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Date Submitted: 01/24/08 Originator: L. M. Dittmer Phone: 372-9227	**WASTE SITE RECLASSIFICATION FORM** Operable Unit(s): 100-DR-1 Waste Site Code: 100-D-2 Type of Reclassification Action: Closed Out ☐ Interim Closed Out ☒ No Action ☐ RCRA Postclosure ☐ Rejected ☐ Consolidated ☐	Control Number: 2007-030

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 100-D-2 Lead Sheeting waste site was located approximately 50 m (164 ft) southwest of the 185-D Building and approximately 16 m (52 ft) north of the east/west oriented road. The site consisted of a lead sheet covering a concrete pad. The history of the site is unknown. A review of aerial photographs available of the 100-D Area from 1943 through 1976 indicates that the 151-D electrical substation and the overhead steam lines were in the vicinity of the 100-D-2 waste site. According to a 1944 drawing of temporary construction facilities, a temporary railroad was also located near this site. However, nothing conclusive was found to indicate the purpose of the lead sheet covering the concrete. Lead sheets previously encountered at other areas of the Hanford Site were used as shielding for penetrating radiation or for corrosion protection (i.e., as barriers below sulfuric acid tanks and pumps). Remediation and verification sampling of this site have been performed in accordance with remedial action objectives and goals established by 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. The selected action involved: (1) removal of the lead sheeting and contaminated concrete and soil, (2) demonstrating through verifcation sampling that cleanup goals have been achieved, and (3) proposing the site for reclassification to Interim Closed Out.

Basis for reclassification:

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 remedial action objectives and the corresponding remedial action goals established in the Remaining Sites ROD. The results of verification sampling show that residual contaminant concentrations 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 results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The basis for reclassification is described in detail in the *Remaining Sites Verification Package for the 100-D-2 Lead Sheeting Waste Site* (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.

S. L. Charboneau DOE Federal Project Director (printed)	Stacy Charboneau Signature	2/8/08 Date
J. B. Price Ecology Project Manager (printed)	John B. Price Signature	3/19/2008 Date
N/A EPA Project Manager (printed)	Signature	Date

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REMAINING SITES VERIFICATION PACKAGE FOR THE 100-D-2 LEAD SHEETING WASTE SITE

Attachment to Waste Site Reclassification Form 2007-030

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REMAINING SITES VERIFICATION PACKAGE FOR THE 100-D-2 LEAD SHEETING WASTE SITE

EXECUTIVE SUMMARY

The 100-D-2 Lead Sheeting waste site, part of the 100-DR-1 Operable Unit, was located approximately 50 m (164 ft) southwest of the 185-D Building and approximately 16 m (52 ft) north of the east/west oriented road (Paddock Street) that passes south of the former D-Area water treatment plant. The site consisted of a lead sheet covering a concrete pad. The history of this site is unknown. The *100-D Area Technical Baseline Report* (Carpenter 1993) refers to this site as an "undocumented solid waste site, lead sheeting," and indicates that the purpose could not be determined by documentation. A review of aerial photographs available of the 100-D Area from 1943 through 1976 indicates that the 151-D electrical substation and the overhead steam lines were in the vicinity of the 100-D-2 waste site. According to a 1944 drawing of temporary construction facilities in 100-D Area (HEW 1944), a temporary railroad was also located near this site. However, nothing conclusive was found to indicate the purpose of the lead sheet covering the concrete. Lead sheets previously encountered at other areas of the Hanford Site were used as shielding for penetrating radiation or for corrosion protection (i.e., as barriers below sulfuric acid tanks and pumps).

Remediation of the 100-D-2 waste site was performed on April 12, 2007. The lead sheet, which was approximately 0.64 cm (0.25 in.) thick, was removed and placed in a drum for later treatment and disposal to the Environmental Restoration Disposal Facility (ERDF). The soil surrounding the concrete pad was moved aside to expose the concrete pad for inspection. The concrete was determined to be solid to at least a depth of 0.6 m (2 ft).

