COMPLETE

ENGINEERING CHANGE NOTICE

1. ECN No. 618189

Proj. ECN

2. ECN Category (mark one)	3. Originator's Name, Organization, MSIN, and Telephone No.	3a. USQ Required?	4. Date
Supplemental [ ] Direct Revision [X] Change ECN [ ] Temporary [ ] Standby [ ] Supersedure [ ] Cancel/Void [ ]	M. Stauffer, T. X. Washington Environmental Sciences/ H6-06/373-9928	[ ] Yes [X] No	October 2, 1995
	5. Project Title/No./Work Order No.	6. Bldg./Sys./Fac. No.	7. Approval Designator
	RCRA Groundwater Sampling & Analysis OM631 R31CA	2440 STVCN	QE
	8. Document Numbers Changed by this ECN (includes sheet no. and rev.)	9. Related ECN No(s).	10. Related PO No.
	WHC-SD-EN-QAPP-001, Rev. 2	N/A	N/A

11a. Modification Work	11b. Work Package No.	11c. Modification Work Complete	11d. Restored to Original Condition (Temp. or Standby ECN only)
[ ] Yes (fill out Blk. 11b) [X] No (NA Blks. 11b, 11c, 11d)	N/A	N/A Cog. Engineer Signature & Date	N/A Cog. Engineer Signature & Date

12. Description of Change

Complete update and revision. Major changes:
o 1.5 Data Quality Objectives: New chapter describing how DQOs are used in groundwater monitoring.
(Continued)

13a. Justification (mark one)

Criteria Change	[ ]	Design Improvement	[ ]	Environmental	[ ]	Facility Deactivation	[ ]
As-Found	[ ]	Facilitate Const	[X]	Const. Error/Omission	[ ]	Design Error/Omission	[ ]

13b. Justification Details

This is an annual review and update of the QAPP.

14. Distribution (include name, MSIN, and no. of copies)

See Distribution Sheet.

~~RELEASE STAMP~~
OFFICIAL RELEASE
BY WHC
DATE NOV 07 1995
ST 31

A-7900-013-2 (11/94) GEF095

ENGINEERING CHANGE NOTICE

1. ECN (use no. from pg. 1) 618189

15. Design Verification Required	16. Cost Impact				17. Schedule Impact (days)	
	ENGINEERING		CONSTRUCTION			
[] Yes	Additional	[] $	Additional	[] $	Improvement	[]
[X] No	Savings	[] $	Savings	[] $	Delay	[]

18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.

SDD/DD	[]	Seismic/Stress Analysis	[]	Tank Calibration Manual	[]
Functional Design Criteria	[]	Stress/Design Report	[]	Health Physics Procedure	[]
Operating Specification	[]	Interface Control Drawing	[]	Spares Multiple Unit Listing	[]
Criticality Specification	[]	Calibration Procedure	[]	Test Procedures/Specification	[]
Conceptual Design Report	[]	Installation Procedure	[]	Component Index	[]
Equipment Spec.	[]	Maintenance Procedure	[]	ASME Coded Item	[]
Const. Spec.	[]	Engineering Procedure	[]	Human Factor Consideration	[]
Procurement Spec.	[]	Operating Instruction	[]	Computer Software	[]
Vendor Information	[]	Operating Procedure	[]	Electric Circuit Schedule	[]
OM Manual	[]	Operational Safety Requirement	[]	ICRS Procedure	[]
FSAR/SAR	[]	IEFD Drawing	[]	Process Control Manual/Plan	[]
Safety Equipment List	[]	Cell Arrangement Drawing	[]	Process Flow Chart	[]
Radiation Work Permit	[]	Essential Material Specification	[]	Purchase Requisition	[]
Environmental Impact Statement	[]	Fac. Proc. Samp. Schedule	[]	Tickler File	[]
Environmental Report	[]	Inspection Plan	[]		[]
Environmental Permit	[]	Inventory Adjustment Request	[]		[]

19. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number Revision

20. Approvals

Signature		Date	Signature	Date
OPERATIONS AND ENGINEERING			ARCHITECT-ENGINEER	
Cog. Eng. M. Stauffer/T.X. Washington	M Stauffer	10/2/95	PE	
Cog. Mgr. D. G. Horton	DG Horton	10/3/95	QA	
QA W.R.Thackaberry	W.R Thackaberry	10-6-95	Safety	
Safety			Design	
Environ. W.E.Toebe	W E Toebe	10/14/95	Environ.	
Other			Other	
			DEPARTMENT OF ENERGY	
			Signature or a Control Number that tracks the Approval Signature	
			ADDITIONAL	

Description of Change (Continued)

o Table 1 (analytes, analytical methods) is now attached as Appendix B with new CRDLs and analyte-specific precision and accuracy data; they conform to the Hanford Analytical Services Quality Assurance Plan (HASQAP) requirements.

o References to soil monitoring (Tables 2 and 3) have been deleted.

RELEASE AUTHORIZATION

Document Number:	WHC-SD-EN-QAPP-001, Rev. 3
Document Title:	Quality Assurance Project Plan for Groundwater Monitoring Activities Managed by Westinghouse Hanford Company
Release Date:	11/7/95

This document was reviewed following the procedures described in WHC-CM-3-4 and is:

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

Chris Willingham — 11/7/95

C. WILLINGHAM

SUPPORTING DOCUMENT

1. Total Pages 44445

2. Title	3. Number	4. Rev No.
Quality Assurance Project Plan for Groundwater Monitoring Activities Managed by Westinghouse Hanford Company	WHC-SD-EN-QAPP-001	3

5. Key Words	6. Author
groundwater monitoring RCRA quality assurance project plan	Name: M. Stauffer Signature Organization/Charge Code OM631/R31CA

7. Abstract

This quality assurance project plan (QAPP) applies specifically to the field activities and laboratory analysis performed for all RCRA groundwater projects conducted by Hanford Technical Services. This QAPP is generic in approach and shall be implemented in conjunction with the specific requirements of individual groundwater monitoring plans.

8. RELEASE STAMP

RECORD OF REVISION	(1) Document Number WHC-SD-EN-QAPP-001	Page 1

(2) Title

Quality Assurance Project Plan for Groundwater Monitoring Activities Managed by Westinghouse Hanford Company

CHANGE CONTROL RECORD

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release	
		(5) Cog. Engr.	(6) Cog. Mgr. Date
	(7)		
Rev. 0	EDT #109150	R.L.Jackson	K.R.Fecht
Rev. 1	Complete revision - replace all pages. ECN #172202	P.B.Freeman	R.L.Jackson
Rev. 2	Minor technical revision in glossary, sections 3.3, 8.1, 8.2, 9.0, 10.0 (redlined). Complete update on referenced procedure titles and Tables 1, 2, 3.	P.B.Freeman 11/3/95	R.L.Jackson
Rev. 3	Complete revision - replaces all pages. ECN #618189	M. Stauffer T. X. Washington	D. G. Horton for 11/7/95
		11/7/95	

A-7320-005 (08/91) WEF168

QUALITY ASSURANCE PROJECT PLAN FOR GROUNDWATER MONITORING ACTIVITIES MANAGED BY WESTINGHOUSE HANFORD COMPANY

Revision 3

GLOSSARY

Accuracy. The closeness of agreement between an observed value and an accepted reference value.

Audit. Audits are considered to be systematic checks, inspections, or surveillances to verify the quality of operation of one or more elements of the total measurement system.

Bias. A systematic error inherent in a method or caused by some artifact or idiosyncrasy of the measurement system.

Blind Sample. A sample that contains a concentration of analyte that is known to the supplier but unknown to the analyzing laboratory. This sample is used to assess accuracy and to monitor the performance of the analytical laboratory(ies) with prepared or purchased materials from U.S. Environmental Protection Agency (EPA) quality control samples/ concentrates or primary materials.

Calibration Check Samples. Verification of the ratio of instrument response to analyte amount, a calibration check, is done by analyzing for different analyte standards in an appropriate solvent. Calibration check solutions are made from a stock solution that is different from the stock solution used to prepare the standards.

Comparability. The confidence with which one data set can be compared to another.

Completeness. A measure of the amount of data obtained from a measurement process compared to the amount that was expected to be obtained under the conditions of measurement.

Contract Required Detection Limit (CRDL). The lowest analyte concentration in a given matrix that a laboratory can be expected to achieve when determining method detection limits based on 40 CFR 136; agreed upon under the contract Statement of Work.

Data group. The data received between an established cut-off date and the previous cut-off date. The data group is identified by data diskette names and batch numbers received during this time period.

Data Quality Objective (DQO). The DQO process is a series of planning steps that is designed to ensure that the type, quantity, and quality of environmental data used in decision making are appropriate for the intended application.

Deviation. For the purposes of environmental investigations, deviation refers to a planned departure from established criteria that may be required as a result of unforeseen field situations or that may be required to correct ambiguities in procedures that may arise in practical applications.

Double blind sample. A quality control sample that contains a concentration of analyte that is known to the supplier but unknown to the analyzing laboratory. The analyzing laboratory is not informed that the sample is a quality control sample. All attempts are made to make this sample appear like a field sample. For example, the double blind sample should be submitted to the laboratory within the same time period and with a sample identification number similar to that of the field samples. The double blind sample does not include matrix matching.

External Quality Control Sample. Any quality control sample prepared without the knowledge of the analytical laboratory.

Field Duplicate Sample. A quality control sample used to determine repeatability of an analytical measurement on identical samples collected as close as possible to the same time and the same location. These samples are stored in separate containers and analyzed independently by the same laboratory.

Field Trip Blank. A quality control sample that contains only Type II reagent water. The field transfer blank is taken during collection of samples. It is filled at the sampling site by pouring Type II reagent water from a cleaned container into vials prepared for volatile organic analysis. This type of sample is collected at one well only on days when sampling for volatile organics occurs.

Full Trip Blank. A quality control sample that contains only Type II reagent water and a preservative. The full trip blank is analyzed for all constituents of interest on all types of sample bottles used during that sampling period.

Inter-laboratory Comparison Sample. A quality control sample used to determine relative bias in an analytical measurement of identical samples collected as close as possible to the same time and the same location. These samples are stored in separate containers and analyzed independently by the primary laboratory and alternate laboratory(ies). These samples will be collected in the same manner as a field duplicate sample with a frequency to be determined on a case by case basis.

Internal Quality Control Sample. Any quality control sample prepared by the analytical laboratory used to establish and monitor the quality of the analytical laboratory.

Laboratory Control Samples. A QC reference sample prepared from an independent standard at a concentration other than that used for calibration, but within the calibration range. Reference samples are required as an independent check on analytical technique and methodology, and shall be run with every analytical batch, or every 20 samples, whichever is greatest.

Matrix Matched Double Blind Sample. A matrix matched double blind sample contains a concentration of analyte that is known to the supplier but unknown to the analyzing laboratory. The sample matrix has been altered to closely match that of the field samples or it is a field sample that has been spiked with a standard.

Nonconformance. A nonconformance is a deficiency in characteristic, documentation, or procedure that renders the quality of material, equipment, services, or activities unacceptable or indeterminate. When the deficiency is of a minor nature, does not effect a permanent or significant change in quality if it is not corrected, and can be brought into conformance with immediate corrective action, it shall not be categorized as a nonconformance. However, if the nature of the condition is such that it cannot be immediately and satisfactorily corrected, it shall be documented in compliance with approved procedures and brought to the attention of management for disposition and appropriate corrective action.

Outlier Observation. An observation that does not conform to the pattern established by other observations in the data set.

Precision. The agreement among a set of individual measurements of the same property, usually under prescribed similar conditions. Standard deviation, relative standard deviation, ranges, and relative ranges are all measures of precision.

Quality Assurance (QA). For the purposes of environmental investigations, QA refers to the total integrated quality planning, quality control, quality assessment, and corrective action activities that collectively ensure that data from monitoring and analysis meets all end-user requirements and/or the intended end use of the data.

Quality Assurance Project Plan (QAPP). The QAPP is an orderly assembly of management policies, project objectives, methods, and procedures that defines how data of known quality will be produced for a particular project or investigation.

Quality Control (QC). For the purposes of environmental investigations, QC refers to the routine application of procedures and defined methods to the performance of sampling, measurement, and analytical processes.

