START

0041766

DOE/RL-95-57
UC-630

Data Evaluation Report

Simulated High-Level Waste Slurry Treatment and Storage Unit

Date Published
May 1995

AUG 1995
RECEIVED
EDMC

United States
Department of Energy
P.O. Box 550
Richland, Washington 99352

Approved for Public Release

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor Battelle Memorial Institute, nor any of their employees, makes **any warranty, expressed or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights.** Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof, or Battelle Memorial Institute. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

PACIFIC NORTHWEST LABORATORY
operated by
BATTELLE MEMORIAL INSTITUTE
for the
UNITED STATES DEPARTMENT OF ENERGY
under Contract DE-AC06-76RLO 1830

Printed in the United States of America

Available to DOE and DOE contractors from the
Office of Scientific and Technical Information, P.O. Box 62, Oak Ridge, TN 37831;
prices available from (615) 576-8401, FTS 626-8401.

Available to the public from the National Technical Information Service,
U.S. Department of Commerce, 5285 Port Royal Rd., Springfield, VA 22161.

The contents of this report were printed on recycled paper

9513386.0223

DOE/RL-95-57
UC-630

Data Evaluation Report

Simulated High-Level Waste Slurry Treatment and Storage Unit

J. L. Julya

May 1995

Prepared for
the U.S. Department of Energy

AUG 1995
RECEIVED
EDMC

Pacific Northwest Laboratory
Richland, Washington 99352

THIS PAGE INTENTIONALLY
LEFT BLANK

EDMS
RECEIVED
AUG 2002

9513386.0224

Executive Summary

At the Simulated High-Level Waste Slurry Treatment and Storage (SHLWS T/S) Unit in the 3000 Area of the Hanford Site, sampling activities were undertaken and the analytical results obtained during soil sampling conducted as part of the Resource Conservation and Recovery Act closure activities. The sampling and analysis effort was performed to identify potential contamination, if it existed, at the SHLWS T/S Unit. The efforts were conducted in accordance with the approved SHLWS T/S Unit closure plan. Soil results were compared to the Hanford Site background thresholds, Model Toxics Control Act Method B limits, and crustal abundance as agreed upon during a data quality objectives process involving the U.S. Department of Energy, Washington State Department of Ecology, and Pacific Northwest Laboratory[a].

No organic or inorganic constituents were found in sufficient concentrations to require the investigated soil to be remediated or to be regulated as dangerous waste. Concentrations were also below the Model Toxics Control Act Method B clean-up action levels established for this unit.

(a) Pacific Northwest Laboratory is operated for the U.S. Department of Energy by Battelle Memorial Institute under Contract DE-AC06-76RLO 1830.

THIS PAGE INTENTIONALLY
LEFT BLANK

9513386.0225

Acronyms and Abbreviations

alpha/beta	alpha/beta radionuclide
%D	percent difference
DI	deionized water
DOE	U.S. Department of Energy
Ecology	Washington State Department of Ecology
EP	Extraction Procedure
EPA	U.S. Environmental Protection Agency
Hg	mercury
ICP	inductively coupled plasma
ID	identification
MTCA	Model Toxics Control Act
PNL	Pacific Northwest Laboratory
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act of 1976
RPD	relative percent difference
SHLWS T/S Unit	Simulated High-Level Waste Slurry Treatment and Storage Unit
SVOA	semivolatile organic compounds analysis
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TSD	treatment, storage, and/or disposal
VOA	volatile organic compounds analysis
WAC	Washington Administrative Code
WHC	Westinghouse Hanford Company

THIS PAGE INTENTIONALLY
LEFT BLANK

9513386.0226

Contents

Executive Summary iii

Acronyms and Abbreviations v

1.0 Introduction 1.1
- 1.1 Regulatory Background 1.1
- 1.2 Background 1.1
- 1.3 Setting 1.2
- 1.4 Hanford Site Background Approach 1.3
- 1.5 Report Organization 1.3

2.0 Sampling Activities 2.1
- 2.1 Sample Location 2.1
- 2.2 Sample Collection 2.2
- 2.3 Field Quality Assurance/Quality Control 2.3
- 2.4 Sample Analysis 2.3

3.0 Data Validation 3.1
- 3.1 Data Qualifiers 3.1
- 3.2 Golder Associates 3.2
- 3.3 Lockheed Analytical Services 3.2

4.0 Analytical Results and Data Tabulation 4.1
- 4.1 Data Summary of Organic Analytes 4.1
- 4.2 Data Summary of Metal Analytes 4.1
- 4.3 Data Summary of Radionuclide Analyses 4.2

5.0 Conclusions 5.1

6.0 References 6.1

Appendix A. Volatile Organic Compounds Validated Data Summary Tables A.1
Appendix B. Volatile Organic Compounds Field Duplicate Results B.1
Appendix C. Semivolatile Organic Compounds Validated Data Summary Tables C.1
Appendix D. Semivolatile Organic Compounds Field Duplicate Results D.1
Appendix E. Metals Validated Data Summary Tables E.1
Appendix F. Metals Validated Field Duplicate Summary F.1
Appendix G. Radiochemistry Validated Data Summary Tables G.1
Appendix H. Radiochemistry Field Duplicate Results H.1
Appendix I. Method and Reporting Detection Limits for Volatile Organic and Semivolatile Organic Compounds Solid Samples I.1

Figures

1.1 Location of SHLWS T/S Unit Within the 3000 Area 1.5

2.1 Soil Sample Locations for SHLWS T/S Unit 2.7

Tables

2.1 Compliance Constituents, Analytical Methods, Detection Limits, and Action Levels 2.4

2.2 SHLWS T/S Unit Sampling Matrix 10/6/94 . . . . . 2.5

1.0 Introduction

This report summarizes the sampling activities undertaken and the analytical results obtained during soil sampling activities conducted as part of the Resource Conservation and Recovery Act of 1976 (RCRA) closure activities for the Simulated High-Level Waste Slurry Treatment and Storage (SHLWS T/S) Unit. This 86,600 ft^2 (8,000 m^2) unit is located in an open area within a fenced-in yard in the 3000 Area of the Hanford Site. The sampling and analysis effort, referred to as the Phase 1 characterization study, was performed to determine if contamination occurred at the SHLWS T/S Unit and identify any contamination if it occurred. The efforts were conducted in accordance with the approved SHLWS T/S Unit closure plan. Results were compared to the Hanford Site background thresholds for soils (described in Section 1.4), Model Toxics Control Act (MTCA) Method B limits, and crustal abundance as agreed upon during a data quality objectives process involving the U.S. Department of Energy (DOE), Washington State Department of Ecology (Ecology), and Pacific Northwest Laboratory (PNL).

1.1 Regulatory Background

The U.S. Environmental Protection Agency (EPA) and Ecology jointly administer the RCRA in the State of Washington. The EPA retains oversight authority while delegating to Ecology enforcement of a state program that is consistent with or more stringent than the corresponding federal program. The implementing regulations can be found in the Washington Administrative Code (WAC) 173-303, "Dangerous Waste Regulations" (WAC 1993), and Title 40, *U.S. Code of Federal Regulations*, Parts 260 through 265 and 267 through 270. Ecology's authorization includes administering treatment, storage, and/or disposal (TSD) closures.

The DOE, EPA, and Ecology have entered into an agreement called the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1989), commonly referred to as the Tri-Party Agreement. One purpose of this agreement is to ensure environmental impacts associated with past activities are investigated and appropriate response actions are taken as necessary to protect human health and the environment. The agreement seeks to promote this goal, in part, by identifying TSD units, identifying which units will undergo closure, and promoting compliance with relevant RCRA permitting requirements.

The SHLWS T/S Unit is identified as a RCRA TSD unit that will be closed in accordance with applicable laws and regulations. Clean closure is the planned option for the SHLWS T/S Unit.

1.2 Background

The SHLWS T/S Unit is located in the 3000 Area in Richland, Washington, within the ICF-Kaiser 1234 Laydown Yard. The simulated high-level waste slurry (SHLWS) was procured for a research demonstration program in 1977 that was later cancelled. The original slurry formulation was toxic, corrosive, ignitable, and slightly radioactive because of naturally occurring radioactive material

used to simulate the required waste material. Because the level of naturally occurring radioactive material in the SHLWS (<2000 pCi/g) was so low, the material was managed as dangerous waste rather than mixed waste.

Unused material (198 barrels) was declared surplus and thereby became a solid waste and thus a dangerous waste requiring management in compliance with the Washington State "Dangerous Waste Regulations" (WAC-173-303). Treatment of the unused material was performed in October and November 1988 and consisted of grouting the waste in 55-gal (208-L) barrels. Grouting was determined to be the best available technology for this particular waste and rendered the resulting slurry nonhazardous. This was confirmed by rat and fish toxicity studies (Majnarich and Ladiges 1989; Zabel 1989), corrosivity testing, and Extraction Procedure (EP) Toxicity analysis (the standard toxicity designation test when the analysis was conducted)(EPA 1992). After treatment and review by Ecology, the grouted material (306 barrels) was removed from the unit and shipped for disposal at facilities authorized to receive nondangerous solid waste.

The amount of contamination at the SHLWS T/S unit was expected to be minimal. All soil known to be contaminated by the slurry was immediately removed. Leaking containers were overpacked or double-contained to control contamination. A heavy plastic secondary containment berm was added to the primary storage area and the treatment area to eliminate the possibility of any material leaking to the environment during treatment and continued storage. Most legacy equipment, including berm material, pallets, and treatment equipment associated with treatment and storage and secondary waste have been handled and disposed of in accordance with the approved closure plan. One remaining barrel of solid waste awaits final designation and disposal, pending analysis of the results of field sampling. In addition, the drip pans have been decontaminated and remain at the site, pending approval that no soil remediation is required.

1.3 Setting

The SHLWS T/S Unit is in an open area, within a fenced-in yard located in the 3000 Area (Figure 1.1) of the Hanford Site at approximately 46°20'52" latitude and 119°16'54" longitude.

The SHLWS T/S Unit identified for closure is defined by roped boundaries and enclosed in a fenced area of approximately 86,600 ft^2 (8,000 m^2) in the shape of an L. The trunk of the L is aligned north-south, with a length of 449.5 ft (137 m) and a width of 187.5 ft (57 m); the base of the L joins the trunk on the southeast corner and is aligned east-west with a length 114.0 ft (35 m) and a width of 77.5 ft (24 m). The unit is surrounded by a 6-ft (1.8-m) chain-link fence. On the western side, which is the only boundary with public access, the fence is topped with barbed wire. Access is controlled by a single 6-ft (1.8-m) locked gate, located on the eastern edge of the unit. A minimum number of keys to the locked gate are available to only those individuals who are cognizant of the special requirements for entry into the SHLWS T/S Unit.

The unit is divided among cordoned areas, including one area used for storage of SHLWS in drums, another used for SHLWS treatment, and one used for accumulation of containerized dangerous wastes for less than 90 days. The areas surrounding the unit were used for nonregulated activities,

including storage of raw materials and structural materials. Raw materials stored in the unit included the grout-forming chemicals used for treatment (fly ash, blast furnace slag, and Portland cement).

1.4 Hanford Site Background Approach

Hanford Site background is a Sitewide approach to determining constituent background concentrations and was developed as an alternative to local unit-based background determinations at the Hanford Site (DOE-RL 1993). Using local backgrounds for each unit can lead to different definitions of contamination and different assessments of remediation goals and risk for different units. The Hanford Site background approach is based on the premise that all of the waste management units are part of a common sequence of vadose zone sediments, and that the basic characteristics that control the chemical composition of these sediments are similar throughout the Hanford Site. The range of natural soil compositions is then used to establish a single set of soil background data. Use of the Hanford Site background for environmental restoration at the Site is technically preferable to the use of the unit-based background because this approach more accurately represents the range of natural variability in soil composition. Also, this approach provides a more consistent, credible, and efficient basis for evaluating contamination in soil.

The Hanford Site background threshold values are summarized in Section 2.0. The background threshold is the concentration level defining the upper limit that is attributable to the background population at a high probability. Background thresholds are based on a tolerance interval approach. The calculated threshold levels depend on the confidence interval and percentile used in the calculation. The WAC-173-340-708(11)(d) (WAC 1992) specifies a tolerance coefficient of 95% and a coverage of 95%. The Hanford Site background threshold values are based on a 95/95 confidence interval. Statistical calculations are described by the WAC (1992).

