicator of the effect the sample matrix has on the accuracy of measurement of the target analytes.

- **Matrix spike duplicate:** A replicate spiked aliquot of a sample that is subjected to the entire sample preparation and analytical process. MSD results are used to determine the bias and precision of a method in a given sample matrix.
- **Method blank:** An analyte-free matrix to which the same reagents are added in the same volumes or proportions as used in the sample processing. The MB is carried through the complete sample preparation~~s~~ and analytical process. The MB is used to quantify contamination resulting from the sample preparation and analysis.
- **Surrogate:** Used only in organic analyses, a compound added to every sample in the analysis batch (field samples and QC samples) prior to preparation. SURs are typically similar in chemical composition to the analyte being determined, but they are not normally encountered. SURs are expected to respond to the preparation and analytical process in a manner similar to the analytes of interest. Because SURs are added to every sample and QC sample, they are used to evaluate overall method performance in a given matrix.

Samples are analyzed within the holding times guidelines provided in Table DA-5. In some instances, constituents in the samples not analyzed within the holding times may be compromised by volatilization, decomposition, or other chemical changes. Data from samples analyzed outside of the holding times are flagged in the HEIS database with an "H."

Table DA-5 Preservation and Holding Time Guidelines for Laboratory Analyses

Constituent[a]	Preservation[b]	Holding Time
~~Wet~~General Chemistry		
Alkalinity	Store ≤6°C	14 days
Cyanide (free and total)	Store ≤6°C, adjust pH to >12 with 50% sodium hydroxide. If oxidizing agents present, add 5 mL 0.1 N sodium arsenite/L or 0.06 g ascorbic acid/L.	14 days
Sulfide	Store ≤6ºC, adjust pH to > 9 with zinc acetate and sodium hydroxide	7 days
Anions		
Chloride, Sulfate	Store ≤6°C	28 days
Nitrate	Store ≤6°C	48 hours
Metals		
Metals by inductively coupled plasma-atomic emission spectrometry	Adjust pH to <2 with nitric acid	6 months
Metals by inductively coupled plasma/mass spectrometry	Adjust pH to <2 with nitric acid	6 months
Mercury by cold-vapor atomic absorption	Adjust pH to <2 with nitric acid	28 days

Table DA-5 Preservation and Holding Time Guidelines for Laboratory Analyses

Constituent[a]	Preservation[b]	Holding Time
Volatile Organic Compounds		
Volatile organics by gas chromatography/mass spectrometry	Store ≤6°C, adjust pH to <2 with sulfuric acid or hydrochloric acid	7 days unpreserved 14 days maximum preserved
Semivolatile Organic Compounds		
Phenols by gas chromatography/mass spectrometry	Store ≤6°C	7 days before extraction 40 days after extraction
Semivolatiles by gas chromatography/ mass spectrometry	Store ≤6°C	7 days before extraction 40 days after extraction
Polychlorinated Biphenyls		
Polychlorinated biphenyls	Store <6°C	1 year before extraction 40 days after extraction
Herbicides		
Herbicides	Store <6°C	7 days before extraction 40 days after extraction
Pesticides		
Pesticides	Store <6°C	7 days before extraction 40 days after extraction
Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans (Totals and Congeners)		
Dioxins/furans by high-resolution gas chromatography/ high-resolution mass spectrometry	Store <6°C	30 days before extraction 45 days after extraction

Notes: Holding times and preservation methods are dependent on the constituent and are consistent with EPA guidance and approved analytical methods. ~~Information in this table does not create Washington State Department of Ecology or Hanford Sitewide Permit requirements but is intended solely as guidance.~~

The container type for a sample is available on the chain-of-custody documentation.

This table applies only to laboratory analyses. Field measurements (e.g., specific conductance, pH, dissolved oxygen ~~[if applicable]~~, temperature, and turbidity) are not listed because they are measured in the field.

[a]See Table DA-2 for constituent list and analytical methods.

[b]For preservation identified as stored at ≤6°C, the sample should be protected against freezing unless it is known that freezing will not impact the sample integrity.

