Department of Energy
Richland Operations Office
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11-AMCP-0212

SEP 20 2011

Mr. D. A. Faulk, Program Manager
Office of Environmental Cleanup
Hanford Project Office
U.S. Environmental Protection Agency
309 Bradley Boulevard, Suite 115
Richland, Washington 99352

Dear Mr. Faulk:

WASTE SITE RECLASSIFICATION FORM (CONTROL NUMBER 2011-048), AND RESPONSE ACTION REPORT FOR THE 200-MG-1 OPERABLE UNIT WASTE SITE 600-40, DOE/RL-2011-66, REVISION 0

This letter transmits signed copies of the Waste Site Reclassification Form (Control Number 2011-048), and the approved Response Action Report for the 200-MG-1 Operable Unit Waste Site 600-40, DOE/RL-2011-66, Revision 0.

If you have any questions, please contact me, or your staff may contact, Al Farabee, of my staff, on (509) 376-8089.

Sincerely,

Jonathan Dowell

Jonathan A. Dowell, Assistant Manager
for the Central Plateau

AMCP:FMR

Attachments

cc: See Page 2

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WASTE SITE RECLASSIFICATION FORM

Date Submitted: 7/20/11 Originator: N. Chandran Phone: 373-4716	Operable Unit(s): 200-MG-1 Waste Site Code: 600-40 Type of Reclassification Action: Closed Out ☐ Interim Closed Out ☒ No Action ☐ RCRA Postclosure ☐ Rejected ☐ Consolidated ☐	Control Number: 2011-048

This form documents agreement among parties listed authorizing classification of the subject unit as Closed Out, Interim Closed Out, No Action, RCRA Postclosure, Rejected, or Consolidated. This form also authorizes backfill of the waste management unit, if appropriate, for Closed Out and Interim Closed out units. Final removal from the NPL of No Action and Closed Out waste management units will occur at a future date.

Description of current waste site condition:
(Summarize status of investigation/remediation of the waste sites.)

The 600-40 waste site is a dumping area located in the 600 Area, approximately 3.6 km (2.2 mi) north of the 200 East Area, and west of West Lake. Observations made during the site walk down included miscellaneous debris comprised of concrete rubble, wood, metal, roofing materials, discarded containers (which were observed to be empty), and tools. The selected alternative authorized by DOE/RL-2009-48, *Action Memorandum for Non-Time-Critical Removal Action for 11 Waste Sites in 200-MG-1 Operable Unit* (Action Memorandum) was removal, treatment, and disposal (RTD). Initial sampling indicated contaminants of potential concern (COPCs) in excess of the established removal action levels (RALs) for the waste site, resulting in the implementation of RTD activities, in accordance with DOE/RL-2009-53, Rev. 1, *Removal Action Work Plan for 48 Waste Sites in the 200-MG-1 Operable Unit* (RAWP). Following RTD, verification sampling was performed in accordance with DOE/RL-2009-60, Rev. 1, *Sampling and Analysis Plan for Selected 200-MG-1 Operable Unit Waste Sites*, which demonstrated the 600-40 waste site had achieved compliance with the RALs and corresponding removal action objectives (RAOs).

The results show that residual soil concentrations of COPCs less than or equal to the RALs supports a reclassification of this site to interim closed out. The current site conditions achieve the RALs and the corresponding RAOs established in the RAWP. The results of waste site sampling are used to make reclassification decisions for the 600-40 waste site in accordance with the TPA-MP-14 (DOE-RL 2007) process. Finalization of a backfill concurrence form provided to the agency(ies) constitutes concurrence that the waste site has achieved the established RAOs and thus backfill and/or contouring may occur at the 600-40 waste site with minimal risk. A Backfill Concurrence Form has been approved by the regulatory agency(ies), and backfill at the 600-40 waste site has been completed.

Basis for reclassification:
(For interim closeout, reference supporting documentation, as listed in Table 3.)

The current site conditions meet RALs and the corresponding RAOs specified in the Action Memorandum. The results show that the residual soil concentrations support reasonably anticipated future land uses recognized in DOE/RL-2008-44, *Engineering Evaluation/Cost Analysis for the 200-MG-1 Operable Unit Waste Sites*, and the Action Memorandum. The results also demonstrate that residual concentrations of COPCs in soil support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft] below ground surface) and that COPC concentrations remaining in the soil are protective of groundwater and the Columbia River. There is no deep zone for the 600-40 waste site therefore no institutional controls are required. The basis for reclassification to interim closed out is described in detail in DOE/RL-2011-66, *Response Action Report for 200-MG-1 Operable Unit Waste Site 600-40*, U.S. Department of Energy, Richland Operation Office, Richland, Washington.

Waste Site Controls:
Engineered Controls: Yes ☐ No ☒ Institutional Controls: Yes ☐ No ☒ O&M requirements: Yes ☐ No ☒
If any of the Waste Site Controls are checked Yes specify control requirements including reference to the Record of Decision, TSD Closure Letter, or other relevant documents.

DA Farabee DOE Federal Project Director (printed)	Signature	7/20/11 Date
Dennis Faulk EPA Project Manager (printed)	Signature	7/21/11 Date

DOE/RL-2011-66
Revision 0

Response Action Report for the 200-MG-1 Operable Unit Waste Site 600-40

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

Contractor for the U.S. Department of Energy
under Contract DE-AC06-08RL14788

CH2MHILL
Plateau Remediation Company

P.O. Box 1600
Richland, Washington 99352

Approved for Public Release;
Further Dissemination Unlimited

DOE/RL-2011-66
Revision 0

Response Action Report for the 200-MG-1 Operable Unit Waste Site 600-40

Date Published
July 2011

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Assistant Secretary for Environmental Management

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Release Approval Date 07/20/2011

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Approval Page

Title: *Response Action Report for the 200-MG-1 Operable Unit Waste Site 600-40*

O. A. Farabee
U.S. Department of Energy, Richland Operations Office

Signature

7/20/11
Date

Executive Summary

This response action report documents the successful completion of the removal action conducted at the 600-40 waste site, also known as the West of West Lake Dumping Area. The alternative proposed in DOE/RL-2008-44, *Engineering Evaluation/Cost Analysis for the 200-MG-1 Operable Unit Waste Sites*[1] (EE/CA), and selected in DOE/RL-2009-48, *Action Memorandum for Non-Time-Critical Removal Action for 11 Waste Sites in 200-MG-1 Operable Unit*[2] (Action Memorandum), was removal, treatment, and disposal (RTD).

The 600-40 waste site was investigated between December 2009 and May 2011 through field observations and sampling to determine the nature and extent of contaminants of potential concern (COPCs) present in the waste site soils as part of the selected removal action alternative of RTD prescribed in the Action Memorandum. This investigation was performed in accordance with DOE/RL-2009-60, *Sampling and Analysis Plan for Selected 200-MG-1 Operable Unit Waste Sites*[3], and DOE/RL-2009-53, *Removal Action Work Plan for 48 Waste Sites in the 200-MG-1 Operable Unit*[4]. Through the investigation summarized in this report, it was found that analytical results from initial sampling demonstrated that soil conditions at the waste site did not comply with established removal action levels (RALs). Therefore, in accordance with the methodology prescribed in the Action Memorandum, RTD of impacted soil was implemented. Verification sampling conducted after RTD activities confirmed that the waste site achieved compliance with RALs and, therefore, met the established removal action objectives without any further removal action.

The results show that the residual soil concentrations of COPCs support reasonably anticipated future land use described in the EE/CA and Action Memorandum. These

[1] DOE/RL-2008-44, 2009, *Engineering Evaluation/Cost Analysis for the 200-MG-1 Operable Unit Waste Sites*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://www2.hanford.gov/arpir/?content=findpage&AKey=0096350.

[2] DOE/RL-2009-48,2009, *Action Memorandum for Non Time Critical Removal Action for 11 Waste Sites in 200-MG-1 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://www.5.hanford.gov/arpir/?content=findpage&AKey=0096131.

[3] DOE/RL-2009-60, 2011, *Sampling and Analysis Plan for Selected 200-MG-1 Operable Unit Waste Sites*, Rev.1, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://www5.hanford.gov/arpir/?content=findpage&AKey=1003290272.

[4] DOE/RL-2009-53, 2010, *Removal Action Work Plan for 48 Waste Sites in the 200-MG-1 Operable Unit*, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://www5.hanford.gov/arpir/?content=findpage&AKey=0912100290.

results also support reclassification to "interim closed out" status in accordance with the process described in RL-TPA-90-0001, *Tri-Party Agreement Handbook Management Procedures*[5]. No institutional controls are required because no deep vadose zone contamination is associated with the 600-40 waste site.

This waste site and the data obtained from the subject sampling evolutions will be included in the risk assessment and remedial investigation/feasibility study for final remedial decisions for the Outer Area.

[5] RL-TPA-90-0001, 2007, *Tri-Party Agreement Handbook Management Procedures*, Guideline Number TPA-MP-14, "Maintenance of the Waste Information Data System (WIDS)," *Rev. 1*, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://www.hanford.gov/hanford/files/TPA-MP14.pdf.

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Terms

bgs	below ground surface
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
COPC	contaminant of potential concern
DOE	U.S. Department of Energy
DQA	data quality assessment
Ecology	Washington State Department of Ecology
EE/CA	*Engineering Evaluation/Cost Analysis for the 200-MG-1 Operable Unit Waste Sites*
EPA	U.S. Environmental Protection Agency
HEIS	Hanford Environmental Information System
MDL	method detection limit
N/A	not available
NA	not applicable
NPL	National Priorities List
O&M	operations and maintenance
OU	Operable Unit
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
QA	quality assurance
QC	quality control
RAL	removal action level
RAO	removal action objective
RAWP	*Removal Action Work Plan for 48 Waste Sites in the 200-MG-1 Operable Unit*
RDL	required detection limit
RI/FS	remedial investigation/feasibility study
ROD	record of decision
RTD	removal, treatment, and disposal
SAP	*Sampling and Analysis Plan for Selected 200-MG-1 Operable Unit Waste Sites*
TPH	total petroleum hydrocarbon
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*

WIDS	Waste Identification Data System
VSP	Visual Sample Plan
ZPC	zone of potential contamination

1 Introduction

This report documents the successful completion of a non-time-critical removal action conducted at the 600-40 waste site. The removal action alternative selected for this waste site was removal, treatment, and disposal (RTD), as proposed in the *Engineering Evaluation/Cost Analysis for the 200-MG-1 Operable Unit Waste Sites* (EE/CA, DOE/RL-2008-44), and authorized by the *Action Memorandum for Non-Time-Critical Removal Action for 11 Waste Sites in 200-MG-1 Operable Unit* (Action Memorandum, DOE/RL-2009-48). Analytical results from initial sampling indicated that the waste site did not achieve compliance with the removal action levels (RALs), thus supporting implementation of the RTD alternative. This report provides the basis for the successful completion of the RTD action performed at the 600-40 waste site. This documentation has been prepared based on U.S. Environmental Protection Agency (EPA) guidance provided in *Close Out Procedures for National Priorities List Sites* (EPA-540-R-98-016).

This report provides a summary of the actions taken and resulting data to support a determination that, through performance of the RTD alternative, conditions remaining at the 600-40 waste site have achieved the established RALs and have met the removal action objectives (RAOs) provided in the Action Memorandum for the 600-40 waste site. The documentation process is consistent with the U.S. Department of Energy (DOE) *Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) Remedial Action Site Closure Guidance* (DOE, 2010).

Statutory authority for the action taken is in accordance with CERCLA (as amended by the *Superfund Amendments and Reauthorization Act of 1986*); *Superfund Implementation* (Executive Order 12580); the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al., 1989), also known as the Tri-Party Agreement; and 40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan."

The non-time-critical removal action for the 600-40 waste site was completed in May 2011 in accordance with the *Removal Action Work Plan for 48 Waste Sites in the 200-MG-1 Operable Unit* (RAWP, DOE/RL-2009-53). This report provides the following information relative to the completion of the subject removal action:

- Background, historical information, regulatory enforcement history, and environmental setting pertinent to this removal action
- A description of the selected alternative, RAOs, and exposure and land use assumptions provided in the related regulatory documents
- A summary of the completed actions, the resulting data collected in support of completion of that removal action, a comparison of data against objectives, and demonstration that RAOs have been met

1.1 Site Description

This section provides general information on the Hanford Site and the 200-MG-1 Operable Unit (OU) and provides a background of the development of the removal action for the 600-40 waste site.

1.1.1 Hanford General Site Information

The Hanford Site, which is part of the DOE nuclear weapons complex, occupies approximately 1,517 km2 (586 mi2) along the Columbia River in Benton County, northwest of the City of Richland in the Lower Columbia Basin in southeastern Washington State (Figure 1-1). From the early 1940s to approximately 1989, the Hanford Site mission included building the world's first large-scale plutonium

production facility, and until the 1980s, the site was used to produce plutonium for nuclear weapons. Other activities included nuclear research, development, and nuclear materials production. These activities created a wide variety of chemical and radioactive wastes that were released into the environment. The Hanford Site mission is now focused on the cleanup of those wastes and ultimate closure of the Hanford Site.

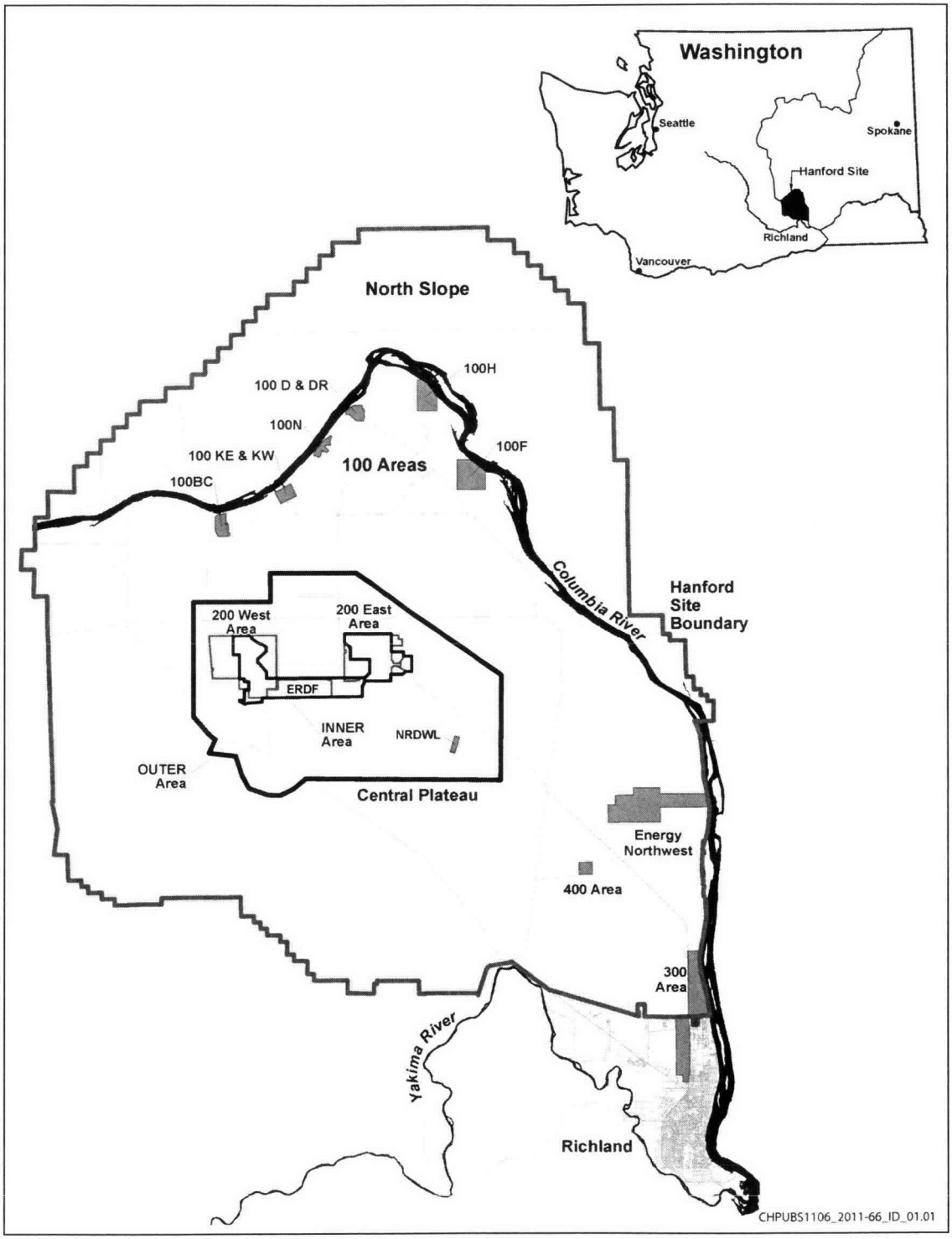

Figure 1-1. Location of the Hanford Site in Washington State

1.1.2 200-MG-1 Operable Unit

The Washington State Department of Ecology (Ecology), DOE, and EPA created the 200-MG-1 OU through the Tri-Party Agreement Milestone M-015-06-02 and Tri-Party Agreement Change Request C-06-02 (Ecology et al., 2006). The 200-MG-1 OU is made up of waste sites in the 200 East and 200 West Areas, and the 600 Area of the Hanford Site. The 600 Area encompasses those areas south of the Columbia River that are not part of another designated area (i.e., 300 Area, 200 East Area, and 100-K) and are not specifically identified (Figure 1-1). The 200-MG-1 OU waste sites consist of French drains, trenches, cribs, ditches, retention basins with shallow contamination (generally less than 4.6 m [15 ft] deep), and areas where chemical and radioactive contaminants were released during material transfers (i.e., unplanned release sites). Additionally, some 200-MG-1 OU sites were produced by airborne dissemination of radioactive particles, or biodegradation and dispersion of plant or animal matter. For those sites containing radionuclides, the radionuclide inventory for this conceptual model group does not include transuranic isotopes greater than or equal to 100 nCi/g.