Verification soil sampling was performed on October 8, 2007, with one soil sample collected adjacent to each side of the concrete pad. Each sample consisted of 20 aliquots of soil distributed across the surface (0 to 0.15 m [0 to 6 in.]) below the existing ground surface, combined into one sample representative of each of the four sides. The analytical results indicated the presence of lead up to 578 mg/kg, exceeding the direct exposure cleanup criteria. Additionally, a sample chipped from the surface of the concrete exhibited lead at a concentration of 32,900 mg/kg. Therefore, additional excavation to remove the concrete pad and surrounding soil was performed on October 15, 2007. Approximately 216 metric tons (239 US tons) of soil and concrete were excavated and disposed of at ERDF.

Following excavation of the 100-D-2 waste site, a second set of verification samples were collected on October 17, 2007, to determine if the remedial action was adequate to support site closure. The analytical results of this sampling indicated that the waste removal action achieved compliance with the remedial action objectives and goals for the 100-D-2 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 100-D-2 site in accordance with the TPA-MP-14 procedure in the *Tri-Party Agreement Handbook Management Procedures* (DOE-RL 2007b).

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 remedial action objectives and the corresponding remedial action goals established in the *Remedial Design Report/Remedial Action Work*

Plan for the 100 Area (DOE-RL 2005b) 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). The results of verification sampling show that residual contaminant concentrations 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 results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. This site does not have a deep zone; therefore, no deep zone institutional controls are required.

Table ES-1. Summary of Remedial Action Goals for the 100-D-2 Site. (2 Pages)

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 are not COCs/COPCs for this site.	N/A
Direct Exposure Nonradionuclides	Attain individual COC/COPC RAGs.	All individual COC/COPC concentrations are below the direct exposure criteria.	Yes
Risk Requirements – Nonradionuclides	Attain a hazard quotient of <1 for all individual noncarcinogens.	All individual hazard quotients are <1.	Yes
	Attain a cumulative hazard quotient of <1 for noncarcinogens.	The cumulative hazard quotient (4.8×10^{-3}) is <1.	
	Attain an excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens.	The excess cancer risk values for individual carcinogens are $<1 \times 10^{-6}$.	
	Attain a total excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.	The total excess cancer risk value (2.0×10^{-7}) is $<1 \times 10^{-5}$.	
Groundwater/River Protection – Radionuclides	Attain single COC/COPC groundwater and river protection RAGs.	Radionuclides are not COCs/COPCs for this site.	N/A
	Attain national primary drinking water regulations:[a] 4 mrem/yr (beta/gamma) dose rate to target receptor/organs.		
	Meet drinking water standards for alpha emitters: the more stringent of 15 pCi/L MCL or 1/25th of the derived concentration guide from DOE Order 5400.5.[b]		
	Meet total uranium standard of 21.2 pCi/L.[c]		

Table ES-1. Summary of Remedial Action Goals for the 100-D-2 Site. (2 Pages)

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Groundwater/River Protection – Nonradionuclides	Attain individual nonradionuclide groundwater and river cleanup requirements.	All individual COC/COPC concentrations are below soil RAGs for the protection of groundwater and the Columbia 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 Areas, 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).

COC = contaminant of concern
COPC = contaminant of potential concern
MCL = maximum contaminant level
N/A = not applicable
RAG = remedial action goal

Soil cleanup levels were established in the Remaining Sites ROD based 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 concern, contaminants of potential concern, and other constituents. Screening levels were not exceeded for the site constituents, with the exception of boron, manganese and vanadium. Concentrations of manganese and vanadium are below site background levels, and boron concentrations are consistent with those seen elsewhere at the Hanford Site (no established background value is available for boron). A more complete quantitative ecological risk assessment will be presented in the baseline risk assessment for the river corridor portion of the Hanford Site and will be used as part of the final closeout decision for this site.

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-D-2 LEAD SHEETING WASTE SITE

STATEMENT OF PROTECTIVENESS

This report demonstrates that the 100-D-2 waste site meets the objectives for interim closure as established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP) (DOE-RL 2005b) 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). The results of verification sampling show that residual contaminant concentrations 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 results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling are not required.

