Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

10-AMCP-0087

FEB 17 2010

Ms. J. A. Hedges, Program Manager
Nuclear Waste Program
State of Washington
Department of Ecology
3100 Port of Benton
Richland, Washington 99354

Dear Ms. Hedges:

HANFORD FACILITY DANGEROUS WASTE CLOSURE/POSTCLOSURE PLAN FOR THE 600 AREA PURGEWATER STORAGE AND TREATMENT FACILITY, DOE/RL-2008-73, REVISION 0, AND STATE ENVIRONMENTAL POLICY ACT ENVIRONMENTAL CHECKLIST FOR THE PURGEWATER STORAGE AND TREATMENT FACILITY, UNIT #1 CLOSURE, REVISION 0, FEBRUARY 2010

This letter transmits the Hanford Facility Dangerous Waste Closure/Postclosure Plan for the 600 Area Purgewater Storage and Treatment Facility, DOE/RL-2008-73, Revision 0, to the State of Washington Department of Ecology for approval and the State Environmental Policy Act, Environmental Checklist for the Purgewater Storage and Treatment Facility unit #1 Closure, Revision 0, February 2010.

Ecology's approval is requested within 15 days of receipt of this letter.

If you have any questions, please contact me, or your staff may contact Matt McCormick, Assistant Manager for the Central Plateau, on (509) 373-9971.

Sincerely,

David A. Brockman
Manager

AMCP:RDH

Attachments

cc: See Page 2

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DOE/RL-2008-73
Revision 0

Hanford Facility Dangerous Waste Closure/Postclosure Plan for the 600 Area Purgewater Storage and Treatment Facility

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

P.O. Box 550
Richland, Washington 99352

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Hanford Facility Dangerous Waste Closure/Postclosure Plan for the 600 Area Purgewater Storage and Treatment Facility

Date Published
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Assistant Secretary for Environmental Management

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P.O. Box 550
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L. D. Arnold 02/02/2010
Release Approval Date

Approved for Public Release;
Further Dissemination Unlimited

Executive Summary

This closure plan addresses the closure of an aboveground, open containment unit located at the Hanford Site. The unit is regulated as a dangerous waste treatment, storage, and/or disposal unit and is in Closure Unit Group 8 (600 Area Purgewater Storage and Treatment Facility Unit 1). Unit 1 stored and treated extracted groundwater and well development water. The groundwater and well development water potentially introduced dangerous waste, dangerous waste constituents, or residues in the liquids and sediments. Unit 1 will be closed pursuant to this closure plan. Requirements in this permit demonstrate compliance with WAC 173-303-610, "Closure, and Post-Closure."[1] The 600 Area Purgewater Storage and Treatment Facility units are considered miscellaneous units (WAC 173-303-680, "Miscellaneous Units"[2])based on the closure standards applicable to surface impoundments in WAC 173-303-650(6), "Closure and Post-Closure Care,"[3] for units closing by removal or decontamination. The closure plan includes the requirements and activities that will be conducted for closure of Unit 1 by removal. Specifically, the dangerous waste, dangerous waste constituents, residues, protective liners, leachate system components, and structural walls of the 600 Area Purgewater Storage and Treatment Facility will be removed and disposed in accordance with the dangerous waste regulations, including Environmental Restoration Disposal Facility waste acceptance criteria. At closure, the site will be graded and graveled. No post-closure care or monitoring is anticipated, as waste or waste constituents are not expected to be left in place at the completion of closure. Unit 2 and the surrounding area did not manage dangerous waste and are not subject to this closure plan.

[1] WAC 173-303-610, "Closure and Post-Closure," *Washington Administrative Code*, Olympia, Washington.
[2] WAC 173-303-680, "Miscellaneous Units," *Washington Administrative Code*, Olympia, Washington.
[3] WAC 173-303-650(6), "Closure and Post-Closure Care," *Washington Administrative Code*, Olympia, Washington.

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Contents

Appendix

Tables

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Terms

CFR	*Code of Federal Regulations*
DOE	U.S. Department of Energy
DWTP	Dangerous Waste Training Plan
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
PSTF	600 Area Purgewater Storage and Treatment Facility
RL	U.S. Department of Energy, Richland Operations Office
SAP	Sampling and Analysis Plan
TSD	treatment, storage, and/or disposal
WAC	*Washington Administrative Code*

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1 Introduction

This closure plan addresses the dangerous waste management unit in Closure Unit Group 8 (600 Area Purgewater Storage and Treatment Facility [PSTF] Unit 1) and describes the requirements and activities that will be conducted for closure by removal. Unit 1 of the PSTF will be closed pursuant to this closure plan.[4] Requirements in this closure plan demonstrate compliance with WAC 173-303-610, "Closure and Post-Closure." The PSTF units are considered miscellaneous units (WAC 173-303-680, "Miscellaneous Units"), and will be closed according to the closure standards applicable to surface impoundments in WAC 173-303-650(6), "Closure and Post-Closure Care," for units closing by removal or decontamination. At closure, the site will be graded and graveled. Because waste or waste constituents are not expected to be left in place at the completion of closure, no postclosure care or monitoring is anticipated.

2 Facility Description

The scope of this closure plan includes Unit 1 of the PSTF. Unit 1consists of one aboveground open-containment vessel (i.e., ModuTank),[5] located just east of the 200 Area Effluent Treatment Facility on the Hanford Site.

Unit 1 was designed and built to manage (via evaporation) extracted groundwater and well development water (also known as purgewater) resulting from well construction groundwater-monitoring activities on the Hanford Site. This unit is a freestanding unit installed on the soil surface and is estimated to be 55 m (180 ft) above groundwater. The capacity of the unit is 3,785,400 L (1,000,000 gallons). The unit has steel sidewalls that support a double layer of flexible membrane liners. The flexible membrane liners are 80-mil, high-density polyethylene, separated by a geotextile layer. A leak detection system consisting of a standpipe with measurable depth and sampling capability is connected between the two liners. Unit 1 has been operational since 1990.

3 Process Information

Purgewater is collected from the development and sampling of various groundwater wells and is transferred to the PSTF by tanker truck. Purgewater is gravity-drained into Unit 1 for storage and solar evaporation. A plastic cover was placed over the Unit 1 liners and purgewater initially was delivered under the cover. Chains held down the cover after it was found to billow. The chains were removed after purgewater was found on top of the cover. Additional purgewater then was placed on top of the cover, open to the atmosphere.

[4] This closure plan is expected to be incorporated into the reissued Hanford Facility Dangerous Waste Permit.

[5] ModuTank is a trademark of ModuTank Inc., Long Island City, New York.

Windblown environmental media and sediments contained in the purgewater have settled out and are concentrated in the northeast corner of Unit 1. Sediments have accumulated to an observed depth of approximately 0.9 m (3 ft). The sediments are in a delta shape, extending about 22.9 m (75 ft). During the summer months, raw water is added to Unit 1 to prevent sediments from drying out and becoming airborne. Waterfowl and other birds frequent the site because of the standing water.

The maximum waste inventory for the treatment, storage, and/or disposal (TSD) unit can be found in the current Part A form as the process design capacity (09-EMD-0007, "Class 1 Modifications to the Hanford Facility Resource Conservation and Recovery Act Permit, Quarter Ending September 30, 2008").

4 Waste Characteristics

The purgewater potentially introduced dangerous waste, dangerous waste constituents, or residues[6] in the Unit 1 liquids and sediments. Various groundwater wells at the Hanford Site have been associated with the following dangerous waste codes:

- F001 because of a carbon tetrachloride groundwater plume
- D007 because of chromium
- D019 depending on the concentration of carbon tetrachloride in the water
- State-only F003 because of past discharges of methanol at 100 Area wells
- F001, F002, state-only F003, F004, and F005 because of an association with the single-shell tank system wells in the 200 East and 200 West Areas. The single-shell tank system wells contained 1,1,1-trichlorocthane, methylene chloride, acetone, methyl isobutyl ketone, total cresols, and methyl ethyl ketone

The constituents listed in Table 1 are or may have been present in purgewater managed by Unit 1.

Table 1. Dangerous Waste, Dangerous Waste Constituents, Residues, and Waste Codes

Constituent	Waste Code
Carbon tetrachloride	D019/F001
1,1,1-trichloroethane	F001
1,1-dichloroethane	Degradation product of 1,1,1-trichloroethane in a reducing environment
Methylene chloride	F002
Acetone	F003*
Methyl isobutyl ketone	F003*
Total cresols	F004
Methyl ethyl ketone	F005
Chromium	D007
Methanol	F003*

*State only.

[6] The phrase "dangerous waste, dangerous waste constituents, or residues" is found in WAC 173-303-610(2)(b), "Closure Performance Standard," and establishes the universe of parameters subject to numerical cleanup levels for clean closure.

5 Closure Strategy and Performance Standards

This chapter discusses the closure strategy and performance standards.

