1217434

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Richland Operations Office
P.O. Box 550
Richland, Washington 99352

11-AMRC-0164

JUN 29 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:

TRANSMITTAL OF THE APPROVED WASTE SITE RECLASSIFICATION FORM AND SUPPORTING DOCUMENTATION FOR THE 600-205, HANFORD TOWNSITE LANDFILL 2, REVISION 0

Attached for your use is the approved Waste Site Reclassification Form No. 2011-031 and supporting "Remaining Site Verification Package for the 600-205, Hanford Townsite Landfill 2," Revision 0. If you have questions, please contact me or your staff may contact Jamie Zeisloft, of my staff, at (509) 372-0188.

Sincerely,

Mark S. French

Mark S. French, Federal Project Director
for the River Corridor Closure Project

AMRC:JHZ

Attachment

cc w/attach:
C. J. Guzzetti, EPA
Administrative Record, H6-08

cc w/o attach:
R. D. Cantwell, WCH
S. L. Feaster, WCH
M. L. Proctor, WCH

Date Submitted: 3/17/2011 Originator: M. L. Proctor Phone: 372-9227	**WASTE SITE RECLASSIFICATION FORM** Operable Unit(s): 100-IU-6 Waste Site Code: 600-205 Type of Reclassification Action: Closed Out ☐ Interim Closed Out ☒ No Action ☐ RCRA Postclosure ☐ Rejected ☐ Consolidated ☐	Control Number: 2011-031

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:

The 600-205, Hanford Townsite Landfill 2 waste site was a large area where domestic waste was dumped during Hanford-era operations. The site contained nonradioactive solid waste and consisted primarily of heavy concentrations of tin cans, bottles, auto parts, and other domestic refuse. The 600-205 waste site is identified as a candidate site for confirmatory sampling in the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington*, (Remaining Sites ROD) U.S. Environmental Protection Agency, Region 10, Seattle, Washington (EPA 1999). During confirmatory sampling, the waste site was stratified into seven areas based on the results of the geophysical survey and site walkdown. Only area 2 was determined to need remediation.

Remedial action at the 600-205 waste site, area 2, was performed from February 24 to March 2, 2010. The total depth of the scraped area was approximately 3 m (10 ft). The waste material and soil was staged to the southwest of the excavated area before removal to the Environmental Restoration Disposal Facility.

Basis for reclassification:

Following remediation, verification sampling was conducted in September 2010. Because the remedial action goals were not attained for portions of the waste site, further remediation occurred, and final verification sampling was conducted in December 2010 and February 2011. The results demonstrate that residual contaminant concentrations are protective of direct exposure, groundwater, and the Columbia River.

In accordance with this evaluation, the verification sampling results support a reclassification of the 600-205 waste site to Interim Closed Out. The current site conditions achieve the remedial action goals established by the Remaining Sites ROD (EPA 1999). The results of verification sampling do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow-zone soils (i.e., surface to 4.6 m [15 ft] deep). The analytical results and rationale presented in the attached remaining sites verification package also demonstrate that the 600-205 waste site is protective of groundwater and the Columbia River. The waste site contamination did not extend into the deep zone; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep-zone soil are not required. The basis for reclassification is described in detail in the *Remaining Sites Verification Package for the 600-205, Hanford Townsite Landfill 2* (attached).

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.

M. S. French DOE Federal Project Director (printed)	Chris Smith for MSF Signature	5/17/11 Date
N/A Ecology Project Manager (printed)	Signature	Date
C. Guzzetti EPA Project Manager (printed)	Signature	5/25/11 Date

REMAINING SITES VERIFICATION PACKAGE FOR THE 600-205, HANFORD TOWNSITE LANDFILL 2

Attachment to Waste Site Reclassification Form 2011-031

April 2011

REMAINING SITES VERIFICATION PACKAGE FOR THE 600-205, HANFORD TOWNSITE LANDFILL 2

EXECUTIVE SUMMARY

The 600-205, Hanford Townsite Landfill 2 waste site, located in the 100-IU-6 Operable Unit, was a large area that was used for dumping of domestic waste during Hanford-era operations. The site is related to Hanford Townsite Landfill 1 (600-110 waste site) that is located to the southeast. The waste was described as nonradioactive solid waste consisting primarily of domestic debris including heavy concentrations of tin cans, bottles, auto parts, and other domestic refuse. Surface grading was evident at the waste site, indicating that additional concentrations of debris may exist below grade.

Evaluation of historical photographs indicated that the area was likely used as a dump during Hanford operations by the Camp Hanford facility, and included the presence of a vehicle repair and maintenance facility. In combination with previous findings that this had been a pre-Hanford waste site, two landfill waste sites were designated in the area, 600-205 and 600-110. The 600-205 waste site is the northernmost landfill.

The 600-205 waste site is identified as a candidate site for confirmatory sampling in the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD) (EPA 1999). Based on the results of confirmatory sampling conducted in 2005, one area of the waste site was recommended for remove, treat, and dispose (WCH 2005). Remedial action at the 600-205 waste site was performed from February 24 to March 2, 2010.

Following remediation, verification sampling was conducted in September 2010. The initial results indicated that further waste removal was necessary. After further remediation, verification sampling was conducted again for some areas in December 2010 and in February 2011. The results indicated that waste removal action achieved compliance with the remedial action objectives (RAOs) and remedial action goals (RAGs) for the 600-205 waste site. A summary of the cleanup evaluation for the soil results against the applicable criteria is presented in Table ES-1. The results of the verification sampling are used to make reclassification decisions for the 600-205 waste site in accordance with the TPA-MP-14 procedure in the *Tri-Party Agreement Handbook Management Procedures* (DOE-RL 2007).

Table ES-1. Summary of Remedial Action Goals for the 600-205 Waste Site.

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Direct Exposure – Radionuclides	Attain 15-mrem/yr dose rate above background over 1,000 years.	Radionuclides were not COPCs for the 600-205 waste site.	NA
Direct Exposure – Nonradionuclides	Attain individual COPC RAGs.	All individual COPC concentrations are below the direct exposure criteria.	Yes
Risk Requirements – Nonradionuclides	Attain a hazard quotient of <1 for all individual noncarcinogens.	The hazard quotients for individual nonradionuclide COPCs are <1.	Yes
	Attain a cumulative hazard quotient of <1 for noncarcinogens.	The cumulative hazard quotient for all sampling areas (1.2×10^{-3}) is <1.	
	Attain an excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens.	Excess cancer risk values for individual nonradionuclide COPCs are $<1 \times 10^{-6}$.	
Risk Requirements – Nonradionuclides	Attain a cumulative excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.	The total excess carcinogenic risk for all sampling areas (6.2×10^{-8}) is $<1 \times 10^{-5}$.	Yes
Groundwater/River Protection – Radionuclides	Attain single COPC groundwater and river RAGs.	Radionuclides were not COPCs for the 600-205 waste site.	NA
	Attain National Primary Drinking Water Regulations: 4 mrem/yr (beta/gamma) dose standard to target receptor/organ [a].		
	Meet drinking water standards for alpha emitters: the more stringent of 15 pCi/L MCL or 1/25th of the derived concentration guide for DOE Order 5400.5 [b].		
	Meet total uranium standard of 21.2 pCi/L [c].		
Groundwater/River Protection – Nonradionuclides	Attain individual nonradionuclide groundwater and Columbia River cleanup requirements.	Lead and 4,4'-DDD are present at concentrations slightly above soil RAGs for groundwater and/or Columbia River protection. However, an evaluation based upon RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b) shows that residual concentrations of these constituents are not predicted to migrate more than 2 m (6.6 ft) within 1,000 years based on the soil-partitioning coefficient (K_d) of 30 mL/g for lead (the contaminant with the lowest K_d value). The thickness of the vadose zone beneath the 600-205 excavation is at least 11.5 m (37.7 ft). Therefore, residual concentrations of these constituents are predicted to be protective of groundwater and the river.	Yes

[a] "National Primary Drinking Water Regulations" (40 *Code of Federal Regulations* 141).
[b] *Radiation Protection of the Public and Environment* (DOE Order 5400.5).
[c] Based on the isotopic distribution of uranium in the 100 Area, the 30 µg/L MCL corresponds to 21.2 pCi/L. Concentration-to-activity calculations are documented in *Calculation of Total Uranium Activity Corresponding to a Maximum Contaminant Level for Total Uranium of 30 Micrograms per Liter in Groundwater* (BHI 2001).

COPC = contaminant of potential concern
DOE = U.S. Department of Energy
MCL = maximum contaminant level
RAG = remedial action goal
RDR/RAWP = *Remedial Design Report/Remedial Action Work Plan for the 100 Area*
RESRAD = RESidual RADioactivity (dose model)

In accordance with this evaluation, the verification sampling results support a reclassification of this site to Interim Closed Out. The current site conditions achieve the RAOs and the corresponding RAGs established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2009) and the Remaining Sites ROD (EPA 1999). These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow-zone soil (i.e., surface to 4.6 m [15 ft]), and contaminant levels remaining in the soil are protective of groundwater and the Columbia River. The 600-205 waste site contamination did not extend into the deep zone; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required.

Soil cleanup levels were established in the Remaining Sites ROD (EPA 1999) based in part on a limited ecological risk assessment. Although not required by the Remaining Sites ROD, a comparison against ecological risk screening levels has been made for the site contaminants of potential concern, and other constituents. Those constituents exceeding the ecological screening level in the *Washington Administrative Code* Chapter 173-340, Table 749-3 were boron and vanadium. The U.S. Environmental Protection Agency ecological soil screening levels were exceeded for lead, manganese, vanadium, zinc, and 4,4'-DDD. Exceedance of screening values is intended to trigger additional evaluation and does not necessarily indicate the existence of risk to ecological receptors. Because the maximum detected levels of manganese, vanadium, and zinc were all below Hanford Site background values, it is believed that the presence of these constituents does not pose a risk to ecological receptors. No established background value is available for boron at this time; a final cleanup level for boron, including consideration of background, will be established through the final remedial investigation/feasibility study process. All exceedances will be evaluated in the context of additional lines of evidence for ecological effects as a part of the final closeout decision for the Columbia River corridor portion of the Hanford Site.

REMAINING SITES VERIFICATION PACKAGE FOR THE 600-205, HANFORD TOWNSITE LANDFILL 2

STATEMENT OF PROTECTIVENESS

The 600-205, Hanford Townsite Landfill 2 waste site verification sampling data, site evaluations, and supporting documentation demonstrate that this site meets the objectives established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP) (DOE-RL 2009) and the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD) (EPA 1999). These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow-zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. The waste site contamination did not extend into the deep zone; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required.

GENERAL SITE INFORMATION AND BACKGROUND

The 600-205, Hanford Townsite Landfill 2 waste site, located in the 100-IU-6 Operable Unit, was a large area that was used for dumping of domestic waste during Hanford-era operations. The site is related to Hanford Townsite Landfill 1 (600-110 waste site) that is located to the southeast. The waste was described as nonradioactive solid waste consisting primarily of domestic debris including heavy concentrations of tin cans, bottles, auto parts, and other domestic refuse. Surface grading was evident at the waste site, indicating that additional concentrations of debris may exist below grade.

Evaluation of historical photographs indicated that the area was likely used as a dump during Hanford operations by the Camp Hanford facility, and included the presence of a vehicle repair and maintenance facility. In combination with previous findings that this had been a pre-Hanford waste site, two landfill waste sites were designated in the area, 600-205 and 600-110. The 600-205 waste site is the northernmost landfill, and is located southeast of the intersection of Route 2 North and Route 11 A (Figure 1). The waste site is located at approximate Washington State Plane (WSP) coordinates N 584717, E 138773.

Geophysical Survey

A geophysical survey was performed February 18, 2004 (BHI 2004) that identified six subsurface anomalous areas, which were investigated during confirmatory sampling, as shown in Figure 2. A small nonvegetated area was observed and several zones with concentrated debris were indicated (Figure 2).

Figure 1. The 600-205 Waste Site Location Map.

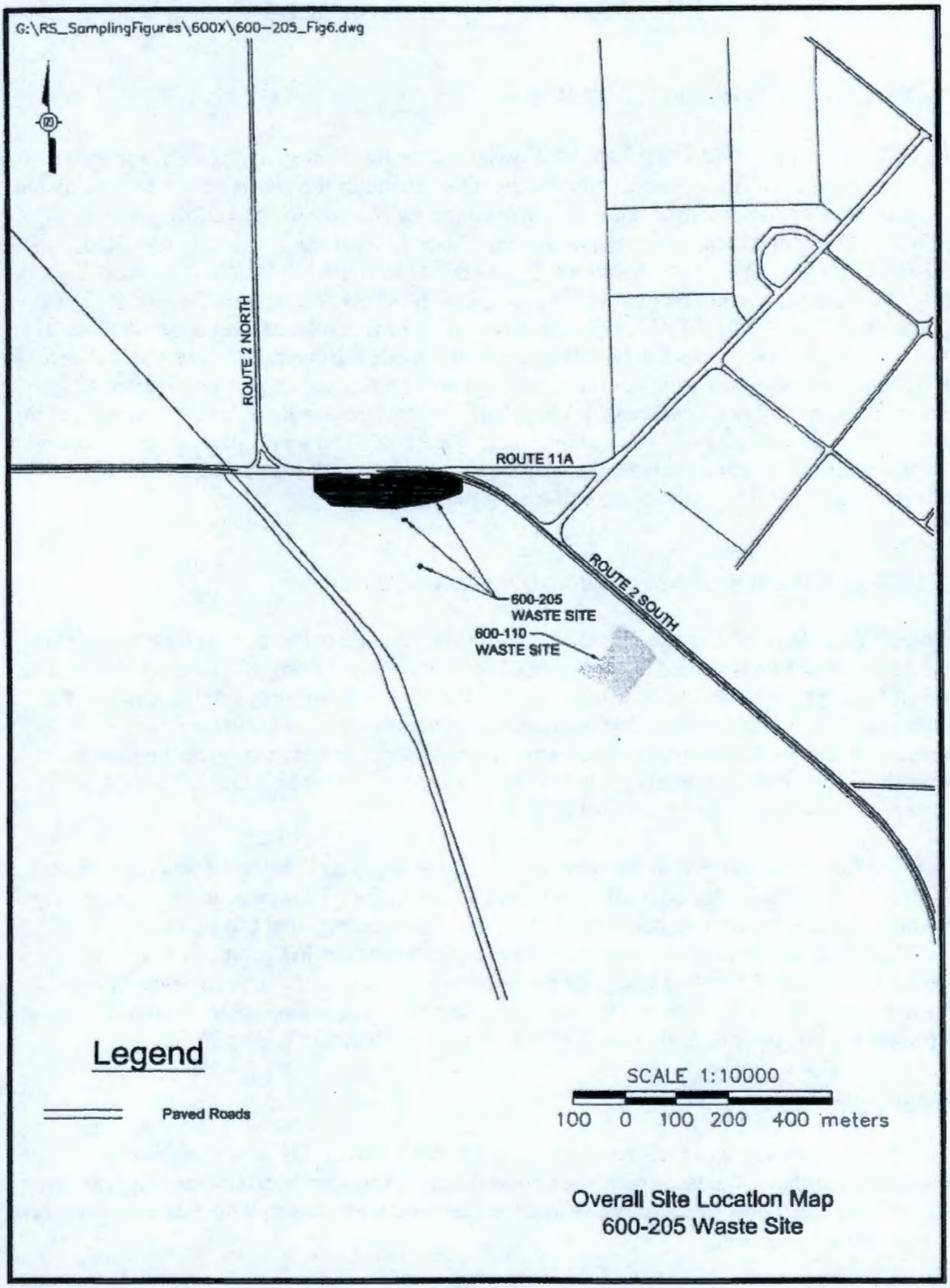
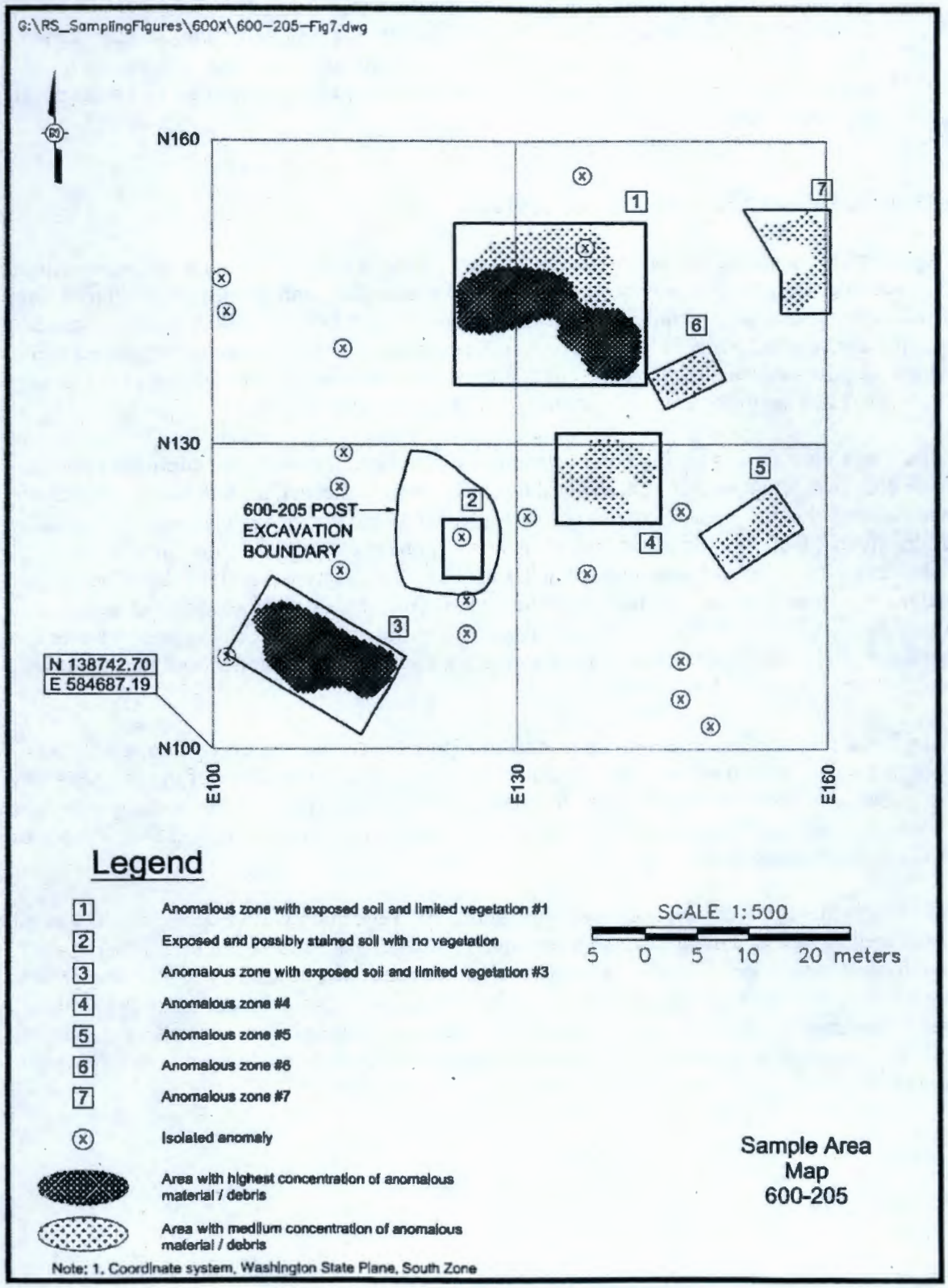


Figure 2. 600-205 Geophysical Investigation Results.