GENERAL SITE INFORMATION AND BACKGROUND

The 100-D-2 waste site is located in the 100-DR-1 Operable Unit of the Hanford Site. The Waste Information Data System describes the 100-D-2 site as a small lead sheet covering a concrete pad (Figure 1).

Figure 1. Photograph of 100-D-2 Waste Site Looking South (Dated September 11, 2006).

The site is located approximately 50 m (164 ft) southwest of the 185-D Building and approximately 16 m (52 ft) north of the east/west oriented road (Figure 2). The history of this site is unknown. The *100-D Area Technical Baseline Report* (Carpenter 1993) refers to this site as an "undocumented solid waste site, lead sheeting," and indicates that the purpose could not be determined by documentation. A review of aerial photographs available of the 100-D Area from 1943 through 1976 indicates that the 151-D electrical substation and the overhead steam lines were in the vicinity of the 100-D-2 waste site. According to a 1944 drawing of temporary construction facilities in 100-D Area (HEW 1944), a temporary railroad was also located near this site. However, nothing conclusive was found to indicate the purpose of the lead sheet covering the concrete. Lead sheets previously encountered at other areas of the Hanford Site were used as shielding for penetrating radiation or for corrosion protection (i.e., as barriers below sulfuric acid tanks and pumps). Remediation of the site was required due to the presence of the lead sheet covering the concrete pad.

REMEDIAL ACTION SUMMARY

Prior to remediation, an in-process soil sample was collected at the site to support waste characterization and evaluation of potential beta-emitting radionuclide contamination. No radiological contamination was detected and the results of this sampling are provided in Appendix A.

Remediation of the 100-D-2 waste site was performed on April 12, 2007. The lead sheet, which was approximately 0.64 cm (0.25 in.) thick, was removed and placed in a drum for later disposal to the Environmental Restoration Disposal Facility (ERDF). The soil surrounding the concrete pad was moved aside to expose the concrete pad for inspection. The concrete was determined to be solid to minimum depth of 0.6 m (2 ft). A photograph showing the condition of the 100-D-2 waste site after removal of the lead sheeting is shown in Figure 3.

Verification soil sampling was performed on October 8, 2007, with one soil sample collected adjacent to each side of the concrete pad (WCH 2007b, WCH 2007c). Each sample consisted of 20 aliquots of soil distributed across the surface (0 to 0.15 m [0 to 6 in.]) below the existing ground surface, combined into one sample representative of each of the four sides. The analytical results indicated the presence of lead up to 578 mg/kg, exceeding the cleanup criteria. Additionally, a sample chipped from the surface of the concrete exhibited lead at a concentration of 32,900 mg/kg. Therefore, additional excavation to remove the concrete pad and surrounding soil was performed on October 15, 2007. Approximately 216 metric tons (239 US tons) of soil and concrete were excavated and disposed of at ERDF. Figure 4 provides a pre-excavation civil survey of the site and Figure 5 is the post-excavation civil survey. The results of the verification soil sampling and waste characterization sampling are provided in Appendix A.

Following excavation of the 100-D-2 waste site, a second round of verification sampling was performed on October 17, 2007, to determine if the remedial action was adequate to support site closure. The analytical results of this sampling indicated that the waste removal action achieved compliance with the remedial action objectives and goals for the 100-D-2 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 100-D-2 site in accordance with the TPA-MP-14 procedure in the *Tri-Party Agreement Handbook Management Procedures* (DOE-RL 2007b).

Figure 2. 100-D-2 Site Location Map.