5.1 Closure Strategy

The closure of the PSTF will be achieved by removal of liquids and solids remaining in Unit 1 to the extent practical, followed by removal of Unit 1. Chapter 6 describes the removal and disposal of potentially contaminated waste residues, plastic liners, metal sidewalls, leachate-collection-system components, and loading facility components. Completion of closure by removal according to the approved closure plan will be certified. Waste management activities, including inspections, will be terminated following removal of the liquids and solids. Assuming that closure can be successfully completed according to the requirements of this plan, no postclosure activity will be required. Should unexpected events occur during closure, including failure to complete closure according to this closure plan, the closure plan will be modified according to the requirements of WAC 173-303-610(3)(b).

5.2 Performance Standards

The closure is subject to the general closure performance standards of WAC 173-303-610(2), "Closure Performance Standard," which states that closure must achieve the following:

- Minimizes the need for further maintenance
- Controls, minimizes, or eliminates postclosure escape of dangerous waste, dangerous constituents, leachate, contaminated run-off, or dangerous waste decomposition products to the ground surface water, groundwater, or the atmosphere
- Returns the land to the appearance and use of surrounding land areas to the degree possible, given the nature of the previous dangerous waste activity

The closure by removal of the PSTF will meet the requirements of the closure performance standards, both general and unit-specific.

The following closure performance standards apply to verification sampling of soils underlying Unit 1 in the PSTF. These standards are established in compliance with WAC 173-303-610(2)(b)(i) based on unrestricted use, and are protective based on direct exposure to soils, direct ingestion of soils, protection of groundwater, and protection of environmental receptors.

The soil clean-closure cleanup levels are the numeric levels identified in WAC 173-340-740, "Unrestricted Land Use Soil Cleanup Standards." The cleanup level for a particular constituent will be the most restrictive level shown in Table 2, provided that the level is not below background levels (DOE/RL-92-24, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*). WAC 173-340-740(3), "Method B Soil Cleanup Levels for Unrestricted Land Use."

WAC 173-340-740(3) contains the following potential clean-closure standards: environmental protection related to ecological receptors, soil concentrations protective of groundwater, soil direct-contact carcinogens, soil direct-contact noncarcinogens, soil direct-contact petroleum vapors, and soil vapors. Table 2 identifies the applicable environmental protection related to ecological receptors, soil concentrations protective of groundwater, soil direct-contact carcinogens, and soil direct-contact noncarcinogens. Methanol has been excluded from Table 2 based on Ecology, 2000, "Contained-In Determination for Groundwater from the 100-NR-2 Operable Unit."

6 Closure Activities

Closure of the PSTF will be conducted in five stages: removal of waste, removal of Unit 1, verification sampling, equipment decontamination, and site restoration.

Field conditions may be encountered that are different from that which is expected. Should field conditions necessitate a change in the requirements of this closure plan, the closure plan will be modified according to the requirements of WAC 173-303-610(3)(b).

Chapter 4 includes a discussion of the constituents associated with the listed waste codes contained on the PSTF Part A form (09-EMD-0007) and a degradation product, 1,1-dichloroethane. Purgewater, sediments, and demolition wastes generated from closure activities will be managed as listed waste (F001 to F005) for the purposes of designating and managing wastes and contaminated environmental media generated according to the requirements of this plan. Listed waste management of these matrices is a conservative measure and does not necessarily indicate the Permittees agree that listed waste was managed in the PSTF.

Sediments and debris generated during closure of PSTF Unit 1 are expected to be disposed of at the Environmental Restoration Disposal Facility (ERDF). If treatment of any closure wastes is required prior to disposal at the ERDF, treatment will occur either at an offsite TSD Facility or at the ERDF. Such wastes will then be disposed of at the ERDF.

Table 2. Comparison of Soil Data to Residential Clean-Closure Levels

TSD Unit Dangerous Waste, Dangerous Waste Constituents, and Residues[a]	Hanford Site Soil Background (mg/kg)[b]	Soil Concentration Protective of Groundwater[c] (mg/kg)	Human-Health Protection Soil Direct Contact[d] (mg/kg)		Screening Levels for Ecological Protection[e] (mg/kg)
	90% Log Normal Percentile		Carcinogen	Noncarcinogen	
Carbon tetrachloride	–	3.10E-03	7.69E+00	5.60E+01	–
1,1,1-trichloroethane	–	1.58E+00	–	1.65E+05	–
1,1,-dichloroethane	–	2.32E-03	1.10E+01	1.60E+03	–
Methylene chloride	–	2.18E-02	1.33E+02	4.80E+03	–
Acetone	–	2.89E+01	–	7.20E+04	–
Methyl isobutyl ketone	–	2.71E+00	–	6.40E+03	–
Total cresols[f]	–	0.507	–	400	–
Methyl ethyl ketone	–	1.96E+01	–	4.80E+04	–
Chromium (total)	18.5	2.00E+03	–	1.20E+05	42

a. Clean-closure evaluations for TSD units are required to use unrestricted (residential) levels in WAC 173-340-740(3), "Method B Soil Cleanup Levels for Unrestricted Land Use," based on WAC 173-303-610(2)(b)(i), "Closure Performance Standard."

b. DOE/RL-92-24, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes.*

c. WAC 173-340-740(3)(b)(iii)(A), "Ground Water Protection." Point of compliance is soils throughout the site (WAC 173-340-740[6], "Point of Compliance").

d. WAC 173-340-740(3)(b)(iii)(B)(I) and (II). Equations are found in (I) "Noncarcinogens" and (II) "Carcinogens" for human-health direct contact. Point of compliance is surface to 4.6 m (15 ft) (WAC 173-340-740[6]).

e. WAC 173-340-740(3)(b)(ii), "Environmental Protection"; WAC 173-340-900, "Tables," Table 749-3. Point of compliance is surface to 4.6 m (15 ft) (WAC 173-340-7490[4][b], "Standard Point of Compliance"). Table 749-3 values are screening levels and were not intended to be cleanup levels (WAC 173-340-7493[2][a][i]), "The Chemicals of Ecological Concern." If soil sample analytical results exceed these screening-level results, the U.S. Department of Energy may develop another number to be used as the cleanup level in accordance with the provisions of WAC 173-340, "Model Toxics Control Act – Cleanup."

f. Total cresols include the m-cresol and p-cresol isomers.

6.1 Removal of Unit 1

Water content in Unit 1 will be reduced using natural evaporation, mechanical methods (e.g., pumping, filtration), and/or absorbent material additions until the sediments are dry enough to remove. The moisture content of sediments will be maintained, or other air dispersal controls applied, to prevent air or wind dispersal of soil and potential dangerous waste or dangerous constituents contained in the soil. Any liquids removed will be contained and treated at the 200 Area Effluent Treatment Facility or solidified and disposed at the ERDF in accordance with corresponding waste acceptance criteria.

Following removal of the liquids, the sediments and structures for Unit 1 will be characterized. Characterization of the sediments will be accomplished under a Sampling and Analysis Plan (SAP) prior to removal of the sediments from Unit 1. A SAP will be developed and submitted to Ecology separately from this closure plan for review and approval prior to the sampling taking place. After receiving the characterization results from the laboratory, a decision will be made on the most appropriate means to remove the sediments. The sediments will be removed using standard industrial equipment used for demolition and/or excavation. Closure waste removed from the unit will be designated as F001-F005 waste (Chapters 4 and 6), evaluated for dangerous waste characteristics in WAC 173-303-090, packaged to meet the ERDF acceptance criteria, and loaded into transport containers for shipment to the ERDF. If treatment of any closure wastes is required prior to disposal at the ERDF, treatment will occur at either an offsite TSD facility or the ERDF, and the treated waste disposed at the ERDF.

Any sediment material introduced to the underlying soil because of spills from the top and bottom liners, or residual soil that exhibits evidence of contamination by visual means will be removed and disposed at the ERDF under an approved waste profile.

Materials generated during the removal action will be designated according to WAC 173-303-070 through 100 and stored in containers near the PSTF. The duration of storage is limited to the duration of closure activities.

6.2 Verification Sampling

The remaining soil surface under Unit 1 will be sampled after the unit and all associated structures have been removed, and after residual soil that exhibits evidence of contamination has been removed in accordance with Section 6.1. The sampling will be accomplished using a systematic areal sampling design (grid) with a random starting point. Appendix A provides details on the sampling method.

6.3 Equipment Decontamination Procedures

Decontamination at the completion of Unit 1 removal and soil excavation generally will be performed using dry methods (such as wiping) to the extent possible. Decontamination activities will be performed within the area where removal has taken place.

Any solid waste debris generated by decontamination of equipment (e.g., rags and personal protective equipment) will be collected and disposed at the ERDF, in accordance with the ERDF "Waste Acceptance Criteria." Any dangerous waste generated will be managed as dangerous waste in accordance with WAC 173-303, "Dangerous Waste Regulations."

6.4 Site Restoration

After all removals have been completed as described in Section 6.1, and verification sampling results show the site to be clean-closed, the site will be graded to an even surface and sloped slightly to prevent

ponding of precipitation. Water and crusting agents or mulch will be used, as necessary, to prevent soil erosion and to limit dust emissions until the area has been graveled.

6.5 Training

Training is provided during operations and closure of the PSTF in accordance with the following.