Reagent Blank. A reagent blank is an aliquot of analyte-free water or solvent analyzed with the analytical batch to monitor the introduction of artifacts into the process. The reagent blank shall be run every 20 samples or each analytical batch, whichever is greater.

Reliable Detection Level (RDL). A detection limit set at 2 times the concentration of the MDL, so the risk of false positives and false negatives falls below 1 percent.

Replicate Sample. Replicate samples are two or more aliquots removed from the same sample container in the laboratory and analyzed independently.

Representativeness. The degree to which the data accurately and precisely represent a characteristic of a population parameter.

Surrogate Compound. An organic compound similar to the analyte of interest in chemical composition, extraction, and chromatography, but which is not normally found in environmental samples. Surrogates are spiked into all blanks, standards, samples, and spiked prior to analysis. Percent recoveries are calculated for each surrogate.

Type II Reagent Water. Distilled or deionized water that is free of contaminants that may interfere with the analytical test in question.

Validation. For the purposes of environmental investigations, validation refers to a systematic process of reviewing a body of data against a set of criteria to provide assurance that the data are acceptable for their intended use. Validation methods may include review of verification activities, screening for outliers, evaluation of internal and external QC data, cross-checking, or technical review.

Verification. For the purposes of environmental investigations, verification refers to the process of determining whether procedures, processes, data, or documentation conform to specified requirements. Verification activities may include inspections, audits, surveillances, or technical review.

CONTENTS

CONTENTS (cont.)

1.0 PROJECT DESCRIPTION

1.1 GENERAL OBJECTIVES

The general objective of all "Resource Conservation and Recovery Act of 1976" groundwater monitoring activities performed by Westinghouse Hanford Company (WHC) Hanford Technical Services (HTS) is to support both interim and final (permitted) status groundwater monitoring programs as required by "Washington Administrative Code" (WAC), Chapters 173-303-400 and 173-303-645 (Ecology 1990). The groundwater monitoring programs for the Hanford Site are described in detail in "Hanford Site Groundwater Protection Management Program" (DOE-RL 1989). Briefly, the program requires the characterization of stratigraphy and groundwater flow regimes beneath specified facilities or sites and the detection of statistically significant concentrations of specified contaminants in groundwater that might originate in such facilities.

1.2 MONITORING ACTIVITIES DESCRIPTION

The specific monitoring activities shall be performed by the HTS Function at individual Resource Conservation and Recovery Act (RCRA) facilities or groundwater monitoring sites. These facilities or sites shall be defined by applicable groundwater monitoring plans (GWMP) as required in the "Hanford Site Groundwater Protection Management Program" (DOE-RL 1989) and will generally fall into one or more of the following categories.

- Technical support for well construction and maintenance activities. This category includes well design and field support in finalization of well screen dimensions and other well design features based on interpretations of wellbore stratigraphy, oversight of well completion, pump installation, well development, and other activities.

- Hydrogeologic characterization. This category includes physical and chemical analysis of soil samples, aquifer testing, geologic logging, geophysical logging, and other activities related to the characterization of the hydrogeologic setting.

- Sampling and analysis of water from quality monitoring well installations. This category includes all routine water level measurements, water quality sampling, chemical and radiological analysis, data validation, and data associated with RCRA facility investigations.

1.3 APPLICABILITY TO WESTINGHOUSE HANFORD COMPANY QUALITY ASSURANCE PROGRAM

This quality assurance project plan (QAPP) applies specifically to the field activities and laboratory analyses performed for all RCRA groundwater monitoring projects and other activities in Section 1.2 conducted by the HTS. It is subordinate to the HTS Quality Assurance Program Plan contained within WHC-IP-1052. This QAPP is generic in approach and shall be implemented in conjunction with the specific requirements of individual GWMPs. HTS may use this QAPP in support of Operational and State of Washington waste discharge permits, and other Hanford Site programs. This QAPP is specifically designed for RCRA groundwater monitoring as a default. Other projects may use different methods, techniques or requirements contained in work plans as specified by their Data Quality Objectives (DQO).

The QAPP is prepared in compliance with the guidance of "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans," QAMS-005/80 (EPA 1983). It describes the means selected to implement the overall quality assurance (QA) program requirements as defined by WHC (1988c). This document controls groundwater monitoring investigations requiring compliance with RCRA guidelines while accommodating the specific requirements specified in the "Hanford Federal Facility agreement and Consent Order" (Ecology et al. 1989). A matrix of procedures and their sources (e.g. "Quality Assurance Manual" WHC-CM-4-2 [WHC 1988c]; the "Environmental Investigations and Site Characterization Manual," WHC-CM-7-7 [WHC 1988d]; "Environmental Engineering and Geotechnology Function Procedures," WHC-CM-7-8 [WHC 1992a]; and the "Geotechnical Engineering Procedures Manual," WHC-IP-0635 [WHC 1992b]) are in Appendix A of this QAPP. This QAPP shall be reviewed and updated periodically. The QAPP distribution shall routinely include all review/approval personnel indicated on the title page of the document and all other individuals designated by the HTS Manager. Plans and procedures referenced in the QAPP are available for regulatory review on request by the direction of the HTS Manager.

1.4 MINIMUM QUALITY ASSURANCE REQUIREMENTS FOR GROUND WATER MANAGEMENT PLAN

The GWMP prepared for each individual RCRA facility investigation will comply with the requirements of this QAPP. As a minimum, the GWMP shall address the following.

- Definition of technical scope. The GWMP shall define the scope of technical activities, including all specific field tests supporting stratigraphic characterization.

- Definition of analytes of interest and specific objectives for data quality. The Hanford Site list provided in Appendices B and C specifies required methods, contractual detection limits, precision, and accuracy to support analytical parameters in each group.

- Definition of specific procedural controls. Based on the comprehensive list provided in Appendix A, individual GWMPs define specific procedural controls that apply to site-specific investigations.

- Definition of unique procedural additions, optional methodologies, modifications, and controls. Where optional methodologies are included in procedures, the options most appropriate for particular investigations shall be specified in the GWMP. Additional procedures or special-case procedural modifications shall be defined and appended or included by reference as appropriate.

- Definition of data evaluation procedures. Procedures for evaluation of data shall be specifically defined in the GWMP and shall include a discussions of statistical methodologies and formulae that may be applied to the data. The guidance provided by the "RCRA Groundwater Monitoring Technical Enforcement Guidance Document" (EPA 1986b), "Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities-Interim Final Guidance" (EPA 1989), and Statistical Analysis of Groundwater monitoring Data at RCRA Facilities- Draft Addendum to Interim Final Guidance (EPA 1992) will be considered as appropriate.

1.5 DATA QUALITY OBJECTIVES

The primary purpose or function of DQOs is to ensure that the type, quantity, and quality of environmental data used in the decision making process are appropriate for their intended purpose (EPA 1993). The process for developing DQOs involves seven general or primary steps:

- State the problem
- Identify the problem
- Identify inputs to the decision
- Define the study boundaries
- Develop a decision rule
- Specify limits on decision errors
- Optimize the design for obtaining data

The DQO process has both a qualitative and a quantitative aspect. The quantitative aspect seeks to use statistics to design the most efficient field investigation that controls the possibility of making an

incorrect decision. The qualitative aspect seeks to encourage good planning for field investigations and complements the statistical design. The DQO process is flexible and iterative.

Groundwater monitoring is conducted at both RCRA and non-RCRA sites as part of the operational environmental monitoring program. They primary purposes of RCRA/operational groundwater monitoring are: (1) to comply with interim and final status state and federal RCRA requirements, (2) to assess the potential impact on groundwater quality, and (3) to provide an early warning of unusual occurrences and trends (WHC-CM-7-4, WHC-CM-7-5).

Different decisions are to be made depending on the monitoring objectives, the monitoring status (interim vs. final status), and monitoring mode (detection, assessment, etc.). This document describes the general requirements of a quality assurance project plan as they apply to sampling and analysis, quality assurance, quality control, data management, and data evaluation, to support the groundwater monitoring activities managed by WHC. Project-specific requirements are to be developed based on the DQO process and documented in the individual groundwater monitoring plans for each site/program.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

2.1 PROJECT MANAGEMENT

The WHC HTS has primary responsibility for conducting RCRA groundwater monitoring investigations. An organizational chart is included as Figure 1. Detailed descriptions of project responsibility are defined in the RCRA Project Management Plan (WHC 1993). Responsibilities of key personnel are described as follows.

- Manager, HTS. The HTS Manager is responsible for overall direction of the RCRA Groundwater Monitoring Program. Responsibilities include the planning and authorization of all work; management of all subcontracted activities; coordination of interface requirements with other supporting organizations; and overall technical, schedule, and budgetary performance. The HTS Manager is responsible for documenting the assignment of individuals to key personnel roles and delegates all or part of these duties as appropriate.

- Manager, Groundwater Management. The Groundwater Management group manager is responsible for implementing the RCRA Groundwater Monitoring Program in accordance with state, federal, and DOE regulations. This includes program planning, organization,

scheduling, budgeting, and coordination with other supporting organizations. The Groundwater Management group manager is responsible and is the primary liaison for all technical activities and functions. This manager delegates all or part of these duties to the RCRA coordinator, cognizant engineer, and task leaders, as appropriate.

- Manager, Environmental Sciences. The Environmental Sciences group manager is responsible for implementing the RCRA Groundwater Monitoring Sampling and analysis contract in accordance with state, federal, and DOE regulations. This includes program planning, organization, scheduling, budgeting, and coordination with other supporting organizations and contractors. This manager delegates all or part of these duties to the sampling and analysis task leader.

- Manager, Well Services. The Well Services group manager is responsible for implementing the Hanford Well Remediation and Decommissioning Plan, coordinating and facilitating the Site Well Administrative Team for RCRA, CERCLA, Operational, and Surveillance program well activities. The Well Service Manager is also responsible for all activities associated with borehole drilling, well construction, and support for borehole characterization. These activities are completed or contracted in accordance with state, federal, and DOE regulations. This includes program planning, organization, scheduling, budgeting, and coordination with other supporting organizations and contractors. This manager delegates all or part of these duties to the Well Maintenance, Remediation, and Abandonment Task Leader and the cognizant Engineer for Well Installation and Characterization.

- Quality Engineer. The Quality Engineer for the HTS provides quality engineering expertise to the RCRA and Operational Monitoring program to include; consultation with management and staff on quality effecting issues, assuring implementation of corrective action and quality improvement procedures, facilitating quality improvement meetings, providing an interface between HTS and internal, external, and contracted quality assurance, audit and surveillance organizations, conducting quality oriented training, coordinating and performing self-assessments, and coordinating records handling.

- Coordinator, RCRA Groundwater Monitoring. The RCRA groundwater monitoring coordinator for HTS coordinates technical activities associated with the RCRA groundwater monitoring program. The coordinator is responsible for overall groundwater monitoring program planning and integration (technical, regulatory, and permitting interface), including organization, staffing, scheduling, budgeting,

and quality planning for all RCRA projects. The coordinator provides technical guidance to the cognizant engineer, field team leaders, task leaders, and facility project scientists.

- Task Leader, Well Maintenance, Remediation, and Abandonment. The well remediation, maintenance, and abandonment task leader is liaison with the Facility project scientists, and responsible for identifying and coordinating all activities associated with well maintenance and remediation. Other responsibilities include all activities associated with the abandonment of non-compliant, hazardous, and/or non-purpose wells and providing technical guidance to the field team coordinator(s).

- Cognizant Engineer, Well Installation and Characterization Support. The Cognizant Engineer for the HTS is liaison to the project scientists and facilitates definitive design and supports construction of the conceptual monitoring network design. The cognizant engineer assists in the planning, staffing, scheduling, and coordination of field activities and hydrogeologic characterization, as well as providing technical guidance to the field team coordinator and well site geologist(s).

- Task Leader, Facility Groundwater Monitoring (Project Scientists). The facility groundwater monitoring task leader coordinates activities of the project scientists to assure consistency and quality of work, plans, and technical facility compliance and documentation. The project scientists are responsible for the ongoing technical management and groundwater monitoring compliance activities at nineteen RCRA facilities and the Solid Waste Landfill.