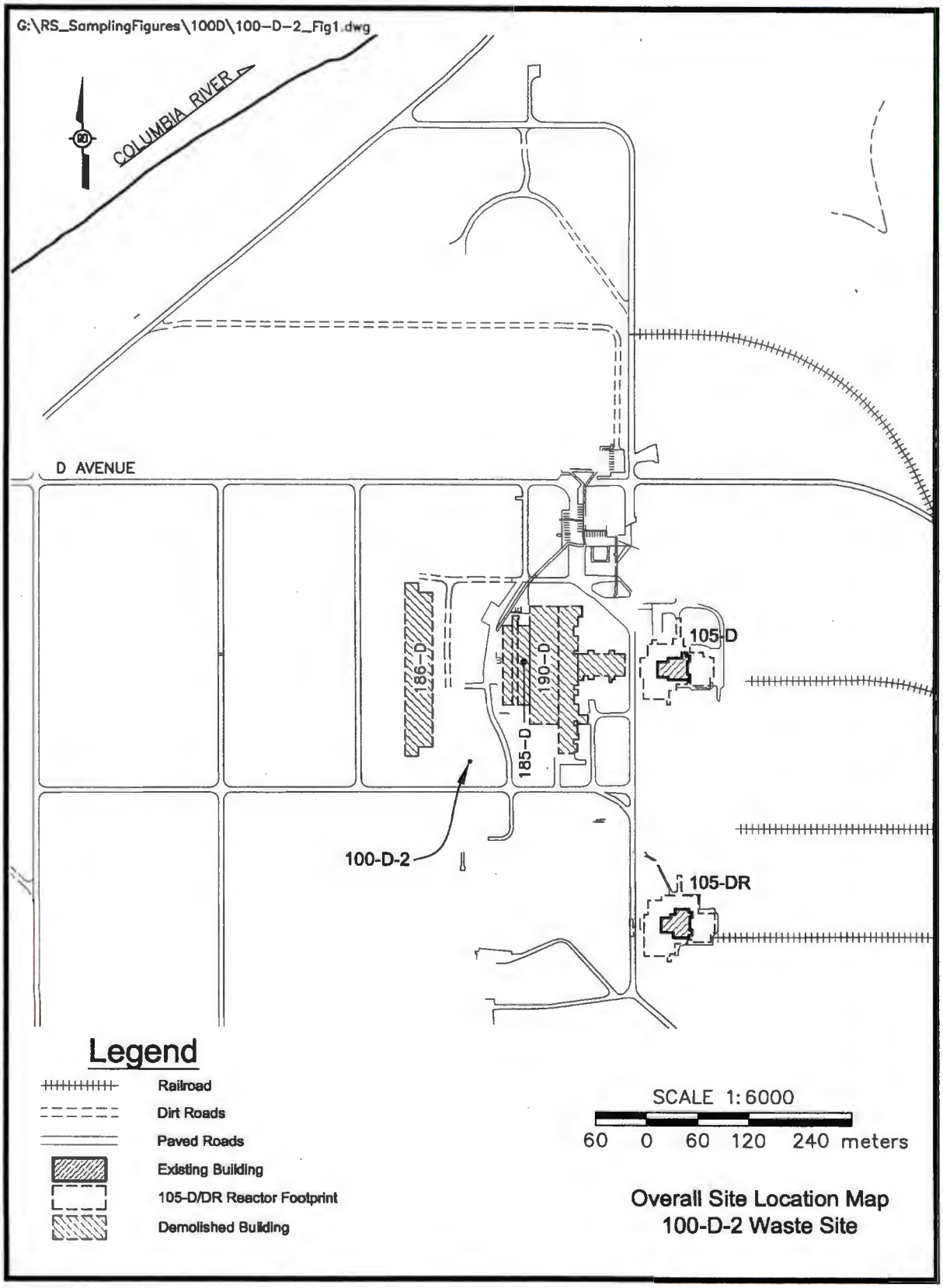


Figure 3. Photograph of 100-D-2 Waste Site (Dated May 1, 2007).

Figure 4. Pre-Excavation Civil Survey Map of the 100-D-2 Waste Site.