Waste management duties include those specified in this section, as well as those contained in WAC 173-303-330(1)(d). Training elements of WAC 173-303-330(1)(d) applicable to the PSTF include the following:

- Procedures for using emergency and monitoring equipment
- Communications or alarm systems
- Response to fires or explosions
- Response to groundwater contamination incidents

Personnel assigned to the PSTF (Table 3) who perform these duties receive training pertaining to their duties. The training plan documentation described in Hanford Facility RCRA Permit Attachment 33 contains specific information regarding the types of training personnel receive based on the following matrix.

Table 3. Personnel Training

	Training Category*				
Hanford Facility RCRA Permit, Attachment 33 Training Category	General Hanford Facility Training	Contingency Plan Training	Emergency Coordinator Training	Operations Training	
600 Area PSTF DWTP Implementing plan	Orientation Program	Emergency Response (Contingency Plan)	Emergency Coordinator Training	General Waste Management	Unit Specific
Job Title/Position					
Teamster	X				X
Nuclear Chemical Operator	X	X		X	X
Supervisor/Field Work Supervisor	X	X			
Building warden	X		X		
Environmental Compliance Officer	X			X	
Non-Resident Waste Service Provider	X			X	

* Refer to the Dangerous Waste Training Plan (DWTP) prepared for the PSTF for a complete description.

6.6 Facility Inspections

Unit 1 inspections will be conducted according to the following criteria:

Inspection Schedule		
Requirement Description	**Inspection Frequency**	**Types of Problems**
Perform inspection of 600 Area PSTF Unit #1	Daily	Water level, visible leaks, leak detection system operable

Inspections will be discontinued following removal of the waste from Unit 1.

6.7 Closure Certification

In accordance with WAC 173-303-610(6), "Certification of Closure," within 60 days of completing the actions in Section 6.4 (60-day clock), the U.S. Department of Energy, Richland Operations Office (RL) will submit to Ecology a certification of closure signed by both RL and an independent registered professional engineer. The certification will specify that the PSTF has been closed in accordance with the specifications contained within the approved closure plan. If the closure plan has not been approved by Ecology at the time actions in Section 6.4 are completed, the 60-day clock will begin upon Ecology approval of the plan.

6.8 Closure Schedule

When the last shipment of dangerous waste is received in Unit 1, removal of the waste in Unit 1 will begin (e.g., evaporation), as described in Section 6.1. The time required for performing closure activities is expected to exceed the 180-day time frame prescribed by WAC 173-303-610(4), "Closure; Time Allowed for Closure."

Closure activities will be completed according to the schedule specified in Table 4. If the closure period must be modified, the closure plan will be modified according to the requirements of WAC 173-303-610(3)(b). Additional time is being requested in this closure plan in accordance with WAC 173-303-610(4)(c) to complete closure because of the need to evaporate water and to characterize the sediments in Unit 1.

Table 4. Closure Schedule

Closure Activity Description	Expected Duration[a]
Notify Ecology that closure will begin	60 days[b]
Unit 1 receives last shipment of waste	N/A
Removal of Unit 1 inventory (water and sediment) including characterization of sediments	210 days
Removal of Unit 1 structures and underlying soil	30 days
Verification sampling	50 days
Equipment decontamination	30 days
Site restoration	30 days
Transmit independent registered professional engineer certification to Ecology	60 days[c]

a. Time durations are consecutive and are added together.

b. 60 days prior to receiving last shipment of purgewater.

c. See Section 6.7 for when this clock starts.

7 Postclosure Plan

No postclosure activity will be required following successful completion of the requirements of this plan. In the event postclosure is required, the closure plan will be modified through obtaining appropriate regulatory approvals.

8 References

40 CFR 268, "Land Disposal Restrictions," *Code of Federal Regulations*. Available at: http://www.access.gpo.gov/nara/cfr/waisidx_08/40cfr268_08.html.

09-EMD-0007, 2008, "Class 1 Modifications to the Hanford Facility Resource Conservation and Recovery Act Permit, Quarter Ending September 30, 2008" (letter to G. P. Davis, Washington State Department of Ecology, from D. A. Brockman), U.S. Department of Energy, Richland Operations Office, Richland, Washington, October 9. Available at: http://www2.hanford.gov/arpir/?content=findpage&AKey=0810160828.

DOE/RL-92-24, 2001, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, Rev. 4, 2 vols., U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://www5.hanford.gov/arpir/?content=findpage&AKey=0096062.

Ecology, 2000, "Contained-In Determination for Groundwater from the 100-NR-2 Operable Unit" (letter to Glenn Goldberg, U.S. Department of Energy, Richland, Washington, from John Price), Washington State Department of Ecology, Kennewick, Washington, December 5. Available at: http://www2.hanford.gov/arpir/?content=findpage&AKey=D8532691.

Resource Conservation and Recovery Act of 1976, 42 USC 6901, et seq. Available at: http://www.epa.gov/epawaste/inforesources/online/index.htm

WAC 173-303, "Dangerous Waste Regulations," *Washington Administrative Code*, Olympia, Washington. Available at: http://apps.leg.wa.gov/WAC/default.aspx?cite=173-303.

- WAC 173-303-200, "Accumulating Dangerous Waste On-Site."
- WAC 173-303-400, "Interim Status Facility Standards."
- WAC 173-303-610, "Closure and Post-Closure."
- WAC 173-303-610(2), "Closure Performance Standard."
- WAC 173-303-610(4),"Closure; Time Allowed for Closure."
- WAC 173-303-610(6), "Certification of Closure."
- WAC 173-303-650(6), "Closure and Post-Closure Care."
- WAC 173-303-680, "Miscellaneous Units."

WAC 173-340, "Model Toxics Control Act – Cleanup," *Washington Administrative Code*, Olympia, Washington. http://apps.leg.wa.gov/WAC/default.aspx?cite=173-340.

- WAC 173-340-740, "Unrestricted Land Use Soil Cleanup Standards."
- WAC 173-340-740(3),"Method B Soil Cleanup Levels for Unrestricted Land Use."
- WAC 173-340-740(3)(b)(ii), "Environmental Protection."

- WAC 173-340-740(3)(b)(iii)(A), "Ground Water Protection."
- WAC 173-340-740(3)(b)(iii)(B)(I), "Noncarcinogens."
- WAC 173-340-740(3)(b)(iii)(B)(II), "Carcinogens."
- WAC 173-340-740(6), "Point of Compliance."
- WAC 173-340-900, "Tables."
- WAC 173-340-7490(4)(b), "Standard Point of Compliance."
- WAC 173-340-7493(2)(a)(i), "The Chemicals of Ecological Concern."

Appendix A

Sampling and Analysis Plan for Closure of the Purgewater Storage and Treatment Facility

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Terms

CFR	*Code of Federal Regulations*
DOE	U.S. Department of Energy
DQA	data quality analysis
DQO	data quality objective
DWTP	Dangerous Waste Training Plan
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
HEIS	Hanford Environmental Information System
PSTF	600 Area Purgewater Storage and Treatment Facility
QA	quality assurance
QAPjP	quality assurance project plan
QC	quality control
RL	U.S. Department of Energy, Richland Operations Office
SAP	Sampling and Analysis Plan
WAC	*Washington Administrative Code*

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A1 Summary of Sampling and Analysis Activities

The sampling and analysis activities included in this plan will provide data of known and adequate quality to meet the data quality objectives (DQOs) defined for the 600 Area Purgewater Storage and Treatment Facility (PSTF) closure plan. This plan describes sampling of soil remaining after all removal activities to demonstrate satisfaction of closure performance standards established in Section 5.2 of the PSTF closure plan.

Areal soil sampling will be performed after all PSTF material, equipment, debris, and residual soil that exhibits evidence of contamination has been removed. Soil sampling under and within the footprint of Unit 1 will be performed to verify that clean closure has been achieved. The area to be sampled will be defined as all soil directly underneath the footprint of the unit, extended outward based on visual evidence of spills, windblown water, or incidental spreading of unit contents during removal.

A2 Data Quality Objectives

This chapter summarizes the DQOs defined for this project.

A2.1 Decision Statements and Decision Rules

Decision statements consolidate potential questions and alternative actions. Decision rules are generated from the decision statements. A decision rule is an "IF...Then..." statement that incorporates the parameters of interest, unit of decision making, action level, and action(s) that would result from resolution of the decision. Table A-1 presents the decision statements and decision rules defined for this sampling and analysis plan (SAP).

Table A-1. Summary of Decision Statements and Decision Rules

Decision Statement	Decision Rule
DS #1 – Sampling of remaining soil, after the removal of Unit 1, associated equipment, materials, and surface soils, generates data that verify that the soil meets numerical closure performance standards identified in the closure plan for those constituents identified in the closure plan.	DR #1 – If the results of the soil sampling show that no residual waste constituents or waste remain in excess of closure performance standards established in the closure plan, then the clean closure will be considered verified and no additional sampling will be required. Otherwise, additional soil will be removed and another round of verification sampling will be conducted.

DR = decision rule
DS = decision statement

A2.2 Target Constituents

The following are the target constituents for the soil closure verification sampling:

- Carbon tetrachloride
- 1,1,1-trichloroethane
- Methylene chloride
- Acetone
- Methyl isobutyl ketone
- Total cresols

- Methyl ethyl ketone
- Chromium

NOTE: Methanol has been excluded based on Ecology, 2000, "Contained-In Determination for Groundwater from the 100-NR-2 Operable Unit."