All of the waste sites contained in the 200-MG-1 OU are located within the Central Plateau, as described in the EE/CA and Action Memorandum. The 600-40 waste site, known as the West of West Lake Dumping Area, is located in the 600 Area, approximately 3.6 km (2.2 mi) north of the 200 East Area, and west of west lake, as shown in Figure 1-2.

1.2 Regulatory and Enforcement History

As discussed in Chapter 1, statutory authority for this removal action is taken in accordance with CERCLA. Further governing requirements for compliance with CERCLA and the *Resource Conservation and Recovery Act of 1976* activities at Hanford are in accordance with the Tri-Party Agreement. The Hanford Site was proposed for inclusion in 53 FR 23988, "National Priorities List for Uncontrolled Hazardous Waste Sites – Update 7," and was placed on the National Priorities List (NPL) on November 3, 1989 (54 FR 41015, "National Priorities List for Uncontrolled Hazardous Waste Sites – Final Rule 10/04/89," October 4, 1989) by EPA. EPA placed the four aggregate areas (i.e., the 100, 200, 300, and 1100 Areas) on the NPL. The 200 Area NPL site consists of the 200 West and 200 East Areas, which contain waste management facilities and inactive irradiated-fuel reprocessing facilities. The site also includes the 200 North Area, formerly used for interim storage and staging of irradiated fuel, and the waste sites assigned to the 200-MG-1 OU.

1.3 Environmental Setting

The Hanford Site is located within the semiarid Pasco Basin in the northern portion of the Columbia Plateau. Normal annual precipitation is 17.7 cm (7 in.). According to *Estimated Recharge Rates at the Hanford Site* (PNL-10285), there are an estimated 2.6 to 17.3 mm (0.1 to 0.7 in.) per year of recharge in the 100 Area. Bedrock beneath the site is basalt of the Columbia River Basalt Group.

The Ringold Formation and the Hanford formation cover the basalt throughout the Central Plateau. Poorly consolidated, river-deposited, well-drained sands, gravels, cobbles, and boulders dominate these units. The Ringold Formation is an interstratified sequence of unconsolidated clay, silt, sand, and gravel-to-cobble sediment deposited by the ancestral Columbia River. The Hanford formation consists of uncemented gravels, sands, and silts deposited by Pleistocene cataclysmic floodwaters. Groundwater from the Hanford Site discharges to the Columbia River, the dominant surface-water body of the Hanford Site. The direction of groundwater flow beneath the Central Plateau is toward the east-northeast. The uses of the Columbia River include the production of hydroelectric power, irrigation, drinking water, recreation, and natural resources.

The average depth from ground surface to groundwater beneath the 200 Area ranges from 50 m (164 ft) to greater than 100 m (328 ft). Additional details on the geology and hydrogeology underlying the 200 Area and the 200-MG-1 OU are not provided in the base response action documents because the 200-MG-1 OU was created for shallow zone (less than 4.6 m [15 ft] in depth) waste sites, which are assumed not to be a threat to groundwater quality. This assumption is based on historical and process knowledge regarding volumes of liquids discharged, lack of mobility of contaminants, and shallow depth of the discharge(s).

The nearest natural surface water body to the 600-40 waste site is the West Lake, located approximately 150 m (492 ft) east of the waste site. The potential for natural groundwater recharge within the 200 North Area is limited to precipitation infiltration. Estimates of recharge from precipitation at the Hanford Site range from 0 to 10 cm (0 to 4 in.) per year.

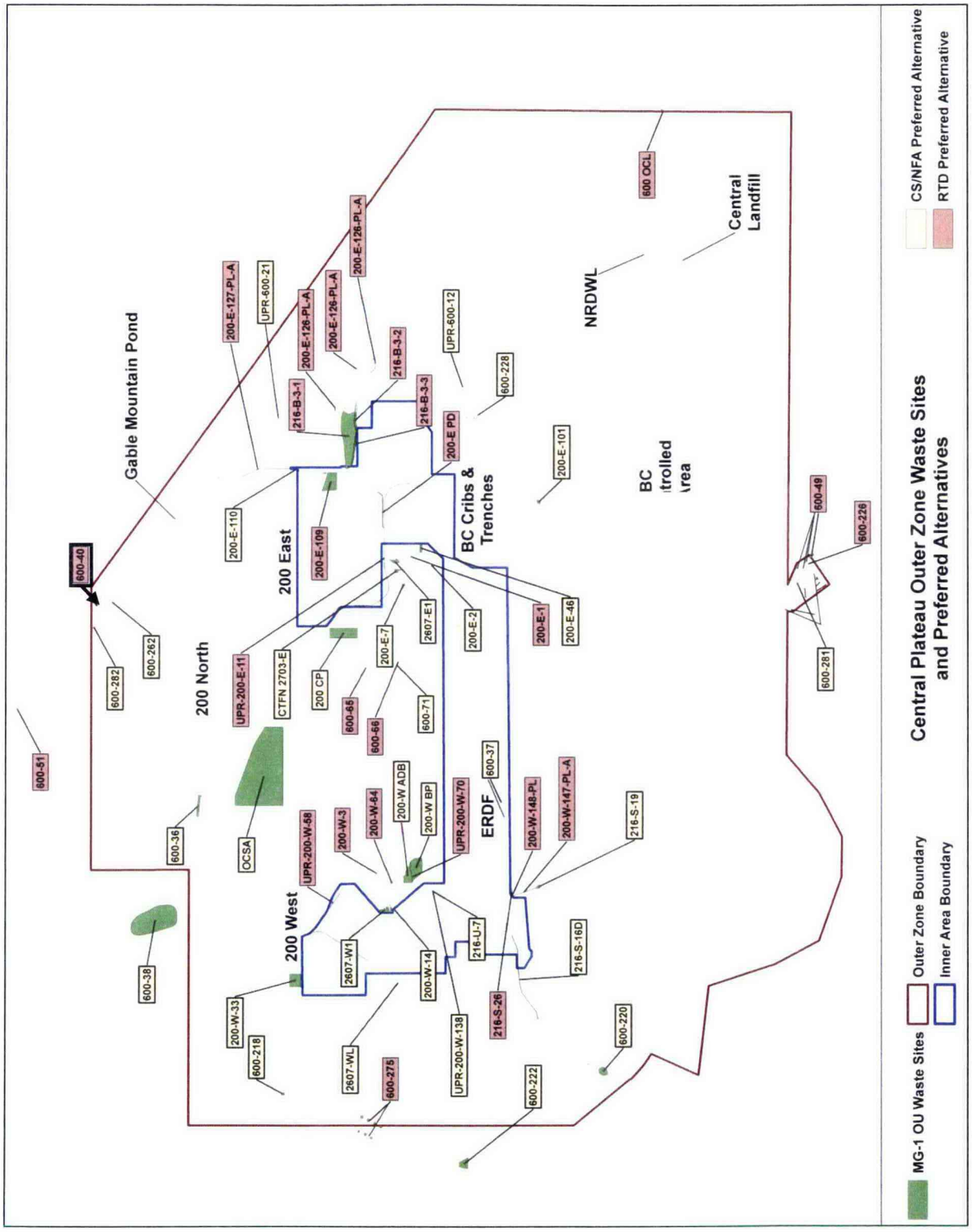

Figure 1-2. 200-MG-1 Operable Unit and Waste Site 600-40

2 Waste Site Background

This section provides a description of the 600-40 waste site, information on process and background, describes the selected alternative, and delineates the RAOs and cleanup standards applicable to this removal action as prescribed in the Action Memorandum.

2.1 600-40 Site Background

The 600-40 waste site is a dumping area located in the 600 Area, approximately 3.6 km (2.2 mi) north of the 200 East Area, and west of West Lake, as shown in Figure 2-1. The waste site is accessed via a gravel road that runs east toward the West Lake. The 600-40 waste site was identified and entered into the Waste Information Data System (WIDS) in February 1993 based on observed debris located at the waste site including concrete rubble, wood, roofing materials, and miscellaneous metal debris and containers. The waste site is comprised of two discrete debris dump sites; one located adjacent to the gravel access road, at the "T" intersection (zone of potential contamination [ZPC] 1), and the second located on the hillside that slopes down toward West Lake (ZPCs 2, 3a, and 3b).

The release mechanism for this waste site is miscellaneous dumping and abandonment of debris not clearly associated with specific projects or facilities. The form of all waste material is solid. There are no references to liquid waste materials being dumped or discarded at the 600-40 waste site. No chemical or radiological processes involving sustained release of materials are associated with this waste site.

2.2 Description of the Selected Alternative

As stated in the EE/CA and Action Memorandum, the selected alternative for the subject waste site was RTD. This alternative was selected because, based on historical activity and process knowledge, and the types of debris observed during site evaluation, concentrations of contaminants of potential concern (COPCs) had the potential to exceed the RALs. Initial sampling and analysis indicated that soil concentrations of COPCs were greater than the RALs, thus confirming the implementation of the RTD alternative. Activities involved in the RTD action set forth in the RAWP and *Sampling and Analysis Plan for Selected 200-MG-1 Operable Unit Waste Sites* (SAP, DOE/RL-2009-60) include soil excavation and verification sampling to demonstrated that the remaining in-situ COPC concentrations in soil are less than or equal to the established RALs, and that no additional removal action is required.

The general sampling design criteria are provided in this section followed by a summary of waste site history, specific sampling design and methodology, and analytical results for the 600-40 waste site. The following key features relevant to the 600-40 waste site were considered during the development of a sample design:

- Direct visual inspection of the waste site surface was performed, using available site information as a guide for visual cues such as soil staining, discoloration, absence of vegetation, and other anomalies.
- Radiological field screening was performed at the surface of the waste site, and during the sampling evolutions, to provide an indication of the presence of radiological COPCs.
- Judgmental and random sampling were conducted in accordance with the methodology prescribed in the SAP. The use of a judgmental methodology based on process knowledge and visual indicators was appropriate for the investigative sampling evolution. Random samples collected from the excavation were considered appropriate for the verification sampling evolution.

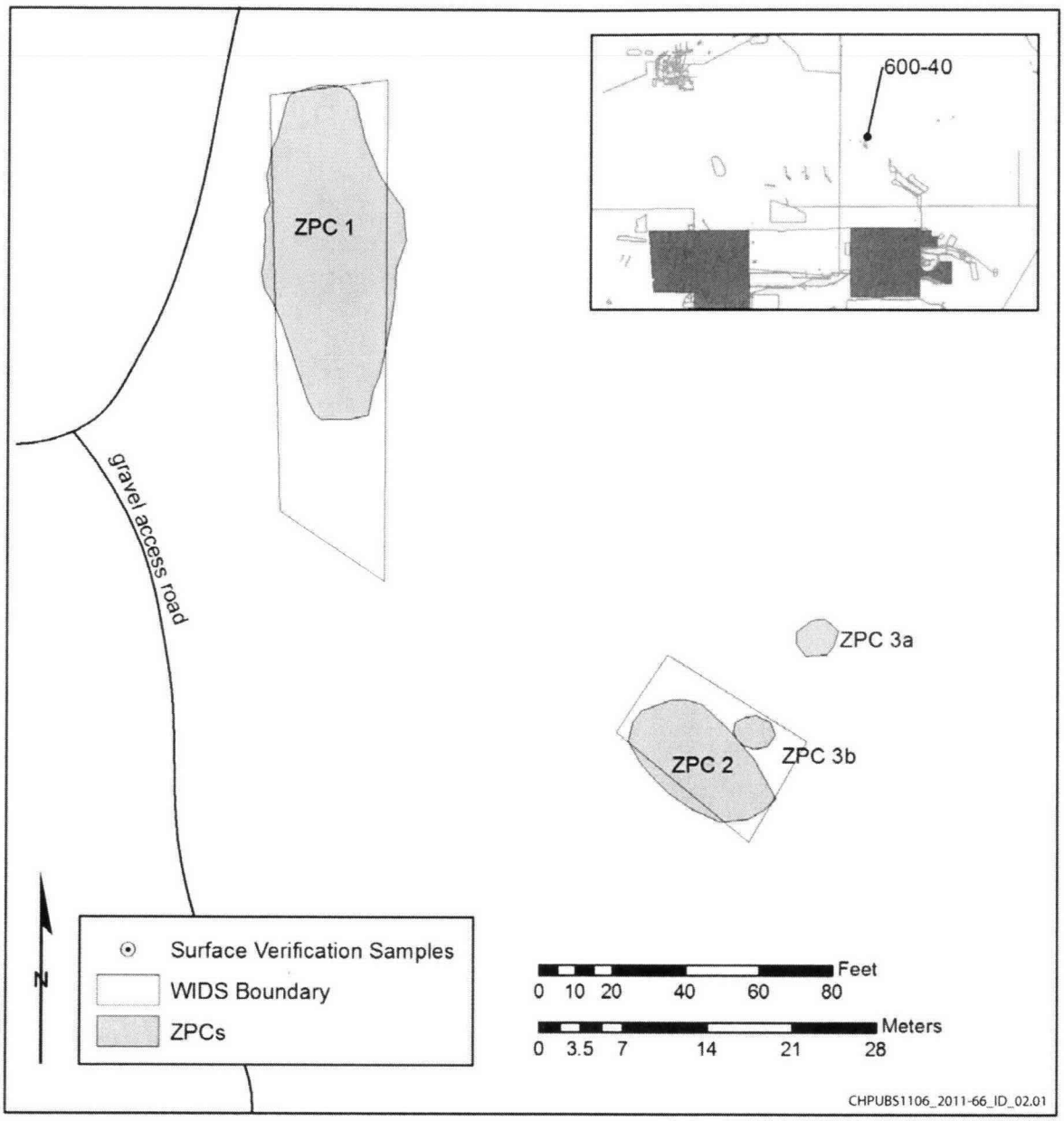

Figure 2-1. 600-40 Waste Site

Based on these key design features, soil samples were collected from the 600-40 waste site and analyzed for COPC concentrations. Evaluation of analytical results from the initial sampling evolution demonstrated that residual concentrations of COPCs in soil were greater than established RALs for COPCs applicable to the 600-40 waste site, resulting in the implementation of the RTD alternative. Table 5-2 provides the maximum concentrations for each COPC from the verification sampling analytical data. Tables A-1 through A-3 provide a detailed summary of all analytical data results for sampling conducted at the 600-40 waste site (Appendix A).