Site Walkdown

A site walkdown was performed in June 2004 with the objective of gathering the information necessary to finalize the sampling requirements for confirmatory sampling. During the walkdown, the areas of soil with no vegetation and signs of staining identified in the geophysical survey were observed.

CONFIRMATORY SAMPLING ACTIVITIES

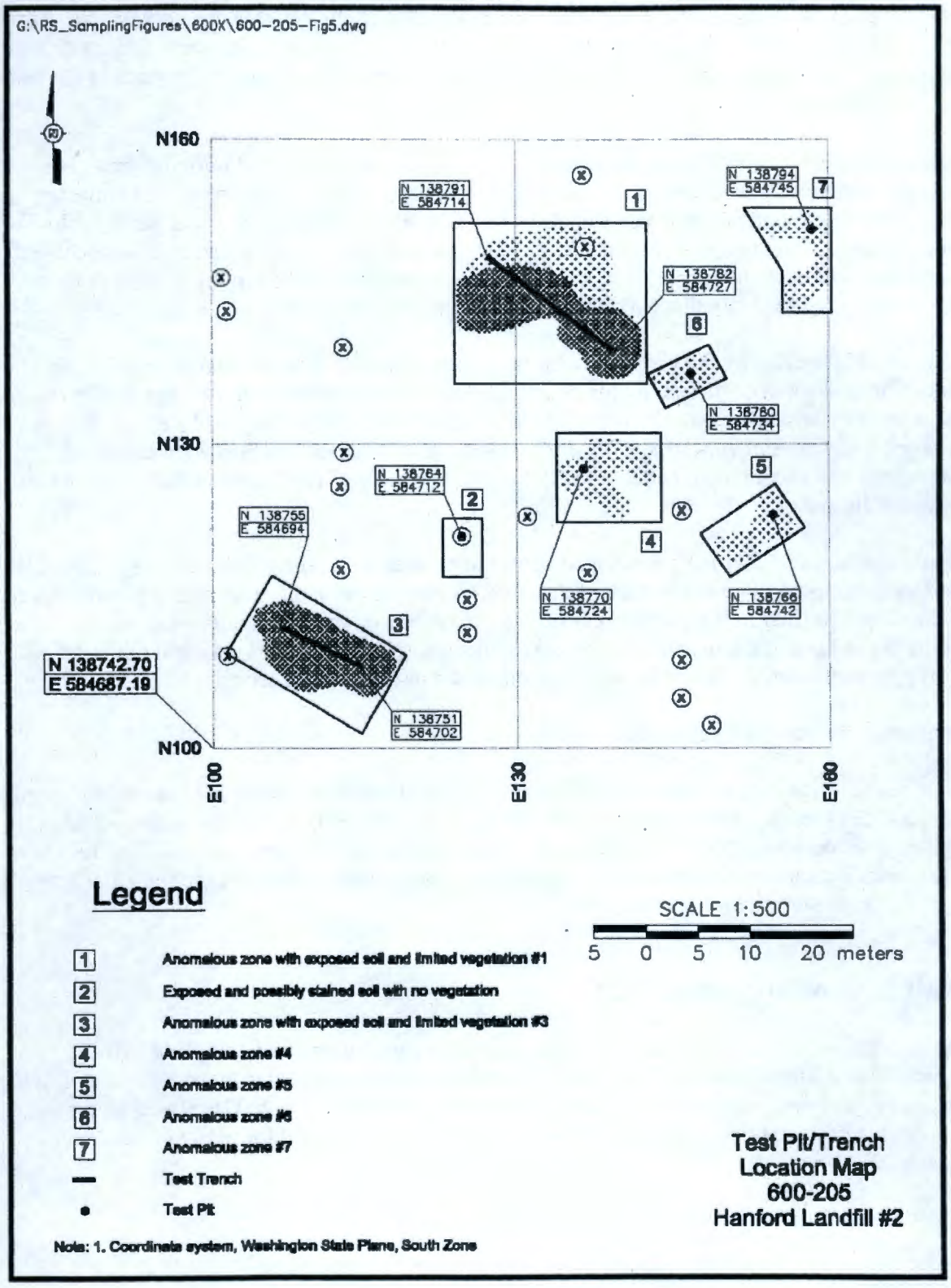
Confirmatory sampling was performed on January 26 and 27, 2005. Seven areas were delineated for sampling using the site walkdown, surface feature mapping, and geophysical mapping data. The geophysical survey identified six areas of potential buried debris, which were evaluated by digging test pits and trenches. The surface feature mapping identified one nonvegetated area, which was not indicated in the geophysical survey, and this area was evaluated by excavation of a test pit. Each sampling area and test pit/trench is indicated in Figure 3.

Area 1 was identified as having no vegetation on the surface. Primary and duplicate samples were collected of the surface soil. After the samples were collected, a 15-m (49-ft) test trench was excavated in this area. No debris or anomalous material was discovered during excavation of this trench; therefore, no miscellaneous debris or potentially impacted soil samples were collected. Native soil was encountered at 3.7 m (12 ft) below ground surface (bgs); one soil sample was collected from the bottom of the trench. Additionally, one battery was discovered approximately 8.2 m (27 ft) from the northwest end of the excavation. Per agreement with the regulator (BHI 2005b), the battery material was segregated, bagged, and placed in a shallow burial at one end of the test trench.

Area 2 was identified as a nonvegetated area with possible surface staining. One sample was collected of the stained surface soil. A test pit was excavated in the center of the sample area. No debris or anomalous material was encountered during this excavation; thus, samples were not collected. Native soil was encountered at 1.5 m (5 ft) bgs, and a sample of soil from the bottom of the trench was collected.

Area 3 was identified as having limited vegetation. No vegetation was observed on the east side of the area as well as a mound on the west side. A sample was collected of the surface soil. The geophysical survey indicated that an area of highly concentrated debris or material was present. An 8-m (26-ft) test trench was located across the sample area. No debris or anomalous material was discovered during excavation of the trench; therefore, samples were not collected. Native soil was encountered at 0.9 m (3 ft) bgs, and a sample of soil from the bottom of the trench was collected.

Figure 3. 600-205 Confirmatory Sampling Locations.



Area 4 was identified by the geophysical survey as an area with potential buried debris. No surface anomalies were present at this area; therefore, no surface soil samples were collected. A test pit was excavated near the center of the area identified in the geophysical survey. No debris or anomalous material was discovered during excavation; thus, no samples were collected. Native soil was encountered at 1.5 m (5 ft) bgs, and a sample of soil from the bottom of the test pit was collected.

Area 5 was identified by the geophysical survey as an area with potential buried debris. No surface anomalies were present in this area; therefore, no surface soil samples were collected. A test pit was excavated near the east end of the area identified in the geophysical survey. No debris or anomalous material was discovered during excavation; thus, no samples were collected. Native soil was encountered at 1.5 m (5 ft) bgs, and a sample of soil from the bottom of the test pit was collected to verify that native soil had not been contaminated.

Area 6 was identified by the geophysical survey as an area with potential buried debris. No surface anomalies were present in this area; therefore, no surface soil samples were collected. A test pit was excavated near the center of the area identified in the geophysical survey. No debris or anomalous material was discovered during excavation; thus, no samples were collected. Native soil was encountered at 0.9 m (3 ft) bgs, and a sample of soil from the bottom of the test pit was collected.

Area 7 was identified by the geophysical survey as an area with potential buried debris, and large boulders were present on the surface of this area. A test pit was excavated near the northeast end of the area identified in the geophysical survey. No debris or anomalous material was discovered during the excavation; thus, no samples were collected. Native soil was encountered at 1.5 m (5 ft) bgs, and a sample of soil from the bottom of the test pit was collected.

Confirmatory Sampling Results

All of the samples collected during confirmatory sampling were analyzed for inductively coupled plasma (ICP) metals, mercury, polychlorinated biphenyls (PCBs), pesticides, semivolatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH), and sulfates. The results of confirmatory sampling and the comparison of these confirmatory results to the remedial action goals (RAGs) are provided in Appendix A.

REMEDIAL ACTION SUMMARY

The 600-205 waste site is identified as a candidate site for confirmatory sampling in the *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington* (EPA 2009). Based on the results of confirmatory sampling, area 2 of the waste site was recommended for remove, treat, and dispose.

Remediation occurred at area 2 of the 600-205 waste site from February 24 to March 2, 2010. The excavated area was approximately 115 m^2 (1,240 ft^2). The waste was staged to the southwest of the excavation, and had an area of approximately 80 m^2 (860 ft^2). Photographs of the waste site are provided in Appendix B.

On March 15, 2010, one in-process sample, J19V17, was collected from the bottom of the waste site and the sidewalls of the excavation. The sample results are provided in Appendix C.

The battery and surrounding soil found in area 1 was drummed on May 17, 2010. The WSP coordinates for the battery were N 137901, E 588495. Per regulatory agreement, no sample was collected from this location.

Based on the results of verification sampling conducted in September and December 2010, several portions of the 600-205 waste site required additional remediation and sampling for TPH and pesticides. A second exceedance of the RAGs occurred for some analytes; therefore, two additional re-samples occurred. The final depth of the excavation was approximately 4 m (13 ft) deep and the staging pile area was 1 m (3 ft) deep, resulting in 512 bank cubic meters (BCM) [670 bank cubic yards (BCY)] of soil that was loaded out to the Environmental Restoration Disposal Facility.

VERIFICATION SAMPLING ACTIVITIES

Verification sampling for the 600-205 waste site was conducted in September and December 2010, and February 2011 to support a determination that residual contaminant concentrations at this site meet the cleanup criteria specified in the RDR/RAWP (DOE-RL 2009) and the Remaining Sites ROD (EPA 1999). The verification sample results are provided in Appendix D and indicate that the waste removal action achieved compliance with the remedial action objectives (RAOs) for the 600-205 waste site. The following subsections provide additional discussion of the information used to develop the verification sampling design. A more detailed discussion of the verification sampling can be found in the *Work Instruction for Verification Sampling of the 600-205, Hanford Townsite Landfill 2* (WCH 2010b).

Contaminants of Potential Concern

The contaminants of potential concern (COPCs) for the 600-205 waste site were identified in the RDR/RAWP (DOE-RL 2009b) as PCBs, pesticides, SVOCs, TPH, volatile organic compounds (VOCs), asbestos, silver, cadmium, barium, chromium (total), hexavalent chromium, mercury, lead, selenium, and sulfate. Field observations during remediation, confirmatory sampling results, and in-process sampling results (Appendix A and C) were then used to refine the list of COPCs for verification sampling.

Pesticides, polycyclic aromatic hydrocarbons (PAH), and lead were detected during confirmatory and/or in-process sampling, and therefore were retained as COPCs. Total petroleum hydrocarbons were detected during in-process sampling, and therefore were included as COPCs. All ICP metals, with the exception of lead, were either undetected or detected below the RAGs,

and therefore were not considered site COPCs. However, analyses were requested for the constituents of the ICP metals list, which also included antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.

Asbestos-containing material was not encountered during remedial activities; therefore, asbestos was eliminated as a COPC. VOCs were not detected in the field and were also eliminated as COPCs. PCBs were not detected during confirmatory sampling; SVOCs and hexavalent chromium were not detected during in-process sampling; therefore, all were eliminated as COPCs. Sulfate was detected well below the RAGs during confirmatory sampling and was eliminated as a COPC.

A summary of all the contaminants analyzed is provided in Table 1.

Table 1. 600-205 Laboratory Analytical Methods.

Analytical Method	Contaminant of Potential Concern
ICP metals [a] – EPA Method 6010	Lead
Pesticides – EPA Method 8081	Organochlorine pesticides
PAH – EPA Method 8310	Polycyclic aromatic hydrocarbons
TPH – NWTPH-Dx [b]	Total petroleum hydrocarbons

[a] Analyses were performed for the expanded list of ICP metals including antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.
[b] NWTPH-Dx analyzed for both diesel and heavy oil range organics.

EPA = U.S. Environmental Protection Agency
ICP = inductively coupled plasma
NWTPH-Dx = Northwest total petroleum hydrocarbons – diesel range organics
PAH = polycyclic aromatic hydrocarbons
TPH = total petroleum hydrocarbons

Verification Sample Design

This section describes the basis for selection of an appropriate sample design and determination of the number of verification samples that were collected. Professional knowledge and the laboratory results of confirmatory and in-process sampling were used to develop the verification sampling design for the 600-205 waste site. A composite sampling design was used to collect samples from the two decision units. These samples are shown in Table 2. Decision Unit 1 consisted of the excavated area and Decision Unit 2 consisted of the staging pile area footprint. Two composite soil samples were collected from each decision unit. Figure 4 shows the locations of each composite sample.

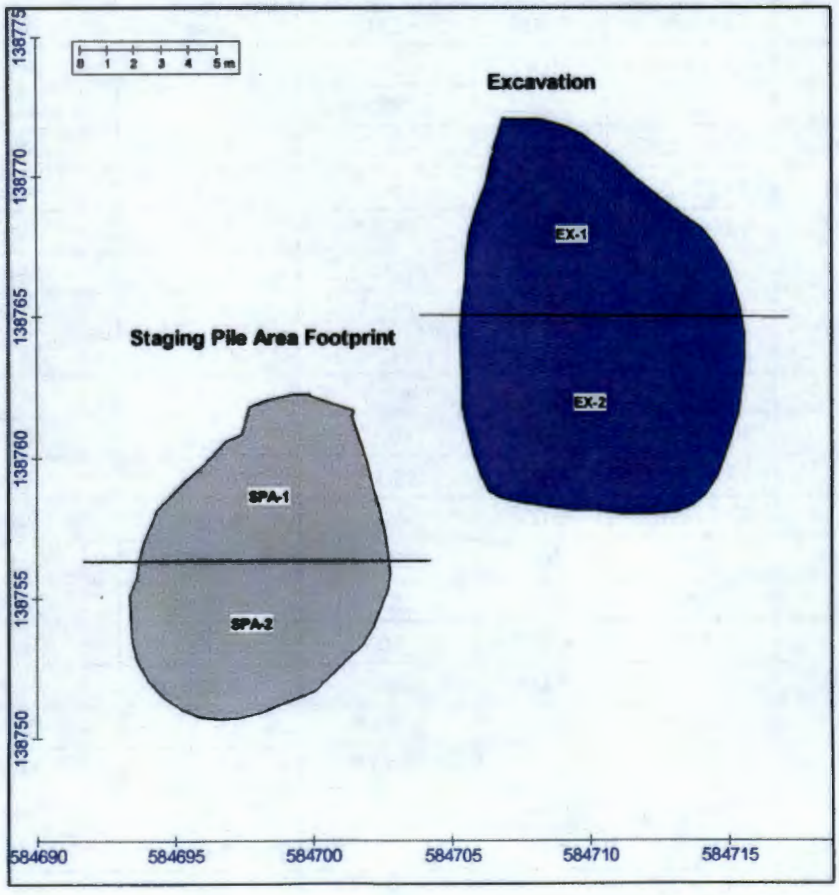
Table 2. 600-205 Verification Sampling Summary Table.