1.5 Report Organization

This report is organized into six main sections and nine appendixes, with the figures and tables located at the end of each chapter:

1.0 Introduction
2.0 Sampling Activities
3.0 Data Validation
4.0 Analytical Results and Data Tabulation
5.0 Conclusions
6.0 References

A. Volatile Organic Compounds Validated Data Summary Tables
B. Volatile Organic Compounds Field Duplicate Results
C. Semivolatile Organic Compounds Validated Data Summary Tables
D. Semivolatile Organic Compounds Field Duplicate Results
E. Metals Validated Data Summary Tables

F. Metals Validated Field Duplicate Summary
G. Radiochemistry Validated Data Summary Tables
H. Radiochemistry Field Duplicate Results
I. Method and Reporting Detection Limits for Volatile Organic and Semivolatile Organic Compounds Solid Samples

Appendices A through H are presented in their entirety as received in the data validation summary report and show analysis results for samples collected in the Phase 1 characterization study.

In this report, the following sections were taken from *Simulated High Level Waste Slurry Treatment and Storage (SHLWS T/S) Unit Closure Plan*, DOE/RL-88-08, Revision 6A (RL 1994):

- Section 1.3, Setting
- Figure 2.1, Location of SHLWS T/S Unit Within 3000 Area
- Figure 2.2, Locations of Soil Samples for SHLWS T/S
- Table 2.1, Compliance Constituents, Analytical Methods, Detection Limits, and Action Levels.

9513386.0229

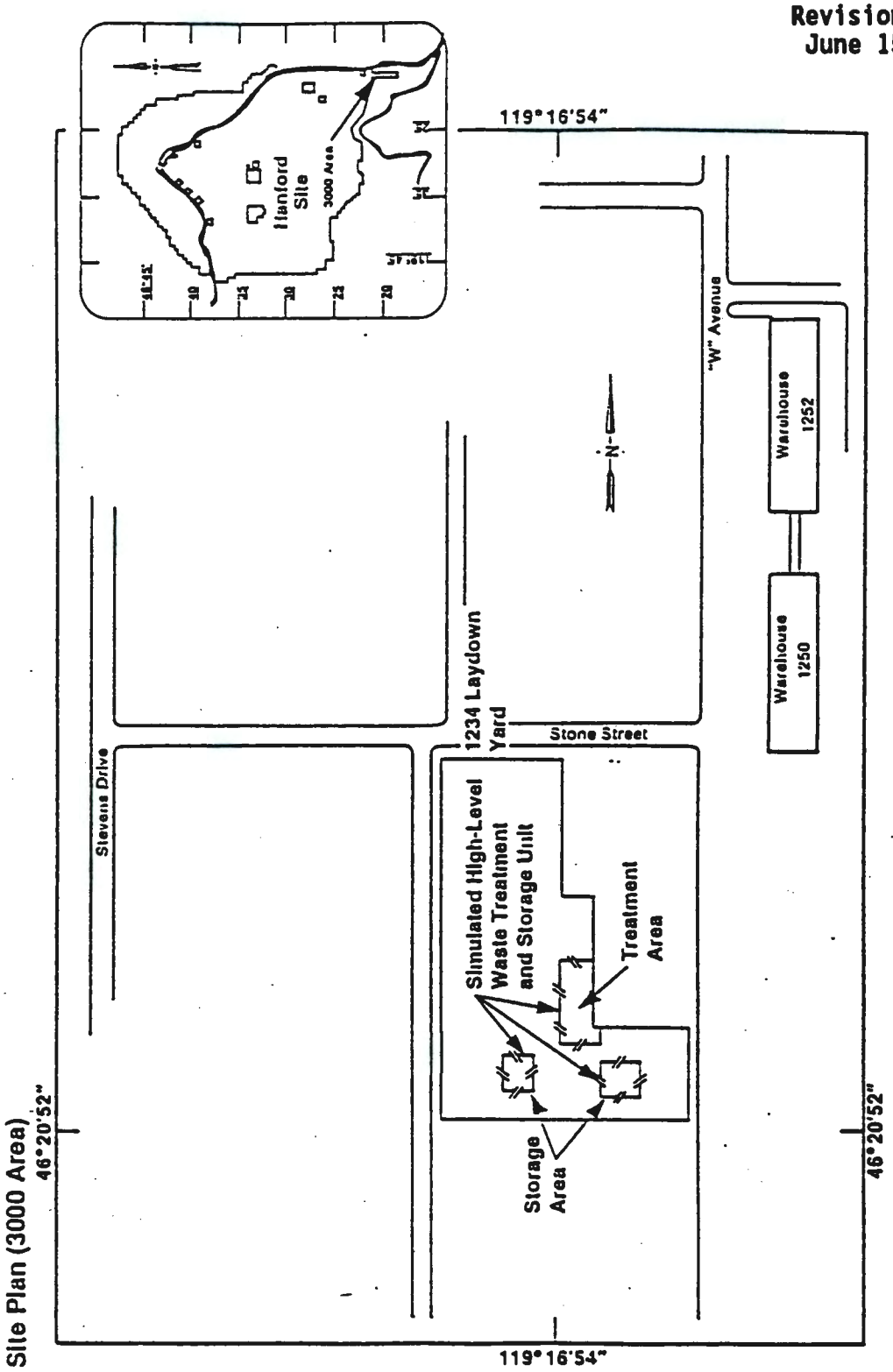

Figure 1.1. Location of SHLWS T/S Unit Within the 3000 Area

THIS PAGE INTENTIONALLY
LEFT BLANK

2.0 Sampling Activities

The sampling and analysis plan was developed based on a data quality objectives process. The primary objective of soil sampling was to determine whether contaminants were present in surface or subsurface soils at the SHLWS T/S Unit at levels exceeding the proposed action levels. Action level determination was agreed on during the data quality objectives meetings and will be used for clean closure on this specific unit only. Table 2.1 lists the compliance constituents, analytical methods, detection limits, and action levels. Potential contaminants of concern were determined based on the waste inventory for the SHLWS T/S Unit.

2.1 Sample Location

Soil samples were collected from 19 locations. More than one depth was collected from some of these locations. Table 2.2 gives the sample identification number, chain-of-custody number, and analysis requested. Figure 2.1 shows the location within the unit. The samples collected consist of the following:

T/S area:

- Five samples (from locations 4 through 8) were collected at the soil and gravel interface for inductively coupled plasma (ICP) metals and mercury (Hg), with one sample (location 5) including alpha/beta radionuclide analysis (alpha/beta), one sample (location 6) including cerium, and one quality control (QC) co-located field duplicate sample (location 5) for ICP metals, Hg, and alpha/beta.

- Three samples (from locations 1 through 3) were collected at the surface for lead.

- Two samples (from locations 4 and 6) were collected at the deep soil interface for ICP metals and Hg.

NE spill location:

- Two samples (from locations 9 and 10) were collected at the soil and gravel interface for ICP metals and Hg, with one sample (location 9) including cerium and one sample (location 10) including alpha/beta. Ecology collected co-located field duplicate samples at location 9 soil and gravel interface for ICP metals, Hg, and lead.

- One sample (from location 9) was collected at the surface for lead including one QC co-located sample for lead. Ecology collected co-located samples at location 9 surface for ICP metals, Hg, and lead.

Storage area:

- Four samples (from locations 11 through 14) were collected at the soil and gravel interface for ICP metals and Hg, with one sample (location 11) including cerium, one sample (location 14) including alpha/beta, and one QC co-located field duplicate sample (location 11) for ICP metals, Hg, and cerium.

- Two samples (from locations 11 and 13) were collected at the surface for lead.

- One sample (from location 11) was collected at the deep soil interface for ICP metals and Hg.

SW spill location:

- Two samples (from locations 15 and 16) were collected at the soil and gravel interface for ICP metals and Hg, with one sample (location 15) including cerium and one sample (location 16) including alpha/beta.

- One sample (from location 15) was collected at the surface for lead.

90-day-or-less accumulation area:

- Three samples (from locations 17 through 19) were collected at the soil and gravel interface for ICP metals and Hg, with one sample (location 18) including volatile organic compounds analysis (VOA) and semivolatile organic compounds analysis (SVOA) and one QC co-located field duplicate sample (location 18) for volatile organic and semivolatile organic compounds. Ecology collected co-located field duplicate samples at location 18 soil and gravel interface for ICP metals, Hg, lead (Pb), VOA, and SVOA.

- Two samples (from locations 18 and 19) were collected at the deep soil interface, with one sample (location 19) including VOA and SVOA.

2.2 Sample Collection

All samples were collected following the procedures in Appendix A, "Sampling and Analysis Plan" of *Simulated High Level Waste Slurry Treatment and Storage (SHLWS T/S) Closure Plan* (RL 1994).

Sample kits containing all of the labeled certified clean bottles and paperwork were prepared for each individual sample location in the preparation laboratory at Pacific Northwest Laboratory's (PNL's) Sigma 5 building. Sample kits were matched to the sample location by the Sampling Field Team Leader. Paperwork was completed by the Sampling Field Team Leader while the Radiation Protection Technologists collected the samples.

All sample locations, samples, and equipment were surveyed during and after sampling for both alpha and beta/gamma radiation using portable instrumentation as required by PNL radiological control.

Pictures were taken of all sample locations as well as the general location within the specific areas. Sampling information was written in a log book.

Surface samples were taken at a depth of 1 in. (2.5 cm). Soil and gravel interface samples were taken at a depth of 14 in. to 17 in. (36 cm to 43 cm), and deep soil interface samples were collected at a depth of 23 in. to 24 in. (58 cm to 61 cm) depending on soil conditions. A shovel and pick were used to dig to a depth 1 in. (2.5 cm) above where the samples were collected. The remaining 1 in. (2.5 cm) of soil was removed with stainless steel tools to prevent any contamination of the sample material with the digging tools.

All samples were collected using stainless steel tools. The soil that was removed was placed on plastic sheets spread around the sampling area; this gave the samplers a clean work area. Surgeons gloves were worn and changed between each sample location to minimize the potential for cross-contamination between samples. Because of the concentration of gravel, all soil except that to be analyzed for volatile organic compounds, was sieved through a 4-mm stainless steel sieve. As many rocks as possible were removed, by hand, for soil collected for VOA, while still preserving the integrity of the VOCs samples. Security tape was applied to the sample bottles immediately after sampling, and sample bottles were surrounded with ice and water in an ice chest.

2.3 Field Quality Assurance/Quality Control

Field quality assurance (QA)/QC provide a basis by which field and laboratory accuracy and reproducibility could be measured. Co-located field duplicate samples and equipment blanks were used to assess precision and bias of sampling. The estimated precision and bias will contain components of the laboratory's precision and bias but must be evaluated in conjunction with laboratory duplicates and method blanks to assess those factors for the laboratory. Co-located field samples collected by Ecology are used to assess laboratory reproducibility. Co-located field duplicate samples were prepared to address issues related to laboratory QA/QC.

Co-located duplicate samples were collected in a 1:20 ratio for all constituents.

Between each use, the tools were washed in a container of deionized (DI) water and Alconox, rinsed in a container of DI water, rinsed again with clean DI water from a squirt bottle, and dried. Tools used for digging were washed in separate containers from those used to wash the sampling tools. All tools were stored on the dull side of aluminum foil until the next use.

After the sampling was completed, an ultra-pure water equipment blank was collected on the sampling tools to check the cleaning of the tools for any potential cross-contamination. Because the sampling was completed in 1 day, only one equipment blank was taken.

A PNL QA representative completed a post-sampling surveillance with no deficiencies noted. Supporting documentation (such as the chain of custody, field record form, shipping paperwork, laboratory notebooks, pictures) were reviewed for completeness and adherence to the SHLWS T/S Unit closure plan. A QA representative was not present during sampling.

2.4 Sample Analysis

Table 2.2 summarizes the analyses requested for soil and water samples, sample ID number, and chain-of-custody number.

All of the samples were analyzed by Lockheed Analytical Services in Las Vegas, Nevada. Ecology's co-located duplicate samples were analyzed by a different laboratory. Appendix I lists all analytes for each specific analytical method as well as the detection limits reported for each.