Personnel with current training and qualifications performed field radiological surveying of the waste site during site evaluation, and during the sampling evolutions, surveying both the samples and sampling locations. Survey methods and practices were performed in accordance with established contractor

methods and protocols. Of the radiological surveys performed for the 600-40 waste site, no radiological dose readings were greater than the measured background, and no radiological contamination was found. The site was confirmed to be a nonradiological site, and the radiological COPCs were eliminated from the list of analytes to be included in laboratory analysis.

2.2.1 Removal Action Objectives

The removal action alternatives for the 200-MG-1 OU waste sites were evaluated based on their overall ability to protect human health and the environment and their effectiveness in maintaining both short-term and long-term protection. The selected alternative must meet the following RAOs established in the Action Memorandum:

- **RAO 1:** Prevent unacceptable risk to human health and ecological receptors from exposure to soils and/or debris contaminated with nonradiological constituents to 4.6 m (15 ft) below ground surface (bgs) at concentrations above the appropriate RALs.
- **RAO 2:** Prevent unacceptable risk to human health and ecological receptors from exposure to soils and/or debris contaminated with radiological constituents to 4.6 m (15 ft) bgs at concentrations above the appropriate RALs.
- **RAO 3:** Control the sources of groundwater contamination to minimize impacts to groundwater resources, protect the Columbia River from adverse impacts, and reduce the degree of groundwater cleanup that may be required under future action.
- **RAO 4:** Prevent adverse impacts to cultural resources and threatened or endangered species, and minimize wildlife habitat disruption.

The RALs for the waste sites identified in the Action Memorandum are based on the RAOs noted above. These RALs are based on attainment of acceptable levels of human health, ecological risk, and protection of groundwater, but are not lower than background levels or detection limits for waste sites. Attainment of RALs is intended to meet the first three RAOs and is expected to satisfy the remedial action objectives established in the final record of decision (ROD). The fourth RAO is met through cultural and ecological reviews performed before starting removal action activities. Table 2-1 lists the nonradiological COPCs identified for the 200-MG-1 OU. Attainment of established RALs and corresponding RAOs is described in Chapter 5 of this report.

Table 2-1. Nonradiological Removal Action Levels

Contaminant of Potential Concern	Background Concentration[a] (mg/kg)	Direct Exposure[b] (mg/kg)	Groundwater Protection[c] (mg/kg)	Required Detection Limit (mg/kg)	Removal Action Levels (mg/kg)	Ecological Risk Screening Values (mg/kg)
Antimony	5	32	5.4	0.6	5.4	5
Arsenic	6.5	6.5[d]	6.5[d]	1.0	6.5[d]	7
Barium	132	16,000	1,650	2	1,650	102
Beryllium	1.51	160	63.2	0.5	63.2	10
Boron	N/A	16,000	210	2	210	0.5
Cadmium	0.81	80	0.81[d]	0.5	0.81[d]	4
Chromium (Total)	18.5	120,000	2,000	1	2,000	42
Chromium (VI)	N/A	240	--[e]	0.5	--[e]	N/A
Cobalt	15.7	24	15.7[d]	2	15.7[d]	20
Copper	22.0	3,200	284	1	284	50
Lead	10.2	250	3,000	5.0	250	50
Lithium	33.5	160	192	2.5	160	35
Manganese	512	3,760	512[d]	5	512[d]	1,100
Mercury	0.33	24	2.09	0.2	2.09	0.1
Nickel	19.1	1,600	130	4	130	30
Selenium	0.78	400	5.2	1	5.2	0.3
Silver	0.73	400	13.6	0.2	13.6	2
Strontium	N/A	48,000	2,920	1	2,920	N/A
Thallium	N/A	5.6	1.59	1	1.59	1
Tin	N/A	48,000	48,000	10	48,000	50
Uranium (Soluble Salts)	3.21	240	3.21[d]	1	3.21[d]	5
Vanadium	85.1	560	2,240	2.5	560	2
Zinc	67.8	24,000	5,970	1	5,970	86
PCB Aroclor 1016	N/A	0.5	0.094	0.017	0.094	0.65
PCB Aroclor 1221	N/A	0.5	0.017[d]	0.017	0.017[d]	0.65
PCB Aroclor 1232	N/A	0.5	0.017[d]	0.017	0.017[d]	0.65
PCB Aroclor 1242	N/A	0.5	0.039	0.017	0.039	0.65

Table 2-1. Nonradiological Removal Action Levels

Contaminant of Potential Concern	Background Concentration[a] (mg/kg)	Direct Exposure[b] (mg/kg)	Groundwater Protection[c] (mg/kg)	Required Detection Limit (mg/kg)	Removal Action Levels (mg/kg)	Ecological Risk Screening Values (mg/kg)
PCB Aroclor 1248	N/A	0.5	0.039	0.017	0.039	0.65
PCB Aroclor 1254	N/A	0.5	0.066	0.017	0.066	0.65
PCB Aroclor 1260	N/A	0.5	0.72	0.017	0.5	0.65
Acenaphthene	N/A	4,800	98	0.33	98	20
Acenaphthylene	N/A	4,800	98	0.33	98	N/A
Anthracene	N/A	24,000	2,270	0.33	2,270	N/A
Benzo[*a*]anthracene	N/A	1.37	0.86	0.33	0.86	N/A
Benzo[*a*]pyrene	N/A	0.137	0.233[f]	0.33	0.33[d]	12
Benzo[*b*]fluoranthene	N/A	1.37	2.95[f]	0.33	1.37	N/A
Benzo[*g,h,i*]perylene	N/A	2,400	25,700	0.33	2,400	N/A
Benzo[*k*]fluoranthene	N/A	1.37	2.95[f]	0.33	1.37	N/A
Chrysene	N/A	13.7	9.56	0.33	9.56	N/A
Dibenz[*a,h*]anthracene	N/A	1.37	4.29	0.33	1.37	N/A
Fluoranthene	N/A	3,200	631	0.33	631	N/A
Fluorene	N/A	3,200	101	0.33	101	30
Indeno[1,2,3-*cd*] pyrene	N/A	1.37	8.33	0.33	1.37	N/A
Naphthalene	N/A	1,600	4.46	0.33	4.46	N/A
Phenanthrene	N/A	24,000	1,140	0.33	1,140	N/A
Pyrene	N/A	2,400	655	0.33	655	N/A
Carbon Tetrachloride[g]	N/A	7.69	0.0031	0.005	0.005	N/A
Xylene[h]	N/A	16,000	14.6	0.01	14.6	N/A
Nitrate (as Nitrogen)	11.8	128,000	40	0.75	40	N/A
TPH–Diesel	N/A	2,000	2,000	5	2,000	200
TPH–Kerosene	N/A	2,000	2,000	5	2,000	200
Fluoride[i]	N/A	4,800	16	5	16	N/A
Asbestos	N/A	N/A[j]	N/A[j]	N/A[j]	1%[j]	N/A

a. If Hanford Site-specific background data are not available, values are then taken from Ecology Publication 94-115, *Natural Background Soil Metals Concentrations in Washington State*. Hanford Site background values are available from nonradiological

Table 2-1. Nonradiological Removal Action Levels

Contaminant of Potential Concern	Background Concentration[a] (mg/kg)	Direct Exposure[b] (mg/kg)	Groundwater Protection[c] (mg/kg)	Required Detection Limit (mg/kg)	Removal Action Levels (mg/kg)	Ecological Risk Screening Values (mg/kg)

background data in DOE/RL-92-24, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, Table D9-2.

b. Direct contact values were calculated based on WAC 173-340-740, "Model Toxics Control Act—Cleanup," "Unrestricted Land Use Soil Cleanup Standards," using method B methodology and assumptions.

c. The groundwater protection values were obtained using equations provided in WAC 173-340-747(4), "Model Toxics Control Act—Cleanup," "Deriving Soil Concentrations for Ground Water Protection," with the physical parameters obtained from the Washington State Department of Ecology website, http://www.ecy.wa.gov/.

d. Where cleanup levels are less than background or RDLs, cleanup levels default to background or RDLs in accordance with WAC 173-340-700(6)(d), "Model Toxics Control Act—Cleanup," "Overview of Cleanup Standards," and WAC 173-340-707(2), "Model Toxics Control Act—Cleanup," "Analytical Considerations," respectively.

e. Based on process knowledge, chromium (VI) is not expected to be present at 200-MG-1 OU waste sites. The following values are given to help guide cleanup:

- 0.2 mg/kg is a calculated value using K_d=0, based on PNNL-13895, *Hanford Contaminant Distribution Coefficient Database and Users Guide*, and WAC 173-340-747, equation 747-1.
- 2.1 mg/kg is based on DOE/RL-96-17, *Remedial Design Report/Remedial Action Work Plan for the 100 Area*.
- 18.4 mg/kg is based on Ecology, 2007, Cleanup Levels and Risk Calculations (CLARC) database.

f. The soil concentration for protection of groundwater values for benzo[*a*]pyrene and benzo[*k*]fluoranthene were incorrectly reported in DOE/RL-2009-48, *Action Memorandum for Non-Time-Critical Removal Action for 11 Waste Sites in 200-MG-1 Operable Unit*, and have been corrected.

g. Carbon tetrachloride is applicable to eleven waste sites authorized by DOE/RL-2009-48.

h. Xylene is applicable only to the 200-W-3, 216-S-19, and 216-S-26 waste sites.

i. Fluoride is added as a COPC for select sites, such as 216-S-19 and 216-S-26, based on process history.

j. The removal action level for asbestos in soil is 1 percent by weight (measured using polarized light microscopy). EPA has used this value for determining if response actions for asbestos should be undertaken (Cook, 2004, *Clarifying Cleanup: Goals and Identification of New Assessment Tools for Evaluating Asbestos at Superfund Cleanups*). Further evaluation of removal actions for asbestos will be conducted as needed on a site-specific basis in the Outer Area RI/FS.

Ecological screening values, which are based on "Model Toxics Control Act—Cleanup," "Tables" (WAC 173-340-900), Table 749-3, are used for screening purposes only and are not considered cleanup levels for this CERCLA removal action (described more fully in Section 5 of the Action Memorandum). If analytical results exceed the ecological values, the results will be further evaluated during the final ecological risk assessment in accordance with the remedial investigation/feasibility study (RI/FS) for the Central Plateau to make final cleanup decisions.

2.2.2 Exposure and Land-Use Assumptions

The 600-40 waste site is located within the Central Plateau, as discussed in more detail in the EE/CA and Action Memorandum for the 200-MG-1 OU. Land use for the Central Plateau is designated for reasonably anticipated future land use recognized in the EE/CA and Action Memorandum (for the purposes of this interim action, RAOs were selected that would support unrestricted land use).

2.2.3 Design Summary

The RTD action alternative was the selected alternative for the 600-40 waste site. Initial sampling and analysis indicated that concentrations of COPCs in the waste site soils were greater than RALs. The RTD

action included removal of impacted soil and miscellaneous debris. The sampling objectives for the 600-40 waste site included visual inspection and radiological survey of the waste site, as well as the collection of focused and random soil samples from the waste site soil matrix as described in Section 3.1 of this report. The following key features of the site-specific sampling design for the 600-40 waste site included:

- Direct visual inspection of the waste site surface was performed, using available site information as a guide for visual cues such as soil staining, discoloration, absence of vegetation, and other anomalies.
- Radiological field screening performed at the surface of the waste site, and during the sampling evolutions, to provide an indication of the presence of radiological COPCs.
- Judgmental and random sampling were conducted in accordance with the methodology prescribed in the SAP. The use of a judgmental methodology based on process knowledge and visual indicators was appropriate for the investigative sampling evolution. Random samples collected from the excavation were considered appropriate for the verification sampling evolution.

2.3 Decision Document Amendments, Significant Differences, or Waivers

No amendments to the EE/CA or Action Memorandum, or technical impracticability waivers were associated with this removal action.

3 Response Activity Summary

As stated in the EE/CA and Action Memorandum, the selected alternative for the 600-40 waste site was RTD. The results of initial sampling indicated COPC concentrations greater than RALs. The removal activities proceeded through excavation of impacted soils under the RTD alternative. Upon conclusion of RTD activities, verification sampling was conducted to demonstrate that COPC concentrations in soils at 600-40 were less than the RALs, thus demonstrating that the RAOs established for this interim action were met.

3.1 Summary of Activities

The removal action at the 600-40 waste site was conducted between December 2009 and May 2011, and included the collection of focused and random soil samples from locations within the boundaries of the waste site, as specified in Section 2.2 per the methodologies prescribed in the SAP. The sampling process, as described in the SAP, was based on the use of an observational approach and included visual inspections, field screening for radiological COPCs, and collection of soil samples from areas identified during site evaluation. The following key activities were pertinent to the removal action at the 600-40 waste site:

- Collection of focused samples during the initial sampling evolution based on visual indicators.
- Excavation of soil under the RTD alternative in ZPCs 1, 2, 3a, and 3b due to analytical results exceeding the RALs.
- Collection of focused in process samples from ZPC 1 to determine the lateral extent of impact. Random samples from excavated areas at the 600-40 waste site for verification purposes. Samples were submitted for laboratory analysis for COPCs, and an evaluation of analytical results was performed to demonstrate achievement of RALs.

3.1.1 Waste Site 600-40 Investigative Sampling

A site evaluation was performed on December 4, 2009 prior to performance of the initial sampling evolution. This evaluation served to support job planning as well as completion of the visual inspection component of the sampling activities described in the SAP. The visual inspection incorporated observational indicators and historical information to identify areas of concern within the waste site boundary. Observations made during the site walk down included miscellaneous debris comprised of concrete rubble, wood, metal, roofing materials, discarded containers (which were observed to be empty), and tools.

For radiological field screening at the 600-40 waste site, survey methods and practices were performed in accordance with established contractor methods and protocols by personnel with current training and qualifications. No radiological postings were present at the waste site. Of the radiological surveys performed during removal action activities, no radiological readings were greater than the measured background, and no radiological contamination was found.

Investigative sampling was conducted on March 1, 2010 at the 600-40 waste site at the four ZPCs established during site evaluation. A total of eight samples were collected at the surface (0 to 0.3 m [0 to 1 ft] bgs) based on visual indicators; three each from ZPCs 1 and 2, and one each from ZPCs 3a and 3b (Figure 3-1). The samples were analyzed for the full suite of nonradiological COPCs (metals, polynuclear aromatic hydrocarbons [PAHs], polychlorinated biphenyls [PCBs], volatile organic analytes, anions, and total petroleum hydrocarbons) in accordance with Rev. 0 of the SAP.