Sample Location	HEIS Number	Sample Date	WSP Coordinates (m)	Sample Analysis
EX-1	J1C3H3	9/27/2010	NA	ICP metals [a], pesticides, PAH, TPH
EX-1 re-sample	J1CXT1	12/7/2010	NA	Pesticides, TPH
EX-1 re-sample 2	J1DWW9	2/3/2011	NA	TPH
EX-2	J1C3H4	9/27/2010	NA	ICP metals [a], pesticides, PAH, TPH
SPA-1	J1C3H5	9/27/2010	NA	
SPA-1 resample	J1CXT2	12/7/2010	NA	Pesticides
SPA-2	J1C3H6	9/27/2010	NA	ICP metals [a], pesticides, PAH, TPH
SPA-2 resample	J1CXT3	12/7/2010	NA	Pesticides
Duplicate of EX-1	J1C3H7	9/27/2010	NA	ICP metals [a], pesticides, PAH, TPH
Equipment blank	J1C3H8	9/27/2010	NA	ICP metals [a]

[a] Analysis for the expanded list of ICP metals were performed to include antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.

HEIS = Hanford Environmental Information System
ICP = inductively coupled plasma
NA = not applicable
PAH = polycyclic aromatic hydrocarbons
TPH = total petroleum hydrocarbons
WSP = Washington State Plane

Figure 4. Verification Sampling Locations for the 600-205 Waste Site.



Verification Sample Results

Verification samples were analyzed using U.S. Environmental Protection Agency-approved analytical methods. Statistical analysis (e.g., calculation of a 95% upper confidence limit value) is inappropriate to use for evaluation of these types of composite samples; therefore, the sample results for each verification sample are evaluated using the maximum detected activity for each COPC and comparing the value directly to the RAG values. Tables 3 and 4 provide a comparison of the maximum result of the composite samples against the cleanup criteria for each decision unit. Individual sample results are provided in Appendix D. If no detections for a given COPC were reported in the data set, then no evaluations were performed for that COPC.

Table 3. Comparison of Maximum Contaminant Concentrations to Remedial Action Goals for the 600-205 Excavation Verification Sampling Data. (2 Pages)

COPC	Maximum Result (mg/kg)	Remedial Action Goals [a] (mg/kg)			Does the Maximum Result Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	5.42 (<BG)	20 [b]	20 [b]	20 [b]	No	--
Barium	70.4 (<BG)	5,600	200	400	No	--
Beryllium	0.384 (<BG)	10.4 [c]	1.51 [b]	1.51 [b]	No	--
Boron [d]	1.38	7,200	320	-- [e]	No	--
Cadmium [f]	0.113 (<BG)	13.9 [c]	0.81 [b]	0.81 [b]	No	--
Chromium (total)	9.42 (<BG)	80,000	18.5 [b]	18.5 [b]	No	--
Cobalt	9.09 (<BG)	24	15.7 [b]	-- [e]	No	--
Copper	18.0 (<BG)	2,960	59.2	22.0 [b]	No	--
Lead	6.9 (<BG)	353	10.2 [b]	10.2 [b]	No	--
Manganese	371 (<BG)	3,760	512 [b]	512 [b]	No	--
Molybdenum [d]	0.360	400	8	-- [e]	No	--
Nickel	10.7 (<BG)	1,600	19.1 [b]	27.4	No	--
Vanadium	59.5 (<BG)	560	85.1 [d]	-- [e]	No	--
Zinc	49.0 (<BG)	24,000	480	67.8 [d]	No	--
TPH – diesel range	3.20	200	200	200	No	--
TPH – motor oil	7.86	200	200	200	No	--
Acenaphthene	0.0591	4,800	96	129	No	--
Anthracene	0.00931	24,000	240	1,920	No	--
Benzo(a)pyrene	0.00445	0.137	0.015 [g]	0.015 [g]	No	--
Benzo(b)fluoranthene	0.0137	1.37	0.015 [g]	0.015 [g]	No	--
Benzo(ghi)perylene	0.00143	2,400	48	192	No	--
Chrysene	0.00203	13.7	0.12	0.1 [g]	No	--
Fluoranthene	0.0127	3,200	64	18.0	No	--

Table 3. Comparison of Maximum Contaminant Concentrations to Remedial Action Goals for the 600-205 Excavation Verification Sampling Data. (2 Pages)

COPC	Maximum Result (mg/kg)	Remedial Action Goals [a] (mg/kg)			Does the Maximum Result Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Fluorene	0.00517	3,200	64	260	No	--
Pyrene	0.00109	2,400	48	192	No	--
4,4'-DDD	0.0651	4.17	0.0365	0.0033 [g]	Yes	Yes [h]

[a] RAGs obtained from the RDR/RAWP (DOE-RL 2009) unless otherwise noted.

[b] Where cleanup levels are less than background, cleanup levels default to background (WAC 173-340-700[4][d]) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement Project Managers as discussed in Section 2.1.2.1 of the RDR/RAWP (DOE-RL 2009).

[c] Carcinogenic cleanup level calculated based on the inhalation exposure pathway per WAC 173-340-750(3), 1996 (Method B for air quality) and an airborne particulate mass loading rate of 0.0001 g/m^3 (*Hanford Guidance for Radiological Cleanup* [WDOH 1997]).

[d] No Hanford Site-specific or Washington State background value available.

[e] No parameters (bioconcentration factors or AWQC values) are available from the Cleanup Levels and Risk Calculations Database (Ecology 2010) or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], 1996 [Method B for surface waters]).

[f] Hanford Site-specific background value is not available; it was not evaluated during background study. Value used is from *Natural Background Soil Metals Concentrations in Washington State* (Ecology 1994).

[g] Where cleanup levels are less than RDLs, cleanup levels default to RDLs per WAC 173-340-707(2) (Ecology 1996).

[h] Based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009), the residual concentrations of 4,4'-DDD are not expected to migrate more than 1 m (3.3 ft) vertically in 1,000 years (based on the distribution coefficient of 4,4'-DDD of 45.8 mL/g). The vadose zone underlying the excavation is approximately 11.5 m (37.7 ft) thick. Therefore, residual concentrations of this constituent are predicted to be protective of groundwater and the Columbia River.

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COPC = contaminant of potential concern
RAG = remedial action goal
RDL = required detection limit
RDR/RAWP = *Remedial Design Report/Remedial Action Work Plan for the 100 Area*
RESRAD = RESidual RADioactivity (dose model)
TPH = total petroleum hydrocarbons
WAC = *Washington Administrative Code*

Table 4. Comparison of Maximum Contaminant Concentrations to Remedial Action Goals for the 600-205 Staging Pile Area Verification Sampling Data. (2 Pages)

COPC	Maximum Result (mg/kg)	Remedial Action Goals [a] (mg/kg)			Does the Maximum Result Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	3.18 (<BG)	20 [b]	20 [b]	20 [b]	No	--
Barium	75.0 (<BG)	5,600	200	400	No	--
Beryllium	0.275 (<BG)	10.4 [c]	1.51 [b]	1.51 [b]	No	--
Boron [d]	1.26	7,200	320	-- [e]	No	--
Cadmium [f]	0.250 (<BG)	13.9 [c]	0.81 [b]	0.81 [b]	No	--
Chromium (total)	9.02 (<BG)	80,000	18.5 [b]	18.5 [b]	No	--
Cobalt	6.81 (<BG)	24	15.7 [b]	-- [e]	No	--
Copper	13.2 (<BG)	2,960	59.2	22.0 [b]	No	--
Lead	12.0	353	10.2 [b]	10.2 [b]	Yes	Yes [g]
Manganese	318 (<BG)	3,760	512 [b]	512 [b]	No	--
Molybdenum [d]	0.287	400	8	-- [e]	No	--
Nickel	9.23 (<BG)	1,600	19.1 [b]	27.4	No	--
Vanadium	53.0 (<BG)	560	85.1 [d]	-- [e]	No	--
Zinc	45.7 (<BG)	24,000	480	67.8 [d]	No	--
TPH – diesel range	3.39	200	200	200	No	--
TPH – motor oil	103	200	200	200	No	--
Acenaphthene	0.00340	4,800	96	129	No	--
Benzo(a)pyrene	0.00145	0.137	0.015 [h]	0.015 [h]	No	--
Benzo(b)fluoranthene	0.00361	1.37	0.015 [h]	0.015 [h]	No	--
Benzo(ghi)perylene	0.00284	2,400	48	192	No	--
Chrysene	0.00608	13.7	0.12	0.1 [h]	No	--
Fluoranthene	0.146	3,200	64	18.0	No	--
Indeno(1,2,3-cd)pyrene	0.00457	1.37	0.33 [h]	0.33 [h]	No	--
Phenanthrene [i]	0.00136	24,000	240	1,920	No	--

Table 4. Comparison of Maximum Contaminant Concentrations to Remedial Action Goals for the 600-205 Staging Pile Area Verification Sampling Data. (2 Pages)

COPC	Maximum Result (mg/kg)	Remedial Action Goals [a] (mg/kg)			Does the Maximum Result Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Pyrene	0.00494	2,400	48	192	No	--

[a] RAGs obtained from the RDR/RAWP (DOE-RL 2009) unless otherwise noted.
[b] Where cleanup levels are less than background, cleanup levels default to background (WAC 173-340-700[4][d]) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement Project Managers as discussed in Section 2.1.2.1 of the RDR/RAWP (DOE-RL 2009).
[c] Carcinogenic cleanup level calculated based on the inhalation exposure pathway per WAC 173-340-750[3], 1996 (Method B for air quality) and an airborne particulate mass loading rate of 0.0001 g/m^3 (*Hanford Guidance for Radiological Cleanup* [WDOH 1997]).
[d] No Hanford Site-specific or Washington State background value available.
[e] No parameters (bioconcentration factors or AWQC values) are available from the Cleanup Levels and Risk Calculations Database (Ecology 2010) or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], 1996 [Method B for surface waters]).
[f] Hanford Site-specific background value is not available; it was not evaluated during background study. Value used is from *Natural Background Soil Metals Concentrations in Washington State* (Ecology 1994).
[g] Based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009), the residual concentrations of lead are not expected to migrate more than 2 m (6.6 ft) vertically in 1,000 years (based on the distribution coefficient of lead of 30 mL/g). The vadose zone underlying the staging pile area is approximately 14.5 m (47.6 ft) thick. Therefore, residual concentrations of this constituent are predicted to be protective of groundwater and the Columbia River.
[h] Where cleanup levels are less than RDLs, cleanup levels default to RDLs per WAC 173-340-707(2) (Ecology 1996).
[i] Toxicity data for this chemical are not available. Cleanup levels are based on surrogate chemicals. Contaminant: phenanthrene; surrogate: anthracene.

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COPC = contaminant of potential concern
RAG = remedial action goal
RDL = required detection limit
RDR/RAWP = *Remedial Design Report/Remedial Action Work Plan for the 100 Area*
RESRAD = RESidual RADioactivity (dose model)
TPH = total petroleum hydrocarbons
WAC = *Washington Administrative Code*

Calculated cleanup levels for aluminum, calcium, iron, magnesium, potassium, silicon, and sodium are not presented in the RDR/RAWP (DOE-RL 2009). Parameters to calculate cleanup levels for these constituents are not presented in the Cleanup Levels and Risk Calculations (CLARC) Database (Ecology 2010) under WAC 173-340-740(3) or other reference databases; therefore, these constituents are not considered COPCs and are not included in the tables. The laboratory-reported data results for all constituents are stored in the Environmental Restoration (ENRE) project-specific database prior to provision to the Hanford Environmental Information System (HEIS) and are presented as an attachment to the direct contact hazard quotient and relative percent difference calculation in Appendix D.

DATA EVALUATION

This section demonstrates that contaminant concentrations at the 600-205 waste site achieve the applicable RAGs developed to support unrestricted land use at the 100 Area as established in the Remaining Sites ROD (EPA 1999) and documented in the RDR/RAWP (DOE-RL 2009).

Nonradionuclide Soil RAGs for Direct Exposure and Groundwater and River Protection Attained

Tables 3 and 4 compare the cleanup verification sample values to the applicable soil RAGs for direct exposure, protection of groundwater, and protection of the Columbia River. All cleanup verification data values pass in direct comparison to the applicable RAGs, with the exception of lead and 4,4'-DDD, which were quantified at concentrations exceeding soil protection RAGs for groundwater and/or river protection within the excavation and/or staging pile areas. Data were not collected on the vertical extent of these contaminants, but an evaluation based upon RESidual RADioactivity modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009) shows that residual concentrations of these constituents are not expected to migrate more than 2 m (6.6 ft) vertically in 1,000 years given the soil-partitioning coefficient (K_d) of 30 mL/g for lead, the contaminant with the lowest K_d value. The vadose zone underlying the deepest part of the excavation is approximately 11.5 m (37.7 ft) thick; therefore, residual concentrations of these constituents are predicted to be protective of groundwater. The only pathway for contaminant migration to the Columbia River is via groundwater; therefore, residual concentrations of these contaminants are also predicted to be protective of the Columbia River. All other cleanup verification data values pass in direct comparison to the applicable RAGs.

Nonradionuclide Hazard Quotient and Carcinogenic Risk RAGs Attained

Calculation of the 600-205 waste site direct contact hazard quotient and carcinogenic risk is presented in Appendix D. Nonradionuclide risk requirements include an individual hazard quotient of less than 1.0, a cumulative hazard quotient of less than 1.0, an individual contaminant carcinogenic risk of less than 1×10^{-6}, and a cumulative carcinogenic risk of less than 1×10^{-5}. For the 600-205 waste site, these risk values were not calculated for constituents that were either not detected or were detected at concentrations below Hanford Site or Washington State background levels. All individual hazard quotients for noncarcinogenic constituents were less than 1.0. The cumulative hazard quotient for those noncarcinogenic constituents above background or detected levels is 1.2×10^{-3}. The total carcinogenic risk is 6.2×10^{-8}. Based on the nonradionuclide groundwater and river protection RAGs shown in Tables 3 and 4, the residual concentrations of the nonradionuclide contaminants are protective of groundwater and the Columbia River.

DATA QUALITY ASSESSMENT

A data quality assessment (DQA) was performed to compare the verification sampling approach (WCH 2010b), the field logbook (WCH 2010a), and resulting analytical data with the sampling and data quality requirements specified by the project objectives and performance specifications.

The DQA for the 600-205 waste site established that the data are of the right type, quality, and quantity to support site verification decisions within specified error tolerances. The evaluation verified that the sample design was sufficient for the purpose of clean site verification. The cleanup verification sample analytical data are stored in the ENRE project-specific database for data evaluation prior to archival in the HEIS and are provided as an attachment to the relative percent difference and direct contact hazard quotient calculation in Appendix D. The detailed DQA is presented in Appendix E.

SUMMARY FOR INTERIM CLOSURE

The 600-205 waste site has been evaluated in accordance with the Remaining Sites ROD (EPA 1999) and the RDR/RAWP (DOE-RL 2009). Verification sampling was performed, and the analytical results indicate that the residual concentrations of COPCs at this site meet the RAOs for direct exposure, groundwater protection, and river protection. In accordance with this evaluation, the verification sampling results support a reclassification of the 600-205 waste site to Interim Closed Out. The waste site contamination does not extend into the deep zone; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required.

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APPENDIX A

CONFIRMATORY SAMPLING RESULTS AND COMPARISON TO REMEDIAL ACTION GOALS

Table A-1. Comparison of Maximum Contaminant Concentrations to Remedial Action Goals for the 600-205 Area 1, Confirmatory Sampling Data.

COPC	Maximum Result (mg/kg)	Remedial Action Goals [a] (mg/kg)			Does the Maximum Result Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Antimony	0.23 (<BG)	32	5 [b]	5 [b]	No	--
Arsenic	3 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	74.9 (<BG)	5,600	200	400	No	--
Beryllium	0.99 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Boron [e]	1.5	7,200	320	-- [f]	No	--
Cadmium [g]	0.28 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	10.1 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	9.9 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	14.7 (<BG)	2,960	59.2	22.0 [c]	No	--
Lead	20.7	353	10.2 [c]	10.2 [c]	Yes	Yes [h]
Manganese	386 (<BG)	3,760	512 [c]	512 [c]	No	--
Molybdenum [e]	0.66	400	8	-- [f]	No	--
Nickel	11.2 (<BG)	1,600	19.1 [c]	27.4	No	--
Vanadium	86.2	560	85.1 [e]	-- [f]	Yes	Yes [h]
Zinc	61.7 (<BG)	24,000	480	67.8 [e]	No	--
Sulfate	15.5 (<BG)	-- [f]	-- [f]	25,000	No	--

[a] RAGs obtained from the RDR/RAWP (DOE-RL 2009) unless otherwise noted.