- Task Leader, Data Management and Reporting. The data management and Reporting task leader is responsible for maintaining the electronic database systems. The task leader coordinates all related activities and ensures that the RCRA groundwater analytical data are accurately entered, stored, and reported via electronic database media. The task leader is also responsible for the preparation and release of the RCRA groundwater monitoring quarterly and annual reports.

- Task Leader, Sampling and Analysis. The sampling and analysis task leader is responsible for coordination of all sampling and analysis activities. Responsibilities include supporting RCRA facility project scientists with the development and maintenance of site-specific groundwater sampling programs, interfacing with sampling and analytical services subcontractors (including preparation of statements of work and site surveillances), scheduling, and program change authorization.

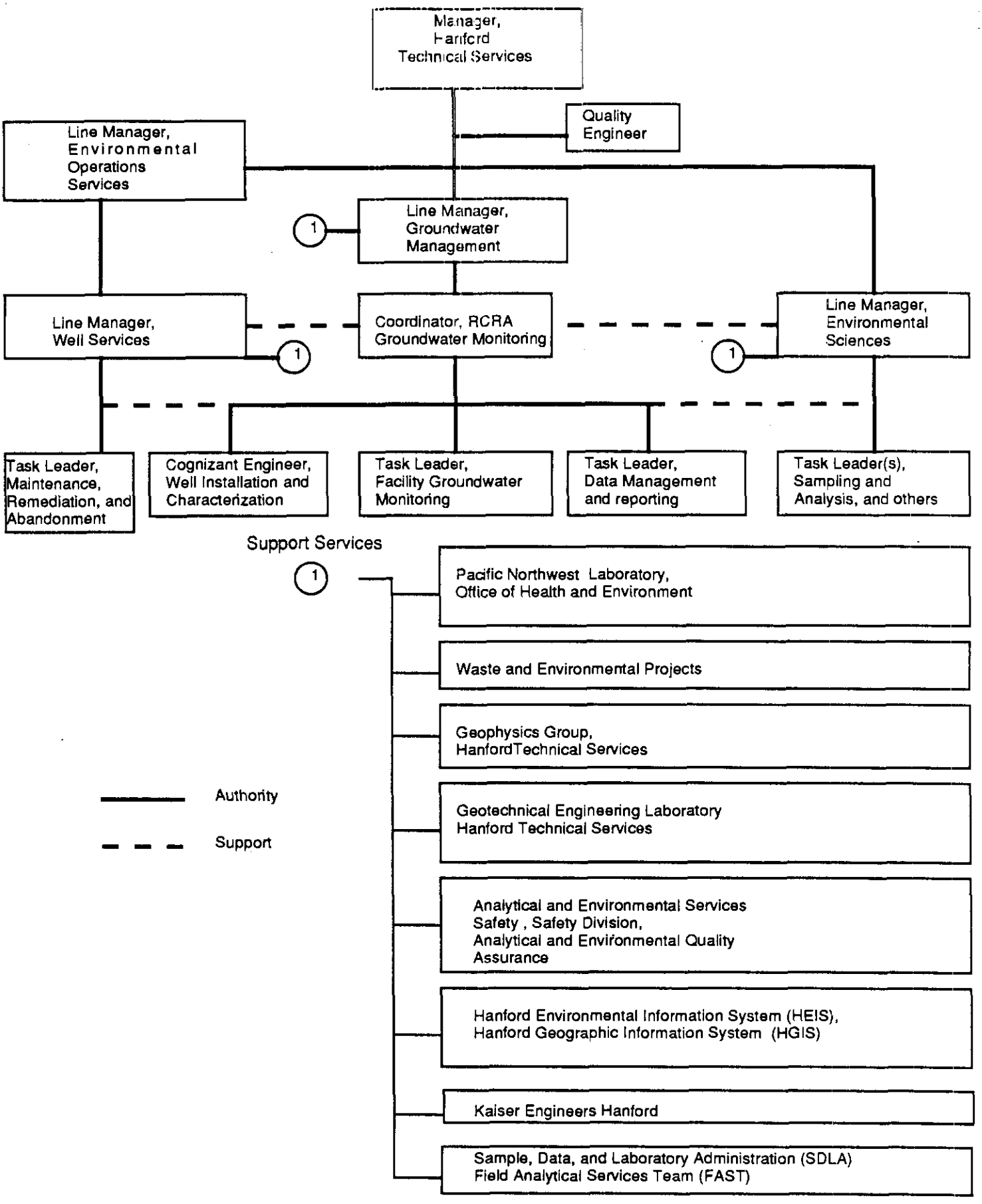

Figure 1. Organization Chart for RCRA Groundweter Monitoring.

2.2 SUPPORTING ORGANIZATIONS

Routine technical support may be provided as follows:

- Analytical and Environmental Quality Assurance. Analytical and Environmental Quality Assurance (AEQA) provides quality engineering support related to procurement control, document approval, and surveillance needs.

- Well Services. Provides support related to routine well maintenance, sampling equipment installation, purgewater disposal, and other needs specific to sampling activities, vadose zone drilling, and groundwater monitoring well drilling. Well drilling also provides an Environmental Compliance officer for the support of that function.

- Hanford Technical Services. HTS manages the participant contractor responsible for groundwater borehole drilling, well construction, and health and safety services, and procures and manages the services of other field subcontractors as necessary to support individual investigations.

- Special Analytical Studies. Provides analytical and field assessment support related to the on-site characterization of RCRA groundwater monitoring samples.

- Environmental Services. Provides document reviews on items related to regulatory program integration.

- Sampling and Mobile Labs. Sampling and Mobile Labs handles collection and preparation of samples, physical description and field analysis, and shipment to the contract laboratory.

- Pacific Northwest Laboratory. Pacific Northwest Laboratory prepares the Statement of Work for the contract laboratory, and then administers the contract.

- Sample, Data, and Laboratory Administration. Sample, Data, and Laboratory Administration prepares the Statement of Work for the contract laboratory, and then administers the contract.

2.3 ANALYTICAL LABORATORIES

Analytical samples shall be routed to an approved WHC, participant contractor, or subcontractor laboratory for geotechnical or chemical analysis. For participant contractors or subcontractors, applicable quality requirements shall be invoked as part of the approved work order or

procurement document. Laboratories shall submit their analytical methods and internal QAPP for WHC review and approval prior to use. At the direction of the HTS Manager, the services of alternate analytical chemistry laboratories may be procured for split (performance audit) sample analysis. Participant contractor or subcontractor laboratories shall be subject to a source surveillance with Environmental QA participation, in compliance with QI 7.3, "Source Surveillance and Inspection." Subsequent surveillance for systems audit purposes shall be in compliance with QAI 10.4, "Surveillance" (WHC 1992c).

2.4 OTHER SUPPORT CONTRACTORS

Procurement of the services of other subcontractors to support any or all of the activities addressed by this QAPP may be initiated at the direction of the HTS Manager. Such services shall be in compliance with standard WHC procurement procedures requirements. All work shall be performed in compliance with WHC-approved QA plans and/or procedures, subject to the controls of QI 7.3, "Source Surveillance and Inspection" (WHC 1988c).

3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENTS

The QA objectives for measurements generally applicable to RCRA ground-water monitoring investigations under the purview of this QAPP are primarily related to: (1) the definition of appropriate methods for chemical analysis for the analytes of interest, (2) the definition of limits and values for analytical precision and accuracy appropriate for the purposes of all RCRA groundwater monitoring investigations at the Hanford Site, and (3) the definition of data representativeness, completeness, and comparability in terms applicable to RCRA groundwater monitoring investigations at the Hanford Site. Detailed discussions of these objectives are provided and supported by the listing in Appendix B of potential analytes of interest, with corresponding target values for detection limits, precision, and accuracy. Specific data quality needs for individual investigations that are different than the minimum requirements established herein shall be addressed within individual GWMPs. Other measurement considerations, accuracy requirements, units, and data recording and reporting protocols for instruments supporting stratigraphic characterization and other types of field investigations shall be as specified in the applicable procedures discussed herein and listed in Appendix A.

3.1 ANALYTES OF INTEREST AND ANALYTICAL METHOD SELECTION

Appendix B identifies potential analytes of interest and corresponding analytical reference methods for RCRA groundwater and non-RCRA monitoring investigations at the Hanford Site. The list of analytes is developed from the compounds identified in 40 CFR 264, Appendix IX (EPA 1986a) and Site-specific parameters required by the RCRA Part A or B permit applications for the individual solid waste management units under the purview of this QAPP. Analytical methods are selected from those suggested in SW-846 (EPA 1990b), or alternate equivalent procedures (e.g., ASTM). Where several methods exist, the more reliable ones have been selected. Corrective action measures shall be initiated by the HTS Manager and/or Environmental Sciences Quality Engineer as appropriate, through the use of the specified procedures. Approved analytical procedures shall require the use of the reporting techniques and units consistent with the EPA reference methods listed in Appendix B to facilitate the comparability of data sets in terms of precision and accuracy.

3.2 CONTRACTUAL DETECTION LIMITS

The performance of the analytical laboratory or laboratories providing support to groundwater monitoring investigations shall be subject to established method- and analyte-specific detection limits and ranges for precision and accuracy. These parameters are presented as target values, which may be adjusted by WHC and the proposed laboratory prior to final approval of associated subcontracts or work orders. These values have been developed after considering those suggested by 40 CFR 264, Appendix IX, historically achieved values in previous analytical subcontracts for similar analyses at the Hanford Site, and the level of performance that may routinely be expected for the methods indicated. Once the values are established as contractual requirements, Appendix B and this section of this QAPP will be revised accordingly.

3.3 REPRESENTATIVENESS, COMPLETENESS, COMPARABILITY, ANALYTICAL PRECISION, AND ACCURACY

The Quality Control (QC) Program uses the quality assurance objectives "Precision, Accuracy, Representativeness, Completeness, and Comparability" (PARCC) based on DQO guidelines (EPA 1987, 1992) and other applicable program specific quality parameters to evaluate the quality of the data and the analytical laboratories analyzing the samples. The values provided in Appendix 8 for precision and accuracy are guidelines that have to be adjusted for the site- specific requirements using the DQO process.

Evaluation Parameters:

Precision is evaluated using data results from laboratory duplicates, field duplicates, and blind samples.

Accuracy is evaluated using data results from laboratory matrix spikes; laboratory quality control samples; EPA Water Pollution, Water Supply, Inter-laboratory Performance Evaluation Programs; and blind samples.

Representativeness expresses the degree to which RCRA facility groundwater monitoring data represent the real composition of the groundwater in the aquifer. Goals for data representativeness for groundwater monitoring programs are addressed qualitatively by the specification of well construction, sampling locations, sampling intervals, and sampling and analyses techniques in the groundwater monitoring plan for each RCRA facility.

Completeness is defined as the percentage of measurements made that are judged to be valid measurements. Completeness is determined by the number of data unflagged during validation divided by the total number of data validated multiplied by 100%.

Comparability is the confidence with which one data set can be compared to another. It is evaluated using replicates to ensure that samples analyzed by different laboratories or by the same laboratory over different time periods are comparable. To attain maximum comparability among field measurements, samplers follow approved sampling procedures. Rigorous adherence to these procedures can ensure the desired consistency among sampling events.

4.0 PROCEDURES

4.1 SAMPLING PROCEDURES

Drilling and sampling equipment, sample material, and sample containers shall be subject to field screening for radioactivity and chemical contamination in compliance with the requirements of governing Radiation Work Permits (RWP) and site safety plans; this is to ensure that samples are not routed to laboratories that are not appropriately equipped and licensed for the performance of mixed waste analyses. All soil sampling performed in support of chemical and physical characterization shall be in compliance with the requirements of environmental investigations instructions (EII) 5.2, "Soil and Sediment Sampling"

(WHC 1988d), or by WHC-approved contractor procedures. Water sampling shall be performed in compliance with EII 5.8, "Groundwater Sampling" (WHC 1988d), or by WHC-approved contractor procedures. Drilling activities shall be performed in compliance with Section 6 "Drilling" (WHC 1988d), or by WHC-approved contractor procedures. Boreholes shall be logged in compliance with EII 9.1, "Geologic Logging" and EII 11.1 "Geophysical Logging" (WHC 1988d), or by WHC-approved contractor procedures. Within each procedure, the sampling methods appropriate for individual investigations shall be defined by the applicable GWMP. Drilling and sampling equipment decontamination shall be in compliance with EII 5.4, "Field Cleaning and/or Decontamination of Equipment," EII 5.5, "1706KE Decontamination of RCRA/CERCLA Sampling Equipment" (WHC 1988d), or by WHC-approved contractor procedures.