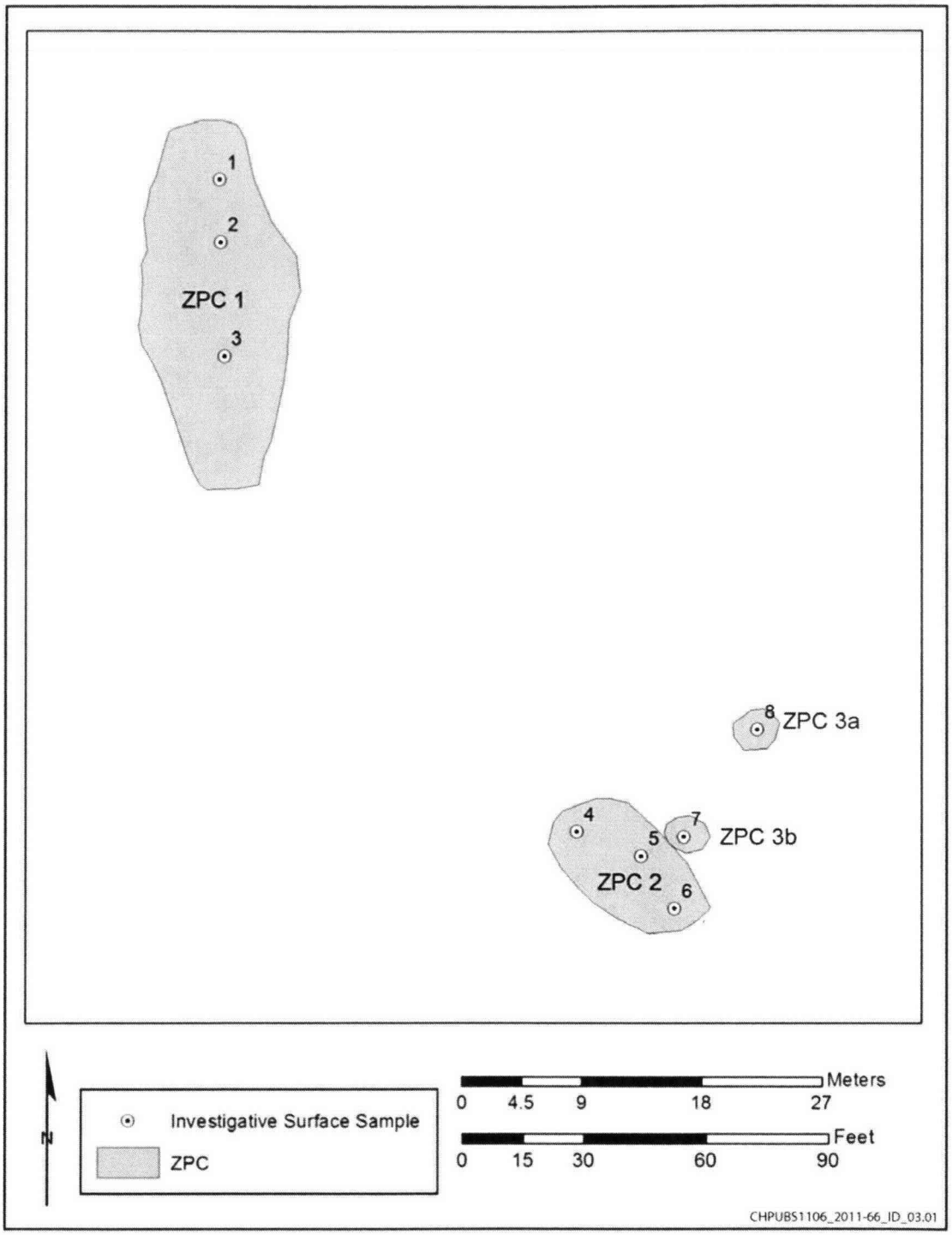

Figure 3-1. 600-40 Waste Site Investigative Sample Locations

Results of the investigative sampling at the 600-40 waste site indicated concentrations of COPCs greater than the RALs, as summarized below.

- **ZPC 1:** Concentrations of PAHs and PCB Aroclors were less than laboratory method detection limits (MDLs); however, laboratory MDLs were greater than the required detection limits (RDLs) and RALs. Accordingly, it was presumed that the results were greater than the RALs.

- **ZPC 2:** Concentrations of benzo[*a*]pyrene, dibenz[*a,h*]athracene, benzo[*a*]anthracene, and nitrate-nitrogen were greater than the RALs.
- **ZPCs 3a and 3b:** Concentrations of COPCs were less than the laboratory MDLs; however, laboratory MDLs were greater than RALs for all PCB Aroclors.

Given that laboratory MDLs were greater than RALs for PAHs and all PCB Aroclors in the surface matrix (0 to 0.3 m [1 ft] bgs), concentrations of these contaminants were presumed to be greater than RALs for the entire waste site (ZPCs 1, 2, 3a, and 3b) thus initiating RTD in those areas.

3.1.2 Waste Site Excavation

The results of the investigative sampling indicated that concentrations of COPCs were presumed to be greater than the RALs for the four ZPCs at the 600-40 waste site. This was due to the laboratory MDLs exceeding the RALs for PAHs and PCBs as discussed in Section 3.1.1. Excavation at the four ZPCs commenced in March 2010, and is described below. The extents of excavation at ZPCs 2, 3a, and 3b were determined visually. Soil removal occurred to a total depth of approximately 0.6 m (2 ft) and was laterally bound by the areas of wood debris and surface devegetation.

The initial extent of excavation at ZPC 1 was determined visually by the presence of debris and soil staining, and extended vertically to approximately 0.6 m (2 ft) bgs. Seven in process samples were collected from the base of the excavated area and analyzed for the full suite of COPCs in accordance with Rev. 0 of the SAP. The laboratory analytical data for ZPC 1 indicated the MDLs were in excess of the RALs for PCB Aroclor 1221, benzo[*a*]pyrene. dibenz[*a,h*]athracene, and indeno[*1,2,3-cd*]pyrene, which resulted in the further refinement of the vertical extent of excavation at ZPC 1. During RTD activities an anomaly was encountered, which appeared to be a sawdust deposit. The material was sampled and analyzed for the full list of COPCs, the results of which indicated the presence of cadmium and nitrate-nitrogen at concentrations greater than the RALs. Based on the analytical results from the anomalous soil sample, the vertical extent of excavation at ZPC 1 was further refined utilizing visual indicators, an additional 0.6 m (2 ft) to 2.7 m (9 ft), for a total depth varying between approximately 1.2 m (4 ft) to 3.4 m (11 ft) bgs. Three additional in process samples were collected on August 5, 2010 from ZPC 1 to confirm that the anomalous material was removed, resulting in analytical results less than the RALs.

3.1.3 Waste Site Verification Sampling

Analytical results of soil samples collected from the areas identified during site evaluation indicated COPC concentrations were greater than the RALs. These locations became areas of excavation during the implementation of the RTD alternative. The lateral and vertical extent of excavation in each area was identified utilizing visual indicators, and extended based on analytical results of in process samples, which were collected from ZPC 1 during RTD activities. Upon completion of RTD activities, a verification sampling design was developed utilizing random sampling and Visual Sample Plan© (VSP) software to locate samples randomly within each area of impact. Samples were collected from the excavated areas as described in the following subsections. A detailed summary of verification sampling analytical results can be found in Table A-3 (Appendix A).

© Visual Sample Plan, Pacific Northwest National Laboratory, Richland, Washington.

3.1.3.1 ZPCs 3a and 3b

The areas of excavation were approximately 8.4 m^2 (90 ft^2) at ZPC 3a and 7.2 m^2 (78 ft^2) at ZPC 3b; therefore, one sample was collected from each location (Figure 3-2) and analyzed for the full suite of COPCs in accordance with Rev. 0 of the SAP.

3.1.3.2 ZPC 2

The area of excavation at ZPC 2 was approximately 98 m^2 (1,055 ft^2); therefore, three soil samples from the base of the excavated area were collected from locations selected randomly utilizing VSP software (Figure 3-2), and analyzed for the full suite of COPCs in accordance with Rev. 0 of the SAP.

Figure 3-2. ZPCs 2, 3a, and 3b Verification Sample Locations

3.1.3.3 ZPC 1

The total area of excavation at ZPC 1 was approximately 590 m^2 (6,351 ft^2); therefore, seventeen verification samples were collected from the base of the excavation from locations selected utilizing VSP software (Figure 3-3) on a triangular grid with a random start and 95 percent upper confidence limit to determine the number of samples. Additionally, three test pits, each evaluated to a total depth of approximately 4.7 m (15 ft) bgs were placed east of ZPC 1 to verify that the extent of the 600-40 waste site is limited to the area of excavation. Analytical results from the verification sampling evolution indicated a maximum concentration of nitrate-nitrogen of 43.7 mg/kg in one sample collected from the base of the excavation. Nitrate-nitrogen is not considered a COPC for the 600-40 waste site, and the reported maximum concentration does not indicate a source of contamination.

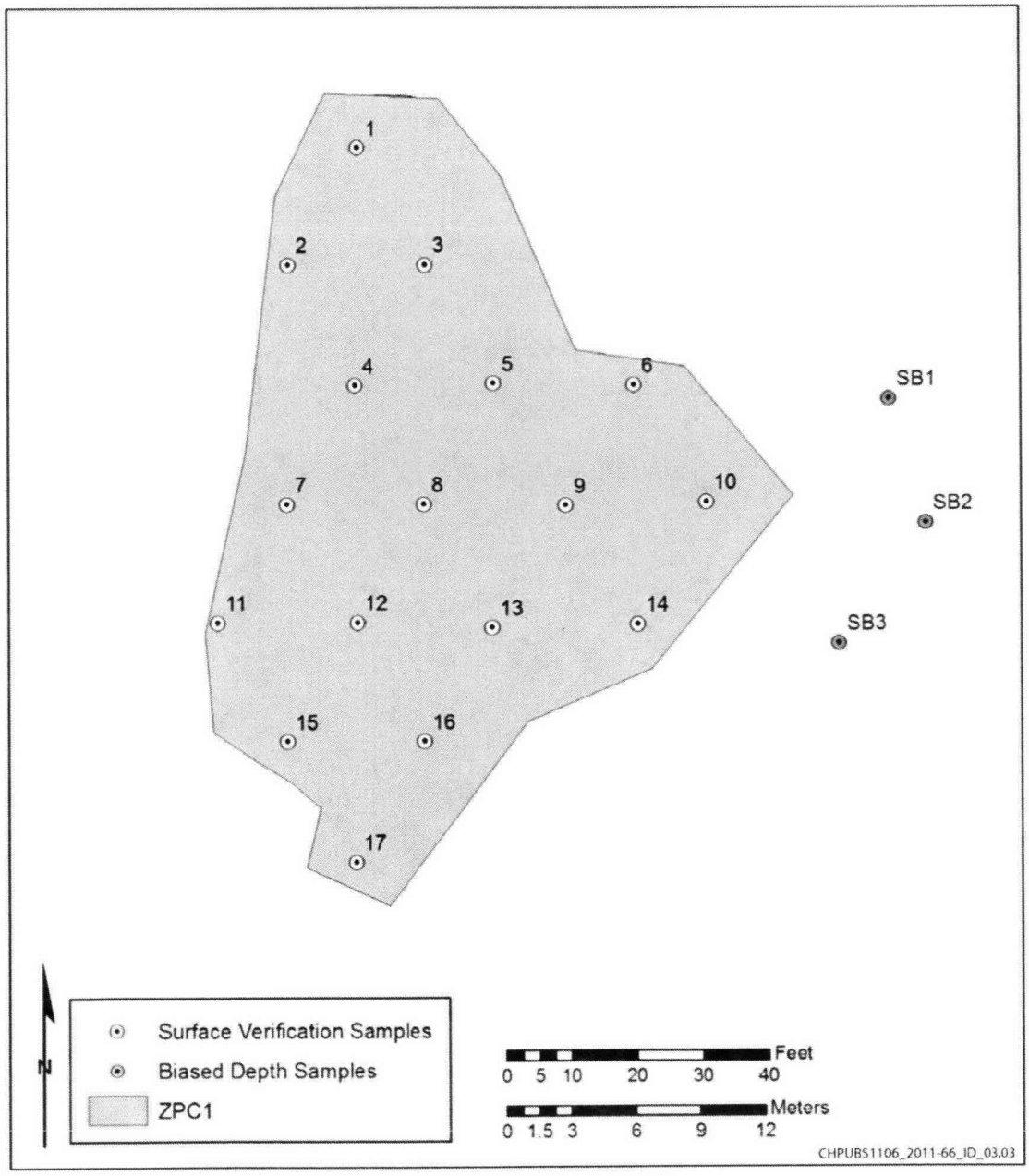

Figure 3-3. ZPC 1 Verification Sample Locations

3.1.4 Backfill and Revegetation

As described in Sections 2.1 and 5.5.1 of the RAWP, backfill and/or contouring may take place at the 600-40 waste site upon concurrence by the signing parties that the RAOs have been attained. Finalization of a backfill concurrence form provided to the agency(ies) provided concurrence that the waste site had achieved the established RAOs; therefore, backfill and/or contouring proceeded at the 600-40 waste site. The backfill concurrence form was approved by the regulatory agency(ies) on May 16, 2011. Backfill of the 600-40 waste site was completed on May 26, 2011.

In accordance with the ecological compliance review conducted for the 600-40 waste site, this area does not meet the requirements of a Level III or Level IV designation as described in *Hanford Site Biological Resources Management Plan* (DOE/RL-96-32); therefore, revegetation at the 600-40 waste site is not required. DOE may elect to revegetate the 600-40 waste site at a future date for aesthetic purposes.

3.1.5 Statement of Protectiveness

In accordance with the SAP, the soil at the 600-40 waste site has been sampled, analyzed, and evaluated. The results obtained through the implementation of the RTD alternative demonstrate that concentrations of COPCs in the soil at the 600-40 waste site are less than RALs (discussed in further detail in Chapter 5). These results also indicate that residual concentrations will support reasonably anticipated future land use recognized in the EE/CA and Action Memorandum, and demonstrate that residual concentrations of COPCs in soil throughout the site are unlikely to affect groundwater or the Columbia River. As summarized in Chapter 5, a review of the sampling results showed that the removal action at the 600-40 waste site has demonstrated achievement of the RAOs established in the Action Memorandum and identified in the RAWP.

4 Chronology of Events

Table 4-1 presents a chronology of major events associated with sampling the subject waste site. The chronology includes approval of the regulatory documents that form the basis of the removal action and key fieldwork activities associated with the removal action.

Table 4-1. Removal Action Chronology

Date	Event
June 5, 2009	DOE/RL-2008-44, *Engineering Evaluation/Cost Analysis for the 200-MG-1 Operable Unit Waste Sites*, approved
July 31, 2009	DOE/RL-2009-48, Revision. 0, *Action Memorandum for Non-Time-Critical Removal Action for 11 Waste Sites in 200-MG-1 Operable Unit*, approved
September 1, 2009	DOE/RL-2009-60, Revision 0, *Sampling and Analysis Plan for Selected Sites 200-MG-1 Operable Unit Waste Sites*, approved
November 25, 2009	DOE/RL-2009-53, Revision 0, *Removal Action Work Plan for 11 Waste Sites in the 200-MG-1 Operable Unit*, approved
December 4, 2009	Site evaluation conducted
March 1, 2010	Investigative sampling completed
March 31, 2010	RTD of the 600-40 waste site commenced
April 19 2010	In process sampling at the 600-40 waste site commenced
June, 2010	RTD of the 600-40 waste site completed
August 5, 2010	In process sampling at the 600-40 waste site completed
October 7, 2010	DOE/RL-2009-53, Rev. 1, *Removal Action Work Plan for 48 Waste Sites in the 200-MG-1 Operable Unit*, approved
November 1, 2010	Verification Sampling at the 600-40 waste site commenced
January 10, 2011	DOE/RL-2009-60, Rev. 1, approved
April 20, 2011	Verification Sampling at the 600-40 waste site completed
May 16, 2011	Backfill Concurrence Form approved
May 26, 2011	Backfill of the 600-40 waste site completed

5 Performance Standards and Construction Quality Control

This chapter addresses the process for demonstrating achievement of performance standards, which include the attainment of RALs and RAOs and maintaining the required quality control (QC) during removal activities.