[b] Where cleanup levels are less than RDLs, cleanup levels default to RDLs per WAC 173-340-707(2) (Ecology 1996).

[c] Where cleanup levels are less than background, cleanup levels default to background (WAC 173-340-700[4][d]) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement Project Managers as discussed in Section 2.1.2.1 of the RDR/RAWP (DOE-RL 2009).

[d] Carcinogenic cleanup level calculated based on the inhalation exposure pathway per WAC 173-340-750(3), 1996 (Method B for air quality) and an airborne particulate mass loading rate of 0.0001 g/m^3 (*Hanford Guidance for Radiological Cleanup* [WDOH 1997]).

[e] No Hanford Site-specific or Washington State background value available.

[f] No parameters (bioconcentration factors or AWQC values) are available from the Cleanup Levels and Risk Calculations Database (Ecology 2010) or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], 1996 [Method B for surface waters]).

[g] Hanford Site-specific background value is not available; it was not evaluated during background study. Value used is from *Natural Background Soil Metals Concentrations in Washington State* (Ecology 1994).

[h] Based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009), the residual concentrations of lead and vanadium are not expected to migrate more than 2 m (6.6 ft) vertically in 1,000 years (based on the distribution coefficient of lead of 30 mL/g). The vadose zone underlying the soil below excavation is approximately 14.7 m (48.2 ft) thick. Therefore, residual concentrations of these constituent are predicted to be protective of groundwater and the Columbia River.

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COPC = contaminant of potential concern
RAG = remedial action goal
RDL = required detection limit
RDR/RAWP = *Remedial Design Report/Remedial Action Work Plan for the 100 Area*
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table A-2. Comparison of Maximum Contaminant Concentrations to Remedial Action Goals for the 600-205 Area 3, Confirmatory Sampling Data.

COPC	Maximum Result (mg/kg)	Remedial Action Goals [a] (mg/kg)			Does the Maximum Result Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Antimony	0.67 (<BG)	32	5 [b]	5 [b]	No	--
Arsenic	3.6 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	75.5 (<BG)	5,600	200	400	No	--
Beryllium	0.87 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Boron [e]	1.4	7,200	320	-- [f]	No	--
Cadmium [g]	0.67 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	9.6 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	8.7 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	16.4 (<BG)	2,960	59.2	22.0 [c]	No	--
Lead	40.3	353	10.2 [c]	10.2 [c]	Yes	Yes [h]
Manganese	359 (<BG)	3,760	512 [c]	512 [c]	No	--
Molybdenum [e]	0.55	400	8	-- [f]	No	--
Nickel	12 (<BG)	1,600	19.1 [c]	27.4	No	--
Vanadium	59.8 (<BG)	560	85.1 [e]	-- [f]	No	--
Zinc	54.9 (<BG)	24,000	480	67.8 [e]	No	--
Sulfate	12.2 (<BG)	-- [f]	-- [f]	25,000	No	--

[a] RAGs obtained from the RDR/RAWP (DOE-RL 2009) unless otherwise noted.
[b] Where cleanup levels are less than RDLs, cleanup levels default to RDLs per WAC 173-340-707(2) (Ecology 1996).
[c] Where cleanup levels are less than background, cleanup levels default to background (WAC 173-340-700[4][d]) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement Project Managers as discussed in Section 2.1.2.1 of the RDR/RAWP (DOE-RL 2009).
[d] Carcinogenic cleanup level calculated based on the inhalation exposure pathway per WAC 173-340-750(3), 1996 (Method B for air quality) and an airborne particulate mass loading rate of 0.0001 g/m^3 (*Hanford Guidance for Radiological Cleanup* [WDOH 1997]).
[e] No Hanford Site-specific or Washington State background value available.
[f] No parameters (bioconcentration factors or AWQC values) are available from the Cleanup Levels and Risk Calculations Database (Ecology 2010) or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], 1996 [Method B for surface waters]).
[g] Hanford Site-specific background value is not available; it was not evaluated during background study. Value used is from *Natural Background Soil Metals Concentrations in Washington State* (Ecology 1994).
[h] Based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009), the residual concentrations of lead are not expected to migrate more than 2 m (6.6 ft) vertically in 1,000 years (based on the distribution coefficient of 30 mL/g). The vadose zone underlying the soil below excavation is approximately 14.7 m (48.2 ft) thick. Therefore, residual concentrations of these constituent are predicted to be protective of groundwater and the Columbia River.

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COPC = contaminant of potential concern
RAG = remedial action goal
RDL = required detection limit
RDR/RAWP = *Remedial Design Report/Remedial Action Work Plan for the 100 Area*
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table A-3. Comparison of Maximum Contaminant Concentrations to Remedial Action Goals for the 600-205 Area 4, Confirmatory Sampling Data.

COPC	Maximum Result (mg/kg)	Remedial Action Goals [a] (mg/kg)			Does the Maximum Result Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	4.3 (<BG)	20 [b]	20 [b]	20 [b]	No	--
Barium	80 (<BG)	5,600	200	400	No	--
Beryllium	1.1 (<BG)	10.4 [c]	1.51 [b]	1.51 [b]	No	--
Boron [d]	0.76	7,200	320	-- [e]	No	--
Cadmium [f]	0.11 (<BG)	13.9 [c]	0.81 [b]	0.81 [b]	No	--
Chromium (total)	10.2 (<BG)	80,000	18.5 [b]	18.5 [b]	No	--
Cobalt	10.6 (<BG)	24	15.7 [b]	-- [e]	No	--
Copper	22	2,960	59.2	22.0 [b]	No	--
Lead	8.9 (<BG)	353	10.2 [b]	10.2 [b]	No	--
Manganese	427 (<BG)	3,760	512 [b]	512 [b]	No	--
Molybdenum [d]	0.65	400	8	-- [e]	No	--
Nickel	13.7 (<BG)	1,600	19.1 [b]	27.4	No	--
Vanadium	74.1 (<BG)	560	85.1 [d]	-- [e]	No	--
Zinc	60.8 (<BG)	24,000	480	67.8 [d]	No	--
Sulfate	51.4 (<BG)	-- [e]	-- [e]	25,000	No	--

[a] RAGs obtained from the RDR/RAWP (DOE-RL 2009) unless otherwise noted.

[b] Where cleanup levels are less than background, cleanup levels default to background (WAC 173-340-700[4][d]) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement Project Managers as discussed in Section 2.1.2.1 of the RDR/RAWP (DOE-RL 2009).

[c] Carcinogenic cleanup level calculated based on the inhalation exposure pathway per WAC 173-340-750(3), 1996 (Method B for air quality) and an airborne particulate mass loading rate of 0.0001 g/m^3 (*Hanford Guidance for Radiological Cleanup* [WDOH 1997]).

[d] No Hanford Site-specific or Washington State background value available.

[e] No parameters (bioconcentration factors or AWQC values) are available from the Cleanup Levels and Risk Calculations Database (Ecology 2010) or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], 1996 [Method B for surface waters]).

[f] Hanford Site-specific background value is not available; it was not evaluated during background study. Value used is from *Natural Background Soil Metals Concentrations in Washington State* (Ecology 1994).

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COPC = contaminant of potential concern
RAG = remedial action goal
RDL = required detection limit
RDR/RAWP = *Remedial Design Report/Remedial Action Work Plan for the 100 Area*
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table A-4. Comparison of Maximum Contaminant Concentrations to Remedial Action Goals for the 600-205 Area 5, Confirmatory Sampling Data.

COPC	Maximum Result (mg/kg)	Remedial Action Goals [a] (mg/kg)			Does the Maximum Result Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Antimony	0.43 (<BG)	32	5 [b]	5 [b]	No	--
Arsenic	2.1 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	68.4 (<BG)	5,600	200	400	No	--
Beryllium	1.7	10.4 [d]	1.51 [c]	1.51 [c]	Yes	Yes [e]
Boron [f]	1.2	7,200	320	-- [g]	No	--
Cadmium [h]	0.27 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	3.9 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	8.3 (<BG)	24	15.7 [c]	-- [g]	No	--
Copper	14.4 (<BG)	2,960	59.2	22.0 [c]	No	--
Lead	2.7 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	312 (<BG)	3,760	512 [c]	512 [c]	No	--
Molybdenum [f]	0.89	400	8	-- [g]	No	--
Nickel	7.7 (<BG)	1,600	19.1 [c]	27.4	No	--
Selenium	0.5 (<BG)	400	5	1	No	--
Vanadium	76.3 (<BG)	560	85.1 [e]	-- [g]	No	--
Zinc	46.8 (<BG)	24,000	480	67.8 [f]	No	--
Sulfate	13.2 (<BG)	-- [g]	-- [g]	25,000	No	--
Bis(2-ethylhexyl) phthalate	0.082	71.4	0.6	0.36	No	--
Di-n-butylphthalate	0.031	8,000	160	540	No	--

[a] RAGs obtained from the RDR/RAWP (DOE-RL 2009) unless otherwise noted.

[b] Where cleanup levels are less than RDLs, cleanup levels default to RDLs per WAC 173-340-707(2) (Ecology 1996).

[c] Where cleanup levels are less than background, cleanup levels default to background (WAC 173-340-700[4][d]) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement Project Managers as discussed in Section 2.1.2.1 of the RDR/RAWP (DOE-RL 2009).

[d] Carcinogenic cleanup level calculated based on the inhalation exposure pathway per WAC 173-340-750(3), 1996 (Method B for air quality) and an airborne particulate mass loading rate of 0.0001 g/m^3 (*Hanford Guidance for Radiological Cleanup* [WDOH 1997]).

[e] Based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009), the residual concentrations of beryllium are not expected to migrate vertically in 1,000 years (based on the distribution coefficient of 790 mL/g). The vadose zone underlying the soil below excavation is approximately 14.7 m (48.2 ft) thick. Therefore, residual concentrations of these constituent are predicted to be protective of groundwater and the Columbia River.

[f] No Hanford Site-specific or Washington State background value available.

[g] No parameters (bioconcentration factors or AWQC values) are available from the Cleanup Levels and Risk Calculations Database (Ecology 2010) or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], 1996 [Method B for surface waters]).

[h] Hanford Site-specific background value is not available; it was not evaluated during background study. Value used is from *Natural Background Soil Metals Concentrations in Washington State* (Ecology 1994).

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COPC = contaminant of potential concern
RAG = remedial action goal
RDL = required detection limit
RDR/RAWP = *Remedial Design Report/Remedial Action Work Plan for the 100 Area*
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table A-5. Comparison of Maximum Contaminant Concentrations to Remedial Action Goals for the 600-205 Area 6, Confirmatory Sampling Data.

COPC	Maximum Result (mg/kg)	Remedial Action Goals [a] (mg/kg)			Does the Maximum Result Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Antimony	0.24 (<BG)	32	5 [b]	5 [b]	No	--
Arsenic	2.6 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	73.9 (<BG)	5,600	200	400	No	--
Beryllium	1.8	10.4 [d]	1.51 [c]	1.51 [c]	Yes	Yes [e]
Boron [f]	0.58	7,200	320	-- [g]	No	--
Cadmium [h]	0.16 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	4.4 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	9.6 (<BG)	24	15.7 [c]	-- [g]	No	--
Copper	15.2 (<BG)	2,960	59.2	22.0 [c]	No	--
Lead	3.3 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	363 (<BG)	3,760	512 [c]	512 [c]	No	--
Molybdenum [f]	0.73	400	8	-- [g]	No	--
Nickel	7.3 (<BG)	1,600	19.1 [c]	27.4	No	--
Vanadium	81.6 (<BG)	560	85.1 [e]	-- [g]	No	--
Zinc	51.8 (<BG)	24,000	480	67.8 [f]	No	--
Sulfate	14.4 (<BG)	-- [g]	-- [g]	25,000	No	--
Bis(2-ethylhexyl) phthalate	0.12	71.4	0.6	0.36	No	--
Di-n-butylphthalate	0.045	8,000	160	540	No	--

[a] RAGs obtained from the RDR/RAWP (DOE-RL 2009) unless otherwise noted.
[b] Where cleanup levels are less than RDLs, cleanup levels default to RDLs per WAC 173-340-707(2) (Ecology 1996).
[c] Where cleanup levels are less than background, cleanup levels default to background (WAC 173-340-700[4][d]) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement Project Managers as discussed in Section 2.1.2.1 of the RDR/RAWP (DOE-RL 2009).
[d] Carcinogenic cleanup level calculated based on the inhalation exposure pathway per WAC 173-340-750[3], 1996 (Method B for air quality) and an airborne particulate mass loading rate of 0.0001 g/m^3 (*Hanford Guidance for Radiological Cleanup* [WDOH 1997]).
[e] Based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009), the residual concentrations of beryllium are not expected to migrate vertically in 1,000 years (based on the distribution coefficient of 790 mL/g). The vadose zone underlying the soil below excavation is approximately 14.7 m (48.2 ft) thick. Therefore, residual concentrations of these constituent are predicted to be protective of groundwater and the Columbia River.
[f] No Hanford Site-specific or Washington State background value available.
[g] No parameters (bioconcentration factors or AWQC values) are available from the Cleanup Levels and Risk Calculations Database (Ecology 2010) or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], 1996 [Method B for surface waters]).
[h] Hanford Site-specific background value is not available; it was not evaluated during background study. Value used is from *Natural Background Soil Metals Concentrations in Washington State* (Ecology 1994).

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RAG = remedial action goal
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WAC = *Washington Administrative Code*

Table A-6. Comparison of Maximum Contaminant Concentrations to Remedial Action Goals for the 600-205 Area 7, Confirmatory Sampling Data.

COPC	Maximum Result (mg/kg)	Remedial Action Goals [a] (mg/kg)			Does the Maximum Result Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	3.8 (<BG)	20 [b]	20 [b]	20 [b]	No	--
Barium	60.1 (<BG)	5,600	200	400	No	--
Beryllium	1.3 (<BG)	10.4 [c]	1.51 [b]	1.51 [b]	No	--
Boron [d]	0.9	7,200	320	-- [e]	No	--
Cadmium [f]	0.12 (<BG)	13.9 [c]	0.81 [b]	0.81 [b]	No	--
Chromium (total)	8.6 (<BG)	80,000	18.5 [b]	18.5 [b]	No	--
Cobalt	9.2 (<BG)	24	15.7 [b]	-- [e]	No	--
Copper	18.6 (<BG)	2,960	59.2	22.0 [b]	No	--
Lead	6.4 (<BG)	353	10.2 [b]	10.2 [b]	No	--
Manganese	353 (<BG)	3,760	512 [b]	512 [b]	No	--
Molybdenum [d]	0.43	400	8	-- [e]	No	--
Nickel	11.5 (<BG)	1,600	19.1 [b]	27.4	No	--
Vanadium	53.5 (<BG)	560	85.1 [d]	-- [e]	No	--
Zinc	49.7 (<BG)	24,000	480	67.8 [d]	No	--
Sulfate	8.5 (<BG)	-- [e]	-- [e]	25,000	No	--
Bis(2-ethylhexyl) phthalate	0.14	71.4	0.6	0.36	No	--
Di-n-butylphthalate	0.079	8,000	160	540	No	--

[a] RAGs obtained from the RDR/RAWP (DOE-RL 2009) unless otherwise noted.

[b] Where cleanup levels are less than background, cleanup levels default to background (WAC 173-340-700[4][d]) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement Project Managers as discussed in Section 2.1.2.1 of the RDR/RAWP (DOE-RL 2009).

[c] Carcinogenic cleanup level calculated based on the inhalation exposure pathway per WAC 173-340-750[3], 1996 (Method B for air quality) and an airborne particulate mass loading rate of 0.0001 g/m^3 (*Hanford Guidance for Radiological Cleanup* [WDOH 1997]).

[d] No Hanford Site-specific or Washington State background value available.

[e] No parameters (bioconcentration factors or AWQC values) are available from the Cleanup Levels and Risk Calculations Database (Ecology 2010) or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], 1996 [Method B for surface waters]).

[f] Hanford Site-specific background value is not available; it was not evaluated during background study. Value used is from *Natural Background Soil Metals Concentrations in Washington State* (Ecology 1994).