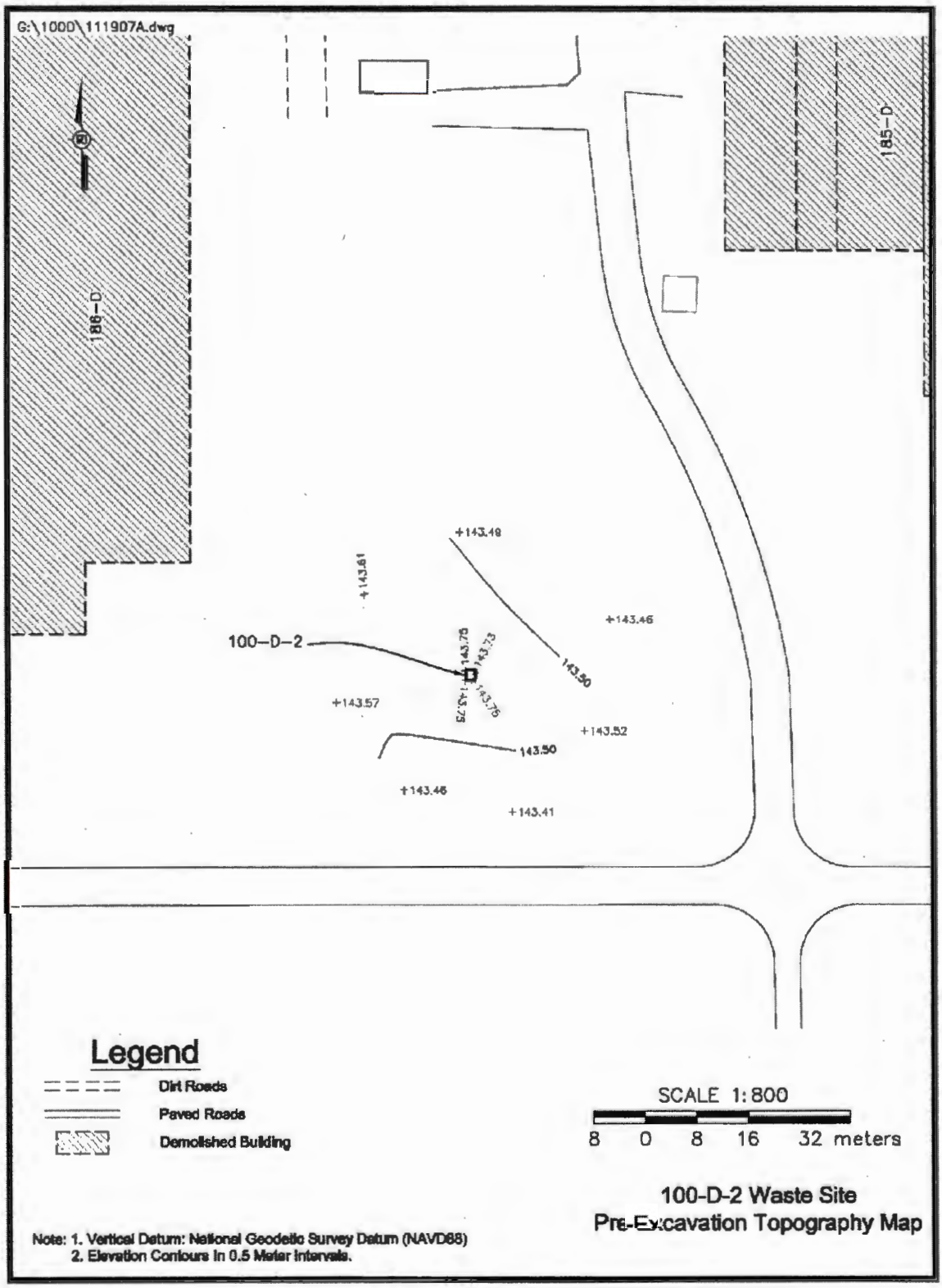