4.2 OTHER SUPPORTING PROCEDURES

With the exception of the analytical chemistry procedures specified in Appendix B, procedures to be used for direct support of RCRA groundwater monitoring activities are presented in Appendix A, cross referenced to their source documents and the types of activities that they will typically support. Any additions or modifications to procedures listed here shall be revised accordingly.

4.3 PROCEDURE APPROVALS AND CONTROL

4.3.1 WHC Procedures

The WHC procedures that will typically be used to support the monitoring activities specifically defined by the individual GWMP have been selected from the QA Program Index and other appropriate sources. Latest approved versions of all referenced procedures shall apply in all cases. Appendix A cites selected procedures, which include the EIIs from WHC-CM-7-7, "Environmental Investigations and Site Characterization Manual" (WHC 1988d) or equivalent, and QR and QI procedures from WHC-CM-4-2, "Quality Assurance Manual" (WHC 1988c). Procedure approval, revision, and distribution control requirements applicable to EIIs are addressed in EII 1.2, "Preparation and Revising Procedures" (WHC 1988d); requirements applicable to QI and QR are addressed in QR 5.0, "Instructions, Procedures, and Drawings; "Preparation of Quality Assurance Documents;" and QR 6.0, "Document Control" (WHC 1988c).

4.3.2 Participant Contractor/Subcontractor Procedures

As noted in Section 2.4, participant contractor and/or subcontractor services may be procured at the direction of the HTS Manager. Such procurement shall be subject to the applicable requirements of QR 4.0,

"Procurement Document Control;" QI 4.1, "Procurement Document Control;" QAI 4.2, "External Services Control;" QR 7.0, "Control of Purchased Items and Services;" QI 7.1, "Procurement Planning and Proposal Evaluation;" and/or QI 7.2, "Supplier Evaluation" (WHC 1988c and WHC 1992c). Whenever such services require procedural controls, mandate the use of WHC procedures, or the submittal of contractor procedures for review and approval prior to use, such requirements shall be included as applicable in the procurement document or work order. In addition to the submittal of analytical procedures, analytical laboratories shall be required to submit the current version of their internal QAPPs. All analytical laboratory plans and procedures shall be reviewed prior to use by qualified personnel from HTS, or other sources, as directed by the HTS Manager. All participant contractor or subcontractor procedures, plans, and/or manuals shall be retained as project quality records in compliance with EII 1.6, "Record Processing" (WHC 1988d); QR 17.0, "Quality Assurance Records;" and QI 17.1, "Quality Assurance Records Control" (WHC 1988c).

4.4 CONTROLLED MANUAL AND PROCEDURE ADDITIONS AND CHANGES

As required by WHC-CM-1-3, "Management Requirements and Procedures" (WHC 1988a), a Controlled Manual Document Change Request (CMDCR) is initiated when additional EIIs or EII updates are necessary as a consequence of individual GWMP requirements. EII additions or changes shall be developed per EII 1.2, "Preparing and Revising Procedures" (WHC 1988d). If deviations from established EIIs are required to accommodate unforeseen field situations, they may be authorized by the field team coordinator in accordance with the requirements of EII 1.4, "Instruction Change Authorizations" (WHC 1988d). Documentation, review, and disposition of Instruction Change Authorization forms are defined within EII 1.4. Other engineering document change requests shall be completed as Engineering Change Notices (ECN) as required by WHC-CM-6-1, "Standard Engineering Practices" (WHC 1988b).

5.0 SAMPLE CUSTODY

All samples obtained during the course of this investigation shall be controlled as required by EII 5.1, "Chain of Custody" (WHC 1988d). EII 5.1 requirements apply as soon as sample material is introduced to the sample container within which it will be preserved, sealed, labeled, and transported to the analytical laboratory. Laboratory chain-of-custody procedures shall be reviewed and approved as required by WHC procurement control procedures as noted in Section 4.1 and shall ensure the maintenance of sample integrity and identification from receipt through the completion of the analytical process. Requirements for return of residual sample

materials after completion of analysis shall be defined in the procurement documentation or work orders to subcontractor or participant contractor laboratories. Chain-of-custody forms shall be initiated for returned residual samples as required by the approved procedures applicable within the participating laboratory. Results of analyses shall be traceable to original samples through unique sample numbers or identification codes. All results of analyses shall be controlled as permanent project quality records as required by QR 17.0, "Quality Assurance Record" (WHC 1988c), and EII 1.6, "Records Processing" (WHC 1988d).

6.0 CALIBRATION PROCEDURES

Calibration of all WHC measuring and test equipment, whether in existing inventory or purchased for this investigation, shall be controlled as required by QR 12.0, "Control of Instruments;" and QI 12.2, "Operator Calibrated Measuring and Test Equipment" (WHC 1988c). Routine operational checks for WHC field equipment shall be as defined in WHC-CM-7-8 5.1, "User Calibration of Groundwater M&TE", and EII 3.2, "Calibration and Control of monitoring Instruments" (WHC 1988d), and other applicable EIIs; similar information shall be provided within WHC-approved participant contractor or subcontractor procedures.

Calibration of WHC, participant contractor, or subcontractor laboratory analytical equipment shall be as defined by applicable reference methods (see Appendix B) and WHC-approved analytical procedures and laboratory QAPP.

7.0 ANALYTICAL PROCEDURES

Analytical methods or procedures based on the reference methods identified in Appendix B and Section 3.0 shall be selected or developed and submitted prior to use in compliance with appropriate WHC procedure, work order, and/or procurement control requirements (Section 4.3.2). Each WHC or contracted analytical laboratory shall meet, at a minimum, the requirements of the "Hanford Analytical Services Quality Assurance Plan" (DOE-RL 1994).

8.0 DATA REDUCTION, VALIDATION, AND REPORTING

8.1 DATA REDUCTION AND DATA PACKAGE PREPARATION

Analytical laboratories shall be responsible for preparing a report that summarizes the results of analyses and a detailed data package that includes information necessary to perform data validation to the extent indicated by the minimum requirements listed in the work order or the procurement documentation. Data reporting requirements and data package content shall comply with the appropriate requirements of Sections 1.4 and 1.5 of Test "Methods for Evaluating Solid Waste," SW-846 (EPA 1990b), as modified by the rule changes included in the "Federal Register," Volume 55, No. 47 (EPA 1990a). These requirements shall be defined in work order or procurement documentation, subject to WHC review and approval as noted in Section 4.3.2. Data packages shall be prepared in legible, reproducible format; any changes must be made by single-line corrections in black, nonsoluble ink, and must be initialed and dated. In general, all laboratory data packages should include the following:

- Sample receipt and tracking documentation, including identification of the organization and individuals performing the analysis; the names and signatures of the responsible analysts; sample holding time requirements; references to applicable chain-of-custody procedures; and the dates of sample receipt, extraction, and analysis

- Quality control data, as appropriate for the methods used, including matrix spike/matrix spike duplicate data, recovery percentages, precision and accuracy data, laboratory blank data, and identification of any nonconformances that may have affected the laboratory's measurement system during the time period in which the analysis was performed

- The analytical results or data deliverables, including reduced data and identification of data qualifiers and contractually defined reporting comments.

Other supporting information, as appropriate for the methods used, such as instrument calibration data, reconstructed ion chromatograms, spectrograms, reduction formulas or algorithms, and raw data, need not be included in the submittal of individual data packages unless specifically requested by the applicable GWMP or the HTS Manager. All sample data, however, shall be retained by the analytical laboratory and made available for systems or program audit purposes on request by WHC, the U.S. Department of Energy (DOE), Richland Field Office (RL), or State of Washington Department of Ecology (Ecology) representatives. Such data

shall be retained by the analytical laboratory through the duration of the authorization work order or period of their contractual statement of work, at which point, it shall be turned over to WHC for archiving. The completed data package shall be reviewed and approved by the analytical laboratory's QA manager prior to submittal for validation. The requirements of this section shall be included in procurement documentation or work orders, as appropriate, in compliance with the standard WHC procurement control procedures referenced in Section 4.3.2.

8.1.1 Validation of Water and Soil Samples

Validation of a data group shall be performed by qualified personnel from HTS, alternate sources as directed by the HTS Manager, or as specifically required by the individual GWMP. A data group is comprised of data received during a quarter between an established cut-off date and the previous quarter's cut-off date. Regardless of the source of validation services, validation requirements shall be defined within WHC-approved procedures.

For hazardous chemical or radiochemical water analyses, data validation shall be supported by the "Validation and Verification of RCRA Groundwater Data" per WHC-CM-7-8, "Environmental Engineering and Geotechnology Function Procedures" (WHC 1992a). Optional validation procedures are WHC-SD-EN-SPP-002, "Data Validation Procedures for Chemical Analysis" (WHC 1992e) and/or WHC-SD-EN-SPP-001, "Data Validation Procedures for Radiochemical Analyses" (WHC 1992d). For hazardous chemical or radiochemical soil analyses, data validation may use the above procedure and is required to state all deviations due to the matrix differences.

8.1.2 Validation of Physical Samples

Validation procedures for physical samples and other types of analyses shall include requirements for QC evaluation at appropriate levels of detail. For physical samples, validation shall be prepared documenting QC activities as recommended by specific work plan.

8.2 RECORDS MANAGEMENT

Data packages and supporting material used to document data validation activities shall be retained at locations specified by the HTS Manager and according to the procedures referenced in sections 8.1.1 and 8.1.2. Quality Assurance records management practices shall be processed in accordance with EII 1.6, "Records Processing," (WHC 1988d) and QR 17.0, "Quality Assurance Records" (WHC 1988c).

Record and non-record material shall be processed in accordance with WHC-CM-3-5, "Document Control and Records Management Manual" (WHC 1989).

9.0 QUALITY CONTROL

The QC program is based on the "RCRA Groundwater Monitoring Technical Enforcement Guidance Document" (EPA 1986b), and Chapter One, "Quality Control" (SW-846) (EPA 1990b). The purpose of the QC activities is to ensure and document that samples are carefully collected and transferred to the analytical laboratory, that the quality of the analytical results are technically sound, and that corrective measures will be taken as needed. The QC program is divided into two areas, external QC and internal QC.

9.1 EXTERNAL QC PROGRAM

Field duplicates, field blanks, performance evaluation samples, and results of EPA Water Pollution, Water Supply, and Intercomparison Studies are used to evaluate the performance of the entire measurement system.

Field duplicate sample results are used to evaluate precision. Field blank data results are used to evaluate potential laboratory/sampling contamination by using the reliable detection limit as the evaluation criteria. The reliable detection limit is two times the method detection limit. Field duplicate and blank data are evaluated according to procedure 2.1, "Evaluation of RCRA Groundwater Field Duplicate and Blank Sample Data" of WHC-CM-7-8 (WHC 1992b). Field duplicate and blank data falling outside of the acceptable range are flagged in the databases along with all associated groundwater data. Field blank data results are also used to calculate a Limit of Detection and Limit of Quantitation for constituents of interest on an annual basis to aid in data evaluation.

Performance Evaluation Samples are standards of known concentrations used to assess accuracy and to monitor the performance of the analytical laboratories. PE data results are evaluated according to procedure 2.4, "Evaluation of RCRA Groundwater Performance Evaluation Sample Data" of WHC-CM-7-8 (WHC 1992b). If PE results for a particular laboratory are outside of the acceptable limits for two consecutive PE examinations, an audit of the laboratory may be initiated.

EPA WP and WS Intercomparison Studies are results of blind samples sent by EPA each quarter to evaluate the performance of laboratories. WHC receives EPA's report of the laboratories' performance on these blind

sample analyses on a quarterly basis. WP/WS Intercomparison studies are evaluated according to procedure 2.6 "Validation and Verification of RCRA Groundwater Data" of WHC-CM-7-8 (WHC 1992b).

The target values for accuracy and precision for organics, inorganics, and radionuclides are specified in Appendix B.