A2.3 Analytical Performance Requirements

Chapter A4 presents analytical performance requirements for the samples collected in the performance of this SAP.

A3 General Sample Design Concepts

The nature of the PSTF and the specific data uses support the use of a systematic sampling design for evaluation of the soil remaining after removal of the PSTF Unit 1 and associated structures. This design is discussed in Ecology Publication 94-49, *Guidance on Sampling and Data Analysis Methods*, and EPA/240/R-02/005, *Guidance on Choosing a Sampling Design for Environmental Data Collection for Use in Developing a Quality Assurance Project Plan*. Ecology Publication 94-49 is referenced in Ecology Publication 94-111, *Guidance for Clean Closure of Dangerous Waste Units and Facilities*, Section 7.2.

For the verification soil sampling, the systematic sampling technique with a random start will be used. Since there has never been sampling of soil underneath the PSTF unit, there is no historical data upon which to statistically define a site-specific acceptable number of samples. The Washington State Department of Ecology (Ecology) guidance suggests that 10 to 20 samples represent a rough guide for area-wide sampling using a grid approach. This Ecology guidance is based on an assumption that the distribution of potential contaminants in the study area is uniform or characterized by the same statistical properties. This reduces the chances of failing to demonstrate compliance with a cleanup level for an area that is clean. The Unit 1 footprint is nominally 65 m (200 ft) by 65 m (200 ft). A grid size of nominally 15 m (49 ft) per side would provide 16 samples for the Unit 1 footprint.

Sample results will be evaluated in accordance with the three-part test identified in *Guidance on Sampling and Data Analysis Methods, Ecology publication #94-49, January 1995,* Initially, the data set itself will be evaluated to determine the observed contaminant data distribution (normal, lognormal or neither). Specific three-part-test-calculations will then be performed based upon the observed distribution of the verification soil concentration data and guidance from *Statistical Guidance for Ecology Site Managers, Ecology publication #92-54*, August 1992. If results of soil verification sampling confirm evidence of contamination above closure performance standards, (failure to meet the three-part test criteria), the actual distribution of such contamination will be evaluated with respect to the assumption of uniformly distributed contamination, and follow-up sampling or soil removal will be implemented.

Figure A-1 shows a logic diagram of the sampling and results interpretation activities.

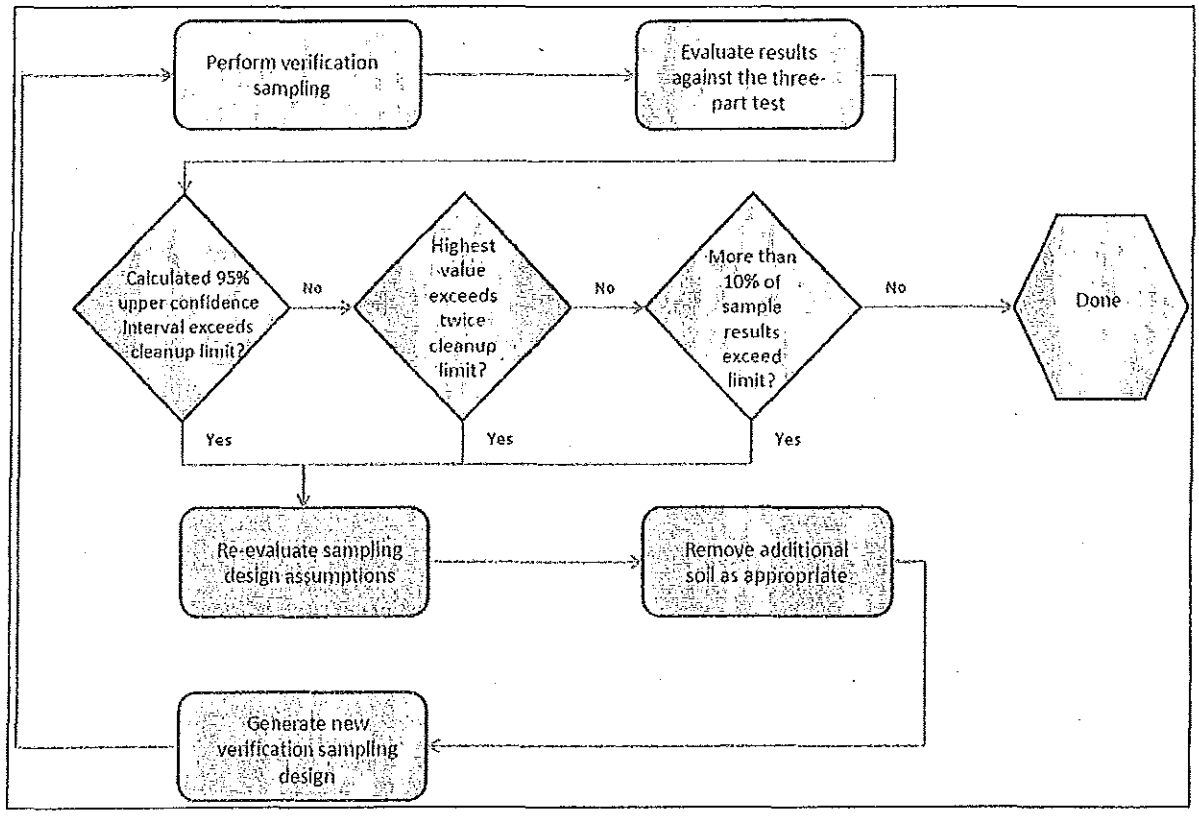

Figure A-1. Flow Chart of Verification Sampling and Results Evaluation

A4 Quality Assurance Project Plan

The quality assurance project plan (QAPjP) establishes the quality requirements for environmental data collection, including sampling, field measurements, and laboratory analysis. This QAPjP is consistent with the requirements of the following:

- DOE O 414.1C, Quality Assurance
- 10 CFR 830, Subpart A, "Quality Assurance Requirements"
- EPA/240/B-01/003, EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5

The following sections describe the quality requirements and controls applicable to this closure.

A4.1 Project Description

This SAP addresses the sampling and analysis activities associated with the closure of the PSTF Unit 1. Unit 1 of the PSTF will be closed in accordance with requirements of this closure plan developed to ensure compliance with the requirements of the PSTF closure plan established according to WAC 173-303-610, "Closure and Post-Closure," as a miscellaneous unit based on the closure standards applicable to surface impoundments in WAC 173-303-650(2), "Design and Operating Requirements," for units closing by removal or decontamination. Dangerous waste, dangerous waste constituents, residues, protective liners, leachate system components, and structural walls of the PSTF will be removed and disposed, in accordance with the dangerous waste regulations. The remaining soil surface will be verified

as meeting closure standards documented in Section 6.2 of the closure plan through soil sampling and analysis according to this SAP.

Details of the closure background, approach, site plan, and cleanup criteria are contained in the body of the closure plan.

A4.1.1 Problem Definition and Background

In support of PSTF clean closure, the objectives of this SAP are to verify that remaining soil under and within the footprint of Unit 1 does not exceed any closure performance standards (clean-closure criteria) documented in Section 6.2 of the closure plan. This will involve systematic sampling of the remaining soil under and within the footprint of Unit 1.

A4.2 Project Management

The following subsections address the basic areas of project management and will ensure that the PSTF Closure Project has a defined goal, the participants understand the goal and the approach to be used, and the planned outputs have been appropriately documented.

A4.2.1 Project/Task Organization

The primary contractor, or its approved subcontractor, will be responsible for collecting, packaging, and shipping soil and other media samples to the laboratory. The project organization, concerning sampling and characterization, is described in the subsections that follow and is shown graphically in Figure A-2. With the exception of the U.S. Department of Energy (DOE) project manager, all other roles and responsibilities are completed by the primary contractor or its approved subcontractor. NOTE: For each functional primary contractor role, there is a corresponding oversight role within DOE.

A4.2.1.1 DOE Project Manager

The DOE project manager directs closure efforts and coordinates all other efforts for this action.

A4.2.1.2 PSTF Closure Director

The PSTF closure director provides oversight for all activities and coordinates with the DOE, Richland Operations Office (RL), regulators, and primary contractor management in support of sampling activities. In addition, support is provided to the DOE project manager to ensure that the work is performed safely and cost-effectively.

A4.2.1.3 PSTF Closure Project Manager

The PSTF Closure Project manager is responsible for direct management of sampling documents and requirements, field activities, and subcontracted tasks. The PSTF Closure Project manager ensures that the field construction manager, sampling coordinator, samplers, and others responsible for implementation of this SAP and QAPjP are provided with current copies of this document and any revisions thereto. The PSTF Closure Project manager works closely with the Quality Assurance (QA) and Health and Safety organizations and the field construction manager to integrate these and the other lead disciplines in planning and implementing the work scope. The PSTF Closure Project manager also coordinates with and reports to RL, the regulators, and primary contractor management on all sampling activities.

A4.2.1.4 Quality Assurance

The QA lead is matrixed to the PSTF Closure Project manager and is responsible for QA issues on the project. Responsibilities include oversight of implementation of the project QA requirements; review of project documents, including DQO summary reports, SAPs, and the QAPjP; and participation in QA assessments on sample collection and analysis activities, as appropriate.