Table 2.1. Compliance Constituents, Analytical Methods, Detection Limits, and Action Levels

Analyte or Parameter (Measurement Method)	Analytical Method[a]	Method Detection Limit [b,c] (ppm)	Action Levels		
			MTCA B Soil (ppm)	MTCA C Soil (ppm)	Sitewide Background[d] (ppm)
Aluminum	6010	40.0	8.0E+4	3.2E+5	1.51E+4
Antimony	6010	12.0	3.2E+4	1.4E+3	ND
Barium	6010	40.0	5.6E+3	5.6E+3	1.75E+2
Cadmium	6010	1.0	4.0E+1	8.0E+1	ND
Calcium	6010	400.0	NA	NA	2.46E+4
Chromium	6010	2.0	4.0E+2	8.0E+4	28
Cobalt	6010	10.0	4.8E+3	TBD	19
Copper	6010	5.0	3.0E+3	1.4E+5	ND
Iron	6010	20.0	TBD	TBD	ND
Magnesium	6010	400.0	NA	NA	9.16E+3
Molybdenum	6010	40.0	4.0E+2	1.75E+4	ND
Manganese	6010	3.0	1.12E+4	1.6E+4	5.83E+2
Nickel	6010	8.0	1.6E+3	1.6E+3	25
Potassium	6010	400.0	NA	NA	3.09E+3
Selenium	6010	60.0	4.0E+2	1.75E+4	ND
Silver	6010	2.0	2.4E+2	1.75E+4	ND
Sodium	6010	400.0	NA	NA	1.38E+3
Strontium	6010	20.0	4.8E+4	1.9E+5	ND
Lead	7421	0.6	2.5E+2	1.0E+3	14.9
Mercury	7471	0.1	2.4E+1	2.4E+1	1.3
Cerium	200.8	1.0	TBD	TBD	60 CA[e]
SVOA	8270	[f]	R[g]	R	ND
VOA	8240	[f]	R	R	ND
Total alpha	LAL-91-SOP-0060[h]	5/10 pCi/g	TBD	TBD	ND
Total beta	LAL-91-SOP-0060[h]	5/10 pCi/g	TBD	TBD	ND

[a] U.S. Environmental Protection Agency. 1986. "USEPA Methods for Evaluating Solid Waste, Physical/Chemical Methods: SW-846, 3rd ed. Quality Control. In *Volume 1A: Laboratory Manual Physical/Chemical Methods Test*. U.S. Environmental Protection Agency, Washington, D.C.
[b] Soil digestion procedure, SW-3050.
[c] Accuracy and precision are discussed in Appendix B.
[d] U.S. Department of Energy, Richland Field Office. 1993. *Hanford Site Background, Part 1. Soil Background for Nonradioactive Analytes*. Rev. 1, Vol. 1 & 2. U.S. Department of Energy, Richland Field Office, Richland, Washington.
[e] Crustal abundance, which is defined in AGI Data Sheet 58 (Dutro et al. 1989)
[f] Analyte dependent. Refer to Appendix I.
[g] R refers to Washington Administrative Code. 1992. "Model Toxics Control Act Cleanup Regulation". WAC-173-340, Olympia, Washington.
[h] Westinghouse Hanford Company. 1991. *Lockheed Analytical Laboratory Standard Operating Procedure*. LAL-91-SOP-0060, Westinghouse Hanford Company, Richland, Washington.
NA = not applicable.
ND = no data.
TBD = to be determined.

Table 2.2. SHLWS T/S Sampling Matrix 10/6/94

Sample Site Soil	Sample Number[a]	Chain of Custody	Constituent List	Duplicate
T/S 1	TS1S	12239,WHC	Pb,ACS*	
T/S 2	TS2S	12240,WHC	Pb,ACS*	
T/S 3	TS3S	12241,WHC	Pb,ACS*	
T/S 4	TS4SG	12242,WHC	ICP,Hg,ACS*	
T/S 4	TS418	12243,WHC	ICP,Hg,ACS*	
T/S 5	TS5SG	12244,WHC	ICP,Hg,Alpha,Beta,ACS*	
T/S 5	TS5SGD	12307		ICP,Hg,Alpha,Beta
T/S 6	TS6SG	12245,WHC	ICP,Hg,Cerium,ACS*	
T/S 6	TS618	12246,WHC	ICP,Hg,ACS*	
T/S 7	TS7SG	12247,WHC	ICP, Hg,ACS*	
T/S 8	TS8SG	12248,WHC	ICP,Hg,ACS*	
NE 9	NE9S	12249,WHC	Pb,ACS*	
NE 9	NE9SD	12308		Pb
NE 9	NE9SG	12250,WHC	ICP,Hg,Cerium,ACS*	
NE 10	NE10SG	12251,WHC	ICP,Hg,Alpha,Beta,ACS*	
SA 11	SA11S	12252,WHC	Pb,ACS*	
SA 11	SA11SG	12253,WHC	ICP,Hg,Cerium,ACS*	
SA 11	SA11SGD	12309		ICP,Hg,Cerium
SA 11	SA1118	12254,WHC	ICP,Hg,ACS*	
SA 12	SA12SG	12255,WHC	ICP,Hg,ACS*	
SA 13	SA13S	12256,WHC	Pb,ACS*	
SA 13	SA13SG	12257,WHC	ICP,Hg,ACS*	
SA 14	SA14SG	12258,WHC	ICP,Hg,Alpha,Beta,ACS*	
SW 15	SW15S	12259,WHC	Pb,ACS*	
SW 15	SW15SG	12260,WHC	ICP,Hg,Cerium,ACS*	
SW 16	SW16SG	12261,WHC	ICP,Hg,Alpha,Beta,ACS*	
90 17	9017SG	12262,WHC	ICP,Hg,ACS*	
90 18	9018SG	12263,WHC	ICP,Hg,VOA,SVOA,ACS*	
90 18	9018SGD	12310		VOA,ABN
90 18	901818	12264,WHC	ICP,Hg,ACS*	
90 19	9019SG	12265,WHC	ICP,Hg,ACS*	

Table 2.2. (contd)

Sample Site Soil	Sample Number[a]	Chain of Custody	Constituent List	Duplicate
90 19	901918	12266,WHC	ICP,Hg,VOA,SVOA,ACS*	
Equipment blank	EQUI1	12267,WHC	ICP,Hg,Pb,Cerium,VOA, SVOA,Alpha,Beta,ACS*	

(a) Explanation of sample numbering.
First two letters or numbers = site location.
TS = treatment and storage area.
NE = NE spill area.
SA = storage area.
SW = SW spill area.
90 = 90-day-or-less accumulation area
Middle numbers = location on map (see Figure 2.1)
Last set of letters or numbers = sample depth
S = surface (1-in. [2.5-cm] depth).
SG = soil and gravel interface.
18 = deep soil interface.
Note: All samples sent to 222S Laboratory for radioactive screen analysis.
ICP constituents of concern are listed on Table 2.1.
D at end of sample number represents a duplicate. Example TS5SGD is a duplicated of TS5SG.
ABN = acid/base/neutral.
ACS* = radioactive activity scan analyzed by Lockheed Analytical Services.
Alpha = alpha radionuclide.
Beta = beta radionuclide.
Hg = mercury.
ICP = inductively coupled plasma.
Pb = lead.
SVOA = semivolatile organic compounds analyses.
VOA = volatile organic compounds analyses.
WHC = Westinghouse Hanford Company.

9513386.0233

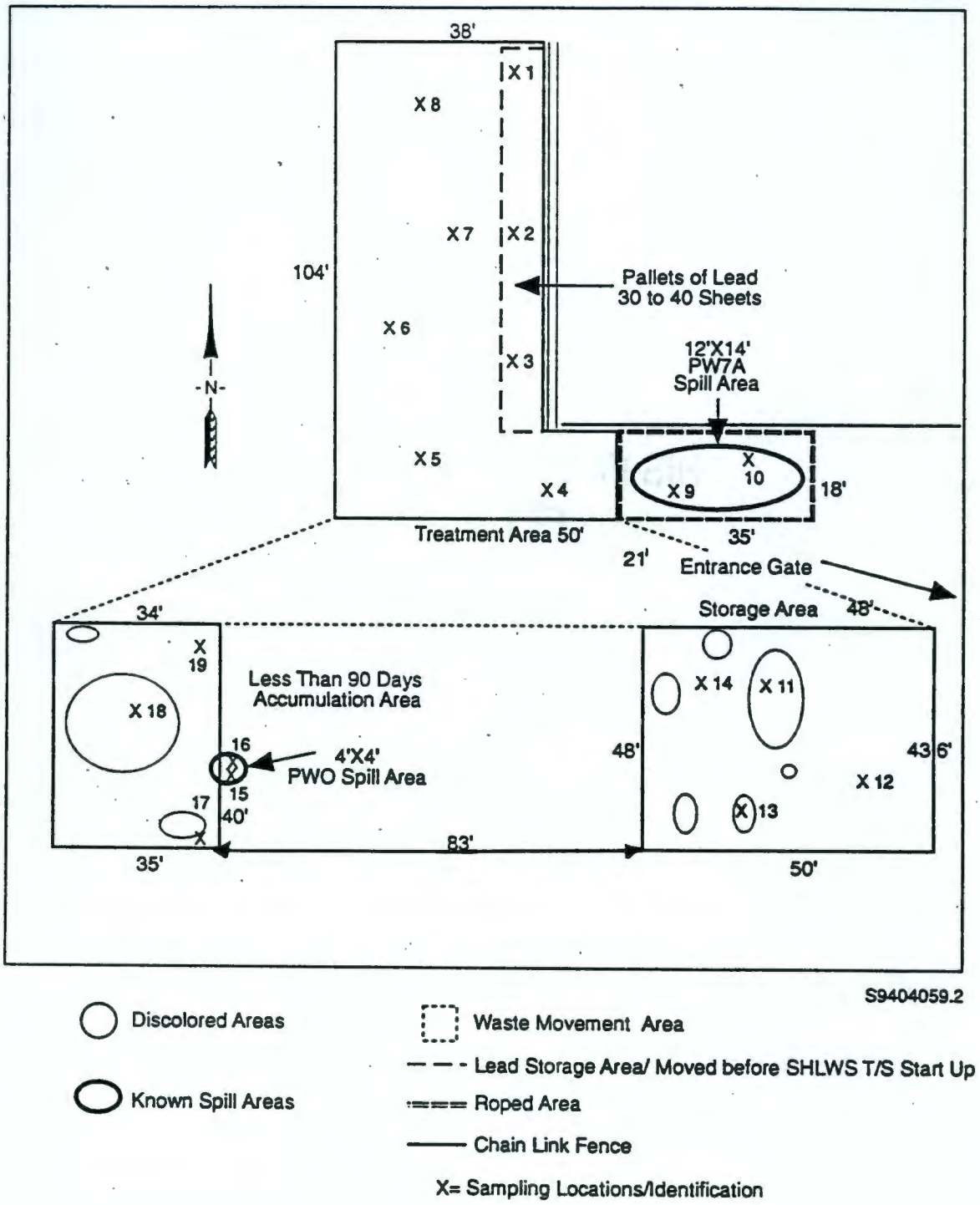

Figure 2.1. Soil Sample Locations for SHLWS T/S Unit

THIS PAGE INTENTIONALLY
LEFT BLANK

3.0 Data Validation

The data validation process included a review of the following QC elements performed by the laboratories and reported in the associated data deliverables:

- holding times
- blank analyses
- surrogates
- matrix spikes
- duplicates.

The validation process establishes organic, inorganic, and radiochemistry qualifiers and definitions to describe the associated data.

3.1 Data Qualifiers

Organic Data Reporting Qualifiers

U Indicates the constituent was analyzed for and not detected. The concentration reported is the sample quantitation limit corrected for aliquot size, dilution, and percent solids (in the case of solid matrices) by the laboratory. The associated data should be considered usable for making decisions.

JN Indicates a tentatively identified compound whose concentration and identification have been determined to be valid as a result of data validation. The associated data should be considered usable for making decisions.

Inorganic Data Reporting Qualifiers

B Indicates the constituent was analyzed for and detected. The concentration reported is less than the contract required quantitation limit but greater than the instrument detection limit. The associated data should be considered usable for making decisions.

U Indicates the constituent was analyzed for and not detected. The concentration reported is the sample detection limit corrected for aliquot size, dilution, and percent solids (in the case of solid matrices) by the laboratory. The associated data should be considered usable for making decisions.

UJ Indicates the constituent was analyzed for and not detected. Because of a minor QC deficiency identified during data validation, the concentration may not accurately reflect the sample detection limit. The associated data have been qualified as estimated but should be considered usable for making decisions.

BJ Indicates the constituent was analyzed for and detected at a concentration less that the contract required quantitation limit but greater than the instrument detection limit. Because of a minor QC deficiency identified during data validation, the associated data have been qualified as estimated but should be considered usable for making decisions.

J Indicates the constituent was analyzed for and detected. Because of a minor QC deficiency identified during data validation, the associated data have been qualified as estimated but should be considered usable for making decisions.

