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Revision 0

Response Action Report for 200-MG-1 Operable Unit Waste Site 600-275

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

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

P.O. Box 550
Richland, Washington 99352

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

Signature

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Date

Executive Summary

This response action report documents the successful completion of the removal action conducted at the 600-275 waste site, also known as the former Igloo Army Ammo Storage Site. 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 600-275 waste site was investigated in December 2009 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. In September 2010, the igloo foundations were removed from the 600-275 waste site; visual inspections of the foundations and underlying soil were conducted, and soil samples were collected between September 2010 and February 2011. 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 11 Waste Sites in the 200-MG-1 Operable Unit*[4] (RAWP). 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,

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[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*, 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, 2009, *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, 2009, *Removal Action Work Plan for 11 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.

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 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,* Guideline Number TPA-MP-14, "Maintenance of the Waste Information Data System"[5]. No institutional controls are required because no deep vadose zone contamination is associated with the 600-275 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
NA	not applicable
NPL	National Priorities List
O&M	operations and maintenance
OU	operable unit
PCB	polychlorinated biphenyl
QA	quality assurance
QC	quality control
RAL	removal action level
RAO	removal action objective
RAWP	*Removal Action Work Plan for 11 Waste Sites in the 200-MG-1 Operable Unit*
RDL	required detection limit
RESRAD	RESidual RADioactivity
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
ZPC	zone of potential contamination

1 Introduction

This report documents the successful completion of a non-time-critical removal action conducted at the 600-275 waste site. The removal action alternative selected for this waste site is removal, treatment, and disposal (RTD), as proposed in DOE/RL-2008-44, *Engineering Evaluation/Cost Analysis for the 200-MG-1 Operable Unit Waste Sites* (EE/CA), and 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). Analytical results from initial sampling conducted after removal of the igloo foundations, indicated that the waste site did not achieve compliance with the removal action levels (RALs); therefore, in accordance with the methodology prescribed in the Action Memorandum, RTD of impacted soil was implemented. This report provides the basis for the successful completion of the RTD action performed at the 600-275 waste site. This documentation has been prepared based on U.S. Environmental Protection Agency (EPA) guidance provided in EPA/540/R-98/016, *Close Out Procedures For National Priorities List Sites.*

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 600-275 waste site have achieved the established RALs and have met the removal action objectives (RAOs) provided in the Action Memorandum for the 600-275 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" (National Contingency Plan).

The non-time-critical removal action for the 600-275 waste site was completed in February 2011 in accordance with DOE/RL-2009-53, *Removal Action Work Plan for 11 Waste Sites in the 200-MG-1 Operable Unit* (RAWP). 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

General information on the Hanford Site and the 200-MG-1 Operable Unit (OU) provides a background of the 600-275 waste site and the development of the removal action for the 600-275 waste site and is described in the subsections that follow.

1.1.1 Hanford General Site Information

The Hanford Site, which is part of the DOE's nuclear weapons complex, occupies approximately 1,517 km^2 (586 mi^2) and is located 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.

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 (that is, 300 Area, 200 East Area, and 100 K Area) and are not specifically identified (Figure 1-1). The 200-MG-1 OU waste sites consist of French drains, trenches, cribs, ditches, and retention basins with shallow contamination (generally less than 4.6 m [15 ft] deep) 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 600-275 waste site, formerly known as the Igloo Army Ammo Storage Site, is located approximately one mile west of the 200 West Area, and east of State Route 240, as shown in Figure 1-2.

1.2 Regulatory and Enforcement History

As discussed in Section 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 the EPA. The 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.