9.2 INTERNAL QC PROGRAM

Internal QC data are generated when the analytical laboratory prepares QC samples to monitor the quality of their analyses. Examples of internal QC samples are laboratory matrix spikes (MS), matrix spike duplicates (MSD), and laboratory blanks. Laboratory control samples and laboratory duplicates are internal QC sample results that the laboratory uses to evaluate analytical accuracy and precision. In addition, quarterly laboratory QC reports summarize the results of MS, MSD, and laboratory blanks over a three month period. MS and MSDs are used to examine laboratory accuracy and precision and laboratory blanks are used to check for laboratory contaminations. Results are reviewed according to procedure 2.8 "Evaluation of Laboratory Quality Control Data" of WHC-CM-7-8 (WHC 1992b). Results outside of QC limits are noted and summarized in quarterly reports. If there appear to be trends of certain constituents or methods with results outside of the QC limits, these issues are brought to the attention of the laboratory contractor to be discussed and resolved with the laboratory contractor.

NCR/Incident Reports cite situations occurring in the laboratory which affect the integrity of the data. All data associated with an NCR/Incidence Report is flagged according to procedure 2.9, "RCRA Analytical Laboratory Incident Reports" of WHC-CM-7-8 (WHC 1992b).

10.0 PERFORMANCE AND SYSTEM AUDITS

As noted in Section 5.12 and Appendix A of "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans," QAMS-005 (EPA 1983), audits shall be performed in environmental investigations to verify the quality of operation of one or more elements of the total measurement system. In the sense intended by QAMS-005, audits may be of two types: (1) performance audits, in which quantitative data are independently obtained for comparison with data routinely obtained by the measurement system, or (2) system audits, involving a qualitative onsite evaluation of laboratories (or other organizational elements of the measurement system) for compliance with established QA program and procedure requirements.

As a minimum, performance audit requirements shall be met for each laboratory providing support to RCRA groundwater monitoring activities by an annual requirement for the analysis of a minimum of one blind or one split sample as defined in Section 9.0 for each analytical method containing analytes of concern as identified by the QC task leader using Appendix B. Analytical procedure shall be reviewed by WHC prior to use as described in Section 4.3.2.

System audits shall be performed, as a minimum, on an annual basis; system audit requirements shall be implemented through the use of procedure QAI 10.4, "Surveillance" (WHC 1992c). Additional performance or system audits shall be performed if as a consequence of corrective action requirements or if requested by the HTS Manager, AEQA QA Engineer, RL, or Ecology.

Performance audit and system audit results shall be documented on a surveillance report. Unsatisfactory conditions shall be resolved in compliance with procedure QAI 10.4, "Surveillance" (WHC 1992c) contingent on the priority as determined by the Corrective Action Evaluation Group. In addition, at the direction of the HTS Manager, all aspects of test activities may also be evaluated by procedure "Self-Assessment" (WHC 1992a).

WHC shall conduct surveillances on all activities and/or services, HTS, other WHC organizations, or on HTS approved work-ordered activities described by this QAPP. The surveillances may be performed on the stated activities and services at any time prior to, during, and following the services being rendered with the notification guidelines stated in the work orders and/or statements of work.

In the case of WHC-approved subcontracted services or subcontract work to another non-WHC organization, the terms of the subcontract shall meet the intent of all quality-affecting activities of the original WHC subcontracted work. WHC shall participate in all audits, surveillances, and inspections of the subcontractor's work; WHC may be asked to serve as an observer during these activities.

11.0 PREVENTIVE MAINTENANCE

Measurement and testing equipment used in the field and laboratory that directly affect the quality of the analytical data shall be subject to preventive maintenance measures that ensure minimization of measurement system downtime. Field equipment maintenance instructions shall be as defined by the approved procedures governing equipment use (e.g., EII 3.2,

"Calibration and Control of Monitoring Instruments;" or other procedure as listed in Appendix A). Laboratories shall be responsible for performing or managing the maintenance of their analytical equipment; maintenance requirements, spare parts lists, and instructions shall be included in individual methods or in laboratory QA plans, subject to WHC review and approval as noted in Section 4.3.2. When samples are analyzed using methods based on the standards defined in Appendix B, the requirements for preventive maintenance of laboratory analytical equipment that are defined by the appropriate reference method shall apply.

12.0 DATA EVALUATION

Data from RCRA and non-RCRA groundwater monitoring investigations shall be evaluated as required by the applicable GWMP and/or appropriate statistical evaluation techniques that may be referenced therein. Data shall first be compiled, validated, and summarized by HTS, or alternate sources as directed by the HTS Manager in compliance with WHC-approved procedures meeting minimum requirements of Section 8.0. The RADE procedure in WHC-CM-7-8 (WHC 1992a) establishes the tracking process for identifying anomalous data or water level results to be evaluated. Reports are then prepared for RL and the regulators by the project scientist, summarizing and interpreting water level and sampling data. This effort identifies the rate and direction of groundwater movement at the RCRA facilities, summarizing all pertinent activities, identifying any problems, and evaluating the extent of groundwater contamination (if compliance or assessment monitoring is being conducted).

13.0 CORRECTIVE ACTION

Corrective action required as a result of surveillance or audit activity shall be dispositioned and documented as required by QAI 10.4, "Surveillance," or WHC-CM-4-6, Section 1.0, "Integrated Audits/Appraisals" contingent upon priority planning grid evaluation per WHC-CM-1-4. Nonconforming conditions shall be processed in accordance with QR 15.0, "Control of Nonconforming Items;" QI 15.1, "Nonconforming Item Reporting;" and QI 15.2, "Nonconformance Report Processing." Unsatisfactory results documented on adverse condition reporting documents (other than NCRs) shall be addressed using WHC-CM-1-4, "Corrective Action Management Manual" (WHC 1993) and/or MRP 5.1, "Corrective Action Management System," and QR 16.0, "Corrective Action;" QI 16.1, "Trend Analysis;" and QI 16.2, "Corrective Action Request" (WHC 1988a).

Primary responsibilities for nonconformance resolution and corrective action are assigned to the HTS Manager and the Environmental Services Quality Assurance Engineer. Other measurement systems, procedures, or plan corrections that may be required as a result of routine processes shall be resolved as required by governing procedures or shall be referred to the HTS Manager for resolution. Copies of all surveillance, nonconformance, audit, and corrective action documentation shall be routed to the project QA records on completion or closure. The project QA records location shall be specified by the HTS Manager.

14.0 QUALITY ASSURANCE REPORTS

As previously stated in Sections 10.0 and 13.0, project activities shall be regularly assessed by surveillance and auditing processes. Record copies of completed surveillance, nonconformance, audit, and corrective action documentation shall be processed to storage by the procedurally designated organization. Records management requirements applicable to subcontractors or participant contractors shall be defined in applicable procurement documents or work orders as noted in Section 4.3.2. A report summarizing all surveillance and audit activities, as well as any associated corrective actions, shall be prepared by the HTS Manager at the completion of each investigation if defined by individual GWMPs.

15.0 REFERENCES

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DOE-RL, 1989, "Hanford Site Groundwater Protection Management Program," DOE/RL-89-12, U.S. Department of Energy, Richland Field Office, Richland, Washington.

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WHC, 1988c, "Quality Assurance Manual," WHC-CM-4-2, Westinghouse Hanford Company, Richland, Washington.

WHC, 1988d, "Environmental Investigations and Site Characterization Manual," WHC-CM-7-7, Westinghouse Hanford Company, Richland, Washington.

WHC, 1989, "Document Control and Records Management Manual," WHC-CM-3-5, Westinghouse Hanford Company, Richland, Washington.

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WHC, 1992b, "Geotechnical Engineering Procedures Manual," WHC-IP-0635, vol. 1 & 2, Westinghouse Hanford Company, Richland, Washington.

WHC, 1992c, "Quality Assurance Qualifications and Instructions," WHC-CM-4-05, Westinghouse Hanford Company, Richland, Washington.

WHC, 1992d, "Data Validation Procedures for Radiochemical Analyses," WHC-SD-EN-SPP-001, Westinghouse Hanford Company, Richland, Washington.

WHC, 1992e, "Data Validation Procedures for Chemical Analysis," WHC-SD-EN-SPP-002, Westinghouse Hanford Company, Richland, Washington.

WHC, 1993a, "Project Management Plan - RCRA Groundwater Monitoring," WHC-SD-EN-PMP-001, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

WHC, 1993b, "Corrective Action Management Manual," WHC-CM-1-4, Westinghouse Hanford Company, Richland, Washington.

Appendix A. Supporting Procedures for RCRA Groundwater and Soil Monitoring Activities.

Procedure	Title or subject	Source	QAPP section reference for Procedure	QAPP section reference for Source
EII 1.2	Preparation & Revising Procedures	WHC-CM-7-7[a]	4.3.1, 4.4	
EII 1.4	Instruction Change Authorizations	WHC-CM-7-7[a]	4.4	
EII 1.5	Field Logbooks	WHC-CM-7-7[a]		1,4,5,6,8
EII 1.6	Records Processing	WHC-CM-7-7[a]	4.3.2, 5.0, 8.2	
EII 1.7	Qualification & Training	WHC-CM-7-7[a]		1,4,5,6,8
EII 3.2	Calibration and Control of Monitoring Instruments	WHC-CM-7-7[a]	11.0, 6.0	
EII 5.1	Chain of Custody/Sample Analysis Request	WHC-CM-7-7[a]	5.0	
EII 5.2	Soil and Sediment Sampling	WHC-CM-7-7[a]	4.1	
EII 5.4	Field Cleaning and/or Decontamination of Equipment	WHC-CM-7-7[a]	4.1	
EII 5.5	Laboratory Cleaning of RCRA/CERCLA Sampling Equipment	WHC-CM-7-7[a]	4.1	
EII 5.7A	Hanford Geotechnical Sample Library Control	WHC-CM-7-7[a]		1,4,5,6,8
EII 5.8	Groundwater Sampling	WHC-CM-7-7[a]	4.1	
EII 5.11	Sample Packaging and Shipping	WHC-CM-7-7[a]		1,4,5,6,8
EII 6.7	Documentation of Well Drilling and Completion Operations	WHC-CM-7-7[a]		1,4,5,6,8
EII 8.3	Remediation of Groundwater Wells	WHC-CM-7-7[a]		1,4,5,6,8
EII 9.1	Geologic Logging	WHC-CM-7-7[a]	4.1	
EII 10.1	Aquifer Testing	WHC-CM-7-7[a]		1,4,5,6,8
EII 10.2	Measurement of Ground-Water Levels	WHC-CM-7-7[a]		1,4,5,6,8
EII 10.3	Purgewater Management	WHC-CM-7-7[a]		1,4,5,6,8
EII 10.4	Well Development Activities	WHC-CM-7-7[a]		1,4,5,6,8
EII 11.1	Geophysical Logging	WHC-CM-7-7[a]	4.1	
EII 11.2	Geophysical Survey Work	WHC-CM-7-7[a]		1,4,5,6,8
EP-2.2	Engineering Document Change Control	WHC-CM-6-1[d]		4
GE-02	Handling, Preparation, Testing, and Disposition of Hazardous Samples in the Geotechnical Engineering Laboratory	WHC-IP-635[c]		1

Appendix A. Supporting Procedures for RCRA Groundwater and Soil Monitoring Activities.