5.1 Attainment of Performance Standards

Soil sampling, laboratory analysis, and data evaluation conducted after RTD activities confirm that the 600-40 waste site meets the RAOs identified in the Action Memorandum, and residual levels of COPCs remaining in the soil are less than or equal to the RALs. As shown in Table 5-1, RAOs 1 and 2 are achieved by preventing unacceptable risk to human health and the environment through direct exposure to soils and debris by reducing the soil concentration of COPCs to less than or equal to the RALs. RAO 3 is achieved by preventing migration and/or leaching of radiological and nonradiological contamination to groundwater by reducing the soil concentration of COPCs to less than or equal to the RALs. RAO 4 is met through cultural and ecological evaluation, performed in August 2009 and September 2009, respectively, and by the implementation of considerations and recommendations during work activities. Demonstration that the soil concentration of COPCs is less than or equal to RALs (Table 5-2) meets RAOs 1, 2, and 3.

Per the methodology prescribed in the RAWP and SAP, initial sampling of the 600-40 waste site consisted of visual inspection, radiological survey, and soil sampling performed in March 2010. Resulting data from the sampling evolution indicating concentrations of COPCs greater than the RALs initiated the excavation of impacted soils, performed between March and June 2010, followed by verification sampling performed between November 2010 and April 2011. The maximum analytical results from verification sampling, provided in Table 5-2 demonstrate that there are no chemical COPC concentrations greater than the RALs remaining in soil at the 600-40 waste site, thus meeting RAOs 1, 2, and 3. A complete summary of analytical results can be found in Tables A-1 through A-3 (Appendix A).

This waste site and the data obtained from the subject sampling evolutions will be included in the risk assessment and RI/FS for final remedial decisions for the Outer Area.

Table 5-1. Summary of Attainment of Cleanup Objectives

Removal Action Objective	Compliance Methods	Removal Action Objectives Attained?
RAO 1: Prevent unacceptable risk to human health and ecological receptors from exposure to soils and/or debris contaminated with nonradiological constituents to 4.6 m (15 ft) bgs at concentrations above the appropriate RALs.	Achieved through verification soil sampling, performed upon completion of RTD activities, which demonstrated that all individual COPC concentrations are less than the RALs.	Yes
RAO 2: Prevent unacceptable risk to human health and ecological receptors from exposure to soils and/or debris contaminated with radiological constituents to 4.6 m (15 ft) bgs at concentrations above the appropriate RALs.	Achieved through the radiological survey of soil, conducted during site evaluation and sampling evolutions, which resulted in no measured dose rates greater than background established for the waste site and no detectable radiological contamination. This demonstrates that all individual radiological COPC concentrations are less than or equal to the RALs.	Yes
RAO 3: Control the sources of groundwater contamination to minimize impacts to groundwater resources, protect the Columbia River from adverse impacts, and reduce the degree of groundwater cleanup that may be required under future actions.	Achieved through verification soil sampling, performed upon completion of RTD activities, which demonstrated that concentrations of COPCs in soil were less than established RALs.	Yes
RAO 4: Prevent adverse impacts to cultural resources and threatened or endangered species, and minimize wildlife habitat disruption.	Achieved through cultural and ecological evaluations and the implementation of considerations during removal activities to minimize wildlife habitat and cultural artifact disruption.	Yes

5.1.1 Performance Standard Documentation

This report addresses the individual 600-40 waste site and not an OU; therefore, this section is not applicable.

5.1.2 Response Action Objectives Verification

RAO performance standard attainment involves comparison of soil analytical data to RALs. The RALs, identified in the Action Memorandum and RAWP, are directly compared to the maximum results from the verification sampling analytical data (Table 5-2). The full set of analytical results from all samples collected is provided in Appendix A.

5.1.3 Contaminant Identification

Table 5-2 provides a direct comparison of verification sample analytical results for each nonradiological COPC, against the established RALs for the 600-40 waste site.

Table 5-2. Comparison of Verification Sample Results Against Removal Action Levels for Contaminants of Potential Concern

Contaminant of Potential Concern	Background Concentration[a] (mg/kg)	Removal Action Level (mg/kg)	Maximum Concentration in Soil (mg/kg)	Does the Maximum Exceed Removal Action Levels?
Metals				
Antimony	5	5.4	U	No
Arsenic	6.5	6.5[b]	4.48	No
Barium	132	1,650	142	No
Beryllium	1.51	63.2	0.618	No
Boron	N/A	210	31.7	No
Cadmium	0.81	0.81[b]	0.155	No
Chromium (Total)	18.5	2,000	22.3	No
Chromium (VI)[c]	N/A	2.1[c]	0.164	No
Cobalt	15.7	15.7[b]	13.5	No
Copper	22.0	284	27.8	No
Lead	10.2	250	12.2	No
Lithium	33.5	160	9.04	No
Manganese	512	512[b]	470	No
Mercury	0.33	2.09	0.17	No
Nickel	19.1	130	23.2	No
Selenium	0.78	5.2	2.56	No
Silver	0.73	13.6	0.17	No
Strontium	N/A	2,920	64.4	No
Thallium	0.1	1.59	0.203	No
Tin	N/A	48,000	8.24	No
Uranium (soluble salts)	3.21	3.21[b]	0.994	No
Vanadium	85.1	560	84.9	No
Zinc	67.8	5,970	88	No
Polychlorinated Biphenyls				
Aroclor 1016	N/A	0.094	U	No
Aroclor 1221	N/A	0.017[b]	U	No
Aroclor 1232	N/A	0.017[b]	U	No

Table 5-2. Comparison of Verification Sample Results Against Removal Action Levels for Contaminants of Potential Concern

Contaminant of Potential Concern	Background Concentration[a] (mg/kg)	Removal Action Level (mg/kg)	Maximum Concentration in Soil (mg/kg)	Does the Maximum Exceed Removal Action Levels?
Aroclor 1242	N/A	0.039	U	No
Aroclor 1248	N/A	0.039	U	No
Aroclor 1254	N/A	0.066	U	No
Aroclor 1260	N/A	0.5	0.15	No
Polynuclear Aromatic Hydrocarbons				
Acenaphthene	N/A	98	U	No
Acenaphthylene	N/A	98	U	No
Anthracene	N/A	2,270	U	No
Benzo[*a*]anthracene	N/A	0.86	U	No
Benzo[*a*]pyrene	N/A	0.33[b]	U	No
Benzo[*b*]fluoranthene	N/A	1.37	U	No
Benzo[*g,h,i*]perylene	N/A	2,400	U[d]	No
Benzo[*k*]fluoranthene	N/A	1.37	U	No
Chrysene	N/A	9.56	U	No
Dibenz[*a,h*]anthracene	N/A	1.37	U[d]	No
Fluoranthene	N/A	631	U	No
Fluorene	N/A	101	U	No
Indeno[*1,2,3-cd*]pyrene	N/A	1.37	U[d]	No
Naphthalene	N/A	4.46	U	No
Phenanthrene	N/A	1,140	U	No
Pyrene	N/A	655	U	No
Volatile Organic Analyte				
Carbon Tetrachloride	N/A	0.005	U	No
Total Petroleum Hydrocarbons				
Diesel	N/A	2,000	1300	No
Kerosene	N/A	2,000	U	No

a. If Hanford Site-specific background data are not available, values are then taken from Ecology Publication 94-115, *Natural Background Soil Metals Concentrations in Washington State* (Ecology Publication 94-115). Hanford Site background values are available from nonradiological background data in DOE/RL-92-24, *Hanford Site Soil Background: Part 1, Soil Background for Nonradioactive Analytes*, Table D9-2.

Table 5-2. Comparison of Verification Sample Results Against Removal Action Levels for Contaminants of Potential Concern

Contaminant of Potential Concern	Background Concentration[a] (mg/kg)	Removal Action Level (mg/kg)	Maximum Concentration in Soil (mg/kg)	Does the Maximum Exceed Removal Action Levels?

b. Where cleanup levels are less than background or RDLs, cleanup levels default to background or RDLs in accordance with "Model Toxics Control Act—Cleanup," "Overview of Cleanup Standards" (WAC 173-340-700(6)(d)), and "Analytical Considerations" (WAC 173-340-707(2)), respectively.

c. Based on process knowledge, chromium (VI) is not expected to be present at 200-MG-1 OU waste sites. The following values are given to help guide cleanup:

- 0.2 mg/kg is the calculated value using K_d=0, based on PNNL-13895, *Hanford Contamination Distribution Coefficient Database and Users Guide*, and WAC 173-340-747, "Deriving Soil Concentrations for Groundwater Protection," equation 747-1.
- 2.1 mg/kg is based on DOE/RL-96-17, *Remedial Design Report/Remedial Action Work Plan for the 100 Area*.
- 18.4 mg/kg is based on Ecology, 2007, Cleanup Levels and Risk Calculations database.

d. Laboratory method detection limits were greater than the required detection limits per DOE/RL-2009-53, *Removal Action Work Plan for 48 Waste Sites in the 200-MG-1 Operable Unit*; however, analytical results are less than the established removal action levels and meet the corresponding removal action objectives.

U = result is less than laboratory detection limit

5.2 Construction Quality Assurance/Quality Control

No construction-related aspects were implemented as part of the selected alternative for the 600-40 waste site; therefore, this section is not applicable.

5.3 Cleanup Verification Quality Assurance/Quality Control

A data quality assessment (DQA) review was performed to compare the sampling approach and analytical data with the sampling and data requirements specified by the SAP. This review involves evaluation of the data to determine if they are of the right type, quality, and quantity to support the intended use (EPA-540-R-00-007, *Soil Screening Guidance for Radionuclides: User's Guide*). The assessment review completes the data life cycle (i.e., planning, implementation, and assessment) that was initiated by the data quality process.

Level C data validation as defined in the contractors' validation procedures, which are based on EPA functional guidelines (for example, Bleyler, 1988a, *Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses*; Bleyler 1988b, *Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses*), was performed for the entire sampling and analysis data package for the samples collected for the 600-40 waste site. Level C validation is a review of the QC data and specifically requires verification of deliverables and requested versus reported analyses and qualification of the results based on: analytical holding times; method blank results; matrix spikes/matrix spike duplicates; surrogate recoveries; duplicates; and analytical method blanks.

Specific data quality objectives for the site are found in the SAP.

All of the sampling and analysis data generated from the initial, in process, and verification sampling of the 600-40 waste site are tracked through Hanford Environmental Information System (HEIS) identification numbers. All of the sampling and analysis data for the 600-40 waste site were found to be useable for decision-making purposes as provided in the following summary:

HEIS Identification Numbers: B249F7, B249F8, B249F3, B249F4, B249F5, B249F9, B249H0, B249H1, B25794, B25796, B25798, B257B0, B257B2, B257B4, B257B6, B257C0, B257C2, B257C4, B257C6, B257C8, B25V39/B25V44, B27345/B27349, B27346/B27350, B27347/B27351, B28P15/B28R79, B28P16/B28P33, B28P17/B28P34, B28P18/B28P35, B28P19/B28P36, B28P20/B28P37, B28P21/B28P38, B28P22/B28P39, B28P23/B28P40, B28P24/B28P41, B28P25/B28P42, B28P26/B28P43, B28P27/B28P44, B28P28/B28P45, B28P29/B28P46, B28P30/B28P47, B28P31/B28P48,B28P69, B28P70, B28P71, B28P72, B28P74, B28P75, B28P76, B28P78, B28P80, B28P81, B28P82, B28P83.

Blanks: Equipment blanks (B249H2/B24CK0, B257D6/B257D7, B27354, B28PL6, and B28PL7) and field trip/transfer blanks (B249H3, B257D8, B25VL4, B27353, B28PM1, and B28PM2) were received intact to the laboratory and holding times were acceptable.

Field Duplicates: The duplicate (B249F6, B257B8, B28P32/B28P49, and B28P77/B28PC8) results were acceptable.

Data Completeness: Analytical reports submitted for validation and verified for completeness based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage was 100 percent. The data has been determined to be useable for decision-making purposes. The final results, narrative supporting the sampling analysis activities and findings, and copies of chains of custody were transmitted in letter reports from the laboratory.

Field Screening: Relative to analytical data in sample media, physical data, and/or field screening results are of lesser importance in making inferences of risk. Because of the secondary importance of such data, no validation for physical property data and/or field screening results was performed. However, field quality assurance (QA)/QC was reviewed to ensure that the data are useable. Field instrumentation, calibration, and QA checks were performed in accordance with the following.

- Calibration of radiological field instruments (such as Geiger-Müller and portable alpha meters) on the Hanford Site is performed under contract by Pacific Northwest National Laboratory, as specified in their program documentation.
- Daily calibration checks are performed and documented for each instrument used in support of waste site sampling and investigation. These checks are made on standard materials that are sufficiently like the matrix under consideration that direct comparison of data can be made. Daily calibration checks of radiological field instruments were performed by trained and qualified radiological control technicians in accordance with established program requirements.

The review and approval of completed field radiation surveys by the radiological controls organization represents the data validation and usability review for handheld field radiological measurements.

The DQA review for the 600-40 waste site found the analytical results to be accurate within the standard errors associated with the methods, including sampling and sample handling. The data are of the correct type, quality, and quantity to support the intended use. Detection limits, precision, accuracy, and sampling data group completeness were assessed to determine if any analytical results should be rejected because of QA/QC deficiencies. All analytical data were found acceptable for decision-making purposes. All of the sampling analytical data are stored in HEIS.

5.4 Regulatory Oversight

This document provides a summary of the removal action taken at the 600-40 waste site; it shows a comparison of the data collected to RALs authorized in approved regulatory documents and provides the

basis to reclassify the waste site status (see Chapter 9). Though this report does not require approval by Ecology or EPA, concurrence of those agencies is necessary, under CERCLA Section 120 and the Tri-Party Agreement, for determinations concerning follow-on remedial actions. This report is therefore provided to the agency (or agencies) for review, in accordance with the approval process for waste site reclassification, as supporting documentation. Upon approval of the waste site reclassification, a copy of this report shall be maintained in the Administrative Record. No additional regulatory oversight was required for the sampling at the 600-40 waste site.

6 Final Inspection and Certifications

There were no final inspections or certification required in the implementation of the selected alternative for the 600-40 waste site; therefore, this section is not applicable.

7 Operations & Maintenance Activities

This chapter discusses the operations and maintenance (O&M) for the 600-40 waste site.

7.1 Remedy-Related Operations and Maintenance or Monitoring

There are no O&M activities or monitoring requirements for the 600-40 waste site; therefore, this section is not applicable.

7.2 Institutional Controls

Based on the analyses performed and presented in this report, there are no waste site specific institutional controls required at the 600-40 waste site; therefore, this section is not applicable.

7.3 Five-Year Reviews

Five-year reviews are required by CERCLA for post-ROD remedial actions, but do not apply to the 600-40 waste site. This waste site and the data obtained from the subject sampling evolution will be included in the risk assessment and RI/FS for final remedial decision for the Outer Area.

8 Summary of Project Costs

For the purposes of reporting costs of removal action for the 600-40 waste site, costs are prorated utilizing an activity/schedule-based methodology. This method is not considered to be audit quality data. Actual costs for waste site cleanup will continue to be collected for each OU or closure area in accordance with the current cost tracking methodology (Table 8-1). These costs will then be included, in accordance with CERCLA requirements, in the response action report for the final remedial action of the OU or closure area.

Table 8-1. Cost Summary

Cost Item	Actual Cost Fiscal Year 2010 ($)	Actual Cost Fiscal Year 2011 ($)	Actual Total Cost ($)
Removal Action Capital (Construction) Costs	0	0	0
Removal Action Operating Costs	167,933.75	34,032.75	201,966.51
Total Removal Action Cost	167,933.75	34,032.75	201,966.51
Projected Yearly Operations and Maintenance Costs	0	0	0

9 Waste Site Reclassification

The waste site reclassification form for the subject waste site is proposed and processed in accordance with the methods and definitions described in *Tri-Party Agreement Handbook Management Procedures* (RL-TPA-90-0001), TPA-MP-14, "Maintenance of the WIDS." Reclassification form 2011-048 for the 600-40 waste site proposes the status of this waste site be changed to "interim closed out." Per TPA-MP-14, "interim closed out" status indicates that a site meets the cleanup standards specified in the approved Action Memorandum (i.e., the interim response action decision document). This site will be evaluated under the cleanup standards established for the final ROD for the Outer Area.