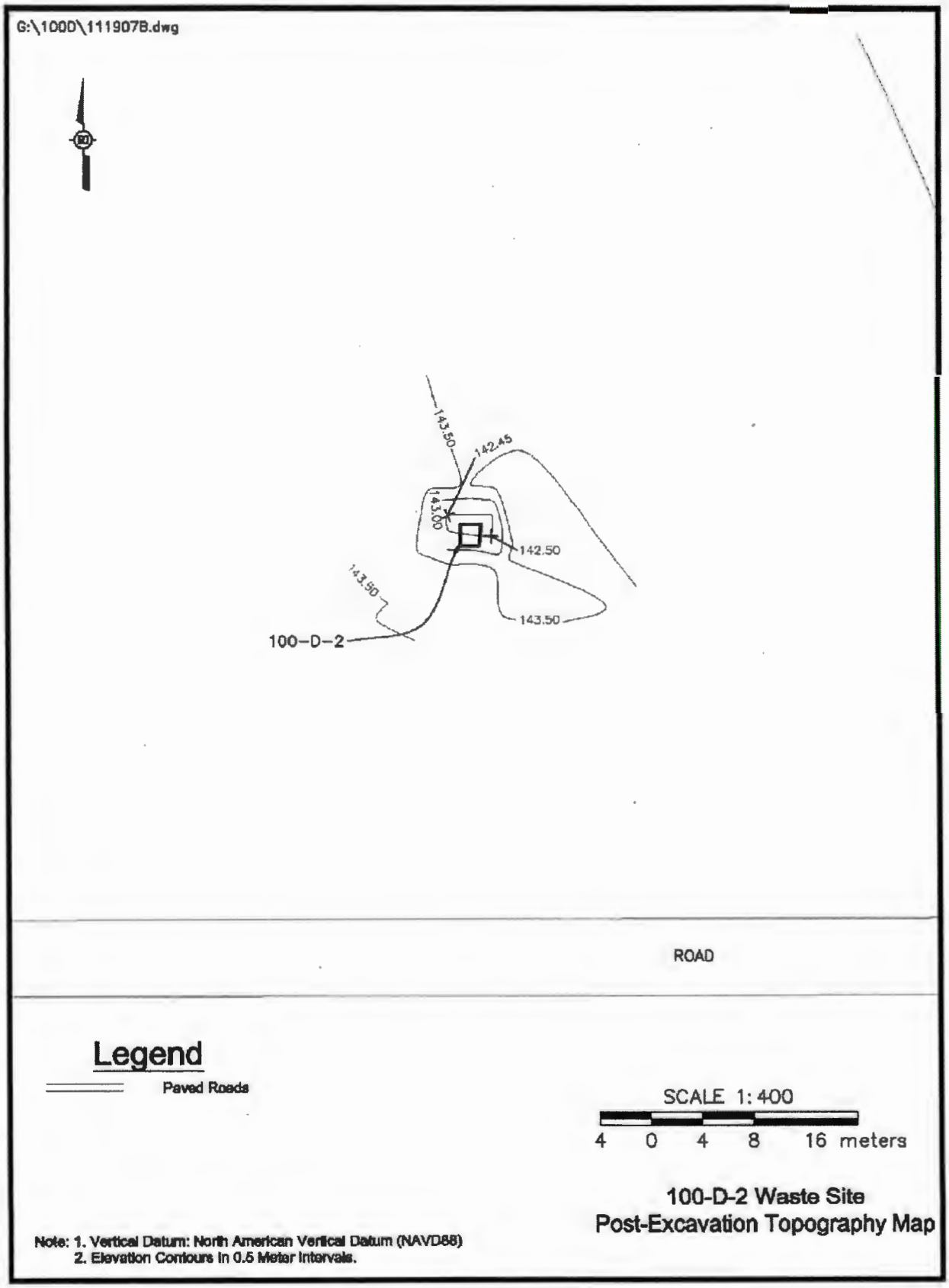