Procedure	Title or subject	Source	QAPP section reference for Procedure	QAPP section reference for Source
GEL-02	Hydraulic Conductivity of Soils and Cementitious Materials Using Flexible Wall Permeameters	WHC-IP-635[c]		1
GEL-04	Triaxial Shear Testing	WHC-IP-635[c]		1
GEL-5	Unconfined Compressive Strength	WHC-IP-635[c]		1
GEL-06	Volume Measurement Using the Beckman Air Comparison Pycnometer	WHC-IP-635[c]		1
GEL-07	Particle Size Distribution of Soils and Aggregates	WHC-IP-635[c]		1
GEL-08	Chemical Grout Time of Set Determination	WHC-IP-635[c]		1
GEL-09	Hydraulic conductivity of Soil Using Fixed Wall Permeameters	WHC-IP-635[c]		1
GEL-10	Specific Gravity of Soils and Aggregates	WHC-IP-635[c]		1
GEL-11	Preparation and Mixing of Cement and Particulate Grout	WHC-IP-635[c]		1
GEL-12	Flow Testing of Grout	WHC-IP-635[c]		1
GEL-13	One Dimensional Consolidation	WHC-IP-635[c]		1
GEL-14	Soil Moisture and Density Determination	WHC-IP-635[c]		1
GEL-16	Moisture Density Relationship of Soils	WHC-IP-635[c]		1
GEL-17	Moisture Retention of Soils	WHC-IP-635[c]		1
GEL-18	Liquid/Plastic Limits and Plastic Index of Soils	WHC-IP-635[c]		1
GEL-19	Calcium Carbonate Testing	WHC-IP-635[c]		1
QAI 4.1	External Services Control	WHC-CM-4-5[b]	4.3.2	
QAI 10.4	Surveillance	WHC-CM-4-5[b]	2.3, 10.0, 13.0	
QI 4.1	Procurement Document Control (S.C.)	WHC-CM-4-2[b]	4.3.2	
QI 7.1	Preprocurement Planning and Proposal Evaluation	WHC-CM-4-2[b]	4.3.2	
QI 7.2	Supplier Evaluation	WHC-CM-4-2[b]	4.3.2	
QI 7.3	Source Surveillance and Inspection	WHC-CM-4-2[b]	2.3, 2.4	
QI 12.2	Operator Calibrated Measuring and Test Equipment	WHC-CM-4-2[b]	6.0	

Appendix A. Supporting Procedures for RCRA Groundwater and Soil Monitoring Activities.

Procedure	Title or subject	Source	QAPP section reference for Procedure	QAPP section reference for Source
QI 15.1	Nonconforming Item Reporting	WHC-CM-4-2[b]	13.0	
QI 15.2	Nonconformance Report Processing	WHC-CM-4-2[b]	13.0	
QI 16.1	Trend Analysis	WHC-CM-4-2[b]	13.0	
QI 16.2	Corrective Action Request	WHC-CM-4-2[b]	13.0	
QI 17.1	Quality Assurance Records Control	WHC-CM-4-2[b]	4.3.2	
QI 18.1	Audit Programming and Scheduling	WHC-CM-4-2[b]		1,2,3,6,8,10
QR 4.0	Procurement Document Control	WHC-CM-4-2[b]	4.3.2	
QR 5.0	Instruction, Procedures, and Drawings	WHC-CM-4-2[b]	4.3.1	
QR 6.0	Document Control	WHC-CM-4-2[b]	4.3.1	
QR 7.0	Control of Purchased Items and Services	WHC-CM-4-2[b]	4.3.2	
QR 12.0	Control of Instruments	WHC-CM-4-2[b]	6.0	
QR 15.0	Control of Nonconforming Items	WHC-CM-4-2[b]	13.0	
QR 16.0	Corrective Action	WHC-CM-4-2[b]	13.0	
QR 17.0	Quality Assurance Records	WHC-CM-4-2[b]	4.3.2, 5.0, 8.2	
QR 18.0	Audits	WHC-CM-4-2[b]	13.0	
2.1	Evaluation of RCRA Groundwater Field Duplicate and Blank Sample Data	WHC-CM-7-8[e]		1,8,9,12
2.2	Groundwater Quality Control Sampling	WHC-CM-7-8[e]		1,8,9,12
2.4	Evaluation of RCRA Groundwater Performance Evaluation Sample Data	WHC-CM-7-8[e]		1,8,9,12
2.6	Validation and Verification of RCRA Groundwater Data	WHC-CM-7-8[e]	8.1.1	9
2.7	RCRA Analytical Data Verification and Hard Copy Storage	WHC-CM-7-8[e]		1,8,12
2.8	Evaluation of Laboratory Quality Control Data	WHC-CM-7-8[e]		1,8,9,12
2.9	RCRA Laboratory Incident reports	WHC-CM-7-8[e]		1,8,12
4.1	Statistical Analysis for Interim-Status Detection Monitoring Programs	WHC-CM-7-8[e]		1,8,12
4.2	Request for Analytical Data Evaluation	WHC-CM-7-8[e]	12.0	
6.1	Purgewater Collection Determination	WHC-CM-7-8[e]		1,8,12

Appendix A. Supporting Procedures for RCRA Groundwater and Soil Monitoring Activities.

Procedure	Title or subject	Source	QAPP section reference for Procedure	QAPP section reference for Source
6.2	Exemption from HPT Field Coverege for Groundwater Well Sampling	WHC-CM-7-8[e]		1,8,12
7.1	Self-Assessment	WHC-CM-7-8[e]	10.0	
10.1	Loading laboratory Diskettes Into HEIS and GeoDAT	WHC-CM-7-8[e]		1;8,12
10.2	Loading Sample Field Record Forms Into HEIS and GeoDAT	WHC-CM-7-8[e]		1,8,12
10.3	Loading Groundwater Measurements Into HEIS and GeoDAT	WHC-CM-7-8[e]		1,8,12

[a] Environmental Investigations and Site Characterization Manual (WHC 1988d).

[b] Quality Assurance Manual (WHC 1988c).

[c] Geotechnical Engineering Procedure Manual (WHC 1992b).

[d] Standard Engineering Practices (WHC 1998b).

[e] Environmental Engineering and Geotechnology Function Procedures (WHC 1992a).

Appendix B. Analytes of Interest and Analytical Methods Used for Groundwater Monitoring Activities

CATEGORY/ STANDARD REFERENCE METHOD	ANALYTE OF INTEREST		CONTRACTUAL REQUIRED QUANTITATION LIMIT (µg/l)[a]	PRECISION Relative Percent Difference[b]	ACCURACY Percent Recovery[c]	COMMENTS
ANIONS[f,g] ASTM D-4327-88 EPA 600 300.0	Chloride	12595-89-0	150	±20%	75% to 125%	d
	Phosphate	14265-44-2	500	±20%	75% to 125%	
	Nitrate	14797-55-8	150	±20%	75% to 125%	
	Nitrite	14797-65-0	150	±20%	75% to 125%	
	Sulfate	14808-79-8	150	±20%	75% to 125%	
	Fluoride	16984-48-8	100	±20%	75% to 125%	
	Bromide	24959-67-9	150	±20%	75% to 125%	
	Nitrite/Nitrate as N					
INDIVIDUAL INORGANIC ANALYTICAL PROCEDURES[f,g,h,j]						d
SOP-DCL-Perchlorate	Perchlorate	7601-89-0	500	±20%	75% to 125%	
SW-846 9012 EPA 600 335.1/2/3	Cyanide	57-12-5	10	±20%	75% to 125%	
SW-846 9030	Sulfide	18496-25-8	300	±20%	75% to 125%	
ASTM D-1426-C EPA 600 350.1/2/3	Ammonium Ion	14798-03-9	50	±20%	75% to 125%	
ASTM D-1385	Hydrazine	302-01-2	5	±20%	75% to 125%	
PHYSICAL CHARACTERISTICS[f,g,i]						
ASTM D-1067-A EPA 600 310.2	Alkalinity		10.0	±20%	75% to 125%	
Std Meth #214A EPA 600 180.1	Turbidity		0.1 NTU	N/A	N/A	
Std Meth #209B EPA 600 160.1	Total Dissolved Solids (TDS)		10	±20%	N/A	
ASTM D-1125-A EPA 600 120.1	Specific Conductance		N/A	N/A	N/A	
SW-846 9050 ASTM D-1293	pH		±0.05	N/A	N/A	
SW-846 9040A EPA 600 150.1 EPA 600 170.0	Temperature		N/A	N/A	N/A	
INDICATOR PARAMETERS[f,j]						
ASTM D-2579-A	Total Carbon		500	±20%	75% to 125%	
SW-846 9060	Total Organic Carbon (TOC)		500	±20%	75% to 125%	
SW-846 9020B	Total Organic Halides (TOX)		10	±20%	75% to 125%	
BIOCHEMICAL OXYGEN DEMAND[f,g] Std Meth 5210.B EPA 600 405.1	Biochemical Oxygen Demand (BOD)		3.0 mg/l	±20%	TBD	
CHEMICAL OXYGEN DEMAND USEPA HACH COD	Chemical Oxygen Demand (COD)		10 mg/l	±20%	75% to 125%	
TOTAL COLIFORM BACTERIA[j]						
SW-846 9132	coliform (filter)		1 colony/100ml	±20%	TBD	
SW-846 9131	coliform (fermentation)		2.2 MPN	±20%	TBD	

CATEGORY/ STANDARD REFERENCE METHOD	ANALYTE OF INTEREST		CONTRACTUAL REQUIRED QUANTITATION LIMIT (µg/L)[a]	PRECISION Relative Percent Difference[b]	ACCURACY Percent Recovery[c]	COMMENTS
ICP METALS[g,j]						
SW-846 6010A	Aluminum	7429-90-5	100	±20%	75% to 125%	
	Iron	7439-89-6	30	±20%	75% to 125%	
	Magnesium	7439-95-4	100	±20%	75% to 125%	
	Manganese	7439-96-5	5	±20%	75% to 125%	
	Nickel	7440-02-0	25	±20%	75% to 125%	
	Potassium	7440-09-7	1000	±20%	75% to 125%	
	Silver	7440-22-4	10	±20%	75% to 125%	
	Sodium	7440-23-5	300	±20%	75% to 125%	
	Tin	7440-31-5	100	±20%	75% to 125%	
	Antimony	7440-36-0	100	±20%	75% to 125%	
	Barium	7440-39-3	10	±20%	75% to 125%	
	Beryllium	7440-41-7	2	±20%	75% to 125%	
	Cobalt	7440-48-4	20	±20%	75% to 125%	
	Copper	7440-50-8	20	±20%	75% to 125%	
	Vanadium	7440-62-2	10	±20%	75% to 125%	
	Zinc	7440-66-6	10	±20%	75% to 125%	
	Calcium	7440-70-2	10	±20%	75% to 125%	
SW-846 6010A SW-846 7131A	Cadmium	7440-43-9	5	±20%	75% to 125%	
SW-846 6010A SW-846 7191 EPA 600 200.8	Chromium	7440-47-3	10	±20%	75% to 125%	
AA METALS[j]						
SW-846 7060	Arsenic	7440-38-2	5	±20%	75% to 125%	
SW-846 7421	Lead	7439-92-1	3	±20%	75% to 125%	
SW-846 7470 SW-846 7471	Mercury	7439-97-6	0.2	±20%	75% to 125%	
SW-846 7740	Selenium	7782-49-2	5	±20%	75% to 125%	
SW-846 7841	Thallium	7440-28-0	5	±20%	75% to 125%	
PESTICIDES AND PCBs BY GC[j]						
SW-846 8080	Aldrin	309-00-2	0.01	±20%	0.81C+0.04	
	Alpha-BHC	319-84-6	0.01	±20%	0.84C+0.03	
	Beta-BHC	319-85-7	0.01	±20%	0.81C+0.07	
	Delta-BHC	319-86-8	0.02	±20%	0.81C+0.07	
	gamma-BHC(Lindane)	58-89-9	0.1	±20%	0.82C+0.05	
	Chlordane	57-74-9	0.02	±20%	0.82C+0.04	
	4,4'-DDD	72-54-8	0.01	±20%	0.84C+0.03	
	4,4'-DDE	72-55-9	0.01	±20%	0.85C+0.14	
	4,4'-DDT	50-29-3	0.01	±20%	0.93C-0.13	
	Dieldrin	60-57-1	0.01	±20%	0.90C+0.02	
	Endosulfan I	959-98-8	0.01	±20%	0.97C+0.04	
	Endosulfan II	33213-65-9	0.01	±20%	0.93C+0.34	
	Endosulfan Sulfate	1031-07-8	0.1	±20%	0.89C-0.37	
	Endrin	72-20-8	0.02	±20%	0.89C-0.04	
	Endrin Aldehyde	7421-93-4	0.02	±20%	0.69C+0.04	
	Heptachlor	76-44-8	0.01	±20%	0.89C+0.10	
	Heptechlor Epoxide	1024-57-3	0.02	±20%	0.80C+1.74	
	Methoxychlor	72-43-5	0.1	±20%	N/A	
	Toxaphene	8001-35-2	1.0	±20%	0.80C+1.74	
	PCBs:					
	Aroclor-1016	12674-11-2	0.5	±20%	0.81C+0.5	
	Aroclor-1221	11104-28-2	0.5	±20%	0.96C+0.65	
	Aroclor-1232	11141-16-5	0.5	±20%	0.91C+10.79	
	Aroclor-1242	53469-21-9	0.5	±20%	0.91C+10.79	
	Aroclor-1248	12672-29-6	0.5	±20%	0.91C+10.79	
	Aroclor-1254	11097-69-1	0.2	±20%	0.91C+10.79	
	Aroclor-1260	11096-82-5	0.2	±20%	0.91C+10.79	
CHLORINATED HERBICIDES BY GC[j]						
SW-846 8150B	2,4-D	94-75-7	0.5	±20%	75%	
	DINOSEB;DNBP	88-85-7	0.5	±20%	N/A	
	SILVEX;2,4,5-TP	93-72-1	0.25	±20%	88%	
	2,4,5-T	93-76-5	0.25	±20%	85%	
ORGANOPHOSPHORUS PESTICIDES BY GC[j]						
SW-846 8140	Disulfoton	298-04-4	0.5	±20%	81.9%	
	Methyl Parathion	298-00-0	0.5	±20%	96%	
	Phorate	298-02-2	0.5	±20%	62.7%	