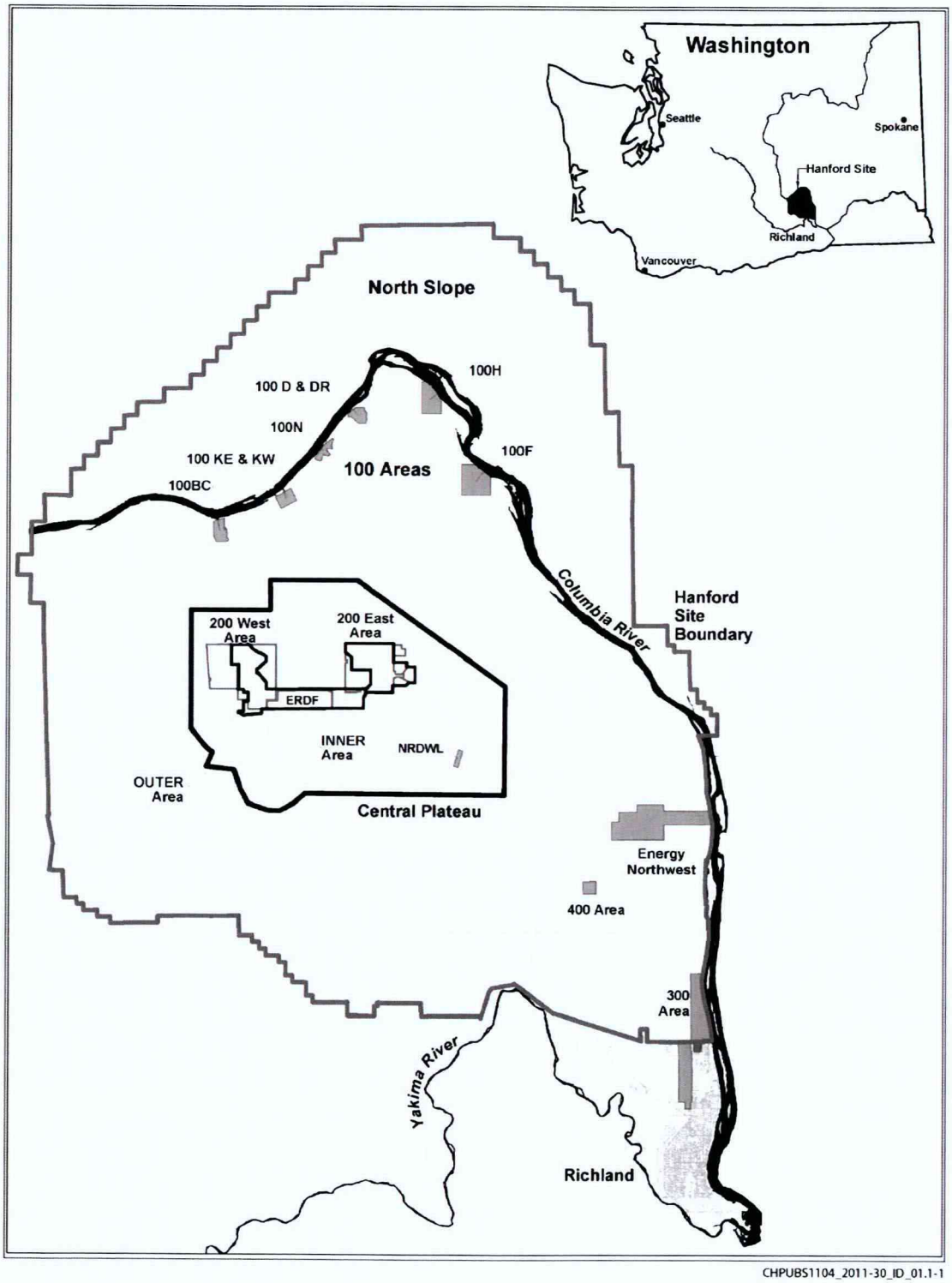

Figure 1-1. Location of the Hanford Site in Washington State

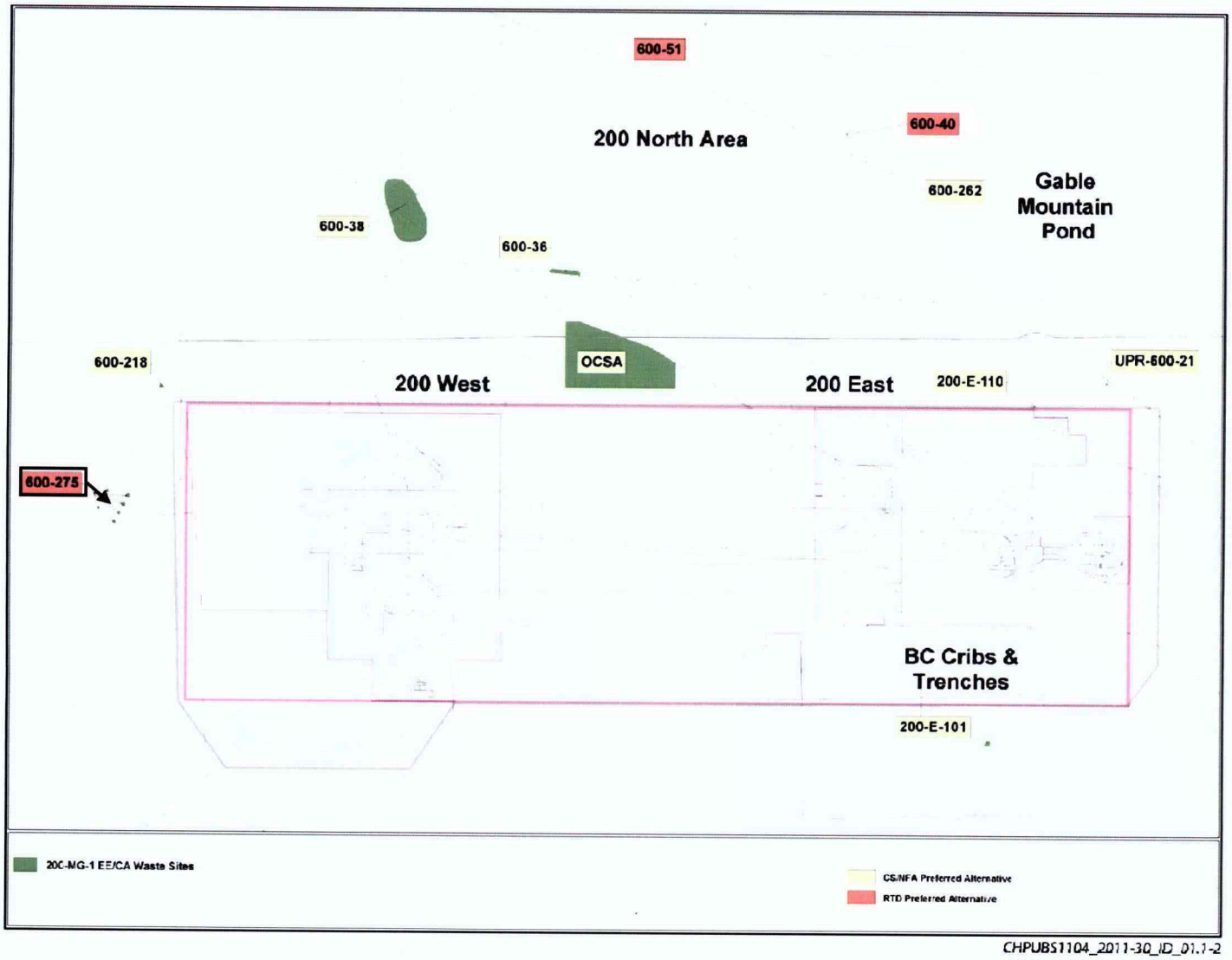

Figure 1-2. 200-MG-1 Operable Unit and Waste Site 600-275

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 PNL-10285, *Estimated Recharge Rates at the Hanford Site*, there is 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 600-275 waste site is the Columbia River itself, located approximately 9 km (5.6 mi) north 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.

2 600-275 Site Background

This section provides a description of the 600-275 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.

2.1 600-275- Site Background

The 600-275 waste site is located approximately one mile west of the 200 West Area and east of State Route 240. The waste site was identified and entered into the Waste Information Data System (WIDS) in 2001. The site is well defined by a perimeter fence and is identified as consisting of rectangular mounds of soil approximately 50 by 45 m (164 by 147.6 ft), covering concrete foundations remaining from the seven army storage igloos. The concrete igloo foundations were sloped to accommodate gutters, which were located on the north and south sides of the foundations (Figure 2-1), and were fitted with a removable capped outlet to facilitate the movement of rainwater runoff to the exterior of the igloos.

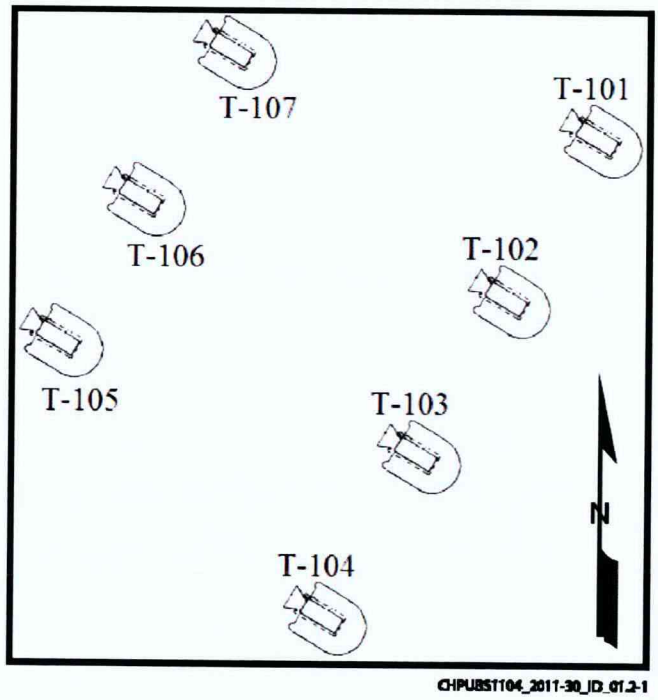

Figure 2-1. 600-275 Waste Site

The seven army igloos were originally used for ammunitions storage and Nike missile parts. In 1961, the igloos were approved for the storage of plutonium recovery product and miscellaneous equipment as a result of increased storage needs for plutonium waste. Drilling equipment for the Basalt Waste Isolation Project was later stored in the igloos once they were no longer needed for plutonium waste storage. There is no record of when the igloos were demolished or when waste storage at the 600-275 waste site was terminated.

According to the WIDS description for the 600-275 waste site, a spill of an unknown substance reportedly occurred in the T-101 igloo, documented in 1964 during routine surveillance and maintenance of the containers of plutonium-bearing materials and carbon tetrachloride. The material released was reportedly contained within the igloo structure, and the area was cleaned upon discovery. The release at the T-101

igloo was the only recorded release in any of the seven igloos at the 600-275 waste site over the duration of its use as a plutonium-bearing materials storage area.

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, concentrations of contaminants of potential concern (COPCs) had the potential to exceed the RALs. Initial sampling and analysis, conducted after igloo foundation removal, indicated that concentrations of COPCs in soil were greater than the RALs. Activities involved in the RTD action set forth in the RAWP and DOE/RL-2009-60, *Sampling and Analysis Plan for Selected 200-MG-1 Operable Unit Waste Sites* (SAP) include soil excavation and verification sampling to demonstrate that the 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 removal action 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 600-275 waste site. The following key features relevant to the 600-275 waste site were considered during the development of a sample design:

- Direct visual inspection of the waste site using available site information as a guide for visual cues such as surface cracks, staining, discoloration, absence of vegetation, and other anomalies. Following removal of soil above the foundations, the exposed foundations were inspected prior to their removal.
- Radiological field screening performed at the surface of the waste site, prior to and during foundation removal, to provide an indication of the presence of radiological COPCs.
- Both judgmental sampling and random sampling were considered appropriate for the initial sampling evolution, conducted in accordance with the methodology prescribed in the SAP.

Based on these key design features, soil samples were collected from the 600-275 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 the RALs for COPCs applicable to the 600-275 waste site, resulting in additional RTD in accordance with the selected alternative. Under this alternative, additional soil was removed from the impacted areas, and a verification sampling evolution was conducted, the results of which confirmed that remaining residual COPC concentrations in soil were less than or equal to the RALs. Table 5-2 provides the maximum concentrations for each COPC from the verification sampling analytical data. Tables A-1 through A-4 provide a detailed summary of all analytical data results for sampling conducted at the 600-275 waste site (Appendix A).

Personnel with current training and qualifications performed field radiological surveying of the waste site during site evaluation, during removal of the igloo foundations, 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 600-275 waste site, no radiological dose readings were greater than the measured background, and no radiological contamination was found.

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. Tables 2-1 and 2-2 list the COPCs identified for the 200-MG-1 OU. Attainment of established RALs and corresponding RAOs is described in Section 5 of this report.