Radiochemistry Data Reporting Qualifiers

U Indicates the constituent was analyzed for but was not detected at a concentration above the minimum detectable activity. The concentration reported is the minimum detectable activity corrected for sample aliquot size, dilution factors, and percent solids (in the case of solid matrices) by the laboratory. The associated data should be considered usable for making decisions.

3.2 Golder Associates

Analytical results were validated by Golder Associates, Inc. Redmond, Washington. As required by the contract with Golder Associates, Inc. and the Westinghouse Hanford Company (WHC) statement of work (WHC 1994), data validation was conducted using the WHC data validation procedures for chemical and radiochemical analyses (WHC 1993a, 1993b). Analytical results were validated to level D as described in the data validation procedures.

3.3 Lockheed Analytical Services

No major deficiencies were identified during the validation of the volatile organic compounds, semivolatile organic compounds, inorganic, or radiochemical analyses. Thus, no data were qualified as unusable (R, UR).

All holding time criteria were met for both water and soil samples analyzed by Lockheed Analytical Services, except for mercury in the soil samples (exceeded by 1 day).

Lockheed Analytical Services prepared and analyzed laboratory blanks for both the soil and water sample matrices. Analyses of the blanks identified some potential laboratory contamination in the calibration and preparation blanks with the following compounds:

- calibration blanks
  - chromium
  - copper
  - manganese
  - vanadium
  - strontium

- preparation blanks
  - lead.

Analytes detected were at levels less than the method detection limit. When evidence of blank contamination was present, blank validation criteria were applied to determine appropriate qualification for associated sample results.

Lockheed Analytical Services prepared the sample matrix, analyzed matrix spike samples, and reported the results as percent recovery as an indication of accuracy. Matrix spike recovery is used as a general correlation for all samples in the analytical batch based on the fact that the samples are related to the same site and have relatively similar analyte concentrations except in the case of the soil VOC samples. The soil VOC matrix spike was analyzed on a sample not related to the SHLWS T/S Unit. The results of the nonrelated sample and the matrix spike done on the nonrelated sample were evaluated and found to be within control limits (50 to 150%) for percent recovery and, therefore, acceptable. Spiked sample results generally were within control limits for percent recovery. The percent recovery for sodium in the laboratory control sample was outside control limits. The ICP serial dilution percent differences (%D) exceeded 10%. Results that fell outside of the applicable control limits were qualified according to the validation procedure. Matrix spike samples were not analyzed and were not a requirement for gross alpha and gross beta analyses. No indication of significant matrix effects was observed in the sample results.

Duplicate samples were prepared and analyzed, and data were reported as relative percent difference (RPD) by Lockheed Analytical Services as an indication of laboratory precision. For organic analyses, RPD calculations were made between results for matrix spike/matrix spike duplicate samples and co-located duplicate samples. For inorganic analyses, RPD calculations were made between co-located duplicate sample results. For radiochemistry analyses, RPD calculations were made between initial and co-located duplicate sample results. Reported RPDs (35%) for co-located duplicate samples and matrix spike duplicate samples were acceptable.

THIS PAGE INTENTIONALLY
LEFT BLANK

4.0 Analytical Results and Data Tabulation

Analytical results are summarized and evaluated in this chapter. The analytical results do not indicate the presence of contamination. Constituent concentrations detected in the samples were compared to Hanford Site background threshold values (discussed in Section 1.4), health-based standards (WAC-173-340) described in Table 2.1, and crustal abundance averages. Specific results are discussed in the following sections.

4.1 Data Summary of Organic Analytes

Acetone and 2-butanone (methyl ethyl ketone) were detected at low levels in sample 9018SG (Appendix A). These constituents are common laboratory contaminants that often give false positive results. Neither constituent was detected in co-located sample 9018SGD (Appendix B). No other target volatile organic compounds were detected. Low levels (maximum of 90 μg/kg) of an unknown hydrocarbon were tentatively identified in three samples.

No target semivolatile organic compounds were detected in the samples. Tentatively identified compounds include an unknown ester in four samples (maximum of 23,000 μg/kg), unknown hydrocarbons in two samples (maximum of 370 μg/kg), and pentachlorobiphenyls in sample 9018SG (Appendix C) (total concentration detected was 1,210 μg/kg). The pentachlorobiphenyls were not detected in co-located sample 9018SGD (Appendix D).

4.2 Data Summary of Metal Analytes

Results for metal analytes were compared to MTCA B action levels, when available. When the MTCA B levels are unavailable, the Hanford Site background threshold levels or, in the case of cerium, the average crustal abundance were used. No metals were detected at concentrations above the MTCA B action levels.

Calcium was found at levels above the Hanford Site background threshold level. Calcium occurs naturally in high concentrations in limestone and caliche as well as other minerals. Calcium's presence in the samples is not indicative of contamination (Appendix E).

Lead was detected in sample number SW15S (97.4 ppm) and sample number TS3S (62.4 ppm). Documentation will be included in the administrative record for future reference.

There is no MTCA B action level or Hanford Site background threshold level for iron.

Cerium was detected in samples SA11SG (Appendix E) at 63.5 μg/kg and co-located duplicate sample SA11SGD (Appendix F) at 57.3 μg/kg. No MTCA B action level or Hanford Site background threshold level has been determined for cerium; however, the cerium crustal abundance average was used for comparison. These samples were subsequently considered within accepted limits as listed in Table 2.1. Documentation will be included in the administrative record for future reference.

4.3 Data Summary of Radionuclide Analyses

The maximum alpha radioactivity measured in the samples was 15.9 pCi/g and the maximum beta measured was 22.2 pCi/g. Uranium and thorium are alpha and beta emitters and naturally occur in soils. The uranium and thorium account for the activities measured.

5.0 Conclusions

Thirty-two samples were collected from the SHLWS T/S Unit for chemical analysis. No analytical results were rejected during data validation. The analyses were performed with a specific set of constituents targeted. Most of the constituents were not detected. No constituents were detected at concentrations above MTCA B action levels or, where those levels have not been determined, above Hanford Site background threshold levels. Of the analytes that showed levels above detection limits, none are considered indicative of contamination and thus the SHLWS T/S Unit is considered clean.

THIS PAGE INTENTIONALLY
LEFT BLANK

6.0 References

40 CFR 260. 1994. U.S. Environmental Protection Agency, "Hazardous Waste Management System: General." *U.S. Code of Federal Regulations*.

40 CFR 261. 1994. U.S. Environmental Protection Agency, "Identification and Listings of Hazardous Waste." *U.S. Code of Federal Regulations*.

40 CFR 262. 1994. U.S. Environmental Protection Agency, "Standards Applicable to Generators of Hazardous Waste." *U.S. Code of Federal Regulations*.

40 CFR 263. 1994. U.S. Environmental Protection Agency, "Standards Applicable to Transporters of Hazardous Waste." *U.S. Code of Federal Regulations*.

40 CFR 264. 1994. U.S. Environmental Protection Agency,"Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities," *U.S. Code of Federal Regulations*.

40 CFR 265. 1994. U.S. Environmental Protection Agency, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities." *U.S. Code of Federal Regulations*.

40 CFR 267. 1994. U.S. Environmental Protection Agency, "Interim Standards for Owners and Operators of New Hazardous Waste Land Disposal Facilities." *U.S. Code of Federal Regulations*.

40 CFR 268. 1994. U.S. Environmental Protection Agency, "Land Disposal Restrictions." *U.S. Code of Federal Regulations*.

40 CFR 270. 1994. U.S. Environmental Protection Agency, "EPA Administered Permit Programs: The Hazardous Waste Permit Program." *U.S. Code of Federal Regulations*.

Dutro Jr., J. T., R. V. Deitrich, and R. M. Foose. 1989. *AGI Data Sheets, Crustal Abundances, Data Sheet 58*, 3rd ed. American Geological Institute, Alexandria, Virginia.

Majnarich, J. J., and W. Ladiges. 1989. *Rat Toxicity Test*. BIOMED No. 11871 and 11872. BIOMED, Inc., Bellevue, Washington.

U.S. Department of Energy, Richland Field Office (DOE-RL). 1993. *Hanford Site Background, Part 1. Soil Background for Nonradioactive Analytes*. Rev. 1, Vol. 1 & 2. U.S. Department of Energy, Richland Field Office, Richland, Washington.

U.S. Department of Energy, Richland Operations Office (RL). 1994. *Simulated High Level Waste Slurry Treatment and Storage (SHLWS) T/S Unit Closure Plan*. DOE/RL-88-08, Rev 6A, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

U.S. Environmental Protection Agency (EPA). 1992. "Extraction Procedure (EP) Toxicity Test Method and Structural Integrity Test." EPA Method 1310A, U.S. Environmental Protection Agency, Washington, D.C.

U.S. Environmental Protection Agency (EPA). 1986. "USEPA Methods for Evaluating Solid Waste, Physical/Chemical Methods: SW-846, 3rd ed. Quality Control. In *Volume 1A: Laboratory Manual Physical/Chemical Methods Test*. U.S. Environmental Protection Agency, Washington, D.C.

Washington Administrative Code (WAC). 1992. "Model Toxics Control Act Cleanup Regulation." WAC-173-340, as amended, Olympia, Washington.

Washington Administrative Code (WAC). 1993. "Dangerous Waste Regulations." WAC-173-303, as amended, Olympia Washington.

Washington State Department of Ecology (Ecology), U.S. Environmental Protection Agency, and U.S. Department of Energy. 1989. *Hanford Federal Facility Agreement and Consent Order*, as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and the U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Westinghouse Hanford Company (WHC). 1991. *Lockheed Analytical Laboratory Standard Operating Procedure*. LAL-91-SOP-0060, Westinghouse Hanford Company, Richland, Washington.

Westinghouse Hanford Company (WHC). 1993a. *Data Validation Procedures for Chemical Analyses*. WHC-SD-EN-SPP-002, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

Westinghouse Hanford Company (WHC). 1993b. *Data Validation Procedures for Radiological Analyses*. WHC-SD-EN-SPP-001, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Westinghouse Hanford Company (WHC). 1994. *Environmental and Waste Characterization Analytical Data Validation. Statement of Work*. MSH-SWV-315905, August 10, Westinghouse Hanford Company, Richland, Washington.

Zabel, M. L., 1989. *Grout Sample Analysis for Corrosivity, EP Toxicity, and Acute Fish Toxicity*. Hanford Environmental Health Foundation, Richland, Washington.

9513386.0239

Appendix A

Volatile Organic Compounds Validated Data Summary Tables

THIS PAGE INTENTIONALLY
LEFT BLANK

	Samp#	9018SG		9018SGD		901918		EQUI1	
	Date	11-8-94		11-8-94		11-8-94		11-8-94	
	Location	90 18		90 18		90 19		---	
	Depth	---		---		---		---	
	Type	SOIL		SOIL		SOIL		WATER, UG/L	
	Comments			CO-LOCATED				EQUIPMENT BLANK	
Parameter	Units	Result	Q	Result	Q	Result	Q	Result	Q
CHLOROMETHANE	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
VINYL CHLORIDE	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
BROMOMETHANE	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
CHLOROETHANE	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
TRICHLOROFLUOROMETHANE	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
ACETONE	UG/KG	13.000		10.000	U	11.000	U	10.000	U
1,1-DICHLOROETHENE	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
CARBON DISULFIDE	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
METHYLENE CHLORIDE	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
TRANS-1,2-DICHLOROETHENE	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
VINYL ACETATE	UG/KG	11.000	U	10.000	U	11.000	U	10.000	U
1,1-DICHLOROETHANE	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
2-BUTANONE	UG/KG	17.000		10.000	U	11.000	U	10.000	U
CIS-1,2-DICHLOROETHENE	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
CHLOROFORM	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
1,1,1-TRICHLOROETHANE	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
CARBON TETRACHLORIDE	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
1,2-DICHLOROETHANE	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
BENZENE	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
TRICHLOROETHENE	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
1,2-DICHLOROPROPANE	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
BROMODICHLOROMETHANE	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
4-METHYL-2-PENTANONE	UG/KG	11.000	U	10.000	U	11.000	U	10.000	U
CIS-1,3-DICHLOROPROPENE	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
TOLUENE	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
TRANS-1,3-DICHLOROPROPENE	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
1,1,2-TRICHLOROETHANE	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
TETRACHLOROETHENE	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
DIBROMOCHLOROMETHANE	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
CHLOROBENZENE	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
ETHYLBENZENE	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
M,P-XYLENES	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
O-XYLENES	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
STYRENE	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
BROMOFORM	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
1,1,2,2-TETRACHLOROETHANE	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
1,3-DICHLOROBENZENE	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
1,4-DICHLOROBENZENE	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
1,2-DICHLOROBENZENE	UG/KG	5.300	U	5.200	U	5.300	U	5.000	U
2-CHLOROETHYLVINYLETHER	UG/KG	---		---		---		20.000	U
2-HEXANONE	UG/KG	---		---		---		10.000	U