10 Observations and Lessons Learned

There were no observations or lessons learned applicable for inclusion in this report.

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Appendix A

Sampling Results for the 600-40 Waste Site

Appendix A

Sampling Results for the 600-40 Waste Site

This appendix contains laboratory analytical results, provided in Tables A-1 through A-3, from the sampling conducted at the 600-40 waste site. The following information is provided in the table headings: Hanford Environmental Information System identification numbers, field sample identifier, and sample depth. Depths provided in the tables are sample depth below the base of the excavation. Surface samples are collected from 0 to 0.3 m (0 to 1 ft) below ground surface (bgs).

Table A-1 provides analytical results for nonradiological contaminants from samples collected during the initial phase of sampling. Analytical results from the three zones of potential contamination (ZPCs) did not meet the established removal action levels (RALs), therefore requiring removal, treatment, and disposal (RTD).

Table A-2 provides analytical results from in process samples collected from ZPC 1. The analytical results from these in process samples were used to further refine the vertical and lateral extents of excavation during RTD activities.

Tables A-3a through A-3c include final verification sampling results for nonradiological contaminants of potential concern, results of which demonstrate achievement of the established RALs at the 600-40 waste site.

Table A-1. Analytical Results for Initial Sampling for Nonradiological Contaminants

Contaminant	Removal Action Levels[a]	Required Detection Limit	Maximum Reported Laboratory Method Detection Limit	Background Concentration[b]	B249F7 ZPC 2 Surface	B249F8 ZPC 2 Surface	B249F9 ZPC 2 Surface	B249F3 ZPC 1 Surface	B249F4 ZPC 1 Surface	B249F5 ZPC 1 Surface	B249H0 ZPC 3 Surface	B249H1 ZPC 3 Surface
Metals	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Antimony	5.4	0.6	0.302	5	0.38	U	U	0.53	0.77	0.45	U	0.75
Arsenic	6.5[c]	1	0.403	6.5	2.15	2.64	2.54	2.84	3.94	2.59	2.25	2.51
Barium	1,650	2	0.201	132	76	72.4	71	57.2	67.5	69.9	74	79.2
Beryllium	63.2	0.5	0.4	1.51	U	U	U	U	0.417	U	U	U
Boron	210	2	1.9	N/A	29.1	52.4	35.4	29.4	29.7	28.8	28.9	29.3
Cadmium	0.81[c]	0.5	0.101	0.81	0.3	0.17	0.14	0.11	0.21	0.1	0.12	U
Chromium (Total)	2,000	1	0.503	18.5	8.15	10.4	9.08	8.22	8.7	9.21	10.5	9.96
Chromium (VI)	N/A	0.5	0.47	N/A	U	U	U	U	U	U	U	U
Cobalt	15.7[c]	2	0.0504	15.7	6.83	7.09	7.41	7.2	7.34	6.63	6.94	7.04
Copper	284	1	0.101	22	10.9	11	12.8	13.1	12.8	10.4	11.4	13.1
Lead	250	5	0.101	10.2	167	5.28	5.36	8.34	6.54	6.64	5.18	5
Lithium	160	2.5	0.4	33.5	7.77	7.66	8.41	7.37	8.51	8.79	7.7	8.58
Manganese	512[c]	5	0.101	512	326	348	341	336	347	325	354	312
Mercury	2.09	0.2	0.0504	0.33	U	U	U	0.05	U	U	U	U
Nickel	130	4	0.201	19.1	7.68	8.74	9.59	7.94	9.12	8.71	9.2	9.48
Selenium	5.2	1	0.302	0.78	0.93	0.92	0.76	1.36	1.02	1.02	0.74	0.67
Silver	13.6	0.2	0.101	0.73	U	U	U	U	0.12	U	U	U
Strontium	2,920	1	0.101	N/A	22.4	18.8	24.6	19.6	22.6	19.7	22.9	24.4
Thallium	1.59	1	0.101	0.1	U	U	U	U	0.17	U	U	U
Tin	48,000	10	0.0504	N/A	0.99	0.48	0.43	0.63	0.63	0.53	0.47	0.41
Uranium	3.21[c]	1	0.0504	3.21	0.42	0.4	0.53	0.52	0.54	0.36	0.47	0.39
Vanadium	560	2.5	0.201	85.1	44.3	45.8	50.3	47.8	49.2	41.9	44.6	45
Zinc	5,970	1	0.806	67.8	181	164	47.2	78.2	53.7	79.9	39.6	38.2
Anions	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Nitrate-N	40	0.75	1.6[d]	11.8	2.6	14.4	55.3	1.65	6.68	U	1.6	3.42

Table A-1. Analytical Results for Initial Sampling for Nonradiological Contaminants

Contaminant	Removal Action Levels[a]	Required Detection Limit	Maximum Reported Laboratory Method Detection Limit	Background Concentration[b]	B249F7 ZPC 2 Surface	B249F8 ZPC 2 Surface	B249F9 ZPC 2 Surface	B249F3 ZPC 1 Surface	B249F4 ZPC 1 Surface	B249F5 ZPC 1 Surface	B249H0 ZPC 3 Surface	B249H1 ZPC 3 Surface
Polynuclear Aromatic Hydrocarbons	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Acenaphthene	98	0.33	6.1[d]	N/A	U	U	U	U	U	U	U	U
Acenaphthylene	98	0.33	6.1[d]	N/A	U	U	U	U	U	U	U	U
Anthracene	2,270	0.33	6.1[d]	N/A	U	U	U	U	U	U	U	U
Benzo(a)anthracene	0.86	0.33	6.1[e]	N/A	0.57	U	1.1	U	U	U	U	U
Benzo(a)pyrene	0.33[c]	0.33	8.7[e]	N/A	1	U	U	U	U	U	U	U
Benzo(b)fluoranthene	1.37	0.33	7.4[e]	N/A	1.9	U	U	U	U	U	U	U
Benzo(k)fluoranthene	1.37	0.33	7.4[e]	N/A	0.92	U	U	U	U	U	U	U
Benzo(g,h,i)perylene	2,400	0.33	9.6[d]	N/A	0.5	U	U	U	U	U	U	U
Chrysene	9.56	0.33	6.1[d]	N/A	1.4	U	U	U	U	U	U	U
Dibenzo(a,h)anthracene	1.37	0.33	11[e]	N/A	U	U	U	U	U	U	U	U
Fluoranthene	631	0.33	6.1[d]	N/A	1.3	U	U	U	U	U	U	U
Fluorene	101	0.33	6.1[d]	N/A	U	U	U	U	U	U	U	U
Indeno(1,2,3-cd)pyrene	1.37	0.33	10[e]	N/A	0.67	U	U	U	U	U	U	U
Naphthalene	4.46	0.33	6.1[e]	N/A	U	U	U	U	U	U	U	U
Phenanthrene	1,140	0.33	6.1[d]	N/A	0.7	U	U	U	U	U	U	U
Pyrene	655	0.5	6.1[d]	N/A	1.1	U	U	U	U	U	U	U
Polychlorinated Biphenyls	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Aroclor 1016	0.094	0.017	0.087[d]	N/A	U	U	U	U	U	U	U	U
Aroclor 1221	0.017[c]	0.017	0.17[e]	N/A	U	U	U	U	U	U	U	U
Aroclor 1232	0.017[c]	0.017	0.087[e]	N/A	U	U	U	U	U	U	U	U
Aroclor 1242	0.039	0.017	0.087[e]	N/A	U	U	U	U	U	U	U	U
Aroclor 1248	0.039	0.017	0.087[e]	N/A	U	U	U	U	U	U	U	U
Aroclor 1254	0.066	0.017	0.087[e]	N/A	U	U	U	U	U	U	U	U
Aroclor 1260	0.5	0.017	0.087[d]	N/A	U	U	0.0066	1.2	U	U	U	U

Table A-1. Analytical Results for Initial Sampling for Nonradiological Contaminants

Contaminant	Removal Action Levels[a]	Required Detection Limit	Maximum Reported Laboratory Method Detection Limit	Background Concentration[b]	B249F7 ZPC 2 Surface	B249F8 ZPC 2 Surface	B249F9 ZPC 2 Surface	B249F3 ZPC 1 Surface	B249F4 ZPC 1 Surface	B249F5 ZPC 1 Surface	B249H0 ZPC 3 Surface	B249H1 ZPC 3 Surface
Volatile Organic Analytes	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Carbon Tetrachloride	0.005	0.005	0.0012	N/A	U	U	U	U	U	U	U	U
Total Petroleum Hydrocarbons	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Diesel	2,000	5	110[d]	N/A	U	U	U	U	U	U	U	U
Kerosene	2,000	5	110[d]	N/A	U	U	U	U	U	U	U	U

a. Removal action levels are from DOE/RL-2009-53, *Removal Action Work Plan for 48 Waste Sites in the 200-MG-1 Operable Unit* (RAWP).

b. If Hanford Site-specific background data are not available, values are then taken from Ecology Publication 94-115, *Natural Background Soil Metals Concentrations in Washington State*. Hanford Site background values are available in nonradiological background data from DOE/RL-92-24, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, Rev. 4, Table D39-2.

c. Where cleanup levels are less than background or required detection limits, cleanup levels default to background or required detection limits per Ecology Publication 94-06, *Model Toxics Control Act Cleanup Regulation Chapter 173-340 WAC* ; WAC 173-340-700(4)(d), "Model Toxics Control Act—Cleanup," "Overview of Cleanup Standards;" and WAC 173-340-707(2), "Model Toxics Control Act—Cleanup," "Analytical Considerations," respectively.

d. Maximum reported laboratory method detection limits were greater than the required detection limit per the RAWP (DOE/RL-2009-53); however, analytical results are below the established removal action levels and meet the corresponding removal action objectives.

e. Maximum reported laboratory method detection limits were greater than the required detection limit per the RAWP (DOE/RL-2009-53) and greater than the established removal action levels.

N/A = not available

U = analyzed for but not detected above laboratory method detection limit

Table A-2. Analytical Results for In Process Sampling for Nonradiological Contaminants of Potential Concern

Contaminant of Potential Concern	Removal Action Levels[a]	Required Detection Limit	Maximum Reported Laboratory Method Detection Limit	Background Concentration[b]	B25794 ZPC 1-1 Surface	B25796 ZPC 1-2 Surface	B25798 ZPC 1-3 Surface	B257B0 ZPC 1-4 Surface	B257B2 ZPC 1-5 Surface	B257B4 ZPC 1-6 Surface	B257B6 ZPC 1-7 Surface	B25V39 B25V44 ZPC 1 Surface	B27349 B27345 ZPC 1 Surface	B27350 B27346 ZPC 1 Surface	B27351 B27347 ZPC 1 Surface
Metals	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Antimony	5.4	0.6	0.302	5	U	U	0.64	0.43	U	U	U	0.7	U	U	U
Arsenic	6.5[c]	1	0.402	6.5	2.65	3.16	2.64	2.82	2.14	1.93	2.38	3.44	1.51	1.65	1.66
Barium	1,650	2	0.201	132	76.6	63	71.3	70.3	51	49.8	49.6	83.4	37.2	47.2	69.2
Beryllium	63.2	0.5	0.0503	1.51	0.35	0.39	0.3	0.25	0.28	0.35	0.24	0.1	0.24	0.21	0.32
Boron	210	2	1.9	N/A	21.4	25.1	24.6	24	26.2	24.4	26.7	16.2	10.5	10.6	19.9
Cadmium	0.81[c]	0.5	0.101	0.81	U	U	U	0.1	U	U	U	1.44	U	U	U
Chromium (Total)	2,000	1	0.503	18.5	9.63	8.1	8.88	8.96	7.22	6.7	4.38	10.4	2.51	3.37	6.57
Chromium (VI)	N/A	0.5	0.1	N/A	U	U	0.12	U	U	0.1	0.11	U	U	U	U
Cobalt	15.7[c]	2	0.0503	15.7	7.26	9.42	8.02	7.85	8.59	8.18	9.02	3.7	7.76	7.41	7.55
Copper	284	1	0.101	22	11	20.4	13.3	13	14.5	13.5	19.1	56.1	14.1	15.4	12.8
Lead	250	5	0.101	10.2	5.34	6.72	6.87	7.53	4.11	4.22	3.38	87.8	2.94	4.92	5.06
Lithium	160	2.5	0.4	33.5	6.72	9.18	6.36	7.09	6.39	5.5	4.71	8.33	4.15	4.32	7.25
Manganese	512[c]	5	0.101	512	323	344	335	327	324	305	316	197	245	258	325
Mercury	2.09	0.2	0.0503	0.33	U	U	U	U	U	U	U	4.78	U	0.17	U
Nickel	130	4	0.201	19.1	9.02	10.3	9.29	9.36	9.66	8.1	7.2	6.45	6.53	6.69	8.76
Selenium	5.2	1	0.302	0.78	0.84	1.27	1.04	1.49	1.5	1.18	1.68	0.54	1.37	1.1	1.03
Silver	13.6	0.2	0.101	0.73	U	U	U	U	U	U	U	5.95	U	0.17	U
Strontium	2,920	1	0.101	N/A	22.9	35.7	25.9	26.2	22.4	19.9	20.5	176	19.1	26.2	25.8
Thallium	1.59	1	0.101	0.1	U	0.09	U	U	U	U	U	U	U	U	U
Tin	48,000	10	0.0503	N/A	0.69	0.51	0.51	0.58	0.43	0.77	1.37	218	0.54	8.24	0.27
Uranium	3.21[c]	1	0.0503	3.21	0.47	0.54	0.42	0.62	0.44	0.37	0.38	0.582	0.34	0.38	0.32
Vanadium	560	2.5	0.201	85.1	44.3	58.2	50	47.2	55.9	56.4	71.8	8.45	18.1	20.9	21.7
Zinc	5,970	1	0.805	67.8	40.6	47.5	45.3	46.6	42.8	42.5	51.2	1250	26.7	75.5	30.2
Anions	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Nitrate-N	40	0.75	6.2[d]	11.8	U	U	U	7.16	U	U	6.32	627.7	1.68	13.8	1.59

Table A-2. Analytical Results for In Process Sampling for Nonradiological Contaminants of Potential Concern