Table 2-1. Radiological Removal Action Levels

Contaminant of Potential Concern	Background Concentration[a] (pCi/g)	Direct Exposure[b] (pCi/g)	Soil Cleanup Level for Groundwater Protection[c] (pCi/g)	Required Detection Limit (pCi/g)	Overall Removal Action Levels (pCi/g)
Americium-241	N/A	31.1	N/A[d]	1.0	31.1
Cesium-137	1.1	6.2	1,465	0.1	6.2
Europium-152	N/A	3.3	N/A[d]	0.1	3.3
Europium-154	0.033	3.0	N/A[d]	0.1	3.0
Europium-155	0.054	125	N/A[d]	0.1	125
Plutonium-238	0.004	38.8	N/A[d]	1.0	38.8
Plutonium-239/240	0.025	33.9	N/A[d]	1.0	33.9
Strontium-90	0.18	4.5	27.6	1.0	4.5
Uranium-233/234	1.1	1.1	1.1	1.0	1.1
Uranium-235	0.11	0.61	0.5	0.5	0.5
Uranium-238	1.1	1.1	1.1	1.0	1.1

a. Hanford Site background values are available from radiological background data are from DOE/RL-96-12, *Hanford Site Background: Part 2, Soil Background for Radionuclides*, Table 4.

b. Radionuclide concentrations for beta/gamma in water correspond to a 4 mrem/yr dose from EPA/540-R-00-007, *Soil Screening Guidance for Radionuclides: User's Guide*. Calculations are based on either RESRAD (ANL, 2009) or WDOH/320-015, *Hanford Guidance for Radiological Cleanup*.

c. Soil concentration for groundwater protection were calculated using RESRAD with the maximum contaminant levels calculated from National Bureau of Standards (NBS Handbook 69, *Maximum Permissible Body Burdens and Maximum Permissible Concentrations of Radionuclides in Air or Water for Occupational Exposure*) maximum permissible concentration as cited in EPA/540-R-00-007 or from 40 CFR 141.66, "Maximum Contaminant Levels for Radionuclides."

d. RESRAD predicts constituent will not reach groundwater within 1,000 years based on 100 Area generic site model using soil column layers and depths.

N/A = not available

Table 2-2. 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)
Antimony	5	32	5.4	0.6	5.4
Arsenic	6.5	6.5[d]	6.5[d]	10	6.5[d]
Barium	132	16,000	1,650	2	1,650
Beryllium	1.51	160	63.2	0.5	63.2
Boron	N/A	16,000	210	2	210
Cadmium	0.81	80	0.81[d]	0.5	0.81[d]
Chromium Total	18.5	120,000	2,000	1	2,000
Chromium (VI)	N/A	240	[e]	0.5	[e]
Cobalt	15.7	24	15.7[d]	2	15.7[d]
Copper	22.0	3,200	284	1	284
Lead	10.2	250	3,000	5	250
Lithium	33.5	160	192	2.5	160
Manganese	512	3,760	512[d]	5	512[d]
Mercury	0.33	24	2.09	0.2	2.09
Nickel	19.1	1,600	130	4	130
Selenium	0.78	400	5.2	1	5.2
Silver	0.73	400	13.6	0.2	13.6
Strontium	N/A	48,000	2,920	1	2,920
Tin	N/A	48,000	48,000	10	48,000
Uranium (soluble salts)	3.21	240	3.21[d]	1	3.21[d]
Vanadium	85.1	560	2,240	2.5	560
Zinc	67.8	24,000	5,970	1	5,970
PCB Aroclor-1016	N/A	0.5	0.094	0.017	0.094
PCB Aroclor-1221	N/A	0.5	0.017[d]	0.017	0.017[d]
PCB Aroclor-1232	N/A	0.5	0.017[d]	0.017	0.017[d]
PCB Aroclor-1242	N/A	0.5	0.039	0.017	0.039
PCB Aroclor-1248	N/A	0.5	0.039	0.017	0.039
PCB Aroclor-1254	N/A	0.5	0.066	0.017	0.066
PCB Aroclor-1260	N/A	0.5	0.72	0.017	0.5
Acenaphthene	N/A	4,800	98	0.33	98
Acenaphthylene	N/A	4,800	98	0.33	98

Table 2-2. 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)
Anthracene	N/A	24,000	2,270	0.33	2,270
Benzo(a)anthracene	N/A	1.37	0.86	0.33	0.86
Benzo(a)pyrene	N/A	0.137	2.33	0.33	0.33[d]
Benzo(b)fluoranthene	N/A	1.37	2.95	0.33	1.37
Benzo(g,h,i)perylene	N/A	2,400	25,700	0.33	2,400
Benzo(k)fluoranthene	N/A	1.37	21.5	0.33	1.37
Chrysene	N/A	13.7	9.56	0.33	9.56
Dibenz(a,h)anthracene	N/A	1.37	4.29	0.33	1.37
Fluoranthene	N/A	3,200	631	0.33	631
Fluorene	N/A	3,200	101	0.33	101
Indeno(1,2,3-cd) pyrene	N/A	1.37	8.33	0.33	1.37
Naphthalene	N/A	1,600	4.46	0.33	4.46
Phenanthrene	N/A	24,000	1,140	0.33	1,140
Pyrene	N/A	2,400	655	0.33	655
Carbon Tetrachloride	N/A	7.69	0.0031	0.005	0.005
Nitrate (as nitrogen)	11.8	128,000	40	0.75	40
TPH-diesel	N/A	2,000	2,000	5	2,000
TPH-kerosene	N/A	2,000	2,000	5	2,000

a. If Hanford Site-specific background data are not available, values are then taken from Ecology Publication No. 94-115, *Natural Background Soil Metals Concentrations in Washington State*. Hanford Site background values are available from nonradiological background data in DOE/RL-92-24, *Hanford Site Soil Background*, Table D9-2.

b. The direct-contact values were obtained from WAC 173-340-900, "Tables," Table 740-1.

c. The groundwater protection values were obtained using equations provided in WAC 173-340-747(4), "Deriving Soil Concentrations for Ground Water Protection," with the physical parameters obtained from http://www.ecy.wa.gov/.

d. Where cleanup levels are less than background or Required Detection Limits (RDLs), cleanup levels default to background or RDLs in accordance with WAC 173-340-700(6)(d), "Overview of Cleanup Standards," and WAC 173-340-707(2), "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 - 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 - based on DOE/RL-96-17 *Remedial Design Report/Remedial Action Work Plan for the 100 Area.*
- 18.4 mg/kg - based on Ecology, 2007, *Cleanup Levels & Risk Calculations (CLARC).*

N/A = not applicable

Ecological screening values, which are based on WAC 173-340-900 "Model Toxics Control Act—Cleanup," "Tables," 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 in order to make final cleanup decisions.

2.2.2 Exposure and Land-Use Assumptions

The 600-275 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 uses 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 selected for 600-275 waste site. Initial soil sampling conducted after the removal of the igloo foundations indicated that concentrations of COPCs in the waste site soils were greater than the RALs. Based on those analytical results, and following the removal of impacted soil, verification sampling was conducted to confirm that residual concentrations of COPCs in soil were less than or equal to the RALs. The sampling objectives for the 600-275 waste site included visual inspection and radiological survey of the foundations and underlying soil, and the collection of discrete soil samples from the waste site as described in Section 3.1 of this report. Key features of the site-specific sampling design for the 600-275 waste site included the following:

- Direct visual inspection of the waste site using available site information as a guide for visual cues such as surface cracks, staining, discoloration, absence of vegetation, and other anomalies. Following removal of soil above the foundations, the exposed foundations were inspected prior to their removal.
- Radiological field screening performed at the surface of the waste site, prior to and during foundation removal, to provide an indication of the presence of radiological COPCs.
- Both judgmental sampling and random sampling were considered appropriate for the initial sampling evolution, conducted in accordance with the methodology prescribed in the SAP.

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 600-275 waste site was RTD. Under this alternative, following removal of the igloo foundations, initial sampling of the underlying soil was conducted, resulting in concentrations of COPCs greater than the RALs. Upon completion of further RTD, verification sampling was conducted, resulting in concentrations of COPCs less than or equal to the RALs, thus demonstrating that the RAOs were met.

3.1 Summary of Activities

The removal action at the 600-275 waste site was conducted between December 2009 and February 2011, and included the collection of judgmental and random 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. Key activities pertinent to the removal action at the 600-275 waste site are listed as follows:

- Removal of seven concrete igloo foundations, and approximately 0.3 m (1 ft) of underlying soil.
- Collection of judgmental and random samples based on historical and process knowledge, and visual indicators.
- Excavation of soil under the RTD alternative in zones of potential contamination (ZPCs) 1 and 2, identified in Figure 2-1 as igloos T-101 and T-104, respectively.
- Collection of random samples from excavated areas at ZPC 1 (T-101) for verification purposes, laboratory analysis for COPCs, and evaluation of analytical results to demonstrate achievement of RALs.

3.1.1 Waste Site 600-275 Initial Sampling

A site evaluation was performed on December 3, 2009 prior to the removal of the igloo foundations and 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 ZPCs within the waste site boundary (Figure 3-1). Observations made during the site walk down included approximately 1 m (3 ft) of soil covering the concrete igloo foundations. The area was involved in the range fire of 2000; the vegetation cover observed at the remainder of the fenced area during site evaluation was mainly comprised of cheatgrass.