The decimal places shown do not reflect the precision reported by the laboratory

9513386.0240

VOLATILE ORGANIC ANALYSIS RESULTS
FOR ANALYSES USING METHOD 8240
TENTATIVELY IDENTIFIED COMPOUNDS

Client Sample ID: BLANK	LAL Sample ID: 15734MB
Date Received: N/A	Date Analyzed: 16-NOV-94
Matrix: SOIL	Dilution Factor: 1
Analytical Batch: 111694-8240-J2	QC Batch ID: 111694-8240

Tentatively Identified Compound	Estimated Concentration (µg/Kg)	Retention Time (minutes	Data Qualifier(s)
UNKNOWN	30	8.00	J

~~072~~
HG 1/16/95

VOLATILE ORGANIC ANALYSIS RESULTS
FOR ANALYSES USING METHOD 8240
TENTATIVELY IDENTIFIED COMPOUNDS

Client Sample ID: 9018SG	LAL Sample ID: L3300-24
Date Received: 10-NOV-94	Date Analyzed: 17-NOV-94
Matrix: SOIL	Dilution Factor: 1
Analytical Batch: 111694-8240-J2	QC Batch ID: 111694-8240

Tentatively Identified Compound	Estimated Concentration (µg/Kg)	Retention Time (minutes	Data Qualifier(s)
UNKNOWN	90	7.98	~~JB~~

Q
LCJ

~~003~~
1/13/95

VOLATILE ORGANIC ANALYSIS RESULTS
FOR ANALYSES USING METHOD 8240
TENTATIVELY IDENTIFIED COMPOUNDS

Client Sample ID: 9018SGD	LAL Sample ID: L3300-26
Date Received: 10-NOV-94	Date Analyzed: 17-NOV-94
Matrix: SOIL	Dilution Factor: 1
Analytical Batch: 111694-8240-J2	QC Batch ID: 111694-8240

Tentatively Identified Compound	Estimated Concentration (µg/Kg)	Retention Time (minutes	Data Qualifier(s)
NONE DETECTED			

~~010~~ 1/12/95

VOLATILE ORGANIC ANALYSIS RESULTS
FOR ANALYSES USING METHOD 8240
TENTATIVELY IDENTIFIED COMPOUNDS

Client Sample ID: 901918	LAL Sample ID: L3300-21
Date Received: 10-NOV-94	Date Analyzed: 17-NOV-94
Matrix: SOIL	Dilution Factor: 1
Analytical Batch: 111694-8240-J2	QC Batch ID: 111694-8240

Tentatively Identified Compound	Estimated Concentration (µg/Kg)	Retention Time (minutes	Data Qualifier(s)
UNKNOWN	50	7.98	~~JB~~ Q UJA

DGS
1/13/95

VOLATILE ORGANIC ANALYSIS RESULTS
FOR ANALYSES USING METHOD 8240
TENTATIVELY IDENTIFIED COMPOUNDS

Client Sample ID: EQUI1	LAL Sample ID: L3298-19
Date Received: 10-NOV-94	Date Analyzed: 19-NOV-94
Matrix: WATER	Dilution Factor: 1
Analytical Batch: 111994-8240-J1	QC Batch ID: 111994-8240

Tentatively Identified Compound	Estimated Concentration (µg/L)	Retention Time (minutes)	Data Qualifier(s)
NONE DETECTED			

Verified [illegible] 1-17-95

~~073~~

9513386.0243

Appendix B

Volatile Organic Compounds Field Duplicate Results

THIS PAGE INTENTIONALLY
LEFT BLANK

SAMPLE NO.:	9018SG		9018SGD		
DATE:	11/8/94		11/8/94		
LOCATION:	90 18		90 18		
PARAMETER	RESULT µg/Kg	Q	RESULT µg/Kg	Q	RPD
CHLOROMETHANE	5.3	U	5.2	U	NC
VINYL CHLORIDE	5.3	U	5.2	U	NC
BROMOMETHANE	5.3	U	5.2	U	NC
CHLOROETHANE	5.3	U	5.2	U	NC
TRICHLOROFLUOROMETHANE	5.3	U	5.2	U	NC
ACETONE	13		10	U	200
1,1-DICHLOROETHENE	5.3	U	5.2	U	NC
CARBON DISULFIDE	5.3	U	5.2	U	NC
METHYLENE CHLORIDE	5.3	U	5.2	U	NC
TRANS-1,2-DICHLOROETHENE	5.3	U	5.2	U	NC
VINYL ACETATE	11	U	10	U	NC
1,1-DICHLOROETHANE	5.3	U	5.2	U	NC
2-BUTANONE	17		10	U	200
CIS-1,2-DICHLOROETHENE	5.3	U	5.2	U	NC
CHLOROFORM	5.3	U	5.2	U	NC
1,1,1-TRICHLOROETHANE	5.3	U	5.2	U	NC
CARBON TETRACHLORIDE	5.3	U	5.2	U	NC
1,2-DICHLOROETHANE	5.3	U	5.2	U	NC
BENZENE	5.3	U	5.2	U	NC
TRICHLOROETHENE	5.3	U	5.2	U	NC
1,2-DICHLOROPROPANE	5.3	U	5.2	U	NC
BROMODICHLOROMETHANE	5.3	U	5.2	U	NC
4-METHYL-2-PENTANONE	11	U	10	U	NC
CIS-1,3-DICHLOROPROPENE	5.3	U	5.2	U	NC
TOLUENE	5.3	U	5.2	U	NC
TRANS-1,3-DICHLOROPROPENE	5.3	U	5.2	U	NC
1,1,2-TRICHLOROETHANE	5.3	U	5.2	U	NC
TETRACHLOROETHENE	5.3	U	5.2	U	NC
DIBROMOCHLOROMETHANE	5.3	U	5.2	U	NC
CHLOROBENZENE	5.3	U	5.2	U	NC
ETHYLBENZENE	5.3	U	5.2	U	NC
M,P-XYLENES	5.3	U	5.2	U	NC
O-XYLENES	5.3	U	5.2	U	NC
STYRENE	5.3	U	5.2	U	NC
BROMOFORM	5.3	U	5.2	U	NC
1,1,2,2-TETRACHLOROETHANE	5.3	U	5.2	U	NC
1,3-DICHLOROBENZENE	5.3	U	5.2	U	NC

SAMPLE NO.:	9018SG		9018SGD		
DATE:	11/8/94		11/8/94		
LOCATION:	90 18		90 18		
PARAMETER	RESULT µg/Kg	Q	RESULT µg/Kg	Q	RPD
1,4-DICHLOROBENZENE	5.3	U	5.2	U	NC
1,2-DICHLOROBENZENE	5.3	U	5.2	U	NC
NC - Not calculated					

9513386.0245

Appendix C

Semivolatile Organic Compounds Validated Data Summary Tables

THIS PAGE INTENTIONALLY
LEFT BLANK

	Sampl#	9018SG		9018SGD		901918		EQUI1	
	Date	11-8-94		11-8-94		11-8-94		11-8-94	
	Location	90 18		90 18		90 19		---	
	Depth	---		---		---		---	
	Type	SOIL		SOIL		SOIL		WATER, UG/L	
	Comments			CO-LOCATED				EQUIPMENT BLANK	
Parameter	Units	Result	Q	Result	Q	Result	Q	Result	Q
PHENOL	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
BIS(2-CHLOROETHYL)ETHER	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
2-CHLOROPHENOL	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
1,3-DICHLOROBENZENE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
1,4-DICHLOROBENZENE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
BENZYL ALCOHOL	UG/KG	1400.000	U	1300.000	U	1400.000	U	20.000	U
1,2-DICHLOROBENZENE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
2-METHYLPHENOL	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
2,2'-OXYBIS(1-CHLOROPROPANE)	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
4-METHYLPHENOL	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
N-NITROSO-DI-N-PROPYLAMINE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
HEXACHLOROETHANE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
NITROBENZENE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
ISOPHORONE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
2-NITROPHENOL	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
2,4-DIMETHYLPHENOL	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
BENZOIC ACID	UG/KG	3500.000	U	3300.000	U	3500.000	U	50.000	U
BIS(2-CHLOROETHOXY)METHANE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
2,4-DICHLOROPHENOL	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
1,2,4-TRICHLOROBENZENE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
NAPHTHALENE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
4-CHLOROANILINE	UG/KG	1400.000	U	1300.000	U	1400.000	U	20.000	U
HEXACHLOROBUTADIENE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
4-CHLORO-3-METHYLPHENOL	UG/KG	1400.000	U	1300.000	U	1400.000	U	20.000	U
2-METHYLNAPHTHALENE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
HEXACHLOROCYCLOPENTADIENE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
2,4,6-TRICHLOROPHENOL	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
2,4,5-TRICHLOROPHENOL	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
2-CHLORONAPHTHALENE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
2-NITROANILINE	UG/KG	3500.000	U	3300.000	U	3500.000	U	50.000	U
DIMETHYLPHTHALATE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
ACENAPHTHYLENE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
2,6-DINITROTOLUENE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
3-NITROANILINE	UG/KG	3500.000	U	3300.000	U	3500.000	U	50.000	U
ACENAPHTHENE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
2,4-DINITROPHENOL	UG/KG	3500.000	U	3300.000	U	3500.000	U	50.000	U
4-NITROPHENOL	UG/KG	3500.000	U	3300.000	U	3500.000	U	50.000	U
DIBENZOFURAN	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U

The decimal places shown do not reflect the precision reported by the laboratory

9513386.0247

	Samp#	9018SG		9018SGD		901918		EQUI1	
	Date	11-8-94		11-8-94		11-8-94		11-8-94	
	Location	90 18		90 18		90 19		---	
	Depth	---		---		---		---	
	Type	SOIL		SOIL		SOIL		WATER, UG/L	
	Comments			CO-LOCATED				EQUIPMENT BLANK	
Parameter	Units	Result	Q	Result	Q	Result	Q	Result	Q
2,4-DINITROTOLUENE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
DIETHYLPHTHALATE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
4-CHLOROPHENYL-PHENYLETHER	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
FLUORENE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
4-NITROANILINE	UG/KG	3500.000	U	3300.000	U	3500.000	U	20.000	U
4,6-DINITRO-2-METHYLPHENOL	UG/KG	3500.000	U	3300.000	U	3500.000	U	50.000	U
N-NITROSODIPHENYLAMINE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
4-BROMOPHENYL-PHENYLETHER	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
HEXACHLOROBENZENE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
PENTACHLOROPHENOL	UG/KG	3500.000	U	3300.000	U	3500.000	U	50.000	U
PHENANTHRENE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
ANTHRACENE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
DI-N-BUTYLPHTHALATE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
FLUORANTHENE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
PYRENE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
BUTYLBENZYLPHTHALATE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
3,3'-DICHLOROBENZIDINE	UG/KG	1400.000	U	1300.000	U	1400.000	U	20.000	U
BENZO(A)ANTHRACENE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
CHRYSENE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
DI-N-OCTYLPHTHALATE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
BENZO(B)FLUORANTHENE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
BENZO(K)FLUORANTHENE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
BENZO(A)PYRENE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
INDENO(1,2,3-CD)PYRENE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
DIBENZ(A,H)ANTHRACENE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U
BENZO(G,H,I)PERYLENE	UG/KG	700.000	U	660.000	U	690.000	U	10.000	U

The decimal places shown do not reflect the precision reported by the laboratory

SEMIVOLATILE ORGANIC ANALYSIS RESULTS
FOR ANALYSES USING METHOD 8270
TENTATIVELY IDENTIFIED COMPOUNDS

Client Sample ID: 9018SG	LAL Sample ID: L3300-25
Date Received: 10-NOV-94	Date Analyzed: 30-NOV-94
Matrix: SOIL	Dilution Factor: 1
Analytical Batch: 113094-8270-K	QC Batch ID: 8270 SEMIVOLATILE_15778

Tentatively Identified Compound	Estimated Concentration (µg/Kg)	Retention Time (minutes)	Data Qualifier(s)	Q
UNKNOWN HYDROCARBON	320	12.76	~~J~~	JN
PENTACHLOROBIPHENYL	420	13.99	~~J~~	JN
PENTACHLOROBIPHENYL	380	14.58	~~J~~	JN
PENTACHLOROBIPHENYL	410	14.96	~~J~~	JN
UNKNOWN ESTER	9700	15.71	~~JB~~	LL