Figure 5. Post-Excavation Boundary of the 100-D-2 Waste Site.



VERIFICATION SAMPLING ACTIVITIES

Remedial Action Goals (RAGs) are the specific numeric goals against which the cleanup verification data are evaluated to demonstrate attainment of the remedial action objectives for the site. Verification sampling for the 100-D-2 waste site was performed in October 2007 after removal of the lead sheeting to collect data to determine if the RAGs had been met (WCH 2007b). However, residual concentrations of lead exceeding direct exposure cleanup levels were present in the soil adjacent to the concrete pad. Additionally, a concrete sample chipped from the surface of the pad contained elevated lead concentrations. Therefore, the concrete pad and adjacent soil surrounding the pad were removed. A second round of verification soil samples was subsequently collected (WCH 2007b). Based on evaluation of the final verification sampling results, the residual contaminant concentrations meet the cleanup criteria specified in the RDR/RAWP (DOE-RL 2005b) and the Remaining Sites ROD (EPA 1999). The following subsections provide additional discussion of the information used to develop the verification sampling design. The results of verification sampling are also summarized to support interim closure of the site.

Contaminants of Potential Concern

The *100 Area Remedial Action Sampling and Analysis Plan (*SAP) (DOE-RL 2005a) specified lead as the contaminant of potential concern (COPC) for the 100-D-2 waste site. Although not COPCs, the expanded list of inductively coupled plasma metals was analyzed and included arsenic, antimony, barium, beryllium, boron, cadmium, total chromium, cobalt, copper, manganese, molybdenum, nickel, phosphorous, selenium, silver, strontium, tin, uranium, vanadium, and zinc. Mercury and soil pH were analyzed for in the verification samples due to the potential use of the site for handling sulfuric acid. Hexavalent chromium was included as a COPC for verification sampling because of its presence as a contaminant in groundwater and the proximity of the 100-D-2 waste site to historical sodium dichromate handling facilities in the 100-D Area.

Verification Sampling Design

This section describes the basis for selection of an appropriate sample design and determination of the number of verification samples that were collected. Representatives from Washington Closure Hanford, the U.S. Department of Energy, and the Washington State Department of Ecology met at the 100-D-2 site on May 1, 2007, to evaluate the site and develop a verification sampling approach (WCH 2007c). It was determined that focused sampling would be used as the most likely area of potential contamination would be the soil surrounding the concrete pad. Therefore, the soil adjacent to each side of the concrete pad was sampled for a total of four samples. Each of the these samples consisted of 20 aliquots of soil adjacent to each side of the concrete pad that were then combined into one sample for laboratory analysis representative of each side of the four sides of the concrete pad.

Verification Sampling Results

Verification soil sampling was performed on October 8, 2007, with one soil sample collected adjacent to each side of the concrete pad (WCH 2000b). Each sample consisted of 20 aliquots of soil distributed across the surface (0 to 0.15 m [0 to 6 in.]) below the existing ground surface, combined into one sample representative of each of the four sides. The analytical results indicated the presence of lead up to 578 mg/kg, exceeding the cleanup criteria. The results of this sampling are provided in Table A-2 of Appendix A. Additionally, a sample chipped from the surface of the concrete exhibited lead at a

concentration of 32,900 mg/kg. Therefore, additional excavation to remove the concrete pad and surrounding soil was performed on October 15, 2007.

Following excavation of the 100-D-2 waste site, a second round of verification sampling was performed on October 17, 2007, to determine if the remedial action was adequate to support site closure (Vanni 2007, WCH 2007b). The second round of verification samples were collected at the same locations and in the manner performed for the first round of verification sampling. A summary of the samples collected for the Phase II verification sampling and the analysis performed is provided in Table 1. All sampling was performed in accordance with ENV-1, *Environmental Monitoring & Management*, to fulfill the requirements of the SAP (DOE-RL 2005a).

Table 1. 100-D-2 Verification Sample Summary.