CATEGORY/ STANDARD REFERENCE METHOD	ANALYTE OF INTEREST	CONTRACTUAL REQUIRED QUANTITATION LIMIT (µg/l)[a]	PRECISION Relative Percent Difference[b]	ACCURACY Percent Recovery[c]	COMMENTS
HALOGENATED VOLATILE ORGANICS BY GC[j] SW-846 8010B/8020A	Benzene 71-43-2	0.2	±20%	0.92C+0.57	
	Carbon Tetrachloride 56-23-5	0.5	±20%	0.98C-1.04	
	Chloroform 67-66-3	0.2	±20%	0.93C-0.39	
	1,4-Dichlorobenzene 106-46-7	0.2	±20%	0.93C-0.09	
	1,1-Dichloroethane 75-34-3	0.2	±20%	0.95C-1.08	
	1,2-Dichloroethane 107-06-2	0.2	±20%	1.04C-1.06	
	cis-1,2-Dichloroethylene 156-59-2	0.2	±20%	TBD	
	trans-1,2-Dichloroethylene 156-60-5	0.2		0.97C-0.16	
	Ethylbenzene 100-41-4	0.2	±20%	0.94C+0.31	
	Methylene chloride 75-09-2	0.2	±20%	TBD	
	Tetrachloroethene 127-18-4	0.2	±20%	0.94C+0.06	
	Toluene 108-88-3	0.2	±20%	0.94C+0.65	
	1,1,1-Trichloroethane 71-55-6	0.2	±20%	0.90C-0.16	
	1,1,2-Trichloroethane 79-00-5	0.2	±20%	0.86C+0.30	
	Trichloroethene 79-01-6	0.2		0.87C+0.48	
	Vinyl Chloride 75-01-4	1.0	±20%	0.97C-0.36	
	Xylene (Total) 1330-20-7	0.6	±20%	TBD	
			±20%		
VOLATILE ORGANICS BY GC/MS[j] SW-846 8260A (Capillary Column) SW-846 8240B (Packed Column)	Acetone 67-64-1	10	±20%	N/A	
	Benzene 71-43-2	5	±20%	99%	
	Carbon Tetrachloride 56-23-5	5	±20%	108%	
	Chloroform 67-66-3	5	±20%	105%	
	Chloroprene 126-99-8	5	±20%	N/A	
	1,1-Dichloroethane 75-34-3	5	±20%	98%	
	1,2-Dichloroethane 107-06-2	5	±20%	100%	
	cis 1,2-Dichloroethylene 156-59-2	5	±20%	N/A	
	trans 1,2-Dichloroethylene 156-60-5	5	±20%	N/A	
	Methylene Bromide 74-95-3	5	±20%	N/A	
	Methylene Chloride 75-09-2	5	±20%	97%	
	Methyl Ethyl Ketone 78-93-3	10	±20%	N/A	
	Iodomethane 74-88-4	5	±20%	N/A	
	Methyl Methacrylate 80-62-6	5	±20%	N/A	
	Hexone 108-10-1	10	±20%	N/A	
	Tetrachloroethene 127-18-4	5	±20%	96%	
	Tetrahydrofuran 109-99-9	10	±20%	N/A	
	Toluene 108-88-3	5	±20%	100	
	1,1,1-Trichloroethane 71-55-6	5	±20%	100%	
	1,1,2-Trichloroethane 79-00-5	5	±20%	102%	
	Trichloroethene 79-01-6	5	±20%	104%	
	Vinyl Chloride 75-01-4	5	±20%	104%	
	Xylene (Total) 1330-20-7	5	±20%	N/A	
	1-Butanol 71-36-3	100	±20%	N/A	
	Ethyl Cyanide 107-12-0	10	±20%	N/A	
	Carbon Disulfide 75-15-0	5	±20%	N/A	

CATEGORY/ STANDARD REFERENCE METHOD	ANALYTE OF INTEREST		CONTRACTUAL REQUIRED QUANTITATION LIMIT (µg/l)[a]	PRECISION Relative Percent Difference[b]	ACCURACY Percent Recovery[c]	COMMENTS
VOLATILE ORAGANICS BY GC/MS /APPENDIX IX ADDITIONS[j] SW-846 8260A (Capillary Column) SW-846 8240B (Packed Column)	Acetonitrile	75-05-8	100	±20%	N/A	
	Acrolein	107-02-8	10	±20%	N/A	
	Acrylonitrile	107-13-1	10	±20%	N/A	
	Allyl chloride	107-05-1	10	±20%	N/A	
	Bromodichloromethane	75-27-4	5	±20%	100%	
	Bromoform	75-25-2	5	±20%	101%	
	Chlorobenzene	108-90-7	5	±20%	91%	
	Chloroethane	75-00-3	5	±20%	100%	
	Dibromochloromethane	124-48-1	5	±20%	99%	
	1,2-dibromo-3-chloropropane	96-12-8	5	±20%	92%	
	1,2-dibromoethane	106-93-4	5	±20%	97%	
	trans-1,4-dichloro-2-butene	110-57-6	5	±20%	N/A	
	dichlorodifluoromethane	75-71-8	5	±20%	99%	
	1,1-dichloroethylene	75-35-4	5	±20%	N/A	
	1,2-dichloropropane	78-87-5	5	±20%	96%	
	cis-1,3-dichloropropene	10061-01-5	5	±20%	N/A	
	trans-1,3-dichloropropene	10061-02-6	5	±20%	N/A	
	1,4-dioxane	123-91-1	100	±20%	N/A	
	ethylbenzene	100-41-4	5	±20%	99%	
	ethyl methacrylate	97-63-2	5	±20%	N/A	
	2-hexanone	591-78-6	10	±20%	N/A	
	isobutyl alcohol	78-83-1	100	±20%	N/A	
	methacrylonitrile	126-98-7	5	±20%	N/A	
	bromomethane	74-83-9	5	±20%	99%	
	chloromethane	74-87-3	5	±20%	101%	
	pentachloroethane	76-01-7	5	±20%	N/A	
	styrene	100-42-5	5	±20%	96%	
	1,1,1,2-tetrachloroethane	630-20-6	5	±20%	100%	
	1,1,2,2-tetrachloroethane	79-34-5	5	±20%	100%	
	Trichlorofluoromethane	75-69-4	5	±20%	97%	
	1,2,3-trichloropropane	96-18-4	5	±20%	96%	
	vinyl acetate	108-05-4	5	±20%	N/A	
PHENOLS BY GC[j] SW-846 8040A	Dinoseb, 2-sec-Butyl-4, 6-dintrophenol	88-85-7	5	±20%	N/A	
	4-chloro-3-methylphenol	59-50-7	5	±20%	0.87C-1.97	
	2-chlorophenol	95-57-8	5	±20%	0.83C-0.84	
	Cresols (methylphenols)	1319-77-3	5	±20%	N/A	
	2,4-Dichlorophenol	120-83-2	5	±20%	0.81C+0.48	
	2,6-Dichlorophenol	87-65-0	5	±20%	N/A	
	2,4-Dimethylphenol	105-67-9	5	±20%	0.62C-1.64	
	2,4-Dinitrophenol	51-28-5	5	±20%	0.80C-1.58	
	4,6-dinitro-o-cresol	534-52-1	5	±20%	N/A	
	2-nitrophenol	88-75-5	5	±20%	0.81C-0.76	
	4-nitrophenol	100-02-7	5	±20%	0.46C+0.18	
	Pentachlorophenol	87-86-5	5	±20%	0.83C+2.07	
	Phenol	108-95-2	1	±20%	0.43C+0.11	
	Tetrachlorophenols	25167-83-3	5	±20%	N/A	
	Trichlorophenols	25167-82-2	5	±20%	N/A	
	2,4,6-Trichlorophenol	88-06-2	5	±20%	0.86-0.40	

CATEGORY/ STANDARD REFERENCE METHOD	ANALYTE OF INTEREST		CONTRACTUAL REQUIRED QUANTITATION LIMIT (µg/l)[a]	PRECISION Relative Percent Difference[b]	ACCURACY Percent Recovery[c]	COMMENTS
SEMIVOLATILE ORGANICS BY GC/MS SW-846 8270B	o-cresol	95-48-7	5	±20%	N/A	
	m+p-cresol	m+p-cresol	5	±20%		
	Decane	124-18-5	5	±20%	N/A	
	Dodecane	112-40-3	5	±20%	N/A	
	Tetradecane	629-59-4	5	±20%	N/A	
	Napthalene	91-20-3	5	±20%	0.76C+1.58	
	Pentachlorophenol	87-86-5	20	±20%	0.93C+1.99	
	Phenol	108-95-2	5	±20%	0.43C+1.26	
	Tributyl phosphate	126-73-8	5	±20%	N/A	
	Tris-2-chloroethyl phosphate	115-96-8	10	±20%	N/A	
	Benzothiazole	95-16-9	5	±20%	N/A	
	Bis(2-ethylhexyl)phthalate	117-81-7	5	±20%	0.84C-1.18	
	2,4-Dichlorophenol	120-83-2	5	±20%	0.87C-0.13	
	2-nitrophenol	88-75-5	5	±20%	0.07C-1.15	