Contaminant of Potential Concern	Removal Action Levels[a]	Required Detection Limit	Maximum Reported Laboratory Method Detection Limit	Background Concentration[b]	B25794 ZPC 1-1 Surface	B25796 ZPC 1-2 Surface	B25798 ZPC 1-3 Surface	B257B0 ZPC 1-4 Surface	B257B2 ZPC 1-5 Surface	B257B4 ZPC 1-6 Surface	B257B6 ZPC 1-7 Surface	B25V39 B25V44 ZPC 1 Surface	B27349 B27345 ZPC 1 Surface	B27350 B27346 ZPC 1 Surface	B27351 B27347 ZPC 1 Surface
Polynuclear Aromatic Hydrocarbons	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Acenaphthene	98	0.33	0.8[d]	N/A	U	U	U	U	U	U	U	U	U	U	U
Acenaphthylene	98	0.33	0.8[d]	N/A	U	U	U	U	U	U	U	U	U	U	U
Anthracene	2,270	0.33	0.8[d]	N/A	U	U	U	U	U	U	U	U	U	U	U
Benzo(a)anthracene	0.86	0.33	0.8[d]	N/A	U	U	U	U	U	U	U	U	U	U	U
Benzo(a)pyrene	0.33[c]	0.33	1.2[e]	N/A	U	U	U	U	U	U	U	U	U	U	U
Benzo(b)fluoranthene	1.37	0.33	1.1[d]	N/A	U	U	U	U	U	U	U	U	U	U	U
Benzo(k)fluoranthene	1.37	0.33	1.1[d]	N/A	U	U	U	U	U	U	U	U	U	U	U
Benzo(g,h,i)perylene	2,400	0.33	1.7[d]	N/A	U	U	U	U	U	U	U	U	U	U	U
Chrysene	9.56	0.33	0.8[d]	N/A	U	U	U	U	U	U	U	U	U	U	U
Dibenzo(a,h)anthracene	1.37	0.33	1.8[e]	N/A	U	U	U	U	U	U	U	U	U	U	U
Fluoranthene	631	0.33	0.8[d]	N/A	U	U	U	U	U	U	U	U	U	U	U
Fluorene	101	0.33	0.8[d]	N/A	U	U	U	U	U	U	U	U	U	U	U
Indeno(1,2,3-cd)pyrene	1.37	0.33	1.8[e]	N/A	U	U	U	U	U	U	U	U	U	U	U
Naphthalene	4.46	0.33	0.8[d]	N/A	U	U	U	U	U	U	U	U	U	U	U
Phenanthrene	1,140	0.33	0.8[d]	N/A	U	U	U	U	U	U	U	U	U	U	U
Pyrene	655	0.5	0.8[d]	N/A	U	U	U	U	U	U	U	U	U	U	U
Polychlorinated Biphenyls	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Aroclor 1016	0.094	0.017	0.027[d]	N/A	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1221	0.017[c]	0.017	0.053[e]	N/A	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1232	0.017[c]	0.017	0.027[e]	N/A	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1242	0.039	0.017	0.027[d]	N/A	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1248	0.039	0.017	0.027[d]	N/A	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1254	0.066	0.017	0.027[d]	N/A	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1260	0.5	0.017	0.027[d]	N/A	U	U	U	0.0086	U	0.55	0.048	U	0.05	0.15	0.082

Table A-2. Analytical Results for In Process Sampling for Nonradiological Contaminants of Potential Concern

Contaminant of Potential Concern	Removal Action Levels[a]	Required Detection Limit	Maximum Reported Laboratory Method Detection Limit	Background Concentration[b]	B25794 ZPC 1-1 Surface	B25796 ZPC 1-2 Surface	B25798 ZPC 1-3 Surface	B257B0 ZPC 1-4 Surface	B257B2 ZPC 1-5 Surface	B257B4 ZPC 1-6 Surface	B257B6 ZPC 1-7 Surface	B25V39 B25V44 ZPC 1 Surface	B27349 B27345 ZPC 1 Surface	B27350 B27346 ZPC 1 Surface	B27351 B27347 ZPC 1 Surface
Volatile Organic Analytes	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Carbon Tetrachloride	0.005	0.005	0.0019	N/A	U	U	U	U	U	U	U	U	U	U	U
Total Petroleum Hydrocarbons	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Diesel	2,000	5	53[d]	N/A	U	U	U	U	U	300	61	U	150	330	240
Kerosene	2,000	5	53[d]	N/A	U	U	U	U	U	U	U	U	U	U	U

a. Removal action levels are from DOE/RL-2009-53, *Removal Action Work Plan for 48 Waste Sites in the 200-MG-1 Operable Unit* (RAWP).

b. If Hanford Site-specific background data are not available, values are then taken from Ecology Publication 94-115, *Natural Background Soil Metals Concentrations in Washington State*. Hanford Site background values are available in nonradiological background data from DOE/RL-92-24, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, Table D39-2.

c. Where cleanup levels are less than background or required detection limits, cleanup levels default to background or required detection limits per Ecology Publication 94-06, *Model Toxics Control Act Cleanup Regulation Chapter 173-340 WAC*; WAC 173-340-700(4)(d), "Model Toxics Control Act—Cleanup," "Overview of Cleanup Standards;" and WAC 173-340-707(2), "Model Toxics Control Act—Cleanup," "Analytical Considerations," respectively.

d. Maximum reported laboratory method detection limits were greater than the required detection limit per the RAWP (DOE/RL-2009-53); however, analytical results are below the established removal action levels and meet the corresponding removal action objectives.

e. Maximum reported laboratory method detection limits were greater than the required detection limit per the RAWP (DOE/RL-2009-53) and greater than the established removal action levels.

N/A = not available

U = analyzed for but not detected above laboratory method detection limit

Table A-3a. Analytical Results for Verification Sampling for Nonradiological Contaminants of Potential Concern

Contaminant of Potential Concern	Removal Action Levels[a]	Required Detection Limit	Maximum Reported Laboratory Method Detection Limit	Background Concentration[b]	B257C0 ZPC 2-8 Surface	B257C2 ZPC 2-9 Surface	B257C4 ZPC 2-10 Surface	B257C6 ZPC 3-11 Surface	B257C8 ZPC 3-12 Surface
Metals	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Antimony	5.4	0.6	0.294	5	U	U	U	U	U
Arsenic	6.5[c]	1	0.393	6.5	3.43	2.73	2.53	2.56	2.58
Barium	1,650	2	0.196	132	77.1	75.8	79	79.7	84.6
Beryllium	63.2	0.5	0.491	1.51	0.41	0.3	0.31	0.26	0.31
Boron	210	2	1.9	N/A	22	21.2	28.3	19.8	23
Cadmium	0.81[c]	0.5	0.0981	0.81	U	0.1	0.13	0.11	U
Chromium (Total)	2,000	1	0.491	18.5	10.5	10.9	10.5	9.63	11.1
Chromium (VI)	N/A	0.5	0.1	N/A	U	U	U	U	U
Cobalt	15.7[c]	2	0.0491	15.7	8.14	7.88	8.08	7.2	7.67
Copper	284	1	0.0981	22	17.4	16.5	12.8	12.8	13.9
Lead	250	5	0.0981	10.2	6.91	4.6	4.8	5.33	5.36
Lithium	160	2.5	0.4	33.5	7.9	6.87	7.18	6.93	6.91
Manganese	512[c]	5	0.0981	512	372	310	365	331	360
Mercury	2.09	0.2	0.0491	0.33	U	U	U	U	U
Nickel	130	4	0.196	19.1	10.4	11.8	9.54	9.77	10.5
Selenium	5.2	1	0.294	0.78	0.96	0.83	1.31	0.87	1.65
Silver	13.6	0.2	0.0981	0.73	U	U	U	U	U

Table A-3a. Analytical Results for Verification Sampling for Nonradiological Contaminants of Potential Concern

Contaminant of Potential Concern	Removal Action Levels[a]	Required Detection Limit	Maximum Reported Laboratory Method Detection Limit	Background Concentration[b]	B257C0 ZPC 2-8 Surface	B257C2 ZPC 2-9 Surface	B257C4 ZPC 2-10 Surface	B257C6 ZPC 3-11 Surface	B257C8 ZPC 3-12 Surface
Strontium	2,920	1	0.0981	N/A	27.4	27.8	21.7	25.3	24.8
Thallium	1.59	1	0.0981	0.1	0.12	U	U	U	U
Tin	48,000	10	0.0491	N/A	0.46	0.4	0.36	0.55	0.36
Uranium	3.21[c]	1	0.0491	3.21	0.56	0.38	0.5	0.4	0.45
Vanadium	560	2.5	0.196	85.1	45.6	49.7	51.8	45.3	45.8
Zinc	5,970	1	0.785	67.8	39.1	40.8	50.4	38.6	40.7
Anions	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Nitrate-N	40	0.75	1.60[d]	11.8	U	3.14	6.82	U	U
Polynuclear Aromatic Hydrocarbons	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Acenaphthene	98	0.33	0.16	N/A	U	U	U	U	U
Acenaphthylene	98	0.33	0.16	N/A	U	U	U	U	U
Anthracene	2,270	0.33	0.16	N/A	U	U	U	U	U
Benzo(a)anthracene	0.86	0.33	0.16	N/A	U	U	U	U	U
Benzo(a)pyrene	0.33[c]	0.33	0.24	N/A	U	U	U	U	U
Benzo(b)fluoranthene	1.37	0.33	0.21	N/A	U	U	U	U	U
Benzo(k)fluoranthene	1.37	0.33	0.22	N/A	U	U	U	U	U
Benzo(g,h,i)perylene	2,400	0.33	0.35	N/A	U	U	U	U	U

Table A-3a. Analytical Results for Verification Sampling for Nonradiological Contaminants of Potential Concern

Contaminant of Potential Concern	Removal Action Levels[a]	Required Detection Limit	Maximum Reported Laboratory Method Detection Limit	Background Concentration[b]	B257C0 ZPC 2-8 Surface	B257C2 ZPC 2-9 Surface	B257C4 ZPC 2-10 Surface	B257C6 ZPC 3-11 Surface	B257C8 ZPC 3-12 Surface
Chrysene	9.56	0.33	0.16	N/A	U	U	U	U	U
Dibenzo(a,h)anthracene	1.37	0.33	0.35	N/A	U	U	U	U	U
Fluoranthene	631	0.33	0.16	N/A	U	U	U	U	U
Fluorene	101	0.33	0.16	N/A	U	U	U	U	U
Indeno(1,2,3-cd)pyrene	1.37	0.33	0.35	N/A	U	U	U	U	U
Naphthalene	4.46	0.33	0.16	N/A	U	U	U	U	U
Phenanthrene	1,140	0.33	0.16	N/A	U	U	U	U	U
Pyrene	655	0.5	0.16	N/A	U	U	U	U	U
Polychlorinated Biphenyls	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Aroclor 1016	0.094	0.017	0.0054	N/A	U	U	U	U	U
Aroclor 1221	0.017[c]	0.017	0.011	N/A	U	U	U	U	U
Aroclor 1232	0.017[c]	0.017	0.0054	N/A	U	U	U	U	U
Aroclor 1242	0.039	0.017	0.0054	N/A	U	U	U	U	U
Aroclor 1248	0.039	0.017	0.0054	N/A	U	U	U	U	U
Aroclor 1254	0.066	0.017	0.0054	N/A	U	U	U	U	U
Aroclor 1260	0.5	0.017	0.0054	N/A	U	U	U	U	U

Table A-3a. Analytical Results for Verification Sampling for Nonradiological Contaminants of Potential Concern

Contaminant of Potential Concern	Removal Action Levels[a]	Required Detection Limit	Maximum Reported Laboratory Method Detection Limit	Background Concentration[b]	B257C0 ZPC 2-8 Surface	B257C2 ZPC 2-9 Surface	B257C4 ZPC 2-10 Surface	B257C6 ZPC 3-11 Surface	B257C8 ZPC 3-12 Surface
Volatile Organic Analytes	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Carbon Tetrachloride	0.005	0.005	0.0012	N/A	U	U	U	U	U
Total Petroleum Hydrocarbons	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Diesel	2,000	5	5.4[d]	N/A	U	U	U	U	U
Kerosene	2,000	5	5.4[d]	N/A	U	U	U	U	U

a. Removal action levels are from DOE/RL-2009-53, *Removal Action Work Plan for 48 Waste Sites in the 200-MG-1 Operable Unit* (RAWP).

b. If Hanford Site-specific background data are not available, values are then taken from Ecology Publication 94-115, *Natural Background Soil Metals Concentrations in Washington State*. Hanford Site background values are available in nonradiological background data from DOE/RL-92-24, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, Table D39-2.

c. Where cleanup levels are less than background or required detection limits, cleanup levels default to background or required detection limits per Ecology Publication 94-06, *Model Toxics Control Act Cleanup Regulation Chapter 173-340 WAC*; WAC 173-340-700(4)(d), "Model Toxics Control Act—Cleanup," "Overview of Cleanup Standards;" and WAC 173-340-707(2), "Model Toxics Control Act—Cleanup," "Analytical Considerations," respectively.

d. Maximum reported laboratory method detection limits were greater than the required detection limit per the RAWP (DOE/RL-2009-53); however, analytical results are below the established removal action levels and meet the corresponding removal action objectives.

N/A = not available

U = analyzed for but not detected above laboratory method detection limit

Table A-3b. Analytical Results for Verification Sampling for Nonradiological Contaminants of Potential Concern

Contaminant of Potential Concern	Removal Action Levels[a]	Required Detection Limit	Maximum Reported Laboratory Method Detection Limit	Background Concentration[b]	B28P15 B28R79 ZPC 1-1 Surface	B28P16 B28P33 ZPC 1-2 Surface	B28P17 B28P34 ZPC 1-3 Surface	B28P18 B28P35 ZPC 1-4 Surface	B28P19 B28P36 ZPC 1-5 Surface	B28P20 B28P37 ZPC 1-6 Surface	B28P21 B28P38 ZPC 1-7 Surface	B28P22 B28P39 ZPC 1-8 Surface	B28P23 B28P40 ZPC 1-9 Surface	B28P24 B28P41 ZPC 1-10 Surface	B28P25 B28P42 ZPC 1-11 Surface	B28P26 B28P43 ZPC 1-12 Surface	B28P27 B28P44 ZPC 1-13 Surface	B28P28 B28P45 ZPC 1-14 Surface	B28P29 B28P46 ZPC 1-15 Surface	B28P30 B28P47 ZPC 1-16 Surface	B28P31 B28P48 ZPC 1-17 Surface
Metals	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Antimony	5.4	0.6	0.33	5	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Arsenic	6.5[c]	1	0.44	6.5	2.91	2.43	2.86	2.6	3.13	2.68	2.7	2.25	1.96	2.82	2.18	2.64	3.11	2.84	1.91	2.1	2.7
Barium	1,650	2	0.22	132	87.7	41.6	73.9	46	66.3	63.4	56.8	50.6	52.8	66.5	94	70.5	73	65.7	90.4	69	94.5
Beryllium	63.2	0.5	0.11	1.51	0.339	0.183	0.303	0.309	0.266	0.398	0.205	0.183	0.231	0.367	0.37	0.272	0.396	U	0.43	0.258	0.59
Boron	210	2	4.5[d]	N/A	11.3	10.2	9.38	12.7	12.6	13.6	9.79	10.3	10.3	8.92	5.1	10.1	11.4	11.1	6.47	9.01	7.17
Cadmium	0.81[c]	0.5	0.11	0.81	0.135	U	U	U	U	U	U	U	U	U	U	0.126	0.155	U	0.125	0.143	0.129
Chromium (Total)	2,000	1	0.55	18.5	13	4.15	11	5.54	9.69	8.24	4.84	7.22	4.68	9.7	9.31	7.8	7.64	6.9	8.59	7.47	10.7
Chromium (VI)	N/A	0.5	0.11	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Cobalt	15.7[c]	2	0.11	15.7	8.38	10.6	8.67	10.5	9.68	9.34	10.9	11.2	10.7	10.2	7.93	8.37	9.56	8.9	7.35	8.05	8.99
Copper	284	1	0.11	22	13.6	17.4	14.8	16.5	16.3	17.4	17.9	17.7	17.6	16.4	12.2	16	17.9	16.3	11.2	15.2	14.1
Lead	250	5	0.11	10.2	5.96	3.63	5.46	3.68	5.07	5.04	3.64	4.29	4	5.73	7.29	5.59	6.3	5.73	6.19	5.38	6.91
Lithium	160	2.5	0.44	33.5	7.61	5.49	8.11	4.62	7.16	6.82	5.36	6.16	4.3	7.18	4.46	7.84	8.02	7.46	6.79	7.27	9.04
Manganese	512[c]	5	0.11	512	381	333	368	349	373	352	409	359	371	403	411	356	370	341	392	356	444
Mercury	2.09	0.2	0.055	0.33	0.0631	U	U	U	U	U	U	U	0.103	U	U	U	0.0712	U	U	U	U
Nickel	130	4	0.22	19.1	11.1	7.67	11.2	8.47	10.4	10.1	8.34	10.7	7.81	10.9	9.87	9.96	10.4	9.96	8.83	9.78	10.8
Selenium	5.2	1	0.33	0.78	0.91	1.77	0.967	1.92	0.935	1.7	2.46	1.29	2.56	1.17	1.07	1.36	1.73	1.56	0.666	0.958	0.943
Silver	13.6	0.2	0.11	0.73	U	U	U	U	U	U	U	U	0.119	U	U	U	U	U	U	U	U
Strontium	2,920	1	0.11	N/A	27.2	24.3	28.5	24.2	31.4	28.8	26.8	24.4	28.4	28.6	24.5	27.5	31.7	27.9	22.1	25	27.9
Thallium	1.59	1	0.11	0.1	U	U	0.119	U	U	U	U	U	U	U	0.107	0.148	0.165	0.113	U	U	0.115
Tin	48,000	10	0.11	N/A	2.62	0.496	0.659	0.496	0.449	0.454	0.504	0.513	4.94	0.938	0.299	0.487	2.7	0.354	0.304	1.92	0.327
Uranium	3.21[c]	1	0.11	3.21	0.557	0.485	0.509	0.452	0.49	0.575	0.479	0.446	0.473	0.47	0.368	0.587	0.573	0.433	0.482	0.378	0.498
Vanadium	560	2.5	0.22	85.1	50.8	77.2	51.7	80.2	65.6	53.7	84.8	84.9	83.9	68.3	32.1	30.7	33	35.5	25.3	26.6	32.6
Zinc	5,970	1	0.88	67.8	70.9	50.2	44.9	52	48.8	45.6	53.6	55	88	54.6	44.4	39.8	55.2	39.8	37.7	45.3	42.2
Anions	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Nitrate-N	40	0.75	1.7[d]	11.8	1.98	U	3.75	U	2.64	2.3	U	U	3.6	19.6	6.14	4.13	29.8	U	4.6	43.6[c]	19.4
Polynuclear Aromatic Hydrocarbons	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Acenaphthene	98	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Acenaphthylene	98	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Anthracene	2,270	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U