In August 2010, the cover soil was removed from the igloo foundations. Visual inspections and radiological surveys were performed on all seven foundations, which were observed to be intact with only superficial hairline cracks, no visual indicators (i.e., staining or discoloration) were observed, and radiological screening did not indicate evidence of contamination or dose rates greater than background. Concrete patches were observed at the T-104 igloo, indicating that the foundation may have been altered after its original construction, suggesting a potential event may have occurred. Historical information indicated a release of an unknown material at the T-101 igloo; however, no visual indicators were observed during site evaluation which substantiated the report of a release. All seven foundations were subsequently removed along with approximately 0.15 m (0.5 ft) of underlying gravel. No soil discoloration was observed beneath the seven igloo foundations. Based on the historical documentation of a release at the T-101 igloo, and concrete patching observed at the T-104 igloo foundation prior to

removal, two individual ZPCs were established for sampling at the 600-275 waste site. ZPC 1 was comprised of the T-101 foundation footprint and its associated gutter outlet, and ZPC 2 consisted of the T-104 foundation footprint and its associated gutter outlet.

For radiological field screening at the 600-275 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 prior to and during removal of the seven igloo foundations, and during sampling activities, no radiological readings were greater than the measured background, and no radiological contamination was found.

Initial soil sampling was conducted on September 15, 2010 at the two ZPCs established during site evaluation. Three samples were collected from the surface (0 to 0.3 m [0 to 1 ft]) of each foundation footprint based on historical and process knowledge, and visual indicators. Additionally, two biased samples were collected from the surface (0 to 0.3 m [0 to 1 ft]) at each of the igloo gutter outfalls (Figure 3-1). The samples were analyzed for the full suite of COPCs (radiological, metals, polynuclear aromatic hydrocarbons, volatile organic analytes, anions, and total petroleum hydrocarbons) in accordance with Revision 0 of the SAP. Analytical results from the initial sampling evolution indicated concentrations of nitrate-nitrogen greater than the RALs at ZPC 1. The maximum concentration of manganese reported was 585 mg/kg; however,manganese was not considered a COPC for the 600-275 waste site based on process knowledge and historical information. The reported value is consistent with recorded background values for manganese at the Hanford Site, and does not indicate a source of contamination (reference Section 5.1.1). Analytical results from samples collected at ZPC 2 indicated concentrations of COPCs in that area were less than the RALs.

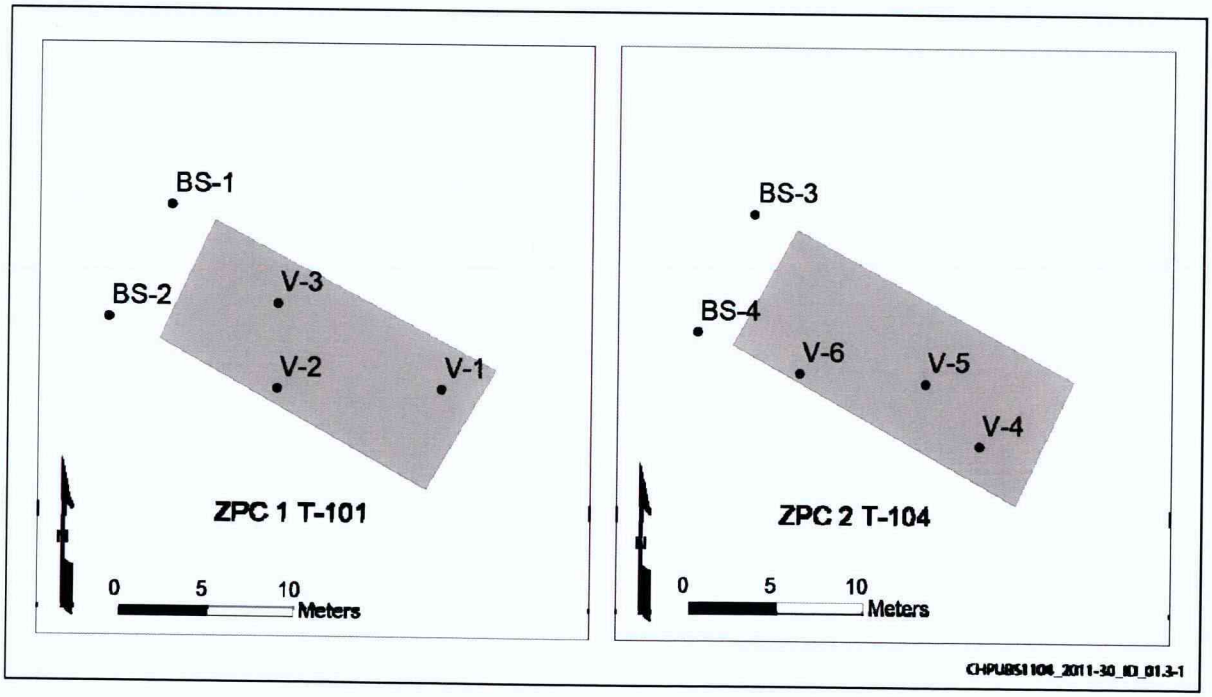

Figure 3-1. Initial Sample Locations at the 600-275 Waste Site.

3.1.2 Waste Site Excavation

The results of the initial sampling indicated that concentrations of COPCs were greater than the RALs at ZPC 1. Excavation of impacted soils at ZPC 1 commenced in January 2011. The initial vertical extent of excavation was approximately 0.6 m (2 ft) at ZPC 1; however, results from in-process sampling conducted during excavation activities indicated concentrations of nitrate-nitrogen in excess of the RAL, further refining the vertical extent of excavation an additional 0.6 m (2 ft), resulting in a total excavation depth of approximately 1.2 m (4 ft).

3.1.3 Waste Site Verification Sampling

The area of excavation at ZPC 1 was approximately 145 m^2 (1,560 ft^2). Three in-process samples collected from ZPC 1 during RTD activities resulted in the further refinement of the vertical extent of excavation based on concentrations of nitrate-nitrogen in excess of the RALs. Maximum reported concentrations of arsenic and manganese from the in-process sampling evolution were 7.17 mg/kg and 513 mg/kg, respectively; however, arsenic and manganese were not considered COPCs based on process knowledge and historical information. The reported values are consistent with recorded background values for arsenic and manganese at the Hanford Site, and do not indicate sources of contamination (reference Section 5.1.1). Implementation of Revision 1 of the SAP allowed for the refinement of the list of COPCs targeted during verification sampling to nitrate-nitrogen only. Three samples, selected randomly using Visual Sample Plan[6] software, were collected from the base of the excavation at ZPC 1 (Figure 3-2).

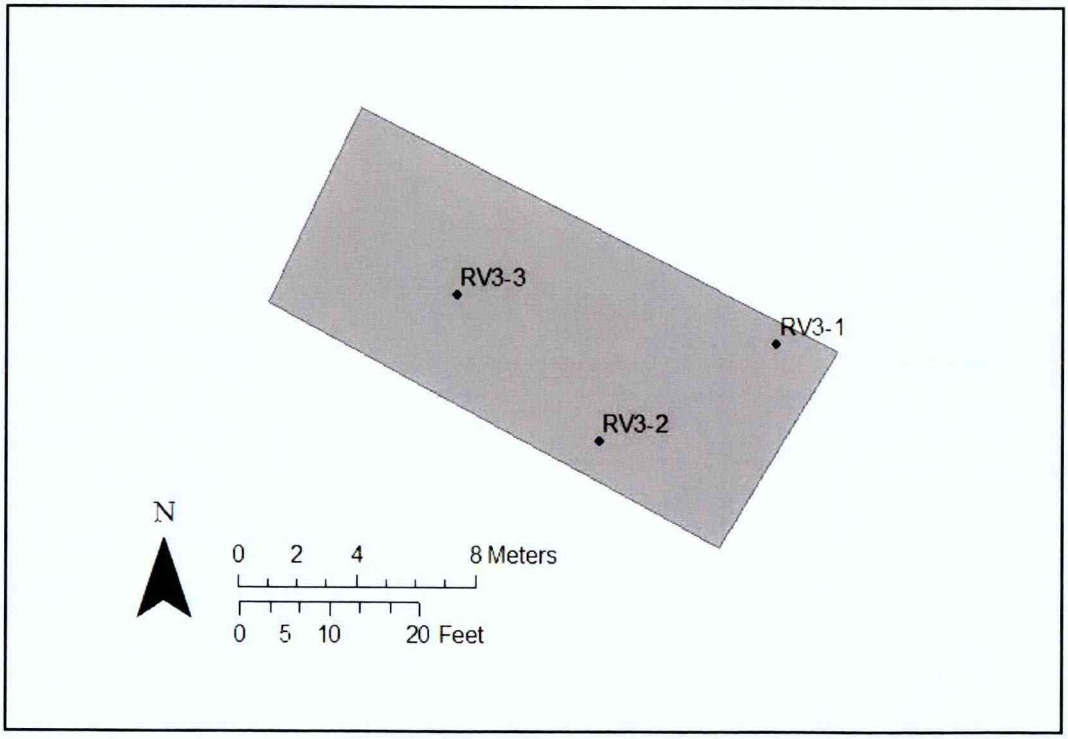

Figure 3-2. Verification Sample Locations at ZPC 1

[6] PNNL-16939, *Visual Sample Plan, Version 5.0 User's Guide.* Visual Sample Plan is a registered trademark of Pacific Northwest National Laboratory, Richland, Washington.