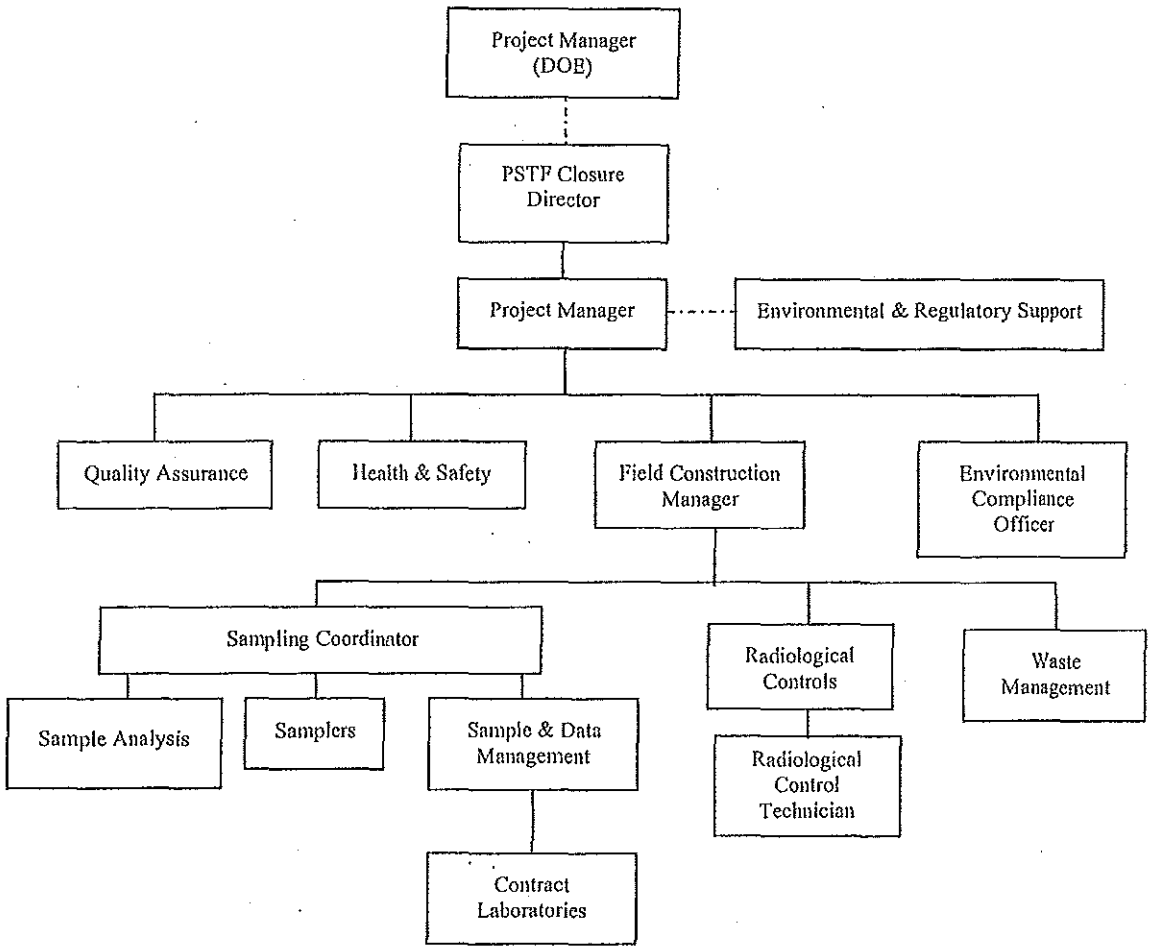

Figure A-2. Project Organization

A4.2.1.5 Health and Safety

The Health and Safety organization responsibilities include coordination of industrial health and safety support within the project, as carried out through health and safety plans, job hazard analyses, and other pertinent safety documents required by federal regulation or by internal primary contractor work requirements. In addition, assistance is provided to project personnel to comply with applicable health and safety standards and requirements. Personnel protective clothing requirements are coordinated with the Radiological Controls lead.

A4.2.1.6 Field Construction Manager

The field construction manager has the overall responsibility for supporting the sampling coordinator in the planning, coordination, and execution of field characterization activities. Responsibilities also include directing training, mock-ups, and practice sessions with field personnel to ensure that the sampling design is understood and can be performed as specified. The field construction manager communicates with the PSTF Closure Project manager to identify field constraints that could affect the sampling design. In addition, the field construction manager directs the procurement and installation of materials and equipment needed to support the field work.

A4.2.1.7 Environmental and Regulatory Support

The environmental and regulatory support lead is responsible for the performance of the U.S. Environmental Protection Agency's (EPA's) seven-step DQO process for this project. Responsibilities include development and documentation of the sampling DQOs and SAP, which includes the sampling design presented in this SAP and the resolution of technical issues. The environmental and regulatory support lead also supports the data quality assessment (DQA) process, as described in Section A4.10.

A4.2.1.8 Environmental Compliance Officer

The environmental compliance officer provides technical oversight, direction, and acceptance of project and subcontracted environmental work and develops appropriate mitigation measures with a goal of minimizing adverse environmental impacts. The environmental compliance officer also reviews plans, procedures, and technical documents to ensure that all environmental requirements have been addressed; identifies environmental issues that affect operations and develops cost-effective solutions; and responds to environmental/regulatory issues or concerns raised by DOE or regulatory agency staff.

A4.2.1.9 Sampling Coordinator

The sampling coordinator's specific responsibilities include conversion of the sampling design requirements into field task instructions that provide specific direction for field activities. The sampling coordinator also provides oversight of the Sample and Data Management organization and the field samplers, develops and oversees the implementation of the letter of instruction to the sample analysis contractor, and oversees data validation.

The Sample and Data Management organization selects the laboratories that perform the analyses. This organization also ensures that the laboratories conform to Hanford Site internal laboratory QA requirements, or their equivalent, and the QA requirements in the closure plan and SAP. The Sample and Data Management organization receives the analytical data from the laboratories, performs the data entry into the Hanford Environmental Information System (HEIS), and arranges for data validation.

The samplers collect all samples, including quality control (QC) samples, and prepare all sample blanks according to the SAP and corresponding field procedures and work packages. The samplers complete the field logbook and chain-of-custody forms, as well as any shipping paperwork. The samplers also deliver the samples to the analytical laboratory.

The Sample Analysis organization analyzes samples in accordance with established procedures and provides necessary sample reports and explanation of results in support of data validation.

A4.2.1.10 Contract Laboratories

The contract laboratories analyze samples in accordance with established procedures and provide necessary sample reports and explanation of results in support of data validation. The laboratories must meet site-specific QA requirements (including those required under Section A4.2.1.9). The Sample and Data Management organization facilitates the project's interface with contract laboratories.

A4.2.1.11 Radiological Controls

The Radiological Controls lead is responsible for the radiological/health physics support within the project. Specific responsibilities include conducting as-low-as-reasonably-achievable reviews, exposure and release modeling, and radiological controls optimization for all work planning. In addition, radiological hazards are identified and appropriate controls are implemented to maintain worker exposures to hazards at as-low-as-reasonably-achievable levels (e.g., personal protective equipment).

Radiological Controls interfaces with the project Health and Safety representative and plans and directs Radiological Control technician support for all activities.

A4.2.1.12 Waste Management

The Waste Management lead communicates policies and procedures and ensures project compliance for storage, transportation, disposal, and waste tracking in a safe and cost-effective manner. Other responsibilities include identifying waste management sampling/characterization requirements to ensure regulatory compliance and interpreting the characterization data to generate waste designations, profiles, and other documents that confirm compliance with waste acceptance criteria.

A4.2.2 Documents and Records

The project manager is responsible for ensuring that the current version of the SAP is being used and for providing any updates to field personnel. Version control is maintained by the administrative document control process. Changes to the sampling plan will be made through modification in accordance with WAC 173-303-610(3)(b).

The field work supervisor or buyer's technical representative is responsible for ensuring that the field instructions are up-to-date and conducted in compliance with any revisions to the SAP. The field work supervisor or buyer's technical representative will ensure that problems encountered in the field are identified, managed, and documented appropriately (e.g., in the field logbook).

The project manager, construction management lead, field work supervisor, or designee will be responsible for communicating field corrective action requirements and for ensuring that immediate corrective actions are applied to field activities.

Logbooks are required for field activities. The logbook must be identified with a unique project name and number. Individuals responsible for recording information in the logbooks will be identified in the front of the logbook. Only authorized persons may make entries. Logbooks will be signed by the field manager, supervisor, cognizant scientist/engineer, or other responsible individual. Logbooks will meet the following requirements:

- Permanently bound
- Waterproof
- Ruled with sequentially numbered pages (pages will not be removed from logbooks for any reason)

Entries to the logbook will be made in indelible ink. Corrections will made by marking the errors through with a single line, entering the correct data, and initialing and dating the changes. Table A-2 presents an example of change control for sampling projects.