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BG = background
COPC = contaminant of potential concern
RAG = remedial action goal
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RESRAD = RESidual RADioactivity (dose model)
TPH = total petroleum hydrocarbons
WAC = *Washington Administrative Code*

Table A-7. Confirmatory Sampling Data for the 600-205 Waste Site. (5 Pages)

Sample Location	HEIS Number	Sample Date	Aluminum			Antimony			Arsenic			Barium			Beryllium			Boron		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Area 1, surface soil	J02D90	01/26/05	5990		1	0.23	U	0.23	3		0.31	71.6	C	0.02	0.78		0.01	1.5		0.18
Area 1, duplicate of J02D90	J02D91	01/26/05	6250		0.98	0.23		0.23	2.9		0.3	74.9	C	0.02	0.86		0.01	1.4		0.18
Area 1, test trench soil	J02D92	01/26/05	4850		0.78	0.18	U	0.18	1.8		0.24	74	C	0.02	0.99		0.01	0.26		0.14
Area 3, surface soil	J02D93	01/26/05	5920		1.1	0.67		0.25	2.3		0.33	66.2	C	0.02	0.77		0.01	0.92		0.19
Area 3, test pit soil	J02D94	01/26/05	6810		0.92	0.22	U	0.22	3.6		0.29	75.5	C	0.02	0.87		0.01	1.4		0.17
Area 2, surface soil	J02D95	01/26/05	5880		0.78	0.18	U	0.18	2.6		0.24	71	C	0.02	0.87		0.01	0.66		0.14
Area 2, test pit soil	J02D96	01/26/05	8280		0.99	0.23	U	0.23	4.9		0.31	86.2	C	0.02	1.1		0.01	0.74		0.18
Area 4, test pit soil	J02D97	01/26/05	8920		0.96	0.22	U	0.22	4.3		0.3	80	C	0.02	1.1		0.01	0.76		0.17
Area 6, test pit soil	J02DD5	01/27/05	4740	C	0.92	0.24		0.22	2.6		0.28	73.9	C	0.02	1.8		0.01	0.58		0.17
Area 7, test pit soil	J02FW4	01/27/05	7590	C	0.85	0.2	U	0.2	3.8		0.26	60.1	C	0.02	1.3		0.01	0.9		0.15
Area 5, test pit soil	J02FW8	01/27/05	3900	C	0.87	0.43		0.2	2.1		0.27	68.4	C	0.02	1.7		0.01	1.2		0.16
Equipment blank	J02DC1	01/26/05	43.6		0.79	0.18	U	0.18	0.41		0.24	1	C	0.02	0.01		0.01	0.45		0.14

Table A-7. Confirmatory Sampling Data for the 600-205 Waste Site. (5 Pages)

Sample Location	HEIS Number	Sample Date	Cadmium			Calcium			Chromium			Cobalt			Copper			Iron		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Area 1, surface soil	J02D90	01/26/05	0.28		0.04	3980	C	0.83	10	C	0.04	7.4		0.07	13.7		0.05	23100		0.89
Area 1, duplicate of J02D90	J02D91	01/26/05	0.26		0.04	3820	C	0.81	10.1	C	0.04	7.7		0.07	14.1		0.05	24600		0.87
Area 1, test trench soil	J02D92	01/26/05	0.11		0.03	6720	C	0.64	4.6	C	0.03	9.9		0.06	14.7		0.04	31900		0.69
Area 3, surface soil	J02D93	01/26/05	0.67		0.04	3710	C	0.88	9.5	C	0.04	6.8		0.08	13.2		0.06	21900		0.94
Area 3, test pit soil	J02D94	01/26/05	0.34		0.04	9670	C	0.77	9.6	C	0.04	8.7		0.07	16.4		0.05	24400		0.83
Area 2, surface soil	J02D95	01/26/05	0.26		0.03	3010	C	0.65	8.1	C	0.04	7.2		0.06	12.1		0.04	24000		0.7
Area 2, test pit soil	J02D96	01/26/05	0.12		0.04	8890	C	0.82	10.1	C	0.04	9.9		0.07	19.9		0.05	28800		0.89
Area 4, test pit soil	J02D97	01/26/05	0.11		0.04	5990	C	0.79	10.2	C	0.04	10.6		0.07	22		0.05	30100		0.86
Area 6, test pit soil	J02DD5	01/27/05	0.16		0.04	6150	C	0.76	4.4	C	0.04	9.6		0.07	15.2		0.05	30200		0.82
Area 7, test pit soil	J02FW4	01/27/05	0.12		0.04	5550	C	0.71	8.6	C	0.04	9.2		0.06	18.6		0.05	23900		0.76
Area 5, test pit soil	J02FW8	01/27/05	0.27		0.04	6500	C	0.72	3.9	C	0.04	8.3		0.06	14.4		0.05	27400		0.78
Equipment blank	J02DC1	01/26/05	0.03	U	0.03	18.7	C	0.66	0.09	C	0.03	0.06	U	0.06	0.13		0.04	107		0.71

Table A-7. Confirmatory Sampling Data for the 600-205 Waste Site. (5 Pages)

Sample Location	HEIS Number	Sample Date	Lead			Magnesium			Manganese			Mercury			Molybdenum			Nickel		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Area 1, surface soil	J02D90	01/26/05	17.2		0.2	4380	C	0.61	351		0.02	0.02	U	0.02	0.64	C	0.18	11.2		0.11
Area 1, duplicate of J02D90	J02D91	01/26/05	20.7		0.2	4360	C	0.59	358		0.02	0.02	U	0.02	0.64	C	0.18	9.9		0.1
Area 1, test trench soil	J02D92	01/26/05	2.7		0.16	4600	C	0.47	386		0.02	0.02	U	0.02	0.66	C	0.14	7.9		0.08
Area 3, surface soil	J02D93	01/26/05	7.9		0.21	4340	C	0.64	313		0.02	0.02	U	0.02	0.55	C	0.19	9.8		0.11
Area 3, test pit soil	J02D94	01/26/05	40.3		0.19	5430	C	0.56	359		0.02	0.01	U	0.01	0.52	C	0.17	12		0.1
Area 2, surface soil	J02D95	01/26/05	24.1		0.16	3840	C	0.48	322		0.02	0.02	U	0.02	0.59	C	0.14	8.8		0.08
Area 2, test pit soil	J02D96	01/26/05	7.1		0.2	6370	C	0.6	401		0.02	0.02	U	0.02	0.75	C	0.18	12.6		0.11
Area 4, test pit soil	J02D97	01/26/05	8.9		0.19	6500	C	0.58	427		0.02	0.02	U	0.02	0.65	C	0.17	13.7		0.1
Area 6, test pit soil	J02DD5	01/27/05	3.3		0.19	4550	C	0.56	363		0.02	0.02	U	0.02	0.73		0.17	7.3	C	0.1
Area 7, test pit soil	J02FW4	01/27/05	6.4		0.17	5490	C	0.52	353		0.02	0.02	U	0.02	0.43		0.16	11.5	C	0.09
Area 5, test pit soil	J02FW8	01/27/05	2.7		0.18	3840	C	0.53	312		0.02	0.02	U	0.02	0.89		0.16	7.7	C	0.09
Equipment blank	J02DC1	01/26/05	0.21		0.16	8.1	C	0.48	3.1		0.02	0.02	U	0.02	0.16	C	0.14	0.08	U	0.08

Table A-7. Confirmatory Sampling Data for the 600-205 Waste Site. (5 Pages)

Sample Location	HEIS Number	Sample Date	Potassium			Selenium			Silicon			Silver			Sodium			Sulfate		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Area 1, surface soil	J02D90	01/26/05	1660	C	0.89	0.42	U	0.42	136		0.62	0.05	U	0.05	142	C	0.16	6.6		1.3
Area 1, duplicate of J02D90	J02D91	01/26/05	1730	C	0.87	0.42	U	0.42	126		0.6	0.05	U	0.05	156	C	0.16	10.5		1.2
Area 1, test trench soil	J02D92	01/26/05	712	C	0.69	0.33	U	0.33	84		0.48	0.04	U	0.04	178	C	0.12	15.5		1.1
Area 3, surface soil	J02D93	01/26/05	1420	C	0.94	0.45	U	0.45	51.7		0.65	0.06	U	0.06	149	C	0.17	5.2		1.1
Area 3, test pit soil	J02D94	01/26/05	1530	C	0.83	0.39	U	0.39	139		0.57	0.05	U	0.05	214	C	0.15	12.2		1
Area 2, surface soil	J02D95	01/26/05	1370	C	0.7	0.33	U	0.33	95.2		0.48	0.04	U	0.04	120	C	0.13	6.44		1
Area 2, test pit soil	J02D96	01/26/05	1530	C	0.89	0.42	U	0.42	111		0.61	0.05	U	0.05	529	C	0.16	84.4		5.6
Area 4, test pit soil	J02D97	01/26/05	1670	C	0.86	0.41	U	0.41	63.2		0.59	0.05	U	0.05	263	C	0.15	51.4		2.2
Area 6, test pit soil	J02DD5	01/27/05	673	C	0.82	0.39	U	0.39	323		0.57	0.05	U	0.05	151		0.15	14.4		1.6
Area 7, test pit soil	J02FW4	01/27/05	1500	C	0.76	0.36	U	0.36	256		0.53	0.05	U	0.05	372		0.14	8.5		1.1
Area 5, test pit soil	J02FW8	01/27/05	609	C	0.78	0.5		0.37	308		0.54	0.05	U	0.05	155		0.14	13.2		1
Equipment blank	J02DC1	01/26/05	122	C	0.71	0.42		0.34	38.2		0.49	0.04	U	0.04	6.4	C	0.13	9.3		1

Table A-7. Confirmatory Sampling Data for the 600-205 Waste Site. (5 Pages)

Sample Location	HEIS Number	Sample Date	Vanadium			Zinc			TPH		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Area 1, surface soil	J02D90	01/26/05	58		0.06	56.5	C	0.05	43.1	U	43.1
Area 1, duplicate of J02D90	J02D91	01/26/05	63.5		0.06	61.7	C	0.05	38.7	U	38.7
Area 1, test trench soil	J02D92	01/26/05	86.2		0.05	53	C	0.04	34.7	U	34.7
Area 3, surface soil	J02D93	01/26/05	53		0.07	49.6	C	0.06	37.8	U	37.8
Area 3, test pit soil	J02D94	01/26/05	59.8		0.06	54.9	C	0.05	34.6	U	34.6
Area 2, surface soil	J02D95	01/26/05	64.9		0.05	53.3	C	0.04	1900	U	351
Area 2, test pit soil	J02D96	01/26/05	69.4		0.06	56	C	0.05	37.3	U	37.3
Area 4, test pit soil	J02D97	01/26/05	74.1		0.06	60.8	C	0.05	36.6	U	36.6
Area 6, test pit soil	J02DD5	01/27/05	81.6		0.06	51.8		0.05	34.8	U	34.8
Area 7, test pit soil	J02FW4	01/27/05	53.5		0.05	49.7		0.05	36.5	U	36.5
Area 5, test pit soil	J02FW8	01/27/05	76.3		0.06	46.8		0.05	34.6	U	34.6
Equipment blank	J02DC1	01/26/05	0.08		0.05	0.5	C	0.04			

C = detected in both the sample and the associated QC blank, the sample concentration was </= 5 times the blank concentration
HEIS = Hanford Environmental Information System
PQL = practical quantitation limit
Q = qualifier
QC = quality control
TPH = total petroleum hydrocarbons
U = undetected

Table A-8. Confirmatory Sampling Data for the 600-205 Waste Site Organics. (3 Pages)

Constituent	Area 1 J02D90 Surface Soil Sample Date 01/26/05			Area 1 Duplicate of J02D90 Sample Date 01/26/05			Area 1 02D92 Test Trench Soil Sample Date 01/26/05			Area 3 J02D93 Surface Soil Sample Date 01/26/05			Area 3 J02D94 Test Pit Soil Sample Date 01/26/05			Area 2 J02D95 Surface Soil Sample Date 01/26/05		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Polychlorinated Biphenyls (PCBs)																		
Aroclor-1016	17	U	17	15	U	15	14	U	14	15	U	15	14	U	14	14	U	14
Aroclor-1221	17	U	17	15	U	15	14	U	14	15	U	15	14	U	14	14	U	14
Aroclor-1232	17	U	17	15	U	15	14	U	14	15	U	15	14	U	14	14	U	14
Aroclor-1242	17	U	17	15	U	15	14	U	14	15	U	15	14	U	14	14	U	14
Aroclor-1248	17	U	17	15	U	15	14	U	14	15	U	15	14	U	14	14	U	14
Aroclor-1254	17	U	17	15	U	15	14	U	14	15	U	15	14	U	14	14	U	14
Aroclor-1260	17	U	17	15	U	15	14	U	14	15	U	15	14	U	14	14	U	14

Constituent	Area 2 J02D96 Test Pit Soil Sample Date 01/26/05			Area 4 J02D97 Test Pit Soil Sample Date 01/26/05			Equipment Blank J02DC1 Sample Date 01/26/05			Area 6 J02DD5 Test Pit Soil Sample Date 01/27/05			Area 7 J02FW4 Test Pit Soil Sample Date 01/27/05			Area 5 J02FW8 Test Pit Soil Sample Date 01/27/05		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Polychlorinated Biphenyls (PCBs)																		
Aroclor-1016	15	U	15	15	U	15	33	U	33	14	U	14	14	U	14	14	U	14
Aroclor-1221	15	U	15	15	U	15	33	U	33	14	U	14	14	U	14	14	U	14
Aroclor-1232	15	U	15	15	U	15	33	U	33	14	U	14	14	U	14	14	U	14
Aroclor-1242	15	U	15	15	U	15	33	U	33	14	U	14	14	U	14	14	U	14
Aroclor-1248	15	U	15	15	U	15	33	U	33	14	U	14	14	U	14	14	U	14
Aroclor-1254	15	U	15	15	U	15	33	U	33	14	U	14	14	U	14	14	U	14
Aroclor-1260	15	U	15	15	U	15	33	U	33	14	U	14	14	U	14	14	U	14

Table A-8. Confirmatory Sampling Data for the 600-205 Waste Site Organics. (3 Pages)

Constituent	Area 1 J02D90 Surface Soil Sample Date 01/26/05			Area 1 Duplicate of J02D90 Sample Date 01/26/05			Area 1 02D92 Test Trench Soil Sample Date 01/26/05			Area 3 J02D93 Surface Soil Sample Date 01/26/05			Area 3 J02D94 Test Pit Soil Sample Date 01/26/05			Area 2 J02D95 Surface Soil Sample Date 01/26/05		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Pesticides																		
Aldrin	22	UD	22	19	UD	19	1.7	U	1.7	19	U	19	1.7	U	1.7	18	U	18
Alpha-BHC	22	UD	22	19	UD	19	1.7	U	1.7	19	U	19	1.7	U	1.7	18	U	18
alpha-Chlordane	22	UD	22	19	UD	19	1.7	U	1.7	19	U	19	1.7	U	1.7	18	U	18
beta-1,2,3,4,5,6-Hexachlorocyclohexane	22	UD	22	19	UD	19	1.7	U	1.7	19	U	19	1.7	U	1.7	18	U	18
Delta-BHC	22	UD	22	19	UD	19	1.7	U	1.7	19	U	19	1.7	U	1.7	5.4		18
Dichlorodiphenyldichloroethane	43	UD	43	39	UD	39	3.5	U	3.5	38	U	38	3.5	U	3.5	68		35
Dichlorodiphenyldichloro-ethylene	43	UD	43	39	UD	39	3.5	U	3.5	38	U	38	3.5	U	3.5	35	U	35
Dichlorodiphenyltrichloroethane	43	UD	43	39	UD	39	3.5	U	3.5	38	U	38	3.5	U	3.5	35	U	35
Dieldrin	43	UD	43	39	UD	39	3.5	U	3.5	38	U	38	3.5	U	3.5	35	U	35
Endosulfan I	22	UD	22	19	UD	19	1.7	U	1.7	19	U	19	1.7	U	1.7	12		18
Endosulfan II	43	UD	43	39	UD	39	3.5	U	3.5	38	U	38	3.5	U	3.5	35	U	35
Endosulfan sulfate	43	UD	43	39	UD	39	3.5	U	3.5	38	U	38	3.5	U	3.5	14		35
Endrin	43	UD	43	39	UD	39	3.5	U	3.5	38	U	38	3.5	U	3.5	35	U	35
Endrin aldehyde	43	UD	43	39	UD	39	3.5	U	3.5	38	U	38	3.5	U	3.5	35	U	35
Endrin ketone	43	UD	43	39	UD	39	3.5	U	3.5	38	U	38	3.5	U	3.5	35	U	35
Gamma-BHC (lindane)	22	UD	22	19	UD	19	1.7	U	1.7	19	U	19	1.7	U	1.7	18	U	18
gamma-Chlordane	22	UD	22	19	UD	19	1.7	U	1.7	19	U	19	1.7	U	1.7	6.5		18
Heptachlor	22	UD	22	19	UD	19	1.7	U	1.7	19	U	19	1.7	U	1.7	18	U	18
Heptachlor epoxide	22	UD	22	19	UD	19	1.7	U	1.7	19	U	19	1.7	U	1.7	18	U	18
Methoxychlor	220	UD	220	190	UD	190	17	U	17	190	U	190	17	U	17	180	U	180
Toxaphene	2200	UD	2200	1900	UD	1900	170	U	170	1900	U	1900	170	U	170	1800	U	1800

Table A-8. Confirmatory Sampling Data for the 600-205 Waste Site Organics. (3 Pages)