EPA = U.S. Environmental Protection Agency

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DA.3.4 Measurement Equipment

Each measuring equipment user will ensure that equipment is functioning as expected, properly handled, and properly calibrated per methods governing control of the measuring equipment. On-site environmental instrument testing, inspection, calibration, and maintenance will be recorded according to approved methods. Field screening instruments will be used, maintained, and calibrated as provided in manufacturer specifications and other approved methods.

DA.3.5 Instrument and Equipment Testing, Inspection, and Maintenance

Collection, measurement, and testing equipment will meet applicable standards (e.g., ASTM International, formerly the American Society for Testing and Materials) or have been evaluated as acceptable and valid according to instrument-specific methods and specifications. Software applications will be acceptance tested prior to use in the field. Measurement and testing equipment used in the field will be subject to preventive maintenance measures to minimize downtime.

DA.3.6 Instrument/Equipment Calibration and Frequency

Field equipment calibration is discussed in Appendix DB.

DA.3.7 Inspection/Acceptance of Supplies and Consumables

Consumables, supplies, and reagents will be reviewed per test methods in SW-846 Compendium and EPA/600 Method series (e.g., EPA/600/4-79/020, *Methods for Chemical Analysis of Water and Wastes*) and will be appropriate for their use. Supplies and consumables used in sampling and analysis activities are procured under internal work processes. Supplies and consumables are checked and accepted by users prior to use.

DA.3.8 Nondirect Measurements

Data obtained from sources such as computer databases, programs, literature files, and historical records will be evaluated by staff assigned by the Prime Contractor Project Manager~~the project scientist~~. Data used in evaluations will be identified by source. Historical data obtained from the HEIS database are usable for comparison to data collected by this groundwater monitoring plan.

DA.3.9 Data Management

Records of data analyses and groundwater surface elevations are maintained as required by WAC 173-303-645(8)(j).

Electronic data access will be through a Hanford Site database (e.g., HEIS). Where electronic data are not available, hard copies will be provided.

DA.4 DATA REVIEW AND USABILITY

This section addresses QA activities that occur after data collection. Implementation of these activities determines whether the data conform to the specified criteria, thus satisfying the project objectives.

DA.4.1 Data Review and Verification

Data review and verification are performed to confirm that field and field QC sampling and chain-of-custody documentation are complete. This review includes linking sample numbers to specific sampling locations, and reviewing sample collection dates and sample preparation and analysis dates to determine if holding times were met.

The criteria for verification include, but are not limited to, review for contractual compliance (e.g., samples were analyzed as requested), use of the correct analytical method, transcription errors, correct application of dilution factors, and the correct application of conversion factors. Data verification is typically conducted on a portion of multi-media samples collected across projects.

The staff member, assigned by the Prime Contractor Project ~~Delivery~~ Manager ~~for Groundwater Science~~, will also perform a data review to determine if observed changes reflect improved/degraded groundwater quality or potential data errors, which may result in a request for data review on questionable data. The laboratory may be asked to check calculations, reanalyze samples, or the well may be resampled. Results of the request for data review process are used to flag data in the HEIS database and to add comments.

DA.4.2 Data Validation

Data validation is performed at the discretion of the Prime Contractor Project ~~Delivery~~ Manager ~~for Groundwater Science~~, under the direction of the SMR group. The decision to perform validation is based on the results of QC samples for individual well networks and discussions ~~with~~ the staff member assigned by the Prime Contractor Project ~~Delivery~~ Manager ~~for Groundwater Science~~. If conducted, data validation (third-party) will be performed at a minimum frequency of 5% per method. Data validation evaluates the analytical quality of data from samples specifically collected for this plan.

DA.4.3 Reconciliation with User Requirements

The purpose of reconciliation with user requirements is to determine if quantitative data are of the correct type and are of adequate quality and quantity to meet the project data needs. For routine groundwater monitoring undertaken by projects, DQIs such as precision, accuracy, representativeness, comparability, completeness, bias, and sensitivity for the specific datasets (individual data packages) will typically be evaluated on an annual basis. A DQI evaluation specific to data quality requirements specified in this plan may be performed at the discretion of the Prime Contract Project ~~Delivery~~ Manager ~~for Groundwater Science~~. Results of the DQI evaluation(s) will be used by the Prime Contract Project ~~Delivery~~ Manager ~~for Groundwater Science~~ to interpret the data and determine if the data quality objectives for this activity have been met.

DA.5 REFERENCES

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