3.1.4 Backfill and Revegetation

As described in Section 2.1 of the RAWP, backfill and/or contouring may take place at the 600-275 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 and thus backfill and/or contouring proceeded at the 600-275 waste site. The backfill concurrence form was approved by the regulatory agency(ies) on March 3, 2011. Backfill of the 600-275 waste site was completed on March 4, 2011.

In accordance with the ecological compliance review conducted for the 600-275 waste site, this area does not meet the requirements of a Level III or Level IV designation as described in DOE/RL-96-32, *Hanford Site Biological Resources Management Plan*. Revegetation at the 600-275 waste site is not required; however, the 600-275 waste site has been reseeded.

3.1.5 Statement of Protectiveness

In accordance with the SAP, the soil at the 600-275 waste site has been sampled, analyzed, and evaluated. The results obtained through the implementation of the RTD alternative demonstrate that contaminant concentrations in the soil at the 600-275 waste site are less than RALs (discussed in further detail in Section 5). These results also indicate that residual concentrations will support reasonably anticipated future land uses 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 Section 5, a review of the sampling results showed that the removal action at the 600-275 waste site has demonstrated achievement of the RAOs established in the Action Memorandum and identified in the RAWP.

4 Chronology of Events

A chronology of major events associated with sampling the subject waste site is presented in Table 4-1. 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 3, 2009	Site evaluation
August 13, 2010	RTD of the 600-275 waste site commenced
September 16, 2010	Initial samples collected
October 15, 2010	Laboratory analytical data evaluation completed
January 27, 2011	In-process samples collected
February 7, 2011	Laboratory analytical data evaluation completed
February 14, 2011	RTD of the 600-275 waste site completed
February 17, 2011	Verification sampling of the 600-275 waste site completed
February 25, 2011	Laboratory analytical data evaluation completed
March 3, 2011	Backfill Concurrence Form approved
March 4, 2011	Backfill of the 600-275 waste site completed
March 18, 2011	Reseeding at the 600-275 waste site completed

5 Performance Standards and Construction Quality Control

This section addresses the process for demonstrating achievement of performance standards, including the attainment of RALs and RAOs and maintaining the required quality controls (QC) during removal activities.

5.1 Attainment of Performance Standards

Soil sampling, laboratory analysis, and data evaluation conducted after RTD activities confirm that the 600-275 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 May 2010 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 600-275 waste site consisted of visual inspection, radiological survey, and soil sampling performed in September 2010. Resulting data from the sampling evolution indicating concentrations of COPCs greater than the RALs initiated the excavation of impacted soils, performed between August 2010 and February 2011, followed by verification sampling performed in February 2011. The results, provided in Table A-1 through Table A-4 (Appendix A), demonstrate that there are no chemical COPC concentrations greater than the RALs remaining in soil at the 600-275 waste site, thus meeting RAOs 1, 2, and 3.

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 igloo foundations and 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. Soil samples collected and analyzed for radiological COPCs resulted in all individual COPC concentrations 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

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 action of the Outer Area

5.1.1 Reported Background Values for Arsenic and Manganese

Concentrations of arsenic were reported that were greater than the established RAL at ZPC 1, although arsenic was not considered a COPC for this waste site based on historical information and process knowledge. The maximum reported concentration of 7.17 mg/kg is less than twice the background value of 6.5 mg/kg and does not indicate a source of contamination as illustrated by the variation being within background range (generally defined as a value less than twice the established 90th percentile value); therefore, the concentration is considered consistent with natural background variation.

Concentrations of manganese were reported which were greater than the RAL at ZPC 1, although manganese was not considered a COPC for this waste site based on historical information and process knowledge. The maximum concentration of 585 mg/kg is less than twice the background value of 512 mg/kg and does not indicate a source of contamination. As a result, the values found at the 600-275 waste site for manganese are considered to be consistent with natural background variation.

5.1.2 Performance Standard Documentation

This report addresses the individual 600-275 waste site and not an OU; therefore, this section is not applicable.

5.1.3 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 a direct comparison to the maximum results from the analytical data (Table 5-2). The full set of analytical results from all samples collected is provided in Appendix A.

5.1.4 Contaminant Identification

Table 5-2 provides a direct comparison of verification sample analytical results for each radiological and nonradiological COPC, as determined from process knowledge and historical information, against the established RALs for the 600-275 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]	Removal Action Level	Maximum Concentration in Soil	Does the Maximum Exceed Removal Action Levels?
Radiological COPCs (pCi/g)				
Americium-241	N/A	31.1	0.038	No
Cesium-137	1.1	6.2	U	No
Europium-152	N/A	3.3	U	No
Europium-154	0.033	3.0	U	No
Europium-155	0.054	125	U	No
Plutonium-238	0.004	38.8	U	No
Plutonium-239/240	0.025	33.9	0.082	No
Strontium-90	0.18	4.5	U	No
Uranium-233/234	1.1	1.1	0.29	No
Uranium-235	0.11	0.5	0.03	No
Uranium-238	1.1	1.1	0.28	No
Nonradiological COPCs (mg/kg)				
Nitrate (as Nitrogen)	11.8	40	5.6	No
Carbon Tetrachloride	N/A	0.005	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*. 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. Hanford Site background values are available from radiological background data from DOE/RL-96-12, *Hanford Site Background: Part 2, Soil Background for Radionuclides*, Table 4.

N/A = not available

U = Analyzed for but not detected above laboratory detection limit

5.2 Construction Quality Assurance/Quality Control

No construction-related aspects were implemented as part of the selected alternative for the 600-275 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 600-275 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 600-275 waste site are tracked through Hanford Environmental Information System (HEIS) identification numbers. All of the sampling and analysis data for the 600-275 waste site were found to be useable for decision-making purposes as provided in the following summary:

HEIS Identification Numbers: B28752/B28765, B28753/B28766, B28748/B28761, B28749/B28762, B28750/B28763, B28757/B28770, B28758/B28771, B28754/B28767, B28755/B28768, B28756/B28769, B2BJR5, B2BJR6, B2BJR7, B2C1N2, B2C1N3, B2C1N5, and B2C1N6.

Blanks: Equipment blanks (B28779, B2BJT1, and B2C1N8) and field transfer blank (B28780) were received intact to the laboratory and holding times were acceptable.

Field Duplicates: The duplicate (B28751/B28764, B2BJR8, and B2C1N4) 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-Mueller 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 and procedural 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 600-275 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 600-275 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 Section 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 600-275 waste site.

6 Final Inspection and Certifications

There were no final inspections or certification required in the implementation of the selected alternative for the 600-275 waste site; therefore, this section is not applicable.

7 Operation & Maintenance Activities

This section discusses the operations and maintenance (O&M) for the 600-275 waste site.

7.1 Remedy-Related Operations and Maintenance or Monitoring

There are no O&M activities or monitoring requirements for the 600-275 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 600-275 waste site.

7.3 Five-Year Reviews

Five-year reviews are required by CERCLA for post-ROD remedial actions, but do not apply to the 600-275 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 600-275 waste site, costs are pro rated 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	142,650	128,660	271,310
Total Removal Action Cost	142,650	128,660	271,310
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 procedures and definitions described in *Tri-Party Agreement Handbook Management Procedures* (RL-TPA-90-0001), TPA-MP-14, "Maintenance of the WIDS." Reclassification form 2011-025 for the 600-275 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.

11 Contact Information

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12 References

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Appendix A

Sampling Results for the 600-275 Waste Site

This appendix contains laboratory analytical results, provided in Table A-1 through Table A-4, from the sampling conducted at the 600-275 waste site. The following information is provided in the table headings: Hanford Environmental Information System identification numbers, zone of potential concern (ZPC) identifier, field sample identifier, igloo identification number, and sample depth. Depths provided in the tables are below ground surface.