Constituent	Area 2 J02D96 Test Pit Soil Sample Date 01/26/05			Area 4 J02D97 Test Pit Soil Sample Date 01/26/05			Equipment Blank J02DC1 Sample Date 01/26/05			Area 6 J02DD5 Test Pit Soil Sample Date 01/27/05			Area 7 J02FW4 Test Pit Soil Sample Date 01/27/05			Area 5 J02FW8 Test Pit Soil Sample Date 01/27/05		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Pesticides																		
Aldrin	1.9	U	1.9	1.8	U	1.8	1.7	U	1.7	1.7	U	1.7	1.8	U	1.8	1.7	U	1.7
Alpha-BHC	1.9	U	1.9	1.8	U	1.8	1.7	U	1.7	1.7	U	1.7	1.8	U	1.8	1.7	U	1.7
alpha-Chlordane	1.9	U	1.9	1.8	U	1.8	1.7	U	1.7	1.7	U	1.7	1.8	U	1.8	1.7	U	1.7
beta-1,2,3,4,5,6-Hexachlorocyclohexane	1.9	U	1.9	1.8	U	1.8	1.7	U	1.7	1.7	U	1.7	1.8	U	1.8	1.7	U	1.7
Delta-BHC	1.9	U	1.9	1.8	U	1.8	1.7	U	1.7	1.7	U	1.7	1.8	U	1.8	1.7	U	1.7
Dichlorodiphenyldichloroethane	3.7	U	3.7	3.7	U	3.7	3.3	U	3.3	3.5	U	3.5	3.7	U	3.7	3.5	U	3.5
Dichlorodiphenyldichloroethylene	3.7	U	3.7	3.7	U	3.7	3.3	U	3.3	3.5	U	3.5	3.7	U	3.7	3.5	U	3.5
Dichlorodiphenyltrichloroethane	3.7	U	3.7	3.7	U	3.7	3.3	U	3.3	3.5	U	3.5	3.7	U	3.7	3.5	U	3.5
Dieldrin	3.7	U	3.7	3.7	U	3.7	3.3	U	3.3	3.5	U	3.5	3.7	U	3.7	3.5	U	3.5
Endosulfan I	1.9	U	1.9	1.8	U	1.8	1.7	U	1.7	1.7	U	1.7	1.8	U	1.8	1.7	U	1.7
Endosulfan II	3.7	U	3.7	3.7	U	3.7	3.3	U	3.3	3.5	U	3.5	3.7	U	3.7	3.5	U	3.5
Endosulfan sulfate	3.7	U	3.7	3.7	U	3.7	3.3	U	3.3	3.5	U	3.5	3.7	U	3.7	3.5	U	3.5
Endrin	3.7	U	3.7	3.7	U	3.7	3.3	U	3.3	3.5	U	3.5	3.7	U	3.7	3.5	U	3.5
Endrin aldehyde	3.7	U	3.7	3.7	U	3.7	3.3	U	3.3	3.5	U	3.5	3.7	U	3.7	3.5	U	3.5
Endrin ketone	3.7	U	3.7	3.7	U	3.7	3.3	U	3.3	3.5	U	3.5	3.7	U	3.7	3.5	U	3.5
Gamma-BHC (lindane)	1.9	U	1.9	1.8	U	1.8	1.7	U	1.7	1.7	U	1.7	1.8	U	1.8	1.7	U	1.7
gamma-Chlordane	1.9	U	1.9	1.8	U	1.8	1.7	U	1.7	1.7	U	1.7	1.8	U	1.8	1.7	U	1.7
Heptachlor	1.9	U	1.9	1.8	U	1.8	1.7	U	1.7	1.7	U	1.7	1.8	U	1.8	1.7	U	1.7
Heptachlor epoxide	1.9	U	1.9	1.8	U	1.8	1.7	U	1.7	1.7	U	1.7	1.8	U	1.8	1.7	U	1.7
Methoxychlor	19	U	19	18	U	18	17	U	17	17	U	17	18	U	18	17	U	17
Toxaphene	190	U	190	180	U	180	170	U	170	170	U	170	180	U	180	170	U	170

D = dilution
PQL = practical quantitation limit
Q = qualifier
U = undetected

APPENDIX B

PHOTOGRAPHS

Figure B-1. Area 2 of the 600-205 Waste Site Prior to Remediation (August 25, 2009).

Figure B-2. Excavation and Waste Staging Pile at the 600-205 Waste Site, Area 2 (March 10, 2010).

APPENDIX C

IN-PROCESS SAMPLING RESULTS

Table C-1. In-Process Sampling Data for the 600-205 Waste Site. (4 Pages)

Constituent	J19V17		
	mg/kg	Q	PQL
Metals			
Aluminum	8250		3.31
Antimony	0.397	U	0.397
Arsenic	3.75		0.662
Barium	97.4		0.331
Beryllium	0.246		0.132
Boron	1.12	B	1.32
Cadmium	0.118	B	0.132
Calcium	7280		66.2
Chromium	11.2		0.132
Cobalt	7.5		1.32
Copper	13.9		0.662
Iron	20800		13.2
Lead	4.52		0.331
Magnesium	5090		49.6
Manganese	324		3.31
Mercury	0.0273	U	0.0273
Molybdenum	0.32	B	1.32
Nickel	10.7		2.65
Potassium	1540		265
Selenium	0.198	U	0.198
Silicon	243		1.32
Silver	0.132	U	0.132
Sodium	412		33.1
Vanadium	54.7		1.65
Zinc	44.6		6.62
Wet Chemistry			
Constituent	**mg/kg**	**Q**	**PQL**
Hexavalent chromium	0.21	U	0.21
Cyanide	0.42	U	0.42
Sulfide, total	20.6	U	20.6
Total Petroleum Hydrocarbons (TPH)			
Constituent	**µg/kg**	**Q**	**PQL**
Diesel range organics	3410	U	3410
Motor Oil	87400		10300

Table C-1. In-Process Sampling Data for the 600-205 Waste Site. (4 Pages)

Constituent	J19V17		
	µg/kg	Q	PQL
Semivolatile Organic Compounds (SVOCs)			
1,2,4 -Trichlorobenzene	341	U	341
1,2-Dichlorobenzene	341	U	341
1,3-Dichlorobenzene	341	U	341
1,4-Dichlorobenzene	341	U	341
2,4, 5 -Trichlorophenol	341	U	341
2,4,6-Trichlorophenol	341	U	341
2,4-Dichlorophenol	341	U	341
2,4-Dimethylphenol	341	U	341
2,4-Dinitrophenol	1700	U	1700
2,4-Dinitrotoluene	341	U	341
2,6-Dinitrotoluene	341	U	341
2-Chloronaphthalene	341	U	341
2-Chlorophenol	341	U	341
2-Methylnaphthalene	341	U	341
2-Methylphenol	341	U	341
2-Nitroaniline	1700	U	1700
2-Nitrophenol	341	U	341
3,3'-Dichlorobenzidine	681	U	681
3-Nitroaniline	1700	U	1700
4, 6 -Dinitro-2-methylphenol	341	U	341
4-Bromophenyl Phenyl Ether	341	U	341
4-Chloro-3 -methylphenol	341	U	341
4-Chloroaniline	341	U	341
4-Chlorophenyl Phenyl Ether	341	U	341
3 - and/ or 4 -Methylphenol	341	U	341
4-Nitroaniline	1700	U	1700
4-Nitrophenol	1700	U	1700
Acenaphthene	341	U	341
Acenaphthylene	341	U	341
Anthracene	341	U	341
Benz[a]anthracene	341	U	341
Benzo[a] pyrene	341	U	341
Benzo[b] fluoranthene	341	U	341
Benzo[g,h,i] perylene	341	U	341
Benzo[k] fluoranthene	341	U	341
Bis(2-chloroethoxy) methane	341	U	341
Bis(2-chloroethyl) ether	341	U	341
Bis(2-chloroisopropyl) ether	341	U	341
Bis(2-ethylhexyl) phthalate	341	U	341
Butyl Benryl Phthalate	341	U	341
Carbazole	341	U	341

Table C-1. In-Process Sampling Data for the 600-205 Waste Site. (4 Pages)

Constituent	J19V17		
	µg/kg	Q	PQL
Semivolatile Organic Compounds (SVOCs)			
Chrysene	341	U	341
Dibenz[4h]anthracene	341	U	341
Dibenzofuran	341	U	341
Diethyl Phthalate	341	U	341
Dimethyl Phthalate	341	U	341
Di-n-butyl Phthalate	341	U	341
Di-n-octyl Phthalate	341	U	341
Fluoranthene	341	U	341
Fluorene	341	U	341
Hexachlorobenzene	341	U	341
Hexachlorobutadiene	341	U	341
Hexachlorocyclopentadiene	341	U	341
Hexachloroethane	341	U	341
Indeno[1,2,3-cd]pyrene	341	U	341
Isophorone	341	U	341
Naphthalene	341	U	341
Nitrobenzene	341	U	341
N-Nitrosodi-n-propylimine	341	U	341
N-Nitrosodiphenylamine	341	U	341
Pentachlorophenol	1700	U	1700
Phenanthrene	341	U	341
Phenol	341	U	341
Pyrene	341	U	341
Polycyclic Aromatic Hydrocarbons (PAH)			
Naphthalene	3.44	U	3.44
Acenaphthylene	3.44	U	3.44
Acenaphthene	3.44	U	3.44
Fluorene	3.44	U	3.44
Phenanthrene	3.44	U	3.44
Anthracene	3.44	U	3.44
Fluoranthene	7.57		3.44
Indeno[,2,3-cd]pyrene	3.44	U	3.44
Pyrene	3.44	U	3.44
Benz[a]anthracene	3.44	U	3.44
Chrysene	3.61		3.44
Benzo[b] fluoranthene	3.44	U	3.44
Benzo[k] fluoranthene	3.44	U	3.44
Benzo[a] pyrene	3.44	U	3.44
Dibenz[4h]anthracene	3.44	U	3.44
Benzo[g,h,i] perylene	3.44	U	3.44

Table C-1. In-Process Sampling Data for the 600-205 Waste Site. (4 Pages)

Constituent	J19V17		
	µg/kg	Q	PQL
Pesticides			
alpha-BHC	64.3	D	1.37
gamma-BHC	1.37	U	1.37
beta-BHC	1.37	U	1.37
delta-BHC	6.12	D	1.37
Heptachlor	1.37	U	1.37
Aldrin	1.37	U	1.37
Heptachlor epoxide	1.37	U	1.37
gamma-Chlordane	4.23	JD	1.37
alpha-Chlordane	1.37	U	1.37
Endosulfan I	1.37	U	1.37
4,4'-DDE	1.37	U	1.37
Dieldrin	1.37	U	1.37
Endrin	1.37	U	1.37
4,4'-DDD	1.37	U	1.37
Endosulfan II	1.37	U	1.37
4,4'-DDT	1.37	U	1.37
Endrin aldehyde	1.37	U	1.37
Endosulfan sulfate	1.37	U	1.37
Methoxychlor	1.37	U	1.37
Endrin ketone	1.37	U	1.37
Toxaphene	1.37	U	1.37

B = blank contamination (organic constituents); estimated result (inorganic constituents)
D = dilution
J = estimated result
PQL = practical quantitation limit
Q = qualifier
U = undetected

APPENDIX D

RELATIVE PERCENT DIFFERENCE AND DIRECT CONTACT HAZARD QUOTIENT CALCULATIONS

Acrobat 8.0

CALCULATION COVER SHEET

Project Title: 100-IU-2/6 Field Remediation **Job No. 14655**

Area: 100-IU-6

Discipline: Environmental Calculation No: 0600X-CA-E0024

Subject: 600-205 Relative Percent Difference (RPD) and Direct Contact Hazard Quotient and Carcinogenic Risk Calculation

Computer Program: Excel Program No: Excel 2003

The attached calculations have been generated to document compliance with established cleanup levels. These calculations should be used in conjunction with other relevant documents in the administrative record.

Committed Calculation ☒ Preliminary ☐ Superseded ☐ Voided ☐

Rev.	Sheet Numbers	Originator	Checker	Reviewer	Approval	Date
0	Cover = 1 Summary = 7 Attachment 1 = 3 Total = 11	J. D. Skoglie	I. B. Berezovskiy	D. I. Bollosson	D. F. Obenauer	3/29/11

SUMMARY OF REVISION

WCH-DE-018 (05/08/2007)

DE01-437.03

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	3/17/2011	Calc. No.:	0600X-CA-E0024	Rev.:	0
Project:	100-IU-2/6 Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	3/17/2011
Subject:	600-205 Relative Percent Difference (RPD) and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 1 of 7	

PURPOSE:

Provide documentation to support the calculation of the direct contact hazard quotient (HQ) and excess carcinogenic risk for the 600-205 waste site. In accordance with the remedial action goals (RAGs) in the remedial design report/remedial action work plan (RDR/RAWP) (DOE-RL 2009a), the following criteria must be met:

1) An HQ of <1.0 for all individual noncarcinogens
2) A cumulative HQ of <1.0 for noncarcinogens
3) An excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens
4) A cumulative excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.

Also, calculate the relative percent difference (RPD) for primary-duplicate sample pairs from the 600-205 verification sampling, as necessary.

GIVEN/REFERENCES:

1) DOE-RL, 2009a, *Remedial Design Report/Remedial Action Work Plan for the 100 Area*, DOE/RL-96-17, Rev. 6, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

2) DOE-RL, 2009b, *100 Area Remedial Action Sampling and Analysis Plan*, DOE/RL-96-22, Rev. 5, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

3) EPA, 1994, *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, EPA 540/R-94/013. U.S. Environmental Protection Agency, Washington, D.C.

4) WAC 173-340, "Model Toxics Control Act – Cleanup," *Washington Administrative Code*, 1996.

5) WCH, 2011, *Remaining Sites Verification Package for the 600-205, Hanford Townsite Landfill 2*, Attachment to Waste Site Reclassification Form 2011-031, Washington Closure Hanford, Inc., Richland, Washington.

SOLUTION:

1) Generate an HQ for each noncarcinogenic constituent detected above background or required detection limit/practical quantitation limit and compare it to the individual HQ of <1.0 (DOE-RL 2009a).

2) Sum the HQs and compare this value to the cumulative HQ of <1.0.

3) Generate an excess cancer risk value for each carcinogenic constituent detected above background or required detection limit/practical quantitation limit and compare it to the excess cancer risk of $<1 \times 10^{-6}$ (DOE-RL 2009a).

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	3/14/2011	Calc. No.:	0600X-CA-E0024	Rev.:	0
Project:	100-IU-2/6 Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	3/14/2011
Subject:	600-205 Relative Percent Difference (RPD) and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 2 of 7	

4) Sum the excess cancer risk value(s) and compare it to the cumulative cancer risk of $<1 \times 10^{-5}$.

5) Use data from WCH (2011) to perform the RPD calculations for primary-duplicate sample pairs, as required.

METHODOLOGY:

The 600-205 waste site is comprised of an excavation and a staging pile area. The direct contact hazard quotient and carcinogenic risk calculations for the 600-205 waste site were conservatively calculated for the entire waste site using the greater of the verification soil sample results (WCH 2011). Of the contaminants of potential concern (COPCs) for this site, boron, molybdenum, the detected polycyclic aromatic hyrdrocarbons, and pesticides require HQ and risk calculations because these analytes were detected and a Washington State or Hanford Site background value is not available. Lead is not included in the calculation based on modeling of child blood levels, which is fundamentally different from the oral-reference dose and cancer slope factors used to calculate typical cleanup levels and associated HQs and cancer risks. Although total petroleum hydrocarbons (diesel + motor oil) were detected and no background value is available, the risk associated with total petroleum hydrocarbons do not contribute to the cumulative toxicity calculation. Also, delta BHC is included in the calculation but there is not any cleanup levels for this constituent. All other site nonradionuclide COPCs were not detected or were quantified below background levels. An example of the HQ and risk calculations is presented below:

1) For example, the maximum value for boron is 1.38 mg/kg, divided by the noncarcinogenic RAG value of 7,200 mg/kg (calculated in accordance with the noncarcinogenic toxics effects formula in WAC 173-340-740[3]), is 1.9×10^{-4}. Comparing this value, and all other individual values, to the requirement of <1.0, this criterion is met.

2) After the HQ calculation is completed for the appropriate analytes, the cumulative HQ can be obtained by summing the individual values. (To avoid errors due to intermediate rounding, the individual HQ values prior to rounding are used for this calculation). The sum of the HQ values is 1.2×10^{-3}. Comparing this value to the requirement of <1.0, this criterion is met.

3) To calculate the excess cancer risk, the maximum or statistical value is divided by the carcinogenic RAG value, then multiplied by 1.0×10^{-6}. For example, the maximum value for benzo(a)pyrene is 0.00445 mg/kg, divided by 0.137 mg/kg, and multiplied as indicated, is 3.2×10^{-8}. Comparing this value, and all other individual values, to the requirement of $<1 \times 10^{-6}$, this criterion is met.

4) After these calculations are completed for the carcinogenic analytes, the cumulative excess cancer risk can be obtained by summing the individual values. To avoid errors due to intermediate rounding, the individual cancer risk values prior to rounding are used for this calculation. The sum of the excess cancer risk values is 6.2×10^{-6}. Comparing this value to the requirement of $<1 \times 10^{-5}$, this criterion is met.