Table A-3b. Analytical Results for Verification Sampling for Nonradiological Contaminants of Potential Concern

Contaminant of Potential Concern	Removal Action Levels[a]	Required Detection Limit	Maximum Reported Laboratory Method Detection Limit	Background Concentration[b]	B28P15 B28R79 ZPC 1-1 Surface	B28P16 B28P33 ZPC 1-2 Surface	B28P17 B28P34 ZPC 1-3 Surface	B28P18 B28P35 ZPC 1-4 Surface	B28P19 B28P36 ZPC 1-5 Surface	B28P20 B28P37 ZPC 1-6 Surface	B28P21 B28P38 ZPC 1-7 Surface	B28P22 B28P39 ZPC 1-8 Surface	B28P23 B28P40 ZPC 1-9 Surface	B28P24 B28P41 ZPC 1-10 Surface	B28P25 B28P42 ZPC 1-11 Surface	B28P26 B28P43 ZPC 1-12 Surface	B28P27 B28P44 ZPC 1-13 Surface	B28P28 B28P45 ZPC 1-14 Surface	B28P29 B28P46 ZPC 1-15 Surface	B28P30 B28P47 ZPC 1-16 Surface	B28P31 B28P48 ZPC 1-17 Surface
Benzo(a)anthracene	0.86	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Benzo(a)pyrene	0.33[c]	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Benzo(b)fluoranthene	1.37	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Benzo(k)fluoranthene	1.37	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Benzo(g,h,i)perylene	2,400	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Chrysene	9.56	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Dibenzo(a,h)anthracene	1.37	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Fluoranthene	631	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Fluorene	101	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Indeno(1,2,3-cd)pyrene	1.37	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Naphthalene	4.46	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Phenanthrene	1,140	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Pyrene	655	0.5	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Polychlorinated Biphenyls	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Aroclor 1016	0.094	0.017	0.004	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1221	0.017[c]	0.017	0.009	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1232	0.017[c]	0.017	0.004	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1242	0.039	0.017	0.004	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1248	0.039	0.017	0.004	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1254	0.066	0.017	0.004	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1260	0.5	0.017	0.004	N/A	U	U	0.0097	0.0078	U	U	U	0.11	0.026	0.036	U	0.013	0.004	U	U	U	U
Volatile Organic Analytes	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Carbon Tetrachloride	0.005	0.005	0.001	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Total Petroleum Hydrocarbons	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Diesel	2,000	5	20[d]	N/A	U	U	U	U	U	U	U	1,300	44	56	U	U	U	U	U	U	U
Kerosene	2,000	5	20[d]	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U

Table A-3b. Analytical Results for Verification Sampling for Nonradiological Contaminants of Potential Concern

Contaminant of Potential Concern	Removal Action Levels[a]	Required Detection Limit	Maximum Reported Laboratory Method Detection Limit	Background Concentration[b]	B28P15 B28R79 ZPC 1-1 Surface	B28P16 B28P33 ZPC 1-2 Surface	B28P17 B28P34 ZPC 1-3 Surface	B28P18 B28P35 ZPC 1-4 Surface	B28P19 B28P36 ZPC 1-5 Surface	B28P20 B28P37 ZPC 1-6 Surface	B28P21 B28P38 ZPC 1-7 Surface	B28P22 B28P39 ZPC 1-8 Surface	B28P23 B28P40 ZPC 1-9 Surface	B28P24 B28P41 ZPC 1-10 Surface	B28P25 B28P42 ZPC 1-11 Surface	B28P26 B28P43 ZPC 1-12 Surface	B28P27 B28P44 ZPC 1-13 Surface	B28P28 B28P45 ZPC 1-14 Surface	B28P29 B28P46 ZPC 1-15 Surface	B28P30 B28P47 ZPC 1-16 Surface	B28P31 B28P48 ZPC 1-17 Surface

a. Removal action levels are from DOE/RL-2009-53, *Removal Action Work Plan for 48 Waste Sites in the 200-MG-1 Operable Unit* (RAWP).

b. If Hanford Site-specific background data are not available, values are then taken from Ecology Publication 94-115, *Natural Background Soil Metals Concentrations in Washington State*. Hanford Site background values are available in nonradiological background data from DOE/RL-92-24, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, Table D39-2.

c. Where cleanup levels are less than background or required detection limits, cleanup levels default to background or required detection limits per Ecology Publication 94-06, *Model Toxics Control Act Cleanup Regulation Chapter 173-340 WAC*; WAC 173-340-700(4)(d), "Model Toxics Control Act—Cleanup," "Overview of Cleanup Standards;" and WAC 173-340-707(2), "Model Toxics Control Act—Cleanup," "Analytical Considerations," respectively.

d. Maximum reported laboratory method detection limits were greater than the required detection limit per the RAWP (DOE/RL-2009-53); however, analytical results are below the established removal action levels and meet the corresponding removal action objectives.

e. Nitrate-nitrogen is not considered a COPC for the 600-40 waste site based on historical information and process knowledge. The reported maximum concentration does not indicate a source of contamination.

N/A = not available

U = analyzed for but not detected above laboratory method detection limit

Table A-3c. Analytical Results for Verification Sampling for Nonradiological Contaminants of Potential Concern

Contaminant of Potential Concern	Removal Action Levels[a]	Required Detection Limit	Maximum Reported Laboratory Method Detection Limit	Background Concentration[b]	B28P69 SB 1a (1.2 m [4 ft])	B28P70 SB 1b (2.4 m [8 ft])	B28P71 SB 1c (3.7 m [12 ft])	B28P72 SB 1d (4.6 m [15 ft])	B28P74 SB 2a (1.2 m [4 ft])	B28P75 SB 2b (2.4 m [8 ft])	B28P76 SB 2c (3.7 m [12 ft])	B28P78 SB 2d (4.6 m [15 ft])	B28P80 SB 3a (1.2 m [4 ft])	B28P81 SB 3b (2.4 m [8 ft])	B28P82 SB 3c (3.7 m [12 ft])	B28P83 SB 3d (4.6 m [15 ft])
Metals	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Antimony	5.4	0.6	0.31	5	U	U	U	U	U	U	U	U	U	U	U	U
Arsenic	6.5[c]	1	0.41	6.5	2.88	2.95	3.14	4.48	2.52	2.21	3.37	2.12	3.36	4.32	3.4	2.99
Barium	1,650	2	0.21	132	71.8	48.7	47	46.6	77.7	48.9	46.7	40.7	62.9	51.9	45.8	45.5
Beryllium	63.2	0.5	0.1	1.51	0.38	0.313	0.354	0.333	0.373	0.247	0.298	0.245	0.417	0.478	0.335	0.368
Boron	210	2	4.4[d]	N/A	26	27.3	29.2	28.4	24.6	31.4	21.1	26.5	22	26.6	26.9	26.7
Cadmium	0.81[c]	0.5	0.1	0.81	U	U	U	U	0.101	U	U	U	U	U	U	U
Chromium (Total)	2,000	1	0.51	18.5	9.58	4.97	5.55	6.41	9.41	4.85	5.9	4.82	8.68	8.7	7.06	5.59
Chromium (VI)	N/A	0.5	0.035	N/A	U	U	0.0448	U	0.043	U	0.0562	0.164	0.0719	U	U	U
Cobalt	15.7[c]	2	0.1	15.7	9.3	10.4	10	10.8	8.75	10.5	10.3	9.59	9.93	11.3	10.4	9.89
Copper	284	1	0.1	22	16	17.1	18.5	18.6	15.2	15.9	16.9	16.1	20.5	21.1	16.5	15.5
Lead	250	5	0.1	10.2	5.27	4.17	4.58	4.4	4.89	3.27	4.07	3.27	6.17	6.3	5.06	3.85
Lithium	160	2.5	0.43	33.5	4.71	3.64	4	3.55	6.1	3.64	3.6	3.08	5.06	6.6	4.82	3.83
Manganese	512[c]	5	0.1	512	372	385	386	411	361	360	376	311	384	429	381	353
Mercury	2.09	0.2	0.051	0.33	U	U	U	U	U	U	U	U	U	U	U	U
Nickel	130	4	0.21	19.1	10.6	8.87	9.07	9.71	10.4	10.9	8.7	8	11.3	13.3	10.8	10
Selenium	5.2	1	0.31	0.78	0.893	1.71	1.66	1.62	1.17	1.63	1.59	1.84	1.43	2.22	1.54	1.67
Silver	13.6	0.2	0.1	0.73	U	U	U	U	U	U	U	U	U	U	U	U
Strontium	2,920	1	0.1	N/A	27.4	24.4	32.1	32.2	25.8	21.5	25.4	23.3	31.8	26.1	26.7	28
Thallium	1.59	1	0.1	0.1	U	U	U	U	U	U	U	U	U	0.105	U	U
Tin	48,000	10	0.1	N/A	0.454	0.434	0.487	0.469	0.424	0.465	0.463	0.44	0.494	0.516	0.46	0.412
Uranium	3.21[c]	1	0.1	3.21	0.462	0.485	0.592	0.681	0.879	0.479	0.675	0.47	0.501	0.607	0.583	0.466
Vanadium	560	2.5	0.21	85.1	56.8	69.6	70.2	79.6	52.4	76.8	73.4	74.9	63.6	77.6	71.6	69.6
Zinc	5,970	1	0.82	67.8	44.4	48.2	48.9	54.6	43.3	49.3	48.1	47.1	49.6	55.5	50.6	47
Polynuclear Aromatic Hydrocarbons	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Acenaphthene	98	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U

Table A-3c. Analytical Results for Verification Sampling for Nonradiological Contaminants of Potential Concern

Contaminant of Potential Concern	Removal Action Levels[a]	Required Detection Limit	Maximum Reported Laboratory Method Detection Limit	Background Concentration[b]	B28P69 SB 1a (1.2 m [4 ft])	B28P70 SB 1b (2.4 m [8 ft])	B28P71 SB 1c (3.7 m [12 ft])	B28P72 SB 1d (4.6 m [15 ft])	B28P74 SB 2a (1.2 m [4 ft])	B28P75 SB 2b (2.4 m [8 ft])	B28P76 SB 2c (3.7 m [12 ft])	B28P78 SB 2d (4.6 m [15 ft])	B28P80 SB 3a (1.2 m [4 ft])	B28P81 SB 3b (2.4 m [8 ft])	B28P82 SB 3c (3.7 m [12 ft])	B28P83 SB 3d (4.6 m [15 ft])
Acenaphthylene	98	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U
Anthracene	2,270	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U
Benzo(a)anthracene	0.86	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U
Benzo(a)pyrene	0.33[c]	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U
Benzo(b)fluoranthene	1.37	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U
Benzo(k)fluoranthene	1.37	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U
Benzo(g,h,i)perylene	2,400	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U
Chrysene	9.56	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U
Dibenzo(a,h)anthracene	1.37	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U
Fluoranthene	631	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U
Fluorene	101	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U
Indeno(1,2,3-cd)pyrene	1.37	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U
Naphthalene	4.46	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U
Phenanthrene	1,140	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U
Pyrene	655	0.5	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U
Polychlorinated Biphenyls	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Aroclor 1016	0.094	0.017	0.004	N/A	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1221	0.017[c]	0.017	0.009	N/A	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1232	0.017[c]	0.017	0.004	N/A	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1242	0.039	0.017	0.004	N/A	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1248	0.039	0.017	0.004	N/A	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1254	0.066	0.017	0.004	N/A	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1260	0.5	0.017	0.004	N/A	U	U	U	U	U	U	U	U	U	U	U	U
Total Petroleum Hydrocarbons	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Diesel	2,000	5	4	N/A	U	U	U	U	U	U	U	U	U	U	U	U

Table A-3c. Analytical Results for Verification Sampling for Nonradiological Contaminants of Potential Concern

Contaminant of Potential Concern	Removal Action Levels[a]	Required Detection Limit	Maximum Reported Laboratory Method Detection Limit	Background Concentration[b]	B28P69 SB 1a (1.2 m [4 ft])	B28P70 SB 1b (2.4 m [8 ft])	B28P71 SB 1c (3.7 m [12 ft])	B28P72 SB 1d (4.6 m [15 ft])	B28P74 SB 2a (1.2 m [4 ft])	B28P75 SB 2b (2.4 m [8 ft])	B28P76 SB 2c (3.7 m [12 ft])	B28P78 SB 2d (4.6 m [15 ft])	B28P80 SB 3a (1.2 m [4 ft])	B28P81 SB 3b (2.4 m [8 ft])	B28P82 SB 3c (3.7 m [12 ft])	B28P83 SB 3d (4.6 m [15 ft])
Kerosene	2,000	5	4	N/A	U	U	U	U	U	U	U	U	U	U	U	U

a. Removal action levels are from DOE/RL-2009-53, *Removal Action Work Plan for 48 Waste Sites in the 200-MG-1 Operable Unit* (RAWP).

b. If Hanford Site-specific background data are not available, values are then taken from Ecology Publication 94-115, *Natural Background Soil Metals Concentrations in Washington State*. Hanford Site background values are available in nonradiological background data from DOE/RL-92-24, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, Table D39-2.

c. Where cleanup levels are less than background or required detection limits, cleanup levels default to background or required detection limits per Ecology Publication 94-06, *Model Toxics Control Act Cleanup Regulation Chapter 173-340 WAC*; WAC 173-340-700(4)(d), "Model Toxics Control Act—Cleanup," "Overview of Cleanup Standards;" and WAC 173-340-707(2), "Model Toxics Control Act—Cleanup," "Analytical Considerations," respectively.

d. Maximum reported laboratory method detection limits were greater than the required detection limit per the RAWP (DOE/RL-2009-53); however, analytical results are below the established removal action levels and meet the corresponding removal action objectives.

N/A = not available

U = analyzed for but not detected above laboratory method detection limit