Table A-2. Example Table for Change Control for Sampling Projects

Type of Change	Action	Documentation
Adding constituents, number of samples outside of WAC 173-303 authority (e.g., radionuclides)	Project management approval; notify regulatory agency if appropriate	Project's sample tracking system
Adding or eliminating target constituents, reducing the number of sampling points subject to WAC 173-303 authority	Revise SAP; obtain regulatory approval; distribute plan	Revised plan

WAC 173-303, "Dangerous Waste Regulations"

The project manager is responsible for ensuring that a project file is properly maintained. The project file will include the following, as appropriate:

- Field logbooks or operational records
- Global Positioning System data
- Chain-of-custody forms
- Sample receipt records
- Inspection or assessment reports and corrective action reports
- Interim progress reports
- Final reports

The project file will contain the records or references to their storage locations.

The laboratory is responsible for maintaining and having the following available upon request:

- Analytical logbooks
- Raw data and QC sample records
- Standard reference material and/or proficiency test sample data
- Instrument calibration information

Records may be stored in either electronic or hard copy format. Documentation and records, regardless of medium or format, are placed in the operating record in accordance with WAC 173-303-380, "Facility Recordkeeping," and controlled in accordance with internal work requirements and processes that ensure accuracy and retrievability of stored records.

Quality control procedures as documented in this SAP, must be followed in the field and laboratory to ensure the data satisfy the data quality requirements. Field QC samples will be collected to evaluate the potential for cross-contamination and to provide information pertinent to field variability. Field QC for sampling will require the collection of field replicates (duplicates), trip or field blanks, and equipment blanks. The precision and bias of the analytical data are determined by the laboratory QC samples.

A4.2.3 Sampling Methods

The soil surface remaining after the removal of PSTF Unit 1, equipment, and surface soil will be sampled using a systematic grid design and field sampling procedures documented in Chapter A5. Chapter A5 provides details of the field activities associated with this sampling.

In the event that there is a failure to accomplish the sampling activities in accordance with this SAP, failures observed by the field lead will be documented in the field logbook and may result in changes to the SAP through modification in accordance with WAC 173-303-610(3)(b) as identified in Table A-2.

The field lead has responsibility for addressing immediate field issues. Quality issues identified after field activities have been completed are addressed in Section A4.5.1.

A4.2.4 QA Objectives

Data quality is assessed by representativeness, comparability, accuracy, precision, completeness, and detection limits. The applicable QC guidelines, quantitative target limits, and levels of effort for assessing data quality are dictated by the intended use of the data and the nature of the analytical method. Each of these is addressed in the following sections.

A4.2.4.1 Representativeness

Representativeness is a measure of how closely the results reflect the actual concentration and distribution of the constituents in the matrix sampled. Sampling plan design, sampling techniques, and sample handling protocols (e.g., storage, preservation, and transportation) have been developed and are discussed in subsequent sections of this document. The use of standard field sampling procedures will establish that protocols have been followed and will ensure sample identification and integrity. Field documentation will provide evidence that this was accomplished.

A4.2.4.2 Comparability

Comparability expresses the confidence with which one data set can be compared to another. Data comparability will be maintained using standard procedures, consistent methods, and consistent units. Table A-3 lists applicable fixed-laboratory methods for analytes and detection limit requirements. Actual detection limits will depend on the sample matrix and the sample quantity available.

A4.2.4.3 Accuracy

Accuracy is an assessment of the closeness of the measured value to the true value. This typically is achieved through analytical instrument calibrations. An estimate of accuracy can be calculated using the results of laboratory control sample recoveries and matrix spike or surrogate recoveries. Validity of calibrations is evaluated by comparing results from the measurement of a standard to known values and/or by generation of in-house statistical limits based on two standard deviations (+/- 2 STDEV). Table A-3 lists the accuracy performance requirements provided for fixed-laboratory analyses for the project.

Table A-3. Analytical Performance Requirements

Data Type	Analyte	Analytical Method*	Detection Limit Requirements (mg/kg)	Accuracy Requirement (% Recovery)	Precision Requirement (% RPD)
Performance Requirements for Laboratory Measurements					
Chem	Chromium (total)	EPA 6010/200.8	1	70 to 130	30
Chem	Carbon tetrachloride	EPA 8260	0.003	70 to 130	30
Chem	1,1,1-Trichloroethane	EPA 8260	0.005	70 to 130	30
Chem	1,1-Dichloroethane	EPA 8260	0.005	70 to 130	30
Chem	Acetone	EPA 8260a	0.005	70 to 130	30

Table A-3. Analytical Performance Requirements

Data Type	Analyte	Analytical Method*	Detection Limit Requirements (mg/kg)	Accuracy Requirement (% Recovery)	Precision Requirement (% RPD)
Chem	Methylene chloride	EPA 8260	0.003	70 to 130	30
Chem	Methyl isobutyl ketone	EPA 8260	0.005	70 to 130	30
Chem	Total cresols	EPA 8270	0.5	70 to 130	30
Chem	Methyl ethyl ketone	EPA 8260a	0.005	70 to 130	30

NOTE 1: Accuracy criteria for associated batch laboratory control sample percent recoveries. Additional analysis-specific evaluations also are performed for matrix spikes, tracers, and carriers as appropriate to the method. Precision criteria for batch laboratory replicate sample analyses. Precision criteria for batch laboratory sample replicate and matrix spike replicate determinations are only applicable when results are greater than 5 to 10 times the method detection limit.

NOTE 2: Accuracy criteria for associated batch matrix spike percent recoveries. Evaluation based on statistical control of laboratory control samples also is performed. Precision criteria for batch laboratory replicate matrix spike analyses or replicate sample analyses. Compounds spiked in the laboratory control sample or matrix spike are those specified in SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*, as amended. Criteria based on laboratory statistical control limits are acceptable. Precision criteria for batch laboratory sample replicate and matrix spike replicate determinations are only applicable when results are greater than 5 to 10 times the method detection limit.

* For four-digit EPA methods, see SW-846. For EPA Method 200.8, see EPA/600/R-94/111, *Methods for the Determination of Metals in Environmental Samples, Supplement 1*.

RPD = relative percent difference

A4.2.4.4 Precision

Precision is a measure of the data spread when more than one measurement has been taken on the same sample. Precision can be expressed as the relative percent difference for duplicate measurements. Analytical precision performance requirements for fixed-laboratory analyses are listed in Table A-3.

A4.2.4.5 Completeness

Completeness is a measure of the amount of valid data obtained from the analytical measurement process and the complete implementation of activities defined in this SAP. There is no specific quantitative completeness requirement. Rather, the DQA will evaluate the impact of qualified or rejected data, or any deviations from the SAP requirements relative to the ability to use the data to address project decisions.

A4.2.4.6 Detection Limits

Detection limits are functions of the analytical method used to provide the data and the quantity of the sample available for analysis. Detection limits also can depend on the sample matrix, the presence of constituents within the sample that interfere with the chemical analysis, and dilution/preparation factors.

A4.3 Field QC

Field QC samples will be collected to evaluate the potential for field cross contamination and to provide information pertinent to field variability. Field QC for sampling in the Central Plateau will require the collection of field duplicates, trip or field blanks, and equipment blanks. The QC samples and the required frequency for collection are described in this section and in Section A5.1.

A4.3.1 Field Duplicates

Field duplicate samples are used to evaluate sample consistency and the precision of field sampling methods. Field duplicates will be collected as additional discrete samples at one grid node. The field duplicate samples will be retrieved from the same depth interval as the primary sample and at the same grid node location.

A4.3.2 Field or Trip Blanks

Field or trip blanks are collected, containerized, and handled in the same manner as the samples. These blanks can be used to indicate sample contamination throughout the entire process (a field blank) or just the shipment process (a trip blank). Field and trip blanks will consist of silica sand or other appropriate media, placed in containers, and analyzed the same as the samples with which they correspond.

A4.3.3 Equipment Blanks

Equipment blanks are collected for any soil-sampling device that is reused. Equipment blanks will consist of deionized water poured over the decontaminated sampling equipment and placed in containers. Equipment blanks will be analyzed the same as the samples with which they correspond. Equipment blank sample requirements are documented in Section A5.1, Table A-6.

If disposable (i.e., single-use) equipment is used, equipment blanks will not be required.

A4.3.4 Prevention of Cross-Contamination

Special care should be taken to prevent field cross contamination of soil samples to avoid the following common ways in which cross contamination or background contamination may compromise the samples:

- Improperly storing or transporting sampling equipment and sample containers
- Contaminating the equipment or sample bottles by setting the equipment/sample bottle on or near potential contamination sources (e.g., uncovered ground)
- Handling bottles or equipment with dirty hands or gloves
- Improperly decontaminating equipment before sampling or between sampling events

A4.3.5 Sample Custody

A chain-of-custody record will be initiated at the time of sampling and will accompany each set of samples shipped to the laboratory. The analyses requested for each sample will be indicated on the accompanying Chain-of-Custody/Sample Analysis Request form. Chain-of-custody procedures will be followed throughout sample collection, transfer, and analysis to ensure that sample integrity is maintained. Each time responsibility for custody of the sample changes, the new and previous custodians will sign the record and note the date and time.