~~XXL~~ 1/18/ ~~202~~

SEMIVOLATILE ORGANIC ANALYSIS RESULTS
FOR ANALYSES USING METHOD 8270
TENTATIVELY IDENTIFIED COMPOUNDS

Client Sample ID: BLANK	LAL Sample ID: 15778MB
Date Received: 10-NOV-94	Date Analyzed: 30-NOV-94
Matrix: SOIL	Dilution Factor: 1
Analytical Batch: 113094-8270-K	QC Batch ID: 8270 SEMIVOLATILE_15778

Tentatively Identified Compound	Estimated Concentration (µg/Kg)	Retention Time (minutes)	Data Qualifier(s)
UNKNOWN ESTER	4300	15.70	J

203
1/13/95

SEMIVOLATILE ORGANIC ANALYSIS RESULTS
FOR ANALYSES USING METHOD 8270
TENTATIVELY IDENTIFIED COMPOUNDS

Client Sample ID: 9018SGD	LAL Sample ID: L3300-27
Date Received: 10-NOV-94	Date Analyzed: 30-NOV-94
Matrix: SOIL	Dilution Factor: 1
Analytical Batch: 113094-8270-K	QC Batch ID: 8270 SEMIVOLATILE_15778

Tentatively Identified Compound	Estimated Concentration (µg/Kg)	Retention Time (minutes)	Data Qualifier(s)
UNKNOWN HYDROCARBON	320	10.34	~~J~~
UNKNOWN HYDROCARBON	350	11.96	~~J~~
UNKNOWN HYDROCARBON	370	12.76	~~J~~
UNKNOWN ESTER	23,000	15.71	~~JB~~

JN
JN.
JN
JN

~~205~~

SEMIVOLATILE ORGANIC ANALYSIS RESULTS
FOR ANALYSES USING METHOD 8270
TENTATIVELY IDENTIFIED COMPOUNDS

Client Sample ID: 901918	LAL Sample ID: L3300-22
Date Received: 10-NOV-94	Date Analyzed: 30-NOV-94
Matrix: SOIL	Dilution Factor: 1
Analytical Batch: 113094-8270-K	QC Batch ID: 8270 SEMIVOLATILE_15778

Tentatively Identified Compound	Estimated Concentration (µg/Kg)	Retention Time (minutes)	Data Qualifier(s)	Q
UNKNOWN ESTER	2400	15.70	~~JB~~	UJ1

1/12/95

C.6

LOCKHEED ANALYTICAL SERVICES

012

SEMIVOLATILE ORGANIC ANALYSIS RESULTS
FOR ANALYSES USING METHOD 8270
TENTATIVELY IDENTIFIED COMPOUNDS

Client Sample ID: EQUI1	LAL Sample ID: L3298-22
Date Received: 10-NOV-94	Date Analyzed: 30-NOV-94
Matrix: WATER	Dilution Factor: 1
Analytical Batch: 113094-8270-K	QC Batch ID: 8270 SEMIVOLATILES_15779

Tentatively Identified Compound	Estimated Concentration (µg/L)	Retention Time (minutes)	Data Qualifier(s)
NONE DETECTED			

170

THIS PAGE INTENTIONALLY
LEFT BLANK

9513386.0250

Appendix D

Semivolatile Organic Compounds Field Duplicate Results

THIS PAGE INTENTIONALLY
LEFT BLANK

SAMPLE NO.:	9018SG		9018SGD		
DATE:	11/8/94		11/8/94		
LOCATION:	90 18		90 18		
PARAMETER	RESULT µg/Kg	Q	RESULT µg/Kg	Q	RPD
PHENOL	700	U	660	U	NC
BIS(2-CHLOROETHYL)ETHER	700	U	660	U	NC
1,3-DICHLOROBENZENE	700	U	660	U	NC
1,4-DICHLOROBENZENE	700	U	660	U	NC
BENZYL ALCOHOL	1400	U	1300	U	NC
BIS(2-CHLOROISOPROPYL)ETHER	700	U	660	U	NC
4-METHYLPHENOL	700	U	660	U	NC
2,4-DIMETHYLPHENOL	700	U	660	U	NC
BIS(2-CHLOROETHOXY)METHANE	700	U	660	U	NC
2,4-DICHLOROPHENOL	700	U	660	U	NC
1,2,4-TRICHLOROBENZENE	700	U	660	U	NC
4-CHLOROANILINE	1400	U	1300	U	NC
DIMETHYLPHTHALATE	700	U	660	U	NC
ACENAPHTHYLENE	700	U	660	U	NC
2,4-DINITROPHENOL	3500	U	3300	U	NC
4-NITROPHENOL	3500	U	3300	U	NC
DIBENZOFURAN	700	U	660	U	NC
2,4-DINITROTOLUENE	700	U	660	U	NC
4-NITROANILINE	3500	U	3300	U	NC
4,6-DINITRO-2-METHYLPHENOL	3500	U	3300	U	NC
4-BROMOPHENYL-PHENYLETHER	700	U	660	U	NC
HEXACHLOROBENZENE	700	U	660	U	NC
ANTHRACENE	700	U	660	U	NC
FLUORANTHENE	700	U	660	U	NC
PYRENE	700	U	660	U	NC
BENZO(A)ANTHRACENE	700	U	660	U	NC
CHRYSENE	700	U	660	U	NC
BIS(2-ETHYLHEXYL)PHTHALATE	700	U	660	U	NC
DI-N-OCTYLPHTHALATE	700	U	660	U	NC
BENZO(B)FLUORANTHENE	700	U	660	U	NC
BENZO(K)FLUORANTHENE	700	U	660	U	NC
BENZO(A)PYRENE	700	U	660	U	NC
INDENO(1,2,3-CD)PYRENE	700	U	660	U	NC
DIBENZ(A,H)ANTHRACENE	700	U	660	U	NC

SAMPLE NO.:	9018SG		9018SGD		
DATE:	11/8/94		11/8/94		
LOCATION:	90 18		90 18		
PARAMETER	RESULT µg/Kg	Q	RESULT µg/Kg	Q	RPD
BENZO(G,H,I)PERYLENE	700	U	660	U	NC
2-CHLOROPHENOL	700	U	660	U	NC
1,2-DICHLOROBENZENE	700	U	660	U	NC
2-METHYLPHENOL	700	U	660	U	NC
N-NITROSO-DI-N-PROPYLAMINE	700	U	660	U	NC
HEXACHLOROETHANE	700	U	660	U	NC
NITROBENZENE	700	U	660	U	NC
ISOPHORONE	700	U	660	U	NC
2-NITROPHENOL	700	U	660	U	NC
BENZOIC ACID	3500	U	3300	U	NC
NAPHTHALENE	700	U	660	U	NC
HEXACHLOROBUTADIENE	700	U	660	U	NC
4-CHLORO-3-METHYLPHENOL	1400	U	1300	U	NC
2-METHYLNAPHTHALENE	700	U	660	U	NC
HEXACHLOROCYCLOPENTADIENE	700	U	660	U	NC
2,4,6-TRICHLOROPHENOL	700	U	660	U	NC
2,4,5-TRICHLOROPHENOL	700	U	660	U	NC
2-CHLORONAPHTHALENE	700	U	660	U	NC
2-NITROANILINE	3500	U	3300	U	NC
2,6-DINITROTOLUENE	700	U	660	U	NC
3-NITROANILINE	3500	U	3300	U	NC
ACENAPHTHENE	700	U	660	U	NC
DIETHYLPHTHALATE	700	U	660	U	NC
4-CHLOROPHENYL-PHENYLETHER	700	U	660	U	NC
FLUORENE	700	U	660	U	NC
N-NITROSODIPHENYLAMINE	700	U	660	U	NC
PENTACHLOROPHENOL	3500	U	3300	U	NC
PHENANTHRENE	700	U	660	U	NC
CARBAZOLE	700	U	660	U	NC
DI-N-BUTYLPHTHALATE	700	U	660	U	NC
BUTYLBENZYLPHTHALATE	700	U	660	U	NC
3,3'-DICHLOROBENZIDINE	1400	U	1300	U	NC
NC - Not calculated					

9513386.0252

Appendix E

Metals Validated Data Summary Tables

THIS PAGE INTENTIONALLY
LEFT BLANK

	Samp#	9017SG		901818		9018SG		901918		9019SG		EQUI1	
	Date	11-8-94		11-8-94		11-8-94		11-8-94		11-8-94		11-8-94	
	Location	90 17		90 18		90 18		90 19		90 19			
	Depth	---		---		---		---		---		---	
	Type	SOIL		SOIL		SOIL		SOIL		SOIL		WATER, UG/L EQUIPMENT BLANK	
	Comments												
Parameter	Units	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
ALUMINUM	MG/KG	5110.000		5580.000		6320.000		6480.000		5980.000		16.000	U
ANTIMONY	MG/KG	10.600	U	10.600	U	10.600	UJ	10.600	UJ	10.700	U	50.000	U
BARIUM	MG/KG	62.400		71.900		87.800		72.600		71.400		9.000	U
BERYLLIUM	MG/KG	---		---		---		---		---		1.000	U
CADMIUM	MG/KG	0.850	U	0.850	U	3.500		0.850	U	0.860	U	4.000	U
CALCIUM	MG/KG	5050.000		4920.000		5430.000		5000.000		6370.000		232.000	BJ
CHROMIUM	MG/KG	9.600	J	7.700	J	11.000		9.500		8.700	J	3.000	UJ
COBALT	MG/KG	8.200	B	9.700	B	22.800		7.100	B	7.200	B	6.000	U
COPPER	MG/KG	16.500		13.900		18.400		12.500		17.100		3.000	UJ
IRON	MG/KG	19600.000		19700.000		24000.000		23800.000		21400.000		28.200	B
LEAD	MG/KG	---		---		---		---		---		2.300	U
MAGNESIUM	MG/KG	3700.000		4120.000		4170.000		4650.000		4220.000		74.900	B
MANGANESE	MG/KG	253.000		294.000		310.000		319.000		301.000		1.000	UJ
MERCURY	MG/KG	0.110	UJ	0.100	UJ	0.110	UJ	0.100	UJ	0.100	UJ	0.200	U
MOLYBDENUM	MG/KG	15.800	B	3.200	U	3.200	U	3.200	U	3.200	U	---	
NICKEL	MG/KG	14.600		20.800		78.500		12.100		10.900		10.000	U
POTASSIUM	MG/KG	792.000	B	1010.000	B	995.000	B	1080.000		953.000	B	620.000	U
SELENIUM	MG/KG	19.100	U	19.200	U	19.100	U	19.100	U	19.300	U	---	
SILVER	MG/KG	0.850	U	0.850	U	0.850	U	0.850	U	0.860	U	4.000	U
SODIUM	MG/KG	476.000	BJ	472.000	BJ	511.000	BJ	477.000	BJ	460.000	BJ	500.000	BJ
STRONTIUM	MG/KG	22.800	B	35.100	B	79.300		24.200	B	22.500	B	1.000	UJ
VANADIUM	MG/KG	---		---		---		---		---		3.000	UJ
ZINC	MG/KG	---		---		---		---		---		84.000	
CERIUM	MG/KG	---		---		---		---		---		1.000	U

The decimal places shown do not reflect the precision reported by the laboratory

9513386.0253

	Samp#	NE10SG		NE9S		NE9SD		NE9SG		SA11ID		SA11S	
	Date	11-8-94		11-8-94		11-8-94		11-8-94		11-8-94		11-8-94	
	Location	NE 10		NE 9		NE 9		NE 9		SA 11		SA 11	
	Depth	---		---		---		---		---		---	
	Type	SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
	Comments					CO-LOCATED							
Parameter	Units	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
ALUMINUM	MG/KG	5250.000		---		---		7250.000		6350.000		---	
ANTIMONY	MG/KG	10.700	U	---		---		10.800	UJ	10.800	U	---	
BARIUM	MG/KG	74.800		---		---		75.000		85.900		---	
BERYLLIUM	MG/KG	---		---		---		---		---		---	
CADMIUM	MG/KG	0.860	U	---		---		0.860	U	0.860	U	---	
CALCIUM	MG/KG	4430.000		---		---		5780.000		3680.000		---	
CHROMIUM	MG/KG	6.700	J	---		---		8.600		8.100	J	---	
COBALT	MG/KG	7.000	B	---		---		9.100	B	7.200	B	---	
COPPER	MG/KG	12.100		---		---		16.100		11.600		---	
IRON	MG/KG	17000.000		---		---		25700.000		22400.000		---	
LEAD	MG/KG	---		34.800	J	43.300		---		---		29.100	J
MAGNESIUM	MG/KG	3880.000		---		---		4520.000		4550.000		---	
MANGANESE	MG/KG	269.000		---		---		358.000		349.000		---	
MERCURY	MG/KG	0.090	UJ	---		---		0.100	UJ	0.100	UJ	---	
MOLYBDENUM	MG/KG	3.200	U	---		---		3.200	U	3.200	U	---	
NICKEL	MG/KG	9.600		---		---		10.000		10.000		---	
POTASSIUM	MG/KG	867.000	B	---		---		1010.000	B	1280.000		---	
SELENIUM	MG/KG	19.300	U	---		---		19.400	U	19.400	U	---	
SILVER	MG/KG	0.860	U	---		---		0.860	U	0.860	U	---	
SODIUM	MG/KG	472.000	BJ	---		---		533.000	BJ	430.000	BJ	---	
STRONTIUM	MG/KG	24.500	B	---		---		24.400	B	19.800	B	---	
VANADIUM	MG/KG	---		---		---		---		---		---	
ZINC	MG/KG	---		---		---		---		---		---	
CERIUM	MG/KG	---		---		---		27.100		---		---	