- Table A-1 provides analytical results for nonradiological contaminants from samples collected during the initial phase of sampling after the removal of the concrete igloo foundations, from ZPC 1, which did not meet the established removal action levels (RALs), therefore requiring additional 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 refine the depth of excavation, and the list of contaminants of potential concern (COPCs) targeted in the verification sampling evolution to nitrate-nitrogen only.
- Table A-3 provides analytical results for radiological COPCs from the initial sampling at ZPCs 1 and 2, which indicate that concentrations of radiological COPCs are less than the established RALs, thus demonstrating achievement of the removal action objectives (RAOs).
- Table A-4 includes final verification sampling results for nonradiological contaminants at ZPC 1, as well as analytical results for nonradiological contaminants from the initial phase of sampling from ZPC 2, which demonstrated achievement of the established RALs.

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]	B28748 B28761 ZPC 1/V-1 (T-101) 0 to 0.3 m (0 to1 ft) bgs	B28749 B28762 ZPC 1/V-2 (T-101) 0 to 0.3 m (0 to1 ft) bgs	B28750 B28763 ZPC 1/V-3 (T-101) 0 to 0.3 m (0 to 1 ft) bgs	B28752 B28765 BS-1 (T-101) 0 to 0.3 m (0 to 1 ft) bgs	B28753 B28766 BS-2 (T-101) 0 to 0.3 m (0 to 1 ft) bgs
Metals	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Antimony	5.4	0.6	0.31	5	U	U	U	U	U
Arsenic	6.5[c]	1	0.41	6.5	3.51	4.88	4.06	4.19	5.05
Barium	1,650	2	0.21	132	127	124	151	94.7	95.8
Beryllium	63.2	0.5	0.10	1.51	0.528	0.512	0.457	0.421	0.294
Boron	210	2	4.3[d]	N/A	41.6	39.6	44.1	32.6	29.3
Cadmium	0.81[c]	0.5	0.10	0.81	0.109	0.112	0.14	0.1	0.1
Chromium Total	2000	1	0.51	18.5	10.6	10.5	11.5	8.96	9.57
Chromium VI	N/A	0.5	0.10	N/A	U	U	U	U	U
Cobalt	15.7[c]	2	0.10	15.7	10.5	10.7	11.6	8.32	7.22
Copper	284	1	0.10	22	16.6	16.8	18.3	13.1	12.8
Lead	250	5	0.10	10.2	7.61	7.1	8.27	4.95	5.53
Lithium	160	2.5	0.42	33.5	9.76	9.74	10.4	10	10.5
Manganese	512[c]	5	0.10	512	498	487	585[e]	394	361
Mercury	2.09	0.2	0.051	0.33	U	U	U	U	U
Nickel	130	4	0.21	19.1	13.3	13.3	14	10.5	11.1

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]	B28748 B28761 ZPC 1/V-1 (T-101) 0 to 0.3 m (0 to1 ft) bgs	B28749 B28762 ZPC 1/V-2 (T-101) 0 to 0.3 m (0 to1 ft) bgs	B28750 B28763 ZPC 1/V-3 (T-101) 0 to 0.3 m (0 to 1 ft) bgs	B28752 B28765 BS-1 (T-101) 0 to 0.3 m (0 to 1 ft) bgs	B28753 B28766 BS-2 (T-101) 0 to 0.3 m (0 to 1 ft) bgs
Selenium	5.2	1	0.31	0.78	1.19	1.7	1.64	1.14	0.958
Silver	13.6	0.2	0.10	0.73	U	U	U	U	U
Strontium	2,920	1	0.10	N/A	29.2	39.4	32.7	41.9	47.7
Thallium	1.59	1	0.10	0.1	0.133	0.127	0.136	0.101	U
Tin	48,000	10	0.10	N/A	0.508	0.525	0.59	0.408	0.307
Uranium	3.21[c]	1	0.10	3.21	0.429	0.601	0.695	0.501	0.44
Vanadium	560	2.5	0.21	85.1	48.6	54.2	52.3	38.6	34.5
Zinc	5970	1	0.82	67.8	45.5	50	52.1	U	35.9
Anions	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Nitrate-N	40	0.75	1.7[d]	11.8	68.8	43.2	69.2	5.24	22.3
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	0.2	N/A	U	U	U	U	U
Acenaphthylene	98	0.33	0.2	N/A	U	U	U	U	U
Anthracene	2,270	0.33	0.2	N/A	U	U	U	U	U
Benzo(a)anthracene	0.86	0.33	0.2	N/A	U	U	U	U	U
Benzo(a)pyrene	0.33[c]	0.33	0.2	N/A	U	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]	B28748 B28761 ZPC 1/V-1 (T-101) 0 to 0.3 m (0 to1 ft) bgs	B28749 B28762 ZPC 1/V-2 (T-101) 0 to 0.3 m (0 to1 ft) bgs	B28750 B28763 ZPC 1/V-3 (T-101) 0 to 0.3 m (0 to 1 ft) bgs	B28752 B28765 BS-1 (T-101) 0 to 0.3 m (0 to 1 ft) bgs	B28753 B28766 BS-2 (T-101) 0 to 0.3 m (0 to 1 ft) bgs
Benzo(b)fluoranthene	1.37	0.33	0.2	N/A	U	U	U	U	U
Benzo(k)fluoranthene	1.37	0.33	0.2	N/A	U	U	U	U	U
Benzo(g,h,i)perylene	2,400	0.33	0.2	N/A	U	U	U	U	U
Chrysene	9.56	0.33	0.2	N/A	U	U	U	U	U
Dibenzo(a,h)anthracene	1.37	0.33	0.2	N/A	U	U	U	U	U
Fluoranthene	631	0.33	0.2	N/A	U	U	U	U	U
Fluorene	101	0.33	0.2	N/A	U	U	U	U	U
Indeno(1,2,3-cd)pyrene	1.37	0.33	0.2	N/A	U	U	U	U	U
Naphthalene	4.46	0.33	0.2	N/A	U	U	U	U	U
Phenanthrene	1,140	0.33	0.2	N/A	U	U	U	U	U
Pyrene	655	0.5	0.2	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	0.004	N/A	U	U	U	U	U
Aroclor 1221	0.017[c]	0.017	0.008	N/A	U	U	U	U	U
Aroclor 1232	0.017[c]	0.017	0.004	N/A	U	U	U	U	U
Aroclor 1242	0.039	0.017	0.004	N/A	U	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]	B28748 B28761 ZPC 1/V-1 (T-101) 0 to 0.3 m (0 to1 ft) bgs	B28749 B28762 ZPC 1/V-2 (T-101) 0 to 0.3 m (0 to1 ft) bgs	B28750 B28763 ZPC 1/V-3 (T-101) 0 to 0.3 m (0 to 1 ft) bgs	B28752 B28765 BS-1 (T-101) 0 to 0.3 m (0 to 1 ft) bgs	B28753 B28766 BS-2 (T-101) 0 to 0.3 m (0 to 1 ft) bgs
Aroclor 1248	0.039	0.017	0.004	N/A	U	U	U	U	U
Aroclor 1254	0.066	0.017	0.004	N/A	U	U	U	U	U
Aroclor 1260	0.5	0.017	0.004	N/A	U	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)**
Carbon Tetrachloride	0.005	0.005	0.001	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	4	N/A	U	U	U	U	U
Kerosene	2,000	5	4	N/A	U	U	U	U	U

a. Removal action levels are from DOE/RL-2009-53, *Removal Action Work Plan for 11 Waste Sites in the 200-MG-1 Operable Unit* (RAWP).

b. If Hanford Site-specific background data is 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 are from DOE/RL-92-24, Rev. 1, 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 (1996), WAC 173-340-700(4)(d), and WAC 173 340 707(2), respectively.

d. Maximum reported laboratory method detection limits were greater than the required detection limit per the RAWP; however, analytical results are below the established removal action levels and meet the corresponding removal action objectives.

e. Manganese was not considered a contaminant of potential concern for this sample location based on process and historical knowledge. Value obtained is consistent with recorded background values for manganese at the Hanford Site (reference Section 5.1.1).