A4.4 Laboratory QC

Table A-3 presents quality objectives and criteria for soil measurement data for all analytes. The ability to meet the detection limit requirements is dependent on the amount of sample obtained and matrix interferences. Table A-5 specifies sample sizes that are adequate to enable the laboratory to achieve project-required detection limits, and the samples should be free from contamination that would reduce the risk of significant matrix interferences. The laboratory will be instructed to report matrix-related issues and QC failures.

A4.4.1 Measurement and Testing Equipment

Measurement and testing equipment used in the field or in the laboratory that directly affects the quality of analytical data will be subject to preventive maintenance measures to ensure minimization of measurement system downtime. Laboratories and onsite measurement organizations must maintain and calibrate their equipment. Calibration of laboratory instruments will be performed in a manner consistent with SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*, as amended, or with auditable DOE Hanford Site and contractual requirements.

Consumables, supplies, and reagents will be reviewed in accordance with SW-846 requirements and will be appropriate for their use. Note that contamination is monitored by the QC samples discussed in Section A4.3.

A4.4.2 Laboratory Sample Custody

Sample custody during laboratory analysis will be addressed in the applicable laboratory standard operating procedures. Laboratory custody procedures will ensure the maintenance of sample integrity and identification throughout the analytical process.

A4.4.3 Laboratory QC

The laboratory method blanks and laboratory control sample/blank spikes will be run at the frequency specified in Table A-4.

Table A-4. Field and Laboratory QC Elements and Acceptance Criteria

Analyte[a]	QC Element	Acceptance Criteria		Corrective Action
		Water	Soil	
Metals				
ICP Metals ICP/MS Metals	MB	< CRDL	< CRDL	Flagged with "C"
	LCS	80-120% recovery[b]	70-130% recovery[b]	Data reviewed[c]
	MS MSD	75-125% recovery[b] ≤ 20% RPD[b]	75-125% recovery[b] ≤30% RPD[b]	Flagged with "N" Data reviewed[c]
	EB, FTB	< 2X MDL	< 2X MDL	Flagged with "Q"
	Field Duplicate	≤ 20% RPD[d]	≤30% RPD[d]	Flagged with "Q"
Volatile Organic Compounds				
VOCs by GC/MS Total Petroleum Hydrocarbons by GC	MB	< MDL		Flagged with "B"
	LCS	Statistically derived[e]		Data reviewed
	MS	Statistically derived[e]		Flagged with "N"
	MSD	Statistically derived[e]		Data reviewed[c]
	SUR	Statistically derived[e]		Data reviewed[c]
	EB, FTB, FXR	< 2X MDL[f]		Flagged with "Q"
	Field Duplicate	≤20% RPD / ≤30% RPD[d]		Flagged with "Q"
Semivolatile Organic Compounds				
Herbicides by GC PCBs by GC Pesticides by GC Phenols by GC Semivolatiles by GC/MS	MB	< 2X MDL		Flagged with "B"
	LCS	Statistically derived[e]		Data reviewed[c]
	MS	Statistically derived[e]		Flagged with "N"
	MSD	Statistically derived[e]		Data reviewed[c]
	SUR	Statistically derived[e]		Data reviewed[c]
	EB, FTB	< 2X MDL[f]		Flagged with "Q"
	Field Duplicate	≤20% RPD /≤ 30% RPD[d]		Flagged with "Q"

a. Specific analytes and method for determination are available from the Sample Data and Reporting organization.

b. Laboratory-determined, statistically derived control limits may also be used. Such limits are reported with the data.

c. After review, corrective actions are determined on a case-by-case basis. Corrective actions may include a laboratory recheck or flagging the data as suspect (Y flag) or rejected (R flag).

d. Applies only in cases where one or both results are greater than 5X the detection limit.

e. Determined by the laboratory based on historical data. Control limits are reported with the data.

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

Table A-4. Field and Laboratory QC Elements and Acceptance Criteria

Analyte[a]	QC Element	Acceptance Criteria		Corrective Action
		Water	Soil	

Data Flags:

B, C	=	Possible laboratory contamination (analyte was detected in the associated method blank).
N	=	result may be biased (associated matrix spike result was outside the acceptance limits).
Q	=	problem with associated field QC sample (blank and/or duplicate results were out of limits).
DUP	=	Laboratory matrix duplicate.
EB	=	Equipment blank.
FTB	=	Full trip blank.
FXR	=	Field transfer blank.
GC	=	Gas chromatography.
ICP	=	Inductively coupled plasma.
ICP/MS	=	Inductively coupled plasma-mass spectrometry.
LCS	=	Laboratory control sample.
MB	=	Method blank.
MDL	=	Method detection limit.
MS	=	Matrix spike.
MSD	=	Matrix spike duplicate.
PCB	=	Polychlorinated biphenyls.
RPD	=	Relative percent difference.
SUR	=	Surrogate.
SVOC	=	semi-volatile organic compounds
TPH	=	total petroleum hydrocarbon
VOC	=	volatile organic compound

A4.4.4 Sample Preservation, Containers, and Holding Times

Table A-5 presents soil sample preservation, containers, and holding times for the analytes of interest and physical property tests. Final sample collection requirements will be identified on a Chain-of-Custody/ Sampling Analysis Request form.

Table A-5. Sample Preservation, Container, and Holding Time Guidelines

Analyte	Matrix	Bottle Number	Bottle Type	Bottle Min. Size	Preservation	Packing Requirements	Holding Time*
Chromium	Soil	1	G/P	50 mL	None	None	6 months
SVOCs	Soil	1	aG	250 mL	None	Cool 4°C	14/40 days
VOCs (Method 5035A)	Soil	1	aG	40 mL	None	Cool 4°C Methanol as required	14 days

* Where two numbers are indicated with a "/" in between, the first number is the time from sample collection to extraction, and the second number is after extraction through analysis.

aG = amber glass
G = glass
Min. = minimum
P = plastic
SVOC = semi-volatile organic compounds
VOC = volatile organic compound

A4.5 Assessment and Oversight

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

A4.5.1 Assessments and Response Actions

Contractor management, regulatory compliance, quality, and/or health and safety organizations may conduct random surveillances and assessments to verify compliance with the requirements outlined in this SAP, project work packages, the project quality management plan, procedures, and regulatory requirements.

If circumstances should arise in the field that require additional assessment activities, they will be performed and recorded. Deficiencies identified by these assessments will be reported in accordance with existing programmatic requirements. The project's line management chain coordinates the corrective actions/deficiencies in accordance with the contractor QA program, the corrective action management program, and associated procedures that implement these programs.

Oversight activities in the contract analytical laboratories, including corrective action management, are conducted in accordance with the laboratories' QA plans. The primary contractor conducts oversight of offsite analytical laboratories to qualify them for performing Hanford Site analytical work.

A4.5.2 Reports to Management

Reports to management on data quality issues will be made at the time these issues are identified. Issues reported by the laboratories are communicated to the Sample and Data Management organization, which initiates a sample disposition record in accordance with contractor procedures. This process is used to document analytical or sample issues and to establish resolution with the project manager.

The DQA report (Section A4.10) may be prepared to determine whether the type, quality, and quantity of the collected data met the quality objectives. Identified data quality issues will be addressed and tracked

to resolution. Any quality-affecting issues will be described in the DQA report and their impact on data usability will be described.

A4.6 Non-direct Measurements

Non-direct measurements include data obtained from sources such as computer databases, programs, literature files, and historical databases. Non-direct measurements will not be evaluated as part of this activity.

A4.7 Data Management

Analytical data resulting from the implementation of the QAPjP will be managed and stored in the Hanford Environmental Information System (HEIS) database in accordance with the applicable programmatic requirements governing data management procedures. At the direction and discretion of the PSTF Closure Project manager, all analytical data packages will be subject to final technical review by qualified personnel before submittal to the regulatory agencies or included in reports. Electronic data access, when appropriate, will be via a database (e.g., HEIS or a project-specific database). Where electronic data are not available, hard copies will be provided.

Planning for sample collection and analysis will be in accordance with the programmatic requirements governing fixed-laboratory sample collection activities, as discussed in the sample team's procedures. In the event that specific procedures do not exist for a particular work evolution, or it is determined that additional guidance to complete certain tasks is needed, a work package will be developed to adequately control the activities, as appropriate. Examples of the sample team's requirements include activities associated with the following:

- Chain-of-custody/sample analysis requests
- Project and sample identification for sampling services
- Control of certificates of analysis
- Logbooks, checklists
- Sample packaging and shipping

A4.7.1 Resolution of Analytical System Errors

Errors reported by the laboratories are reported to the sampling coordinator, who initiates a sample disposition record. This process is used to document analytical errors and to establish resolution with the PSTF Closure Project manager. In addition, the primary contractor QA organization receives quarterly reports that provide summaries and summary statistics of the analytical errors.

A4.8 Validation and Verification Requirement

Completed data packages will be validated by qualified primary contractor Sample and Data Management personnel or by a qualified independent contractor. Validation will consist of verifying required deliverables, requested versus reported analyses, chain-of-custody documentation, and transcription errors. Validation also will include evaluating and qualifying the results based on holding times, method blanks, laboratory control samples, laboratory duplicates, and chemical and tracer recoveries, as appropriate. No other validation or calculation checks will be performed.