The decimal places shown do not reflect the precision reported by the laboratory

	Sampl#	SA11SG		SA11SGD		SA12SG		SA13S		SA13SG		SA14SG	
	Date	11-8-94		11-8-94		11-8-94		11-8-94		11-8-94		11-8-94	
	Location	SA 11		SA 11		SA 12		SA 13		SA 13		SA 14	
	Depth	---		---		---		---		---		---	
	Type	SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
	Comments			CO-LOCATED									
Parameter	Units	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
ALUMINUM	MG/KG	6820.000		6820.000		5780.000		---		5820.000		5520.000	
ANTIMONY	MG/KG	10.700	UJ	10.700	UJ	10.700	U	---		10.800	U	10.500	U
BARIUM	MG/KG	76.300		79.000		72.100		---		73.600		68.200	
BERYLLIUM	MG/KG	---		---		---		---		---		---	
CADMIUM	MG/KG	0.860	U	0.850	U	0.860	U	---		0.870	U	0.840	U
CALCIUM	MG/KG	5590.000		5030.000		4530.000		---		4450.000		4680.000	
CHROMIUM	MG/KG	8.600		9.900		8.100	J	---		7.300	J	6.100	J
COBALT	MG/KG	7.100	B	7.700	B	6.900	B	---		7.000	B	7.400	B
COPPER	MG/KG	13.000		13.500		11.900		---		11.000		12.900	
IRON	MG/KG	23600.000		24400.000		20200.000		---		20200.000		20300.000	
LEAD	MG/KG	---		---		---		26.500		---		---	
MAGNESIUM	MG/KG	4510.000		4580.000		4170.000		---		4390.000		4230.000	
MANGANESE	MG/KG	325.000		338.000		298.000		---		305.000		307.000	
MERCURY	MG/KG	0.100	UJ	0.100	UJ	0.100	UJ	---		0.110	UJ	0.110	UJ
MOLYBDENUM	MG/KG	3.200	U	3.200	U	3.200	U	---		3.200	U	3.200	U
NICKEL	MG/KG	10.100		10.800		11.000		---		9.700		9.900	
POTASSIUM	MG/KG	1060.000	B	1060.000	B	1020.000	B	---		1020.000	B	905.000	B
SELENIUM	MG/KG	19.300	U	19.200	U	19.300	U	---		19.500	U	19.000	U
SILVER	MG/KG	0.860	U	0.850	U	0.860	U	---		0.870	U	0.840	U
SODIUM	MG/KG	483.000	BJ	545.000	BJ	426.000	BJ	---		459.000	BJ	433.000	BJ
STRONTIUM	MG/KG	23.000	B	23.100	B	20.300	B	---		20.900	B	19.800	B
VANADIUM	MG/KG	---		---		---		---		---		---	
ZINC	MG/KG	---		---		---		---		---		---	
CERIUM	MG/KG	63.500		57.300		---		---		---		---	

The decimal places shown do not reflect the precision reported by the laboratory

	Sampl	SW15S		SW15SG		SW16SG		IS1S		IS2S		IS3S	
	Date	11-8-94		11-8-94		11-8-94		11-8-94		11-8-94		11-8-94	
	Location	SW 15		SW 15		SW 16		I/S 1		I/S 2		I/S 3	
	Depth	---		---		---		---		---		---	
	Type	SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
	Comments												
Parameter	Units	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
ALUMINUM	MG/KG	---		6920.000		6180.000		---		---		---	
ANTIMONY	MG/KG	---		10.600	UJ	10.700	U	---		---		---	
BARIUM	MG/KG	---		72.000		73.000		---		---		---	
BERYLLIUM	MG/KG	---		---		---		---		---		---	
CADMIUM	MG/KG	---		0.850	U	0.860	U	---		---		---	
CALCIUM	MG/KG	---		6120.000		5340.000		---		---		---	
CHROMIUM	MG/KG	---		9.300		7.300	J	---		---		---	
COBALT	MG/KG	---		9.400	B	6.900	B	---		---		---	
COPPER	MG/KG	---		17.800		16.200		---		---		---	
IRON	MG/KG	---		24900.000		20600.000		---		---		---	
LEAD	MG/KG	97.400		---		---		6.700	J	13.400		62.400	J
MAGNESIUM	MG/KG	---		4620.000		4030.000		---		---		---	
MANGANESE	MG/KG	---		337.000		318.000		---		---		---	
MERCURY	MG/KG	---		0.110	UJ	0.110	UJ	---		---		---	
MOLYBDENUM	MG/KG	---		3.200	U	3.200	U	---		---		---	
NICKEL	MG/KG	---		15.100		8.600	B	---		---		---	
POTASSIUM	MG/KG	---		1080.000		1100.000		---		---		---	
SELENIUM	MG/KG	---		19.100	U	19.300	U	---		---		---	
SILVER	MG/KG	---		0.850	U	0.860	U	---		---		---	
SODIUM	MG/KG	---		573.000	BJ	495.000	BJ	---		---		---	
STRONTIUM	MG/KG	---		25.200	B	22.500	B	---		---		---	
VANADIUM	MG/KG	---		---		---		---		---		---	
ZINC	MG/KG	---		---		---		---		---		---	
CERIUM	MG/KG	---		28.900		---		---		---		---	

The decimal places shown do not reflect the precision reported by the laboratory

	Sampl#	TS41B		TS45G		TS55G		TS55GD		TS61B		TS65G	
	Date	11-8-94		11-8-94		11-8-94		11-8-94		11-8-94		11-8-94	
	Location	T/S 4		T/S 4		T/S 5		T/S 5		T/S 6		T/S 6	
	Depth	---		---		---		---		---		---	
	Type	SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
	Comments							CO-LOCATED					
Parameter	Units	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
ALUMINUM	MG/KG	5410.000		5370.000		4940.000		4930.000		6310.000		7280.000	
ANTIMONY	MG/KG	10.700	U	10.600	U	10.600	U	10.500	U	10.800	U	10.700	UJ
BARIUM	MG/KG	69.500		69.300		64.000		66.600		77.200		72.700	
BERYLLIUM	MG/KG	---		---		---		---		---		---	
CADMIUM	MG/KG	0.860	U	0.850	U	0.840	U	0.840	U	0.860	U	0.860	U
CALCIUM	MG/KG	3850.000		4240.000		4290.000		4370.000		3890.000		4170.000	
CHROMIUM	MG/KG	7.400	J	7.200	J	6.900	J	6.200	J	9.100	J	10.300	
COBALT	MG/KG	6.100	B	6.200	B	6.300	B	5.600	B	7.200	B	7.600	B
COPPER	MG/KG	9.800		10.400		12.400		11.800		13.200		12.900	
IRON	MG/KG	16900.000		16800.000		18000.000		16300.000		21400.000		23000.000	
LEAD	MG/KG	---		---		---		---		---		---	
MAGNESIUM	MG/KG	4060.000		4170.000		3960.000		3900.000		4430.000		4620.000	
MANGANESE	MG/KG	285.000		287.000		288.000		263.000		326.000		324.000	
MERCURY	MG/KG	0.090	UJ	0.110	UJ	0.110	UJ	0.110	UJ	0.110	UJ	0.100	UJ
MOLYBDENUM	MG/KG	3.200	U	3.200	U	3.200	U	3.200	U	3.200	U	3.200	U
NICKEL	MG/KG	10.800		8.400	B	9.600		8.100	B	11.600		11.200	
POTASSIUM	MG/KG	1100.000		1120.000		925.000	B	853.000	B	1250.000		1250.000	
SELENIUM	MG/KG	19.300	U	19.100	U	19.000	U	18.900	U	19.400	U	19.300	U
SILVER	MG/KG	0.860	U	0.850	U	0.840	U	0.840	U	0.860	U	0.860	U
SODIUM	MG/KG	374.000	BJ	399.000	BJ	424.000	BJ	444.000	BJ	449.000	BJ	447.000	BJ
STRONTIUM	MG/KG	17.800	B	19.500	B	18.600	B	23.000	B	21.000	B	23.100	B
VANADIUM	MG/KG	---		---		---		---		---		---	
ZINC	MG/KG	---		---		---		---		---		---	
CERIUM	MG/KG	---		---		---		---		---		28.400	

The decimal places shown do not reflect the precision reported by the laboratory

9513386.0255

	Sampl#	TS7SG		TS8SG	
	Date	11-8-94		11-8-94	
	Location	T/S 7		T/S 8	
	Depth	---		---	
	Type	SOIL		SOIL	
	Comments				
Parameter	Units	Result	Q	Result	Q
ALUMINUM	MG/KG	5590.000		5970.000	
ANTIMONY	MG/KG	10.700	U	11.000	U
BARIUM	MG/KG	81.300		69.600	
BERYLLIUM	MG/KG	---		---	
CADMIUM	MG/KG	0.860	U	0.880	U
CALCIUM	MG/KG	5170.000		4270.000	
CHROMIUM	MG/KG	8.400	J	8.200	J
COBALT	MG/KG	6.900	B	6.800	B
COPPER	MG/KG	11.900		10.400	
IRON	MG/KG	19600.000		17400.000	
LEAD	MG/KG	---		---	
MAGNESIUM	MG/KG	4520.000		4360.000	
MANGANESE	MG/KG	305.000		303.000	
MERCURY	MG/KG	0.110	UJ	0.110	UJ
MOLYBDENUM	MG/KG	3.200	U	3.300	U
NICKEL	MG/KG	9.500		11.200	
POTASSIUM	MG/KG	973.000	B	1060.000	B
SELENIUM	MG/KG	19.300	U	19.800	U
SILVER	MG/KG	0.860	U	0.880	U
SODIUM	MG/KG	446.000	BJ	483.000	BJ
STRONTIUM	MG/KG	23.200	B	21.000	B
VANADIUM	MG/KG	---		---	
ZINC	MG/KG	---		---	
CERIUM	MG/KG	---		---	

The decimal places shown do not reflect the precision reported by the laboratory

9513386.0256

Appendix F

Metals Validated Field Duplicate Summary

THIS PAGE INTENTIONALLY
LEFT BLANK

SAMPLE NO.:	TS5SG		TS5SGD		
DATE:	11/8/94		11/8/94		
LOCATION:	T/S 5		T/S 5		
PARAMETER	RESULT MG/KG	Q	RESULT MG/KG	Q	RPD
ALUMINUM	4940		4930		.2
ANTIMONY	10.6	U	10.5	U	NC
BARIUM	64		66.6		4
CADMIUM	0.84	U	0.84	U	NC
CALCIUM	4290		4370		2
CHROMIUM	6.9	J	6.2	J	10.7
COBALT	6.3	B	5.6	B	11.8
COPPER	12.4		11.8		5.0
IRON	18000		16300		10
MAGNESIUM	3960		3900		2
MANGANESE	288		263		9
MERCURY	0.11	UJ	0.11	UJ	NC
MOLYBDENUM	3.2	U	3.2	U	NC
NICKEL	9.6		8.1	B	16.9
POTASSIUM	925	B	853	B	8
SELENIUM	19	U	18.9	U	NC
SILVER	0.84	U	0.84	U	NC
SODIUM	424	BJ	444	BJ	5
STRONTIUM	18.6	B	23	B	21
NC - Not calculated					