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

Contaminant	Removal Action Levels[a]	Required Detection Limit	Maximum Reported Laboratory Method Detection Limit	Background Concentration[b]	B2BJR5 ZPC 1 RV-1 (T-101) 0.6 to 1 m (2 to 3 ft) bgs	B2BJR6 ZPC 1 RV-2 (T-101) 0.6 to 1 m (2 to 3 ft) bgs	B2BJR7 ZPC 1 RV-3 (T-101) 0.6 to 1 m (2 to 3 ft) bgs
Metals	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Antimony	5.4	0.6	0.32	5	0.32	0.32	0.3
Arsenic	6.5[c]	1	0.43	6.5	5.23	5.45	7.17[e]
Barium	1,650	2	0.22	132	99.8	138	98.9
Beryllium	63.2	0.5	0.11	1.51	0.385	0.517	0.422
Boron	210	2	4.7[d]	N/A	4.6	4.7	4.3
Cadmium	0.81[c]	0.5	0.11	0.81	0.11	0.116	0.1
Chromium Total	2000	1	0.54	18.5	11.4	12.9	9.18
Chromium VI	N/A	0.5	NA	N/A	NA	NA	NA
Cobalt	15.7[c]	2	0.11	15.7	10.8	12.5	9.62
Copper	284	1	0.11	22	14.7	19.6	13.4
Lead	250	5	0.11	10.2	5.83	8.33	5.69
Lithium	160	2.5	0.46	33.5	7.33	8.62	6.45
Manganese	512[c]	5	0.11	512	417	513[e]	397
Mercury	2.09	0.2	NA	0.33	NA	NA	NA
Nickel	130	4	0.22	19.1	13.1	15.6	11.1
Selenium	5.2	1	0.32	0.78	1.81	2.18	2.25

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

Contaminant	Removal Action Levels[a]	Required Detection Limit	Maximum Reported Laboratory Method Detection Limit	Background Concentration[b]	B2BJR5 ZPC 1 RV-1 (T-101) 0.6 to 1 m (2 to 3 ft) bgs	B2BJR6 ZPC 1 RV-2 (T-101) 0.6 to 1 m (2 to 3 ft) bgs	B2BJR7 ZPC 1 RV-3 (T-101) 0.6 to 1 m (2 to 3 ft) bgs
Silver	13.6	0.2	0.11	0.73	0.11	0.11	0.1
Strontium	2,920	1	0.11	N/A	44.5	40.1	55.8
Thallium	1.59	1	0.11	0.1	0.156	0.146	0.1
Tin	48,000	10	0.11	N/A	0.513	0.535	0.423
Uranium	3.21[c]	1	0.11	3.21	0.739	0.654	1.42
Vanadium	560	2.5	0.22	85.1	61.5	61.4	55.1
Zinc	5970	1	0.86	67.8	48.5	52.8	43.2
Anion	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Nitrate-N	40	0.75	1.8[d]	11.8	0.468	76.9	13.7
Polynuclear Aromatic Hydrocarbons	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Acenaphthene	98	0.33	NA	N/A	NA	NA	NA
Acenaphthylene	98	0.33	NA	N/A	NA	NA	NA
Anthracene	2,270	0.33	NA	N/A	NA	NA	NA
Benzo(a)anthracene	0.86	0.33	NA	N/A	NA	NA	NA
Benzo(a)pyrene	0.33[c]	0.33	NA	N/A	NA	NA	NA
Benzo(b)fluoranthene	1.37	0.33	NA	N/A	NA	NA	NA

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

Contaminant	Removal Action Levels[a]	Required Detection Limit	Maximum Reported Laboratory Method Detection Limit	Background Concentration[b]	B2BJR5 ZPC 1 RV-1 (T-101) 0.6 to 1 m (2 to 3 ft) bgs	B2BJR6 ZPC 1 RV-2 (T-101) 0.6 to 1 m (2 to 3 ft) bgs	B2BJR7 ZPC 1 RV-3 (T-101) 0.6 to 1 m (2 to 3 ft) bgs
Benzo(k)fluoranthene	1.37	0.33	NA	N/A	NA	NA	NA
Benzo(g,h,i)perylene	2,400	0.33	NA	N/A	NA	NA	NA
Chrysene	9.56	0.33	NA	N/A	NA	NA	NA
Dibenzo(a,h)anthracene	1.37	0.33	NA	N/A	NA	NA	NA
Fluoranthene	631	0.33	NA	N/A	NA	NA	NA
Fluorene	101	0.33	NA	N/A	NA	NA	NA
Indeno(1,2,3-cd)pyrene	1.37	0.33	NA	N/A	NA	NA	NA
Naphthalene	4.46	0.33	NA	N/A	NA	NA	NA
Phenanthrene	1,140	0.33	NA	N/A	NA	NA	NA
Pyrene	655	0.5	NA	N/A	NA	NA	NA
Polychlorinated Biphenyls	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Aroclor 1016	0.094	0.017	NA	N/A	NA	NA	NA
Aroclor 1221	0.017[c]	0.017	NA	N/A	NA	NA	NA
Aroclor 1232	0.017[c]	0.017	NA	N/A	NA	NA	NA
Aroclor 1242	0.039	0.017	NA	N/A	NA	NA	NA
Aroclor 1248	0.039	0.017	NA	N/A	NA	NA	NA

Table A-3. Analytical Results for Verification Sampling for Radiological Contaminants

Contaminant	Removal Action Levels [a]	Required Detection Limit (pCi/g)	Maximum Reported Laboratory Method Detection Limit (pCi/g)	Background Activity[b] (pCi/g)	B28748 B28761 ZPC 1 V-1 (T-101) 0 to 0.3 m (0 to1 ft) bgs	B28749 B28762 ZPC 1 V-2 (T-101) 0 to 0.3 m (0 to1 ft) bgs	B28750 B28763 ZPC 1 V-3 (T-101) 0 to 0.3 m (0 to 1 ft) bgs	B28752 B28765 BS-1 (T-101) 0 to 0.3 m (0 to 1 ft) bgs	B28753 B28766 BS-2 (T-101) 0 to 0.3 m (0 to 1 ft) bgs	B28748 B28761 ZPC 1/V-1 (T-101) 0 to 0.3 m (0 to1 ft) bgs	B28754 B28767 ZPC 2 V-4 (T-104) 0 to 0.3 m (0 to 1 ft) bgs	B28755 B28768 ZPC 2 V-5 (T-104) 0 to 0.3 m (0 to 1 ft) bgs	B28756 B28769 ZPC 2 V-6 (T-104) 0 to 0.3 m (0 to 1 ft) bgs	B28757 B28770 ZPC 2 BS-3 (T-104) 0 to 0.3 m (0 to 1 ft) bgs	B28758 B28771 ZPC 2 BS-4 (T-104) 0 to 0.3 m (0 to 1 ft) bgs
Radionuclides	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)
Americium-241	31.1	1.0	0.072	N/A	U	0.015	0.038	0.029	0.02	0.03	0.021	0.024	0.027	0.023	U
Cesium-137	6.2	0.1	0.047	1.1	U	U	U	U	U	U	U	U	U	U	U
Europium-152	3.3	0.1	0.14	N/A	U	U	U	U	U	U	U	U	U	U	U
Europium-154	3	0.1	0.21	0.033	U	U	U	U	U	U	U	U	U	U	U
Europium-155	125	0.1	0.35	0.054	U	U	U	U	U	U	U	U	U	U	U
Plutonium-238	38.8	1.0	0.065	0.004	U	U	U	U	U	U	U	U	U	U	U
Plutonium-239/240	33.9	1.0	0.021	0.025	U	0.015	U	U	0.015	U	0.025	0.031	0.021	0.019	0.082
Strontium-90	4.5	1.0	0.43	0.18	U	U	U	U	U	U	U	U	U	U	U
Uranium-233/234	1.1	1.0	0.023	1.1	0.19	0.18	0.29	0.2	0.17	0.16	0.13	0.11	0.14	0.16	0.12
Uranium-235	0.5	0.5	0.024	0.11	0.026	0.017	0.018	U	0.03	U	U	U	U	U	U
Uranium-238	1.1	1.0	0.023	1.1	0.18	0.17	0.28	0.17	0.16	0.18	0.11	0.13	0.14	0.15	0.14

a. Removal action levels are from DOE/RL-2009-53, *Removal Action Work Plan for 11 Waste Sites in the 200-MG-1 Operable Unit.*

b. Hanford Site background values for radiological background data are available from DOE/RL-96-12, *Hanford Site Background: Part 2, Soil Background for Radionuclides*, Table 4.