Level C data validation is defined in the contractor's validation procedures, which are based on EPA functional guidelines (e.g., Bleyler, 1988a, *Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses*; Bleyler, 1988b, *Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses*), will be performed for up to 20 percent of the data by matrix and analyte

group (e.g., semivolatiles, metals, anions). The goal is to cover the various analyte groups and matrices during the validation.

When outliers or questionable results are identified in the DQA, additional data validation will be performed. The additional validation will be up to 5 percent of the statistical outliers and/or questionable data. The additional validation will begin with Level C and may increase to Levels D and E, as needed to ensure that the data are usable. Note that Level C validation is a review of the QC data, while Levels D and E include review of calibration data and calculations of representative samples from the dataset. All data validation will be documented in data validation reports. An example of questionable data is the positive detections greater than the practical quantitation limit or reporting limit in soil from a reference site that should not have exhibited contamination. Similarly, results below background would not be expected and could trigger a validation inquiry. With the exception of rejected data ("R" qualified), all data will be used.

At least one data validation package will be generated. Validation requirements identified in this section are consistent with Level C validation, as defined in the data validation procedures.

All identified data quality issues will be addressed and tracked to resolution. Any quality-affecting issues will be described in the DQA report and their impact on data usability will be described.

A4.9 DQA

The DQA process compares completed field sampling activities to those proposed in corresponding sampling documents and provides an evaluation of the resulting data. The purpose of the data evaluation is to determine if quantitative data are of the correct type and are of adequate quality and quantity to meet the project DQOs. The DQA will be performed in accordance with the EPA DQA process, EPA/240/B-06/002, *Data Quality Assessment: A Reviewer's Guide,* EPA QA/G-9R, and EPA/240/B-06/003, *Data Quality Assessment: Statistical Methods for Practitioners,* EPA QA/G-9S.

Analytical results from verification sampling will be compared to the three-part test identified in *Guidance on Sampling and Data Analysis Methods, Ecology publication 94-49, January 1995.* This test states:

> "The decision rule for demonstrative compliance with a cleanup level has three parts: (1) upper 95 percent confidence limit on the true population mean (average) must be less than the cleanup level, (2) no sample concentration can be more than twice the cleanup level, and (3) less than 10 percent of the samples can exceed the cleanup level."

If results do not meet the three-part test, the sampling plan will be reevaluated.

A5 Field Sampling Plan

A5.1 Sampling Objectives

The primary objective of the field sampling plan is to clearly identify and describe the sampling and analysis activities that will be conducted to support the PSTF Closure Project decisions. The field sampling plan uses the sampling approaches developed in the EPA DQO process and subsequent workshops with RL, EPA, and Ecology as the basis for the site-specific sampling plan presented in the following sections. The overall sampling strategy is outlined in Table A-6.

A5.1.1 Media Random Systematic Sampling and Analysis

The remaining soil surface under and within the footprint of Unit 1 will be sampled after all storage unit and associated structures have been removed, and after residual soil that exhibits evidence of contamination has been removed or sampled in accordance with the previous section. The sampling will generate residual contamination data that will be used to evaluate the achievement of clean closure. Sampling will be accomplished using a systematic areal sampling design (grid) with a random starting point.

Table A-6. PSTF Closure Sampling Plan

Area or Waste Stream Description	Data Needs	Sampling Approach	Location and Number of Samples	Constituents
Remaining soil from under and within the footprint of Unit 1	Chemical data for verification that closure performance standards have been met	• For the soil area under and within the footprint of Unit 1, collect 16 random systematic samples within the footprint of the removed unit plus a replicate sample and one trip blank for volatile analyses only. Also prepare one equipment and field blank, as appropriate. • Photographs of the sampling activities should be used for documentation purposes.	Collect 16 discrete samples from a 4 ft by 4 ft grid plus one duplicate sample for analyses. All samples will be collected from 0 to 10 cm (0 to 4 in.) in depth, except for the volatile sample, which will be collected at 10 to 20 cm (4 to 8 in.). Prepare one field blank for volatile analysis. Prepare one equipment blank if sampling equipment is decontaminated in the field.	All chemical constituents listed in Section A2.2. Sample containers will be selected and samples will be preserved in accordance with Section A4.4.4. NOTE: Additional parameters might be added, at the discretion of the permittee, to address any future decision-making needs.

To determine specific sampling points, the perimeter of the entire residual footprint, including potentially impacted adjacent areas identified by visual observations, from the removal of Unit 1 will be staked as a right rectangle. The footprint to be sampled will include the entire area underneath the removed unit, plus any adjacent area where surface soil has been removed during the unit removal process. Two random numbers will be used as the X and Y coordinates for the initial grid node. Lines parallel to the X and Y axes will be staked, with the distance between lines being nominally 15 m (49 ft). This will result in a 4 by 4 matrix of grid nodes within the footprint of Unit 1.

The nominal 15 m (49 ft) grid spacing will be modified in the field to force the grid to expand to fill the identified footprint area. If the actual footprint area is expanded such that the grid spacing will exceed 20 m (66 ft), then additional grid nodes will be added to reduce the grid spacing to less than 20 m (66 ft).

Once the sampling grid has been established, nonvolatile soil samples will be collected from 0 to 20 cm (0 to 8 in.) deep from the soil surface, at each grid node. Sufficient soil volume will be collected to provide for the chemical analysis as shown in Table A-3. Volatile grab samples will be taken from 10 to 20 cm (4 to 8 in.). The restriction on taking the volatiles sample at the deeper half of the 0 to 20 cm (0 to 8 in.) near-surface interval is to avoid sampling for volatiles within the top soil surface where some percentage of the volatile constituents may have been lost to the atmosphere.

Particles greater than 2 mm (0.4 in.) in diameter (e.g., organic debris, trash, and sticks) will be removed before placing soil samples into the containers for shipment to the laboratory. This sampling grid is based on the conceptual model that evidence of any release from the unit would be detectable within the 0 to 20 cm (0 to 8 in.) depth.

One node within the Unit 1 footprint will be designated for collection of a field duplicate.

A5.2 Sampling Locations and Frequency

Table A-6 lists the sampling techniques and the samples required for the PSTF Closure Project. Table A-6 also summarizes the number of samples required for each location or media. While it is expected that the sample locations will be sampled once, all the sites or media are accessible and additional sampling may be conducted if the initial results prove to be insufficient to support site closure decisions.

A5.3 Sampling Processes

The sampling processes to be implemented in the field will be implemented consistent with the requirements outlined in this SAP. The project will use the CH2M HILL Plateau Remediation Company Soil Sampling organization to perform the sample collection associated with the PSTF Closure Project. The approved sampling organization will perform the sample collection activities in accordance with established instructions for sample collection, collection equipment, and sample handling.

A5.4 Sample Management

Sample and data management activities will be performed in accordance with the prime contractor QA program. Sample preservation, container, and holding-time requirements will be indicated on Chain-of-Custody/Sample Analysis Request forms in accordance with SW-846, and the specific analytical method prepared for specific sample events.

Soil sampling and field measurements will be conducted according to the following approved work processes.

Sample Identification. The Sample Data Tracking System database will be used to track the samples through the collection and laboratory analysis process. The HEIS database is the repository for the laboratory analytical results. Hanford Environmental Information System sample numbers will be issued to the sampling organization. Each sample will be identified and labeled with a unique HEIS sample number. The sample location, depth, and corresponding HEIS numbers will be documented in the sampler's field logbook.

Each sample container will be labeled with the following information, using a waterproof marker on firmly affixed, water-resistant labels:

- HEIS number
- Sample collection date/time
- Name/initials of person collecting the sample
- Analysis required
- Sample weight
- Preservation method, if applicable

Field Sampling Logbook. All information pertinent to field sampling and analysis will be recorded in bound logbooks in accordance with SW-846. The sampling team will be responsible for recording all relevant sampling information. Entries made in the logbook will be dated and signed by the individual who made the entry.

Sample Custody. A chain-of-custody record will be initiated at the time of sampling and will accompany each set of samples shipped to the laboratory. The analyses requested for each sample will be indicated on the accompanying Chain-of-Custody/Sample Analysis Request form. Chain-of-custody procedures will be followed throughout sample collection, transfer, analysis, and disposal to ensure that sample integrity is maintained. Each time responsibility for custody of the sample changes, the new and previous custodians will sign the record and note the date and time. The sampler will make a copy of the signed record before the sample is shipped and will transmit it to Sample and Data Management within 24 hours of shipping.

A custody seal (i.e., evidence tape) will be affixed to the lid of each sample jar in a manner that would indicate tampering. The container seal will be inscribed with the sampler's initials and the date sealed.

Sample Containers and Preservatives. Level I EPA pre-cleaned sample containers will be used for soil samples. Container sizes may vary, depending on laboratory-specific volumes needed to meet analytical detection limits. Final required container types and volumes will be identified by the Waste Sampling and Characterization Facility.

Sample Shipping. Data that may prequalify the samples will be used to select proper packaging, marking, labeling, and shipping paperwork in accordance with U.S. Department of Transportation regulations (49 CFR, "Transportation") and to verify that the sample can be received by the offsite analytical laboratory. The sampler will send copies of the shipping documentation to System Sample and Data Management within 24 hours of shipping.

A6 References

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