5) The RPD is calculated when both the primary value and the duplicate value for a given analyte are above detection limits and are greater than 5 times the target detection limit (TDL). The TDL is a

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	3/14/2011	Calc. No.:	0600X-CA-E0024	Rev.:	0
Project:	100-IU-2/6 Field Remediation	Job No:	14655	Checked:	I. B. Berezovsky	Date:	3/14/2011
Subject:	600-205 Relative Percent Difference (RPD) and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 3 of 7	

laboratory detection limit pre-determined for each analytical method and is listed for certain analytes in Table II-1 of the SAP (DOE-RL 2009b). Other analytes will have their own pre-determined constituents and will have their own TDLs based on the laboratory and method used. Where direct evaluation of the attached sample data showed that a given analyte was not detected in the primary and/or duplicate sample, further evaluation of the RPD value was not performed. The RPD calculations use the following formula:

$$RPD = [\ |M-D|/((M+D)/2)]*100$$

where, M = main sample value D = duplicate sample value

When an analyte is detected in the primary or duplicate sample, but was quantified at less than 5 times the TDL in one or both samples, an additional parameter is evaluated. In this case, if the difference between the primary and duplicate results exceeds a control limit of 2 times the TDL, further assessment regarding the usability of the data is performed. This assessment is provided in the data quality assessment section of the RSVP.

For quality assurance/quality control (QA/QC) duplicate RPD calculations, a value less than 30% indicates the data compare favorably. For regulatory splits, a threshold of 35% is used (EPA 1994). If the RPD is greater than 30% (or 35% for regulatory split data), further investigation regarding the usability of the data is performed. No split samples were collected for cleanup verification of the subject site. Additional discussion is provided in the data quality assessment section of the applicable RSVP (WCH 2011), as necessary.

RESULTS:

1) List individual noncarcinogens and corresponding HQs >1.0: None
2) List the cumulative noncarcinogenic HQ >1.0: None
3) List individual carcinogens and corresponding excess cancer risk >1 x 10^{-6}: None
4) List the cumulative excess cancer risk for carcinogens >1 x 10^{-5}: None

Table 1 shows the results of the hazard quotient and excess cancer risk calculations.

Table 2 shows the results of the RPD calculations for the 600-205 waste site. The evaluation of the QA/QC duplicate RPD calculations is performed within the data quality assessment section of the RSVP.

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	3/14/2011	Calc. No.:	0600X-CA-E0024	Rev.:	0
Project:	100-IU-2/6 Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	3/14/2011
Subject:	600-205 Relative Percent Difference (RPD) and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 4 of 7	

Table 1. Direct Contact Hazard Quotient and Excess Cancer Risk Results for the 600-205 Waste Site.

Contaminants of Potential Concern	Maximum Value[a] (mg/kg)	Noncarcinogen RAG[b] (mg/kg)	Hazard Quotient	Carcinogen RAG[b] (mg/kg)	Carcinogen Risk
Metals					
Boron	1.38	7,200	1.9E-04	--	--
Lead[c]	12.0	353	--	--	--
Molybdenum	0.360	400	9.0E-04	--	--
Total Petroleum Hydrocarbons					
TPH - (diesel + motor oil)[d]	107	200	--	--	--
Polyaromatic Hydrocarbons					
Acenaphthene	0.0591	4,800	1.2E-05	--	--
Anthracene	0.00931	24,000	3.9E-07	--	--
Benzo(a)pyrene	0.00445	--	--	0.137	3.2E-08
Benzo(b)fluoranthene	0.0137	--	--	1.37	1.0E-08
Benzo(ghi)perylene	0.00284	2,400	1.2E-06	--	--
Chrysene	0.00608	--	--	13.7	4.4E-10
Fluoranthene	0.146	3,200	4.6E-05	--	--
Fluorene	0.00517	3,200	1.6E-06	--	--
Indeno(1,2,3-cd)pyrene	0.00457	--	--	1.37	3.3E-09
Phenanthrene[e]	0.00136	24,000	5.7E-08	--	--
Pyrene	0.00494	2,400	2.1E-06	--	--
Pesticides					
BHC, delta[f]	0.00438	--	--	--	--
DDD, 4,4'-	0.0651	--	--	4.17	1.6E-08
Totals					
Cumulative Hazard Quotient:			**1.2E-03**		
Cumulative Excess Cancer Risk:					**6.2E-08**

Notes:

[a] = From WCH (2011).

[b] = Value obtained from the RDR/RAWP (DOE-RL 2009a) or *Washington Administrative Code* (WAC) 173-340-740(3), Method B, 1996, unless otherwise noted.

[c] = Value for the noncarcinogenic RAG calculated using Guidance Manual for the Integrated Exposure Uptake Biokinetic Model for Lead in Children, EPA/540/R 93/081, Publication No. 9285.7, U.S. Environmental Protection Agency, Washington, D.C.

[d] = The risk associated with total petroleum hydrocarbons do not contribute to the cumulative toxicity calculation.

[e] = Toxicity data for phenanthrene are not available. The cleanup level is based on use of surrogate chemicals.
phenanthrene surrogate: anthracene

[f] = There are not any cleanup levels for delta BHC

-- = not applicable RAG = remedial action goal

Washington Closure Hanford, Inc.		CALCULATION SHEET					
Originator:	J. D. Skoglie	Date:	3/17/2011	Calc. No.:	0600X-CA-E0024	Rev.:	0
Project:	100-IU-2/6 Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	3/17/2011
Subject:	600-205 Relative Percent Difference (RPD) and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 5 of 7	

Table 2. Relative Percent Difference Calculations for the 600-205 Waste Site. (2 Pages)

600-205 Duplicate Analysis

Sampling Area	HEIS Number	Sample Date	Aluminum			Arsenic			Barium			Beryllium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EX-1	J1C3H3	9/27/10	6240	J	4.04	3.18		0.808	61.1		0.404	0.239		0.162
Duplicate of J1C3H3	J1C3H7	9/27/10	6380	J	3.29	3.45		0.658	59.9		0.329	0.251		0.132

Analysis:

	TDL	5	10	2	0.2
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)
	RPD	2.2%		2.0%	
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable

600-205 Duplicate Analysis

Sampling Area	HEIS Number	Sample Date	Boron			Cadmium			Calcium			Chromium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EX-1	J1C3H3	9/27/10	0.959	B	1.62	0.111	B	0.162	4400	J	80.8	6.78		0.162
Duplicate of J1C3H3	J1C3H7	9/27/10	0.885	B	1.32	0.103	B	0.132	4910	J	65.8	6.91		0.132

Analysis:

	TDL	2	0.2	100	1
Duplicate Analysis	Both > PQL?	No-Stop (acceptable)	No-Stop (acceptable)	Yes (continue)	Yes (continue)
	Both >5xTDL?			Yes (calc RPD)	Yes (calc RPD)
	RPD			11.0%	1.9%
	Difference > 2 TDL?	No - acceptable	No - acceptable	Not applicable	Not applicable

600-205 Duplicate Analysis

Sampling Area	HEIS Number	Sample Date	Cobalt			Copper			Iron			Lead		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EX-1	J1C3H3	9/27/10	6.36		1.62	11.1		0.808	19200		16.2	4.42		0.404
Duplicate of J1C3H3	J1C3H7	9/27/10	6.66		1.32	11.3		0.658	19600		13.2	4.76		0.329

Analysis:

	TDL	2	1	5	5
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)
	RPD		1.8%	2.1%	
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	No - acceptable

600-205 Duplicate Analysis

Sampling Area	HEIS Number	Sample Date	Magnesium			Manganese			Molybdenum			Nickel		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EX-1	J1C3H3	9/27/10	3930	J	60.6	284		4.04	0.269	B	1.62	7.96		3.23
Duplicate of J1C3H3	J1C3H7	9/27/10	3950	J	49.4	299		3.29	0.259	B	1.32	8.58		2.63

Analysis:

	TDL	75	5	2	4
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)		No-Stop (acceptable)
	RPD	0.5%	5.1%		
	Difference > 2 TDL?	Not applicable	Not applicable	No - acceptable	No - acceptable

B = estimated result. Result is less than the RL but greater than the MDL.
EX = excavation
HEIS = Hanford Environmental Information System
J = estimate
PQL = practical quantitation limit.
Q = qualifier.
RPD = relative percent difference.
TDL = target detection limit

Washington Closure Hanford, Inc.			CALCULATION SHEET				
Originator:	J. D. Skoglie	Date:	3/15/2011	Calc. No.:	0600X-CA-E0024	Rev.:	0
Project:	100-IU-2/6 Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	3/15/2011
Subject:	600-205 Relative Percent Difference (RPD) and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 6 of 7	

Table 2. Relative Percent Difference Calculations for the 600-205 Waste Site. (2 Pages)

600-205 Duplicate Analysis

Sampling Area	HEIS Number	Sample Date	Potassium			Silicon			Sodium			Vanadium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EX-1	J1C3H3	9/27/10	1130		323	144	J	1.62	283		40.4	52.1	J	2.02
Duplicate of J1C3H3	J1C3H7	9/27/10	1120		263	109	J	1.32	319		32.9	54.5	J	1.65

Analysis:

	TDL	400	2	50	2.5
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)
	RPD		27.7%	12.0%	4.5%
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	Not applicable

600-205 Duplicate Analysis

Sampling Area	HEIS Number	Sample Date	Zinc			TPH - diesel range			TPH-motor oil (high boiling)			Acenaphthene		
			mg/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
EX-1	J1C3H3	9/27/10	38.1		8.08	96300	J	3250	181000		9760	59.1		3.43
Duplicate of J1C3H3	J1C3H7	9/27/10	39.6		6.58	118000	J	3400	221000	J	10200	48.1		3.44

Analysis:

	TDL	1	5000	5000	15
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)
	RPD	3.9%	20.3%	19.9%	
	Difference > 2 TDL?	Not applicable	Not applicable	Not applicable	No - acceptable

600-205 Duplicate Analysis

Sampling Area	HEIS Number	Sample Date	Anthracene			Benzo(a)pyrene			Benzo(b)fluoranthene			Chrysene		
			ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
EX-1	J1C3H3	9/27/10	8.93		3.43	1.72	J	3.43	8.96		3.43	0.927	J	3.43
Duplicate of J1C3H3	J1C3H7	9/27/10	9.31		3.44	4.45		3.44	13.7		3.44	2.03	J	3.44

Analysis:

	TDL	15	15	15	15
Duplicate Analysis	Both > PQL?	Yes (continue)	No-Stop (acceptable)	Yes (continue)	No-Stop (acceptable)
	Both >5xTDL?	No-Stop (acceptable)		No-Stop (acceptable)	
	RPD				
	Difference > 2 TDL?	No - acceptable	No - acceptable	No - acceptable	No - acceptable

600-205 Duplicate Analysis

Sampling Area	HEIS Number	Sample Date	Fluoranthene			Fluorene		
			ug/kg	Q	PQL	ug/kg	Q	PQL
EX-1	J1C3H3	9/27/10	12.7		3.43	1.20	J	3.43
Duplicate of J1C3H3	J1C3H7	9/27/10	8.97		3.44	5.17		3.44

Analysis:

	TDL	15	15
Duplicate Analysis	Both > PQL?	Yes (continue)	No-Stop (acceptable)
	Both >5xTDL?	No-Stop (acceptable)	
	RPD		
	Difference > 2 TDL?	No - acceptable	No - acceptable

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	J. D. Skoglie		Date:	3/14/2011	Calc. No.:	0600X-CA-E0024	Rev.: 0
Project:	100-IU-2/6 Field Remediation		Job No:	14655	Checked:	I. B. Berezovskiy	Date: 3/14/2011
Subject:	600-205 Relative Percent Difference (RPD) and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations						Sheet No. 7 of 7

CONCLUSION:

The calculations in Tables 1 and 2 demonstrate that the 600-205 waste site meets the requirements for the hazard quotients and carcinogenic (excess cancer) risk and RPDs, respectively, as identified in the RDR/RAWP (DOE-RL 2009a) and SAP (DOE-RL 2009b). The hazard quotients and carcinogenic (excess cancer) risk and RPD calculations are for use in the RSVP for this site.

Attachment 1. 600-205 Waste Site Verification Sampling Results. (Metals)

Sample Location	HEIS Number	Sample Date	Aluminum			Antimony			Arsenic			Barium			Beryllium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EX-1	J1C3H3	9/27/10	6240	J	4.04	0.485	UJ	0.485	3.18		0.808	61.1		0.404	0.239		0.162
Duplicate of J1C3H3	J1C3H7	9/27/10	6380	J	3.29	0.395	UJ	0.395	3.45		0.658	59.9		0.329	0.251		0.132
EX-2	J1C3H4	9/27/10	9110	J	4.89	0.586	UJ	0.586	5.42		0.977	70.4		0.489	0.384		0.195
SPA-1	J1C3H5	9/27/10	7090	J	3.97	0.476	UJ	0.476	2.96		0.794	72.2		0.397	0.254		0.159
SPA-2	J1C3H6	9/27/10	7590	J	4.28	0.513	UJ	0.513	3.18		0.856	75.0		0.428	0.275		0.171
Equipment blank	J1C3H8	9/27/10	159	J	3.38	0.406	UJ	0.406	0.676	U	0.676	1.81		0.338	0.131	B	0.135

Sample Location	HEIS Number	Sample Date	Boron			Cadmium			Calcium			Chromium			Cobalt		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EX-1	J1C3H3	9/27/10	0.959	B	1.62	0.111	B	0.162	4400	J	80.8	6.78		0.162	6.36		1.62
Duplicate of J1C3H3	J1C3H7	9/27/10	0.885	B	1.32	0.103	B	0.132	4910	J	65.8	6.91		0.132	6.66		1.32
EX-2	J1C3H4	9/27/10	1.38	B	1.95	0.113	B	0.195	5990	J	97.7	9.42		0.195	9.09		1.95
SPA-1	J1C3H5	9/27/10	1.24	B	1.59	0.250		0.159	3310	J	79.4	8.26		0.159	6.22		1.59
SPA-2	J1C3H6	9/27/10	1.26	B	1.71	0.192		0.171	3670	J	85.6	9.02		0.171	6.81		1.71
Equipment blank	J1C3H8	9/27/10	1.35	U	1.35	0.135	U	0.135	33.7	JB	67.6	0.135	U	0.135	1.35	U	1.35

Sample Location	HEIS Number	Sample Date	Copper			Iron			Lead			Magnesium			Manganese		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EX-1	J1C3H3	9/27/10	11.1		0.808	19200		16.2	4.42		0.404	3930	J	60.6	284		4.04
Duplicate of J1C3H3	J1C3H7	9/27/10	11.3		0.658	19600		13.2	4.76		0.329	3950	J	49.4	299		3.29
EX-2	J1C3H4	9/27/10	18.0		0.977	24600		19.5	6.90		0.489	5250	J	73.3	371		4.89
SPA-1	J1C3H5	9/27/10	13.2		0.794	19600		15.9	12.0		0.397	3870	J	59.6	303		3.97
SPA-2	J1C3H6	9/27/10	12.1		0.856	20400		17.1	8.08		0.428	4040	J	64.2	318		4.28
Equipment blank	J1C3H8	9/27/10	0.676	U	0.676	541		13.5	0.455		0.338	20.1	JB	50.7	6.94		3.38

Sample Location	HEIS Number	Sample Date	Molybdenum			Nickel			Potassium			Selenium			Silicon		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EX-1	J1C3H3	9/27/10	0.269	B	1.62	7.96		3.23	1130		323	0.242	U	0.242	144	J	1.62
Duplicate of J1C3H3	J1C3H7	9/27/10	0.259	B	1.32	8.58		2.63	1120		263	0.197	U	0.197	109	J	1.32
EX-2	J1C3H4	9/27/10	0.360	B	1.95	10.7		3.91	1650		391	0.293	U	0.293	168	J	1.95
SPA-1	J1C3H5	9/27/10	0.272	B	1.59	8.54		3.18	1580		318	0.238	U	0.238	169	J	1.59
SPA-2	J1C3H6	9/27/10	0.287	B	1.71	9.23		3.42	1670		342	0.257	U	0.257	182	J	1.71
Equipment blank	J1C3H8	9/27/10	1.35	U	1.35	2.70	U	2.70	38.4	B	270	0.203	U	0.203	70.3	J	1.35

Sample Location	HEIS Number	Sample Date	Silver			Sodium			Vanadium			Zinc		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EX-1	J1C3H3	9/27/10	0.162	U	1.62	283		40.4	52.1	J	2.02	38.1		8.08
Duplicate of J1C3H3	J1C3H7	9/27/10	0.132	U	1.32	319		32.9	54.5	J	1.65	39.6		6.58
EX-2	J1C3H4	9/27/10	0.195	U	1.95	540		48.9	59.5	J	2.44	49.0		9.77
SPA-1	J1C3H5	9/27/10	0.159	U	1.59	199		39.7	51.5	J	1.99	45.2		7.94
SPA-2	J1C3H6	9/27/10	0.171	U	1.71	200		42.8	53.0	J	2.14	45.7		8.56
Equipment blank	J1C3H8	9/27/10	0.135	U	1.35	33.8	U	33.8	0.237	JB	1.69	1.37	B	6.76

B = estimated result, result is less than the RL but greater than the MDL
D = result reported from a dilution
J = estimated result
HEIS = Hanford Environmental Information System
PQL = practical quantitation limit
Q = qualifier
U = undetected

Attachment	1	Sheet No.	1 of 3
Originator	J. D. Skoglie	Date	2/28/11
Checked	I. B. Berezovskiy	Date	2/28/11
Calc. No.	0600X-CA-E0024	Rev. No.	0