N/A = Not Available

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

Table A-4. Analytical Results for Verification Sampling for Nonradiological Contaminants

Contaminant	Removal Action Levels[a]	Required Detection Limit	Maximum Reported Laboratory Method Detection Limit	Background Concentration[b]	B28754 B28767 ZPC 2 V-4 (T-104) 0 to 0.3 m (0 to 1 ft) bgs	B28755 B28768 ZPC 2 V-5 (T-104) 0 to 0.3 m (0 to 1 ft) bgs	B28756 B28769 ZPC 2 V-6 (T-104) 0 to 0.3 m (0 to 1 ft) bgs	B28757 B28770 ZPC 2 BS-3 (T-104) 0 to 0.3 m (0 to 1 ft) bgs	B28758 B28771 ZPC 2 BS-4 (T-104) 0 to 0.3 m (0 to 1 ft) bgs	B2C1N2 ZPC 1 RV3-1 (T-101) 1.2 to 1.6 m (4 to 5 ft) bgs	B2C1N3 ZPC 1 RV3-2 (T-101) 1.2 to 1.6 m (4 to 5 ft) bgs	B2C1N5 ZPC 1 RV3-3 (T-101) 1.2 to 1.6 m (4 to 5 ft) bgs
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	0.31	5	U	U	U	U	U	NA	NA	NA
Arsenic	6.5[c]	1	0.41	6.5	2.82	2.59	2.67	3.8	4.32	NA	NA	NA
Barium	1,650	2	0.21	132	98.3	91	94.1	90.2	90.3	NA	NA	NA
Beryllium	63.2	0.5	0.10	1.51	0.366	0.294	0.323	0.31	0.29	NA	NA	NA
Boron	210	2	4.3[d]	N/A	31	30	30.6	27.4	26.8	NA	NA	NA
Cadmium	0.81[c]	0.5	0.10	0.81	U	U	U	U	U	NA	NA	NA
Chromium Total	2000	1	0.51	18.5	7.59	6.58	7.86	8.54	8.68	NA	NA	NA
Chromium VI	N/A	0.5	0.10	N/A	U	U	U	U	U	NA	NA	NA
Cobalt	15.7[c]	2	0.10	15.7	8.04	7.28	8.26	6.8	7.21	NA	NA	NA
Copper	284	1	0.10	22	11.6	9.95	11.2	10.5	11.9	NA	NA	NA
Lead	250	5	0.10	10.2	5.21	4.74	4.83	4.53	4.94	NA	NA	NA
Lithium	160	2.5	0.42	33.5	6.18	6.51	7.3	9.45	8.51	NA	NA	NA
Manganese	512[c]	5	0.10	512	420	378	383	352	357	NA	NA	NA
Mercury	2.09	0.2	0.051	0.33	U	U	U	U	U	NA	NA	NA
Nickel	130	4	0.21	19.1	9.42	8.47	10.3	10.3	10.6	NA	NA	NA
Selenium	5.2	1	0.31	0.78	1.32	0.694	1.02	0.804	1.03	NA	NA	NA
Silver	13.6	0.2	0.10	0.73	U	U	U	U	U	NA	NA	NA
Strontium	2,920	1	0.10	N/A	21.9	21.5	23.6	34.7	48.9	NA	NA	NA
Thallium	1.59	1	0.10	0.1	U	U	U	U	U	NA	NA	NA
Tin	48,000	10	0.10	N/A	0.373	0.325	0.343	0.312	0.335	NA	NA	NA
Uranium	3.21[c]	1	0.10	3.21	0.385	0.504	0.349	0.656	0.456	NA	NA	NA
Vanadium	560	2.5	0.21	85.1	46.9	36.8	40.1	34.5	40.9	NA	NA	NA
Zinc	5970	1	0.82	67.8	38.7	42.1	34.4	34.6	35.7	NA	NA	NA
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)

Table A-4. Analytical Results for Verification Sampling for Nonradiological Contaminants

Contaminant	Removal Action Levels[a]	Required Detection Limit	Maximum Reported Laboratory Method Detection Limit	Background Concentration[b]	B28754 B28767 ZPC 2 V-4 (T-104) 0 to 0.3 m (0 to 1 ft) bgs	B28755 B28768 ZPC 2 V-5 (T-104) 0 to 0.3 m (0 to 1 ft) bgs	B28756 B28769 ZPC 2 V-6 (T-104) 0 to 0.3 m (0 to 1 ft) bgs	B28757 B28770 ZPC 2 BS-3 (T-104) 0 to 0.3 m (0 to 1 ft) bgs	B28758 B28771 ZPC 2 BS-4 (T-104) 0 to 0.3 m (0 to 1 ft) bgs	B2C1N2 ZPC 1 RV3-1 (T-101) 1.2 to 1.6 m (4 to 5 ft) bgs	B2C1N3 ZPC 1 RV3-2 (T-101) 1.2 to 1.6 m (4 to 5 ft) bgs	B2C1N5 ZPC 1 RV3-3 (T-101) 1.2 to 1.6 m (4 to 5 ft) bgs
Nitrate-N	40	0.75	1.7[d]	11.8	9.77	21.80	25.70	1.60	5.00	5.56	3.32	2.83
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	0.2	N/A	U	U	U	U	U	NA	NA	NA
Acenaphthylene	98	0.33	0.2	N/A	U	U	U	U	U	NA	NA	NA
Anthracene	2,270	0.33	0.2	N/A	U	U	U	U	U	NA	NA	NA
Benzo(a)anthracene	0.86	0.33	0.2	N/A	U	U	U	U	U	NA	NA	NA
Benzo(a)pyrene	0.33[c]	0.33	0.2	N/A	U	U	U	U	U	NA	NA	NA
Benzo(b)fluoranthene	1.37	0.33	0.2	N/A	U	U	U	U	U	NA	NA	NA
Benzo(k)fluoranthene	1.37	0.33	0.2	N/A	U	U	U	U	U	NA	NA	NA
Benzo(g,h,i)perylene	2,400	0.33	0.2	N/A	U	U	U	U	U	NA	NA	NA
Chrysene	9.56	0.33	0.2	N/A	U	U	U	U	U	NA	NA	NA
Dibenzo(a,h)anthracene	1.37	0.33	0.2	N/A	U	U	U	U	U	NA	NA	NA
Fluoranthene	631	0.33	0.2	N/A	U	U	U	U	U	NA	NA	NA
Fluorene	101	0.33	0.2	N/A	U	U	U	U	U	NA	NA	NA
Indeno(1,2,3-cd)pyrene	1.37	0.33	0.2	N/A	U	U	U	U	U	NA	NA	NA
Naphthalene	4.46	0.33	0.2	N/A	U	U	U	U	U	NA	NA	NA
Phenanthrene	1,140	0.33	0.2	N/A	U	U	U	U	U	NA	NA	NA
Pyrene	655	0.5	0.2	N/A	U	U	U	U	U	NA	NA	NA
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	0.004	N/A	U	U	U	U	U	NA	NA	NA
Aroclor 1221	0.017[c]	0.017	0.008	N/A	U	U	U	U	U	NA	NA	NA
Aroclor 1232	0.017[c]	0.017	0.004	N/A	U	U	U	U	U	NA	NA	NA
Aroclor 1242	0.039	0.017	0.004	N/A	U	U	U	U	U	NA	NA	NA
Aroclor 1248	0.039	0.017	0.004	N/A	U	U	U	U	U	NA	NA	NA

Table A-4. Analytical Results for Verification Sampling for Nonradiological Contaminants

Contaminant	Removal Action Levels[a]	Required Detection Limit	Maximum Reported Laboratory Method Detection Limit	Background Concentration[b]	B28754 B28767 ZPC 2 V-4 (T-104) 0 to 0.3 m (0 to 1 ft) bgs	B28755 B28768 ZPC 2 V-5 (T-104) 0 to 0.3 m (0 to 1 ft) bgs	B28756 B28769 ZPC 2 V-6 (T-104) 0 to 0.3 m (0 to 1 ft) bgs	B28757 B28770 ZPC 2 BS-3 (T-104) 0 to 0.3 m (0 to 1 ft) bgs	B28758 B28771 ZPC 2 BS-4 (T-104) 0 to 0.3 m (0 to 1 ft) bgs	B2C1N2 ZPC 1 RV3-1 (T-101) 1.2 to 1.6 m (4 to 5 ft) bgs	B2C1N3 ZPC 1 RV3-2 (T-101) 1.2 to 1.6 m (4 to 5 ft) bgs	B2C1N5 ZPC 1 RV3-3 (T-101) 1.2 to 1.6 m (4 to 5 ft) bgs
Aroclor 1254	0.066	0.017	0.004	N/A	U	U	U	U	U	NA	NA	NA
Aroclor 1260	0.5	0.017	0.004	N/A	U	U	U	U	U	NA	NA	NA
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	0.001	N/A	U	U	U	U	U	NA	NA	NA
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	4	N/A	U	U	U	U	U	NA	NA	NA
Kerosene	2,000	5	4	N/A	U	U	U	U	U	NA	NA	NA

a. Removal Action Levels are from DOE/RL-2009-53, *Removal Action Work Plan for 11 Waste Sites in the 200-MG-1 Operable Unit.*

b. If Hanford Site-specific background data is 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 Non- Radiological Background data are from DOE/RL-92-24, Rev. 1, 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 (1996), WAC 173-340-700(4)(d), and WAC 173 340 707(2), respectively.

NA = not applicable

N/A = not available

U = Analyzed for but not detected above laboratory method detection limit.