SAMPLE NO.:	SA11SG		SA11SGD		
DATE:	11/8/94		11/8/94		
LOCATION	SA 11		SA 11		
PARAMETER	RESULT MG/KG	Q	RESULT MG/KG	Q	RPD
ALUMINUM	6820		6820		0
ANTIMONY	10.7	UJ	10.7	UJ	NC
BARIUM	76.3		79		3
CADMIUM	0.86	U	0.85	U	NC
CALCIUM	5590		5030		11
CERIUM	63.5		57.3		10
CHROMIUM	8.6		9.9		14
COBALT	7.1	B	7.7	B	8.1
COPPER	13		13.5		4
IRON	23600		24400		3
MAGNESIUM	4510		4580		2
MANGANESE	325		338		4
MERCURY	0.1	UJ	0.1	UJ	NC
MOLYBDENUM	3.2	U	3.2	U	NC
NICKEL	10.1		10.8		6.7
POTASSIUM	1060	B	1060	B	0
SELENIUM	19.3	U	19.2	U	NC
SILVER	0.86	U	0.85	U	NC
SODIUM	483	BJ	545	BJ	12
STRONTIUM	23	B	23.1	B	0.4
NC - Not calculated					

SAMPLE NO.:	NE9S		NE9SD		
DATE:	11/8/94		11/8/94		
LOCATION:	NE 9		NE 9		
PARAMETER	RESULT MG/KG	Q	RESULT MG/KG	Q	RPD
LEAD	34.8	J	43.3		21.8
NC - Not calculated					

THIS PAGE INTENTIONALLY
LEFT BLANK

9513386.0259

Appendix G

Radiochemistry Validated Data Summary Tables

THIS PAGE INTENTIONALLY
LEFT BLANK

	Samp#	EQU11		NE10SG		SA14SG		SW16SG		TS5SG		TS5SGD	
	Date	11-8-94		11-8-94		11-8-94		11-8-94		11-8-94		11-8-94	
	Location			NE 10		SA 14		SW 16		T/S 5		T/S 5	
	Depth	---		---		---		---		---		---	
	Type	WATER (in pCi/l)		SOIL		SOIL		SOIL		SOIL		SOIL	
	Comments	EQUIPMENT BLANK										CO-LOCATED	
Parameter	Units	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
GROSS ALPHA	pCi/g	0.110	U	9.300		9.000		15.400		9.500		15.900	
GROSS BETA	pCi/g	-0.200	U	16.700		19.000		18.000		14.300		22.200	

The decimal places shown do not reflect the precision reported by the laboratory

9513306.0120

THIS PAGE INTENTIONALLY
LEFT BLANK

9513386.0261

Appendix H

Radiochemistry Field Duplicate Results

THIS PAGE INTENTIONALLY
LEFT BLANK

SAMPLE NO.:	TS5SG		TS5SGD		
DATE:	11/8/94		11/8/94		
LOCATION:	T/S 5		T/S 5		
PARAMETER	RESULT pCi/L	Q	RESULT pCi/L	Q	RPD
GROSS ALPHA	9.5		15.9		50.4
GROSS BETA	14.3		22.2		43.3

THIS PAGE INTENTIONALLY
LEFT BLANK

9513586.0263

Appendix I

Method and Reporting Detection Limits for Volatile Organic and Semivolatile Organic Compounds Solid Samples

THIS PAGE INTENTIONALLY
LEFT BLANK

Issued on 7/05/94

Lockheed Analytical Services

METHOD AND REPORTING DETECTION LIMITS FOR SOLID SAMPLES USING EPA METHOD 3550/8270 - SEMIVOLATILE ANALYSES BY GC/MS

Method 3550/8270 - Solid Samples		
CONSTITUENT	MDL[a] (µg/kg)	RDL[b] (µg/kg)
Phenol	460	660
bis(2-Chloroethyl)ether	280	660
2-Chlorophenol	400	660
1,3-Dichlorobenzene	240	660
1,4-Dichlorobenzene	250	660
Benzyl alcohol	560	1300
1,2-Dichlorobenzene	260	660
2-Methylphenol	480	660
bis(2-Chloroisopropyl)ether	240	660
4-Methylphenol	540	660
N-Nitroso-di-n-propylamine	350	660
Hexachloroethane	250	660
Nitrobenzene	220	660
Isophorone	250	660
2-Nitrophenol	410	660
2,4-Dimethylphenol	390	660
bis(2-Chloroethoxy)methane	280	660
Benzoic acid	410	3300
2,4-Dichlorophenol	410	660
1,2,4-Trichlorobenzene	210	660
Naphthalene	250	660

Method 3550/8270 - Solid Samples		
CONSTITUENT	MDL[a] (µg/kg)	RDL[b] (µg/kg)
4-Chloroaniline	390	1300
Hexachlorobutadiene	220	660
4-Chloro-3-methylphenol	520	1300
2-Methylnaphthalene	280	660
Hexachlorocyclopentadiene	160	660
2,4,6-Trichlorophenol	310	660
2,4,5-Trichlorophenol	370	660
2-Chloronaphthalene	230	660
2-Nitroaniline	310	3300
Dimethyl phthalate	190	660
Acenaphthylene	190	660
2,6-Dinitrotoluene	250	660
3-Nitroaniline	420	3300
Acenaphthene	190	660
2,4-Dinitrophenol	410	3300
4-Nitrophenol	570	3300
Dibenzofuran	200	660
2,4-Dinitrotoluene	260	660
Diethylphthalate	240	660
4-Chlorophenyl phenyl ether	180	660
Fluorene	200	660
4-Nitroaniline	450	3300
4,6-Dinitro-2-methylphenol	260	3300
N-Nitrosodiphenylamine	130	660
4-Bromophenyl phenyl ether	160	660

Issued on 7/05/94

Method 3550/8270 - Solid Samples		
CONSTITUENT	MDL[a] (µg/kg)	RDL[b] (µg/kg)
Hexachlorobenzene	140	660
Pentachlorophenol	380	3300
Phenanthrene	120	660
Anthracene	140	660
Carbazole	200	660[c]
Di-n-butyl phthalate	150	660
Fluoranthene	200	660
Pyrene	260	660
Butyl benzyl phthalate	150	660
3,3'-Dichlorobenzidine	360	1300
Benzo(a)anthracene	130	660
bis(2-Ethylhexy)phthalate	150	660
Chrysene	120	660
Di-n-octyl phthalate	170	660
Benzo(b)fluoranthene	190	660
Benzo(k)fluoranthene	260	660
Benzo(a)pyrene	140	660
Indeno(1,2,3-cd)pyrene	120	660
Dibenz(a,h)anthracene	130	660
Benzo(g,h,i)perylene	140	660

a - Determined on 5/12/94 using a 30-g sample, with GPC cleanup, and a 1 µL injection.

b - Adopted from the PQLs specified by Method 8270, Revision A, July 1992, and Revision 1, July 1992.

c - Adopted from the CRQL specified by CLP OLMO1.1.

METHOD AND REPORTING DETECTION LIMITS FOR SOLID SAMPLES USING EPA METHODS 8240/8260 - VOLATILE ORGANIC ANALYSES BY GC/MS

METHODS 8240/8260 - SOLID SAMPLES		
Routine Analytes	MDL[a] (µg/kg)	RDL[b] (µg/kg)
Chloromethane	2	5
Vinyl Chloride	2	5
Bromomethane	2	5
Chloroethane	1	5
Trichlorofluoromethane	2	5
Acetone	4[c]	10
2-Chloroethyl vinyl ether	5	20
1,1-Dichloroethene	2	5
Methylene Chloride	1	5
Carbon Disulfide	1	5
Vinyl Acetate	2[c]	10
1,1-Dichloroethane	1	5
2-Butanone	1	10
trans-1,2-Dichloroethene	1	5
cis-1,2-Dichloroethene	1	5
Chloroform	2	5
1,1,1-Trichloroethane	2	5
Carbon Tetrachloride	2	5
1,2-Dichloroethane	2	5
Benzene	2	5
Trichloroethene (TCE)	2	5
1,2-Dichloropropane	1	5
Bromodichloromethane	1	5
4-Methyl-2-pentanone	1	10
2-Hexanone	2	10
cis-1,3-Dichloropropene	1	5
trans-1,3-Dichloropropene	1	5
1,1,2-Trichloroethane	1	5
Toluene	1	5
Dibromochloromethane	2	5
Tetrachloroethene (PCE)	2	5
Chlorobenzene	2	5
Ethylbenzene	2	5
m,p-Xylenes	3	5
o-Xylene	2	5
Styrene	1	5

METHODS 8240/8260 - SOLID SAMPLES		
Routine Analytes	MDL[a] (μg/kg)	RDL[b] (μg/kg)
Bromoform	2	5
1,1,2,2-Tetrachloroethane	2	5
1,3-Dichlorobenzene	2	5
1,4-Dichlorobenzene	2	5
1,2-Dichlorobenzene	2	5

a - Calculated based on the aqueous MDLs determined on 4/22/93.
b - The LAS RDLs met the estimated quantitation limits (PQLs) specified in Method 8260 of 5 μg/kg for all the target compounds listed in Table 1 in Method 8260. For the analytes that are not listed in Method 8260, such as ketones, the LAS RDLs are generated based on the MDL study.
c - Calculated based on the aqueous MDLs determined on 2/19/93.

METHOD 8240/8260 - SOLID SAMPLES		
Additional Analytes	MDL[a] (µg/kg)	RDL
Dichlorodifluoromethane	2	5
Freon 113	2	10
2,2-Dichloropropane	1	5
Bromochloromethane	1	5
1,1-Dichloropropene	2	5
Dibromomethane	2	5
1,2-Dibromoethane	1	5
1,3-Dichloropropane	1	5
1,1,1,2-Tetrachloroethane	2	5
Isopropylbenzene	2	5
1,2,3-Trichloropropane	2	5
n-Propylbenzene	2	5
Bromobenzene	2	5
1,3,5-Trimethylbenzene	2	5
2-Chlorotoluene	2	5
4-Chlorotoluene	2	5
tert-Butylbenzene	2	5
1,2,4-Trimethylbenzene	2	5
sec-Butylbenzene	2	5
p-Isopropyltoluene	2	5
n-Butylbenzene	2	5
1,2-Dibromo-3-chloropropane	2	5
1,2,4-Trichlorobenzene	2	5
Hexachlorobutadiene	2	5
Naphthalene	1	5
1,2,3-Trichlorobenzene	2	5
a - Calculated based on the aqueous MDLs determined on 4/22/93.		

Distribution

No. of Copies

Offsite

12 DOE/Office of Scientific and Technical Information

S. Arlt
927 G.W. Way
Richland, WA 99352

W. Burke
Board of Trustees
Confederated Tribes of the Umatilla Indian Reservation
P.O. Box 638
Pendleton, OR 97801

A. W. Conklin
Washington State Department of Health
P.O. Box 47800
Olympia, WA 98504-7800

R. Cook
Yakama Indian Nation
P.O. Box 151
Toppenish, WA 98948

D. R. Duncan
U.S. Environmental Protection Agency, Region 10
1200 6th Ave
Seattle, WA 98101

R. Jim, Manager
Environmental Restoration and Waste Management Program
Yakama Indian Nation
P.O. Box 151
Toppenish, WA 98948

No. of Copies

D. Powaukee, Manager
Environmental Restoration and Waste Management Program
Nez Perce Tribe
P.O. Box 365
Lapwai, ID 83540

J. Witczak
Washington State Department of Ecology
Ecology Bldg.
P.O. Box 47600
Olympia, WA 98504-7600

Onsite

6 **DOE Richland Operations Office**

M. A. Barnard	L4-40
C. E. Clark	A5-15
E. M. Mattlin	A5-15
G. M. McClure	A7-75
J. E. Rasmussen	A5-15
J. W. Wiley	K8-50

ICF Kaiser Hanford Company

L. A. Gaddis	S3-09

MacTec

J. K. Bartz	R3-82

Washington State Department of Ecology

G. P. Davis	B5-18

No. of Copies		
3	**Westinghouse Hanford Company**	
	R. C. Brunke	H6-23
	C. S. Wilson	H6-08
	Administration File	
2	**U.S. Environmental Protection Agency**	
	D. R. Sherwood	B5-01
13	**Pacific Northwest Laboratory**	
	B. J. Day	P7-79
	R. L. Fichter	P7-39
	J. L. Julya	K6-79
	C. W. Lindenmeier	K6-81
	H. W. Slater	P7-35
	Publishing Coordination	K1-06
	Technical Report Files (5)	
	Routing	
	R. M. Ecker	SEQUIM
	P. M. Irving	K9-05
	S. A. Rawson	K9-34
	P. C. Hays (last)	K9-41