CATEGORY/ STANDARD REFERENCE METHOD	ANALYTE OF INTEREST		CONTRACTUAL REQUIRED QUANTITATION LIMIT (µg/L)[a]	PRECISION Relative Percent Difference[b]	ACCURACY Percent Recovery[c]	COMMENTS
SEMIVOLATILE ORGANICS BY GC/MS/ APPENDIX IX ADDITIONS[d] SW-846 8270B	Acenapthene	83-32-9	5	±20%	0.96C+0.19	
	Acenapthylene	208-96-8	5	±20%	0.89C+0.74	
	Acetophenone	98-86-2	5	±20%	N/A	
	2-Acetylaminofluorene	53-96-3	5	±20%	N/A	
	4-Aminobiphenyl	92-67-1	5	±20%	N/A	
	Aniline	62-53-3	10	±20%	N/A	
	Anthracene	120-12-7	5	±20%	0.80C+0.68	
	Aramite	140-57-8	20	±20%	N/A	
	Benzo[a]anthracene	56-55-3	5	±20%	0.88C-0.60	
	Benzo[b]fluoranthene	205-99-2	5	±20%	0.93C-1.80	
	Benzo[k]fluoranthene	207-08-9	5	±20%	0.87C-1.56	
	Benzo[ghi]perylene	191-24-2	5	±20%	0.98C-0.86	
	Benzo[a]pyrene	50-32-8	5	±20%	0.90C-0.13	
	Benzyl alcohol	100-51-6	20	±20%	N/A	
	bis(2-chloroethoxy)methane	111-91-1	5	±20%	1.12C-5.04	
	bis(2-chloroethyl)ether	111-44-4	5	±20%	0.86C-1.54	
	bis(2-chloroisopropyl)ether	108-60-1	5	±20%	1.03C-2.31	
	4-bromophenyl phenyl ether	101-55-3	5	±20%	0.91C-1.34	
	Butyl benzyl phthalate	85-68-7	5	±20%	N/A	
	p-chloroaniline	106-47-8	10	±20%	N/A	
	Chlorobenzilate	510-15-6	10	±20%	N/A	
	4-chloro-3-methylphenol	59-50-7	5	±20%	0.84C+0.35	
	2-chloronapthalene	91-58-7	5	±20%	0.89C+0.01	
	2-chlorophenol	95-57-8	5	±20%	0.78+0.29	
	4-chlorophenylphenyl ether	7005-72-3	5	±20%	0.91C+0.53	
	Chrysene	218-01-9	5	±20%	0.93C-1.00	
	Diallate	2303-16-4	20	±20%	N/A	
	Dibenzo[a,h]anthracene	53-70-3	5	±20%	0.88C+4.72	
	Dibenzofuran	132-64-9	5	±20%	N/A	
	Di-n-butyl phthalate	84-74-2	5	±20%	0.59C+0.71	
	1,2-dichlorobenzene	95-50-1	5	±20%	0.80C+0.28	
	1,3-dichlorobenzene	541-73-1	5	±20%	0.86C-0.70	
	1,4-dichlorobenzene	106-46-7	5	±20%	0.73C-1.47	
	3,3'-dichlorobenzidine	91-94-1	10	±20%	1.23C-12.65	
	2,6-dichlorophenol	87-65-0	10	±20%	N/A	
	Diethyl phthalate	84-66-2	10	±20%	0.43C+1.00	
	O,O-diethyl O-2-pyrazinyl phosphorothiolate	297-97-2	10	±20%	N/A	
	Dimethoate	60-51-5	N/A	±20%	N/A	
	p-(dimethylamino)azobenzene	60-11-7	10	±20%	N/A	
	7,12-dimethylbenz[a]anthracene	57-97-6	3	±20%	N/A	
	Pyridine	110-86-1	3	±20%	N/A	
	3,3-dimethylbenzidine	119-93-7	5	±20%	N/A	
	a,a-dimethylphenethylamine	122-09-8	50	±20%	N/A	
	2,4-dimethylphenol	105-67-9	5	±20%	0.71C+4.41	
	Dimethyl phthalate	131-11-3	5	±20%	0.20C+1.03	
	m-dinitrobenzene	99-65-0	5	±20%	1.09C-3.05	
	4,6-dinitro-o-cresol	534-52-1	20	±20%	N/A	
	2,4-dinitrophenol	51-28-5	20	±20%	0.81C-18.04	
	2,4-dinitrotoluene	121-14-2	5	±20%	0.92C-4.81	
	2,6-dinitrotoluene	606-20-2	5	±20%	1.06C-3.60	
	Diphenylamine	122-39-4	5	±20%	N/A	

CATEGORY/ STANDARD REFERENCE METHOD	ANALYTE OF INTEREST	CONTRACTUAL REQUIRED QUANTITATION LIMIT (µg/l)[a]	PRECISION Relative Percent Difference[b]	ACCURACY Percent Recovery[c]	COMMENTS
SEMIVOLATILE ORGANICS BY GC/MS/ APPENDIX IX ADDITIONS[1] SW-846 8270B	Di-n-octyl phthalate 117-84-0	5	±20%	N/A	
	Ethyl methanesulfonate 62-50-0	5	±20%	N/A	
	Famphur 52-85-7	50	±20%	N/A	
	Fluoranthene 206-44-0	5	±20%	0.81C+1.10	
	Fluorene 86-73-7	5	±20%	0.90C-0.00	
	Hexachlorobenzene 118-74-1	5	±20%	0.74C+0.66	
	Hexachlorobutadiene 87-68-3	5	±20%	0.71C-1.01	
	Hexachlorocyclopentadiene 77-47-4	5	±20%	N/A	
	Hexachloroethane 67-72-1	5	±20%	0.73C-0.83	
	Hexachlorophene 70-30-4	50	±20%	N/A	
	Hexachloropropene 1888-71-7	5	±20%	N/A	
	Ideno[1,2,3-cd]pyrene 193-39-5	5	±20%	0.78C-3.10	
	Isodrin 465-73-6	20	±20%	N/A	
	Isophorone 78-59-1	20	±20%	1.12C+1.41	
	Isosafrole 120-58-1	20	±20%	N/A	
	Kepone 143-50-0	20	±20%	N/A	
	Methapyrilene 91-80-5	5	±20%	N/A	
	3-methylcholanthrene 56-49-5	5	±20%	N/A	
	Methyl methanesulfonate 66-27-3	5	±20%	N/A	
	2-methylnaphthalene 91-57-6	5	±20%	N/A	
	1,4-naphthoquinone 130-15-4	N/A	±20%	N/A	
	1-naphthylamine 134-32-7	10	±20%	N/A	
	2-naphthylamine 91-59-8	10	±20%	N/A	
	2-nitroaniline 88-74-4	50	±20%	N/A	
	3-nitroaniline 99-09-2	50	±20%	N/A	
	4-nitroaniline 100-01-6	50	±20%	N/A	
	Nitrobenzene 98-95-3	5	±20%	1.09C-3.05	
	4-nitrophenol 100-02-7	20	±20%	0.61C-1.22	
	4-nitroquinoline-1-oxide 56-57-5	20	±20%	N/A	
	N-nitrosodi-n-butylamine 924-16-3	10	±20%	N/A	
	N-nitrosodiethylamine 55-18-5	10	±20%	N/A	
	N-nitrosodimethylamine 62-75-9	10	±20%	N/A	
	N-nitrosodiphenylamine 86-30-6	3	±20%	N/A	
	N-nitrosodipropylamine 621-64-7	3	±20%	1.12C-6.22	
	N-nitrosomethylethylamine 10595-95-6	10	±20%	N/A	
	N-nitrosomorpholine 59-89-2	10	±20%	N/A	
	N-nitrosopiperidine 100-75-4	10	±20%	N/A	
	N-nitrosopyrrolidine 930-55-2	10	±20%	N/A	
	5-nitro-o-toluidine 99-55-8	20	±20%	N/A	
	Parathion 56-38-2	5	±20%	N/A	
	Pentachlorobenzene 608-93-5	5	±20%	N/A	
	Pentachloronitrobenzene 82-68-8	5	±20%	N/A	
	Phenacetin 62-44-2	5	±20%	N/A	
	Phenanthrene 85-01-8	5	±20%	0.87C+0.06	
	p-phenylenediamine 106-50-3	50	±20%	N/A	
	Pronamide 23950-58-5	20	±20%	N/A	
	Pyrene 129-00-0	5	±20%	0.84C-0.16	
	Safrole 94-59-7	10	±20%	N/A	
	1,2,4,5-tetrachlorobenzene 95-94-3	5	±20%	N/A	
	2,3,4,6-tetrachlorophenol 58-90-2		±20%	N/A	

CATEGORY/ STANDARD REFERENCE METHOD	ANALYTE OF INTEREST	CONTRACTUAL REQUIRED QUANTITATION LIMIT (µg/l)[a]	PRECISION Relative Percent Difference[b]	ACCURACY Percent Recovery[c]	COMMENTS
SEMIVOLATILE ORGANICS BY GC/MS/ APPENDIX IX ADDTITIONS SW-846 8270B	Tetraethyl dithiopyrophosphate 3689-24-5	20		N/A	
	o-Toluidine 95-53-4	20	±20%	N/A	
	1,2,4-trichlorobenzene 120-82-1	5	±20%	N/A	
	2,4,5-trichlorophenol 95-95-4	10	±20%	N/A	
	2,4,6-trichlorophenol 88-06-2	10	±20%	0.91C-0.18	
	0,0,0-triethyl phosphorothioate 126-68-1	10		N/A	
	sym-trinitrobenzene 99-35-4	10	±20% ±20%	N/A	
DIOXINS AND DIBENZOFURANS BY GC/MS SW-846 8280	PCDDs (Polychlorinated Dibenzo-p-Dioxins):				
	Tetrachlorodibenzo-p-Dioxins (2,3,7,8-TCDD) 1746-01-6	0.005	±20%	TBD	
	Pentachlorodibenzo-p-dioxins (Total PeCDD) 36088-22-9	0.030	±20%	TBD	
	Hexachlorodibenzo-p-dioxins (Total HxCDO) 34465-4608	0.010	±20%	TBD	
	Heptachlorodibenzo-p-dioxins (Total HpCDD) 37871-00-4	0.010	±20%	TBD	
	Octochlorodibenzo-p-dioxins (2,3,7,8 OCDD) 3268-87-9	0.005	±20%	TBD	
	PCDFs (Polychlorinated Dibenzofurans):				
	Tetrachlorodibenzofurans (Total) 55722-24-5	0.005	±20%	TBD	
	Pentachlorodibenzofurans (Total) 30402-15-4	0.005	±20%	TBD	
	Hexachlorodibenzofurans (Total) 55684-94-1	0.005	±20%	TBD	
	Heptachlorodibenzofurans (Total) 38998-75-3	0.005	±20%	TBD	
	Octochlorodibenzofurans (2,3,7,8) 39001-02-0	0.005	±20%	TBD	
RADIONUCLIDES[h,j] ITAS Am-241 ITAS Gamma Scan	Americium-241 14596-10-2	TBD	±20%	75% to 125%	
	Cesium-137 10045-97-3	TBD	±20%	75% to 125%	
	Cobalt-60 10198-40-0	TBD	±20%	75% to 125%	
	Potassium-40 13966-00-2	TBD	±20%	75% to 125%	
	Beryllium-7 13966-02-4	TBD	±20%	75% to 125%	
	Ruthenium-106 13967-48-1	TBD	±20%	75% to 125%	
	Cesium-134 13967-70-9	TBD	±20%	75% to 125%	
	Zinc-65 13982-39-3	TBD	±20%	75% to 125%	
	Antimony-125 14234-35-6	TBD	±20%	75% to 125%	
	Europium-152 14683-23-9	TBD	±20%	75% to 125%	
	Europium-155 14391-16-3	TBD	±20%	75% to 125%	
	Europium-154 15585-10-1	TBD	±20%	75% to 125%	
	Cerium/Praseodymium-144				

Appendix B. Analytes of Interest and Analytical Methods Used for Groundwater Monitoring Activities.

[a] These values reflect negotiated contractual values as specified in the final procurement documents or work orders. The CRQL is a target range and is not specifically determined by the method. In subsequent procurement documents and work orders, the applicable CRQL will be determined by the DQO. (See paragraph 3.2.)

[b] Duplicate sample results are used to evaluate laboratory precision using a Relative Percent Difference (RPD) of ±20% as the evaluation criteria. If the result of either duplicate sample is below the Practical Quantitation Limit (PQL), the results are not evaluated. The ±20% criterion is based on the Hanford Analytical Services Quality Assurance Plan. The precision for organic duplicate analyses is not specified in the HASQAP. For the time being, ±20% used for inorganic duplicate analyses will also be used for organic duplicate analyses. For radiochemical analyses, results are not evaluated if they fall below the Limit of Quantitation (LOQ) calculated annually in the Annual Report for RCRA Groundwater Monitoring.

[c] Accuracy is expressed as percent recovery for Inorganic Analyses, Total Carbon, Total Organic Carbon, and Radiochemical analyses according to the Hanford Analytical Services Quality Assurance Plan. In accordance with the HASQAP, accuracy for Organic Analytes is based on SW-846. The comment field indicates how the values for organic analytes were obtained.

[d] Accuracy was determined as percent mean recovery by a single operator.

[e] Accuracy is the expected recovery x' for one or more measurements of sample containing a concentration of C, which is the true concentration (in $\mu g/l$).

[f] Standard methods are from American Society for Testing and Materials (ASTM 1992).

[g] Standard methods are from Methods for Chemical Analysis of Water and Waste (EPA 1979).

[h] Analytical methods shall be WHC or WHC-approved participant contractor or subcontractor procedures.

[i] Standard methods are from Standard Methods for the Examination of Water and Wastewater (APHA 1985).

Appendix B. Analytes of Interest and Analytical Methods Used for Groundwater Monitoring Activities.

[j] Standard methods are from Test Methods for Evaluating Solid Waste (SW-846) (EPA 1992).

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