Attachment 1. 600-205 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1C3H3 EX-1			J1CXT1 EX-1 re-sample[a]			J1C3H7 Duplicate of J1C3H3[b]			J1C3H4 EX-2			J1C3H5 SPA-1			J1CXT2 SPA-1 re-sample[a]			J1C3H6 SPA-2			J1CXT3 SPA-2 re-sample[a]		
		9/27/2010			12/7/2010			9/27/2010			9/27/2010			9/27/2010			12/7/2010			9/27/2010			12/7/2010		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	59.1		3.43				48.1		3.44	0.887	J	3.54	3.42	U	3.42				3.40		3.39			
Acenaphthylene	PAH	3.43	U	3.43				3.44	U	3.44	3.54	U	3.54	3.42	U	3.42				3.39	U	3.39			
Anthracene	PAH	8.93		3.43				9.31		3.44	2.31	J	3.54	3.42	U	3.42				3.39	U	3.39			
Benzo(a)anthracene	PAH	3.43	U	3.43				3.44	U	3.44	3.54	U	3.54	3.42	U	3.42				3.39	U	3.39			
Benzo(a)pyrene	PAH	1.72	J	3.43				4.45		3.44	3.54	U	3.54	1.45	J	3.42				1.27	J	3.39			
Benzo(b)fluoranthene	PAH	8.96		3.43				13.7		3.44	3.54	U	3.54	3.61		3.42				1.94	J	3.39			
Benzo(ghi)perylene	PAH	3.43	U	3.43				1.43	J	3.44	3.54	U	3.54	2.84	J	3.42				0.883	J	3.39			
Benzo(k)fluoranthene	PAH	3.43	U	3.43				3.44	U	3.44	3.54	U	3.54	3.42	U	3.42				3.39	U	3.39			
Chrysene	PAH	0.927	J	3.43				2.03	J	3.44	3.54	U	3.54	3.42	U	3.42				6.08		3.39			
Dibenz[a,h]anthracene	PAH	3.43	U	3.43				3.44	U	3.44	3.54	U	3.54	3.42	U	3.42				3.39	U	3.39			
Fluoranthene	PAH	12.7		3.43				8.97		3.44	3.54	U	3.54	146		3.42				34.5		3.39			
Fluorene	PAH	1.20	J	3.43				5.17		3.44	3.54	U	3.54	3.42	U	3.42				3.39	U	3.39			
Indeno(1,2,3-cd)pyrene	PAH	3.43	U	3.43				3.44	U	3.44	3.54	U	3.54	4.57		3.42				3.39	U	3.39			
Naphthalene	PAH	3.43	U	3.43				3.44	U	3.44	3.54	U	3.54	3.42	U	3.42				3.39	U	3.39			
Phenanthrene	PAH	3.43	U	3.43				3.44	U	3.44	3.54	U	3.54	3.42	U	3.42				1.36	J	3.39			
Pyrene	PAH	3.43	U	3.43				1.09	J	3.44	3.54	U	3.54	3.42	U	3.42				4.94		3.39			
Aldrin	PEST	2.66	UD	2.66	1.34	UD	1.34	2.72	UD	2.72	1.43	UD	1.43	1.34	UD	1.34	1.35	UD	1.35	1.32	UD	1.32	1.4	UD	1.35
Alpha-BHC	PEST	70.9	JD	2.66	1.34	UD	1.34	223	JD	2.72	1.43	UJD	1.43	10.2	JD	1.34	1.35	UD	1.35	8.64	JD	1.32	1.4	UD	1.35
alpha-Chlordane	PEST	2.66	UD	2.66	1.34	UD	1.34	2.72	UD	2.72	1.43	UD	1.43	1.34	UD	1.34	1.35	UD	1.35	1.32	UD	1.32	1.4	UD	1.35
beta-BHC	PEST	2.66	UD	2.66	1.34	UD	1.34	2.72	UD	2.72	1.43	UD	1.43	1.34	UD	1.34	1.35	UD	1.35	1.32	UD	1.32	1.4	UD	1.35
Delta-BHC	PEST	2.66	UD	2.66	4.38	JD	1.34	2.72	UD	2.72	1.43	UD	1.43	1.34	UD	1.34	1.35	UD	1.35	1.32	UD	1.32	1.4	UD	1.35
4,4'-DDD	PEST	86.2	D	2.66	65.1	D	1.34	453	D	2.72	3.33	JD	1.43	28.2	D	1.34	1.35	UD	1.35	21.2	D	1.32	1.4	UD	1.35
4,4'-DDE	PEST	2.66	UD	2.66	1.34	UD	1.34	2.72	UD	2.72	1.43	UD	1.43	1.34	UD	1.34	1.35	UD	1.35	1.32	UD	1.32	1.4	UD	1.35
4,4'-DDT	PEST	2.66	UD	2.66	1.34	UD	1.34	2.72	UD	2.72	1.43	UD	1.43	1.34	UD	1.34	1.35	UD	1.35	1.32	UD	1.32	1.4	UD	1.35
Dieldrin	PEST	2.66	UD	2.66	1.34	UD	1.34	2.72	UD	2.72	1.43	UD	1.43	1.34	UD	1.34	1.35	UD	1.35	1.32	UD	1.32	1.4	UD	1.35
Endosulfan I	PEST	2.66	UD	2.66	1.34	UD	1.34	2.72	UD	2.72	1.43	UD	1.43	1.34	UD	1.34	1.35	UD	1.35	1.32	UD	1.32	1.4	UD	1.35
Endosulfan II	PEST	2.66	UD	2.66	1.34	UD	1.34	2.72	UD	2.72	1.43	UD	1.43	1.34	UD	1.34	1.35	UD	1.35	1.32	UD	1.32	1.4	UD	1.35
Endosulfan sulfate	PEST	2.66	UD	2.66	1.34	UD	1.34	2.72	UD	2.72	1.43	UD	1.43	1.34	UD	1.34	1.35	UD	1.35	1.32	UD	1.32	1.4	UD	1.35
Endrin	PEST	2.66	UD	2.66	1.34	UD	1.34	2.72	UD	2.72	1.43	UD	1.43	1.34	UD	1.34	1.35	UD	1.35	1.32	UD	1.32	1.4	UD	1.35
Endrin aldehyde	PEST	2.66	UD	2.66	1.34	UD	1.34	2.72	UD	2.72	1.43	UD	1.43	1.34	UD	1.34	1.35	UD	1.35	1.32	UD	1.32	1.4	UD	1.35
Endrin ketone	PEST	2.66	UD	2.66	1.34	UD	1.34	2.72	UD	2.72	1.43	UD	1.43	1.34	UD	1.34	1.35	UD	1.35	1.32	UD	1.32	1.4	UD	1.35
Gamma-BHC (Lindane)	PEST	2.66	UD	2.66	1.34	UD	1.34	2.72	UD	2.72	1.43	UD	1.43	1.34	UD	1.34	1.35	UD	1.35	1.32	UD	1.32	1.4	UD	1.35
gamma-Chlordane	PEST	2.66	UD	2.66	1.34	UD	1.34	2.72	UD	2.72	1.43	UD	1.43	1.34	UD	1.34	1.35	UD	1.35	1.32	UD	1.32	1.4	UD	1.35
Heptachlor	PEST	2.66	UD	2.66	1.34	UD	1.34	2.72	UD	2.72	1.43	UD	1.43	1.34	UD	1.34	1.35	UD	1.35	1.32	UD	1.32	1.4	UD	1.35
Heptachlor epoxide	PEST	2.66	UD	2.66	1.34	UD	1.34	2.72	UD	2.72	1.43	UD	1.43	1.34	UD	1.34	1.35	UD	1.35	1.32	UD	1.32	1.4	UD	1.35
Methoxychlor	PEST	2.66	UD	2.66	1.34	UD	1.34	2.72	UD	2.72	1.43	UD	1.43	1.34	UD	1.34	1.35	UD	1.35	1.32	UD	1.32	1.4	UD	1.35
Toxaphene	PEST	26.6	UJD	26.6	13.4	UD	13.4	27.2	UJD	27.2	14.3	UJD	14.3	13.4	UJD	13.4	13.5	UD	13.5	13.2	UJD	13.2	14	UD	13.5

[a] Samples EX-1, SPA-1, and SPA-2 were re-sampled due to a RAG exceedance for pesticides. Re-sample data is used in place of the original data for pesticides.

[b] During re-sampling for EX-1 a duplicate was not taken. Therefore, the original pesticide duplicate data is for information only.

Attachment 1 Sheet No. 2 of 3
Originator J. D. Skoglie Date 2/28/11
Checked I. B. Berezovskiy Date 2/28/11
Calc. No. 0600X-CA-E0024 Rev. No. 0

Attachment 1. 600-205 Waste Site Verification Sampling Results. (TPH)

Sample Location	HEIS Number	Sample Date	TPH - diesel range			TPH - motor oil (high boiling)		
			ug/kg	Q	PQL	ug/kg	Q	PQL
EX-1	J1C3H3	9/27/10	96300	J	3250	181000		9760
EX-1 re-sample[a]	J1CXT1	12/7/10	197000		3560	297000		10700
EX-1 re-sample[b]	J1DWW9	2/3/11	3200	J	3550	6110	J	10700
Duplicate of J1C3H3	J1C3H7	9/27/10	118000	J	3400	221000	J	10200
EX-2	J1C3H4	9/27/10	3540	UJ	3540	7860	J	10600
SPA-1	J1C3H5	9/27/10	3390	UJ	3390	64700	J	10200
SPA-2	J1C3H6	9/27/10	3370	UJ	3370	103000	J	10100
Equipment blank	J1C3H8	9/27/10						

[a] Sample EX-1 was re-sampled due to an exceedance of the RAGs for TPH.

[b] Sample EX-1 was re-sampled a second time due to an exceedance of the RAGs for TPH. Re-sample data for J1DWW9 is used in place of the original data for TPH.

Attachment	1	Sheet No.	3 of 3
Originator	J. D. Skoglie	Date	2/28/11
Checked	I. B. Berezovskiy	Date	2/28/11
Calc. No.	0600X-CA-E0024	Rev. No.	0

APPENDIX E

DATA QUALITY ASSESSMENT

APPENDIX E

DATA QUALITY ASSESSMENT

CONFIRMATORY SAMPLING

A data quality assessment (DQA) was performed to compare the verification sampling approach and resulting analytical data with the sampling and data requirements specified in the site-specific sample design (WHC 2010b). This DQA was performed in accordance with site specific data quality objectives found in the *100 Area Remedial Action Sampling and Analysis Plan* (SAP) (DOE-RL 2009).

A review of the sample design (WCH 2010b), the field logbooks (WCH 2010a), and applicable analytical data packages has been performed as part of this DQA. All samples were collected and analyzed per the sample design. To ensure quality data, the SAP data assurance requirements and the data validation procedure for chemical analysis (BHI 2000) are used as appropriate. This review involves evaluation of the data to determine if they are of the right type, quality, and quantity to support the intended use (i.e., closeout decisions). The DQA completes the data life cycle (i.e., planning, implementation, and assessment) that was initiated by the data quality objectives process (EPA 2006).

Sample data collected at the 600-205 waste site were provided by the laboratories in three sample delivery groups (SDGs): SDG K2419, KP0028, and KP0037. SDG K2419 was submitted for third-party validation. Samples in the 600-205 data set were analyzed using U.S. Environmental Protection Agency (EPA) method 6010 (inductively coupled plasma [ICP] metals), Northwest total petroleum hydrocarbons (NWTPH-Dx) EPA method 8310 (polycyclic aromatic hydrocarbons [PAH]), and SW-846 method 8081 (pesticides). The ICP metals include: antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.

No major deficiencies were found in any of the SDGs. Minor deficiencies are discussed by SDG as follows below. If no comments are made about a specific analysis it should be assumed that no deficiencies in the quality of the data were found. Unless otherwise noted deficiencies listed below are specific to the individual SDG, but apply to all samples within that SDG.

SDG K2419

SDG K2419 comprises six soil samples (J1C3H3 through 8) from the excavation area and the staging pile area at the 600-205 waste site. Sample J1C3H7 is the field duplicate of sample J1C3H3. Sample J1C3H8 is the equipment blank (EB). SDG K2419 was submitted for formal third-party validation. Minor deficiencies are as follows:

In the TPH analysis, the laboratory duplicate relative percent difference (RPD) calculated for diesel range organics (DRO) was above the acceptance criteria (less than 30%) at 32%. Elevated RPDs in environmental samples are generally attributed to natural heterogeneity in the

sample matrix. Third-party validation has qualified all DRO results in SDG K2419 as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the TPH analysis, the laboratory did not spike the laboratory control standard (LCS), matrix spike (MS), or matrix spike duplicate (MSD) with a motor oil standard. Third-party validation has qualified all motor oil results in SDG K2419 as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the pesticide analysis, the laboratory did not prepare an MS, MSD, or LCS for toxaphene. Third-party validation has qualified all toxaphene results in SDG K2419 as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the pesticide analysis, the MS/MSD recoveries for alpha-BHC (43.2% and 39.4%, respectively) were below project control limits (50-150%). Third-party validation has qualified all alpha-BHC results in SDG K2419 as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the MS recoveries for antimony (31%), calcium (40%), magnesium (56%), silicon (188%), and vanadium (67%) were out of project control limits (70-130%). Third-party validation has qualified all antimony, calcium, magnesium, silicon, and vanadium results in SDG K2419 as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the LCS recoveries for aluminum (133%), antimony (66%), and silicon (31%) exceeded the project control limits (70-130%). Third-party validation has qualified all aluminum, antimony, and silicon results in SDG K2419 as estimated with "J" flags. Estimated data are usable for decision-making purposes.

SDG KP0028

SDG KP0028 comprises three soil samples (J1CXT1-3) from the excavation area and the staging pile area at the 600-205 waste site. Minor deficiencies are as follows:

In the TPH analysis, the MS/MSD recoveries for DRO (40% and 13%, respectively) were below project control limits (50-150%). All DRO results in SDG KP0028 may be considered estimated. Estimated data are usable for decision-making purposes.

In the TPH analysis, the laboratory did not spike the LCS, MS, or MSD with a motor oil standard. All motor oil results in SDG KP0028 may be considered estimated. Estimated data are usable for decision-making purposes.

In the pesticide analysis, the laboratory did not prepare a MS, MSD, or LCS for toxaphene. All toxaphene results in SDG KP0028 may be considered estimated. Estimated data are usable for decision-making purposes.

SDG KP0037

SDG KP0037 comprises a single soil samples (J1DWW9) from the excavation area at the 600-205 waste site. Minor deficiencies are as follows:

In the TPH analysis, the laboratory did not spike the LCS, MS, or MSD with a motor oil standard. All motor oil results in SDG KP0037 may be considered estimated. Estimated data are usable for decision-making purposes.

FIELD QUALITY ASSURANCE/QUALITY CONTROL

Relative percent difference (RPD) evaluations of main sample(s) versus the laboratory duplicate(s) are routinely performed and reported by the laboratory. Any deficiencies in those calculations are reported by SDG in the previous sections.

Field quality assurance/quality control (QA/QC) measures are used to assess potential sources of error and cross contamination of samples that could bias results. A single set of field QA/QC samples were collected (main sample: J1C3H3, and duplicate: J1C3H7), as documented in the field logbook (WCH 2010a).

The RPDs for the main and field duplicate samples have been calculated and are presented in Appendix D. The entire sample data set including the duplicate sample data are presented as an attachment to the RPD calculation.

Field duplicate samples provide a relative measure of the degree of local heterogeneity in the sampling medium, unlike laboratory duplicates that are used to evaluate precision in the analytical process. The field duplicates are evaluated by computing the RPD of the sample/duplicate pair(s), for each contaminant of concern. No major or minor deficiencies in the RPD calculations were found for the duplicate samples.

The RPDs calculated met the field duplicate acceptance criteria (less than 30%). A secondary check of the data variability is used when one or both of the samples being evaluated (main and duplicate) is less than 5 times the target detection limit (TDL), including undetected analytes. In these cases, a control limit of ± 2 times the TDL is used (Appendix D) to indicate that a visual check of the data is required by the review. This check was not required for any analytes. A visual inspection of all of the data is also performed. No additional major or minor deficiencies are noted. The data are usable for decision-making purposes.

SUMMARY

Limited, random, or sample matrix-specific influenced batch QC issues such as those discussed above are a potential for any analysis. The number and types seen in these data sets are within expectations for the matrix types and analyses performed. The DQA review of the 600-205

verification sampling data found that the analytical results are accurate within the standard errors associated with the analytical methods, sampling, and sample handling.

The DQA review for the 600-205 waste site concludes that the reviewed data are of the right 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 as a result of QA and QC deficiencies. The verification sample analytical data are stored in the Environmental Restoration (ENRE) project-specific database prior to being submitted for inclusion in the Hanford Environmental Information System (HEIS) database. The verification sample analytical data are also summarized in Appendix D.

REFERENCES

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WCH, 2010a, *IU-2/6 Remaining Sites Sampling and Field Activities*, Logbook EL-1643-02, Washington Closure Hanford, Richland, Washington.

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