Sample	Sample Number	Sample Analysis
Soil (west side)	J15W10	ICP metals, mercury, hexavalent chromium, and pH
Duplicate of J15W10	J15W11	ICP metals, mercury, hexavalent chromium, and pH
Soil (north side)	J15W12	ICP metals, mercury, hexavalent chromium, and pH
Soil (east side)	J15W13	ICP metals, mercury, hexavalent chromium, and pH
Soil (south side)	J15W14	ICP metals, mercury, hexavalent chromium, and pH
Equipment blank	J15W09	ICP metals, mercury, hexavalent chromium, and pH

ICP = inductively coupled plasma

Verification samples were analyzed using U.S. Environmental Protection Agency-approved analytical methods. Since focused sampling was performed for the 100-D-2 verification sampling, the maximum detected contaminant concentration in the four soil samples was compared directly with the cleanup levels. Table 2 provides a comparison of the maximum contaminant results with the RAGs for the site. Contaminants that were not detected by laboratory analysis are excluded from the table. Calculated cleanup levels are not presented in the *Cleanup Levels and Risk Calculations Database* (Ecology 2005) under *Washington Administrative Code* (WAC) 173-340-740(3) for aluminum, calcium, iron, magnesium, potassium, silicon, and sodium; therefore, these constituents are not considered site COPCs. Phosphorous was detected in the samples, but is present as an essential nutrient (phosphate) and therefore not included in the table (EPA 1989). The laboratory-reported data results for all constituents are stored in the Environmental Restoration (ENRE) project-specific database prior to archival in the Hanford Environmental Information System (HEIS) and are presented in Appendix A.

Table 2. Comparison of Maximum Contaminant Concentrations to Action Levels for the 100-D-2 Waste Site.

COC/COPC	Maximum Result[a] (mg/kg)	Remedial Action Goals[b] (mg/kg)			Does the Maximum Result Exceed RAGs?	Does the Maximum Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	2.1 (<BG)	20	20	20	No	--
Barium	65 (<BG)	5,600	132	224	No	--
Beryllium	0.19 (<BG)	10.4	1.51	1.51	No	--
Boron	3.3	16,000	320	--[c]	No	--
Cadmium	0.31 (<BG)	13.9	0.81	0.81	No	--
Chromium (total)	7.3 (<BG)	80,000	18.5	18.5	No	--
Cobalt	6.7 (<BG)	1,600	32	--[c]	No	--
Copper	14.5 (<BG)	2,960	59.2	22.0	No	--
Hexavalent chromium	0.41	2.1	4.8	2	No	--
Lead	8.9 (<BG)	353	10.2	10.2	No	--
Lithium	4.7 (<BG)	1,600	33.5	--[c]	No	--
Manganese	294 (<BG)	11,200	512	512	No	--
Molybdenum	0.92	400	8	--[c]	No	--
Nickel	11.8 (<BG)	1,600	19.1	27.4	No	--
Strontium	24.6	48,000	960	--[c]	No	--
Tin	2.4	48,000	960	--[c]	No	--
Vanadium	50.1 (<BG)	560	85.1	--[c]	No	--
Zinc	51.3 (<BG)	24,000	480	67.8	No	--

[a] These results are from the second round of verification soil sampling that was performed after additional remediation was completed after the first round of verification samples indicated the presence of lead exceeding the cleanup criteria.

[b] Lookup values and RAGs obtained from the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP) (DOE-RL 2005b) or calculated per WAC-173-340-720, 173-340-730, and 173-340-740, Method B, 1996, unless otherwise noted.

[c] No cleanup level is available from the *Cleanup Levels and Risk Calculations Database* (Ecology 2005), and no bioconcentration factor or ambient water quality criteria values are available to calculate cleanup levels (WAC 173-340-730(3)(a)(iii), 1996 [Method B for surface waters]).

-- = not applicable
BG = background
COC = contaminant of concern
RAG = remedial action goal
RESRAD = RESidual RADioactivity (dose assessment model)
WAC = *Washington Administrative Code*

DATA EVALUATION

Evaluation of the verification sampling results provided in Table 2 indicates that residual concentrations of all COPCs are all below RAGs. Assessment of the risk requirements for the 100-D-2 waste site is determined by calculation of the hazard quotient and excess cancer risk values for nonradionuclides. These calculations are located in Appendix B. The 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}. These risk values were not calculated for constituents that were not detected or were detected at concentrations below Hanford Site or Washington State background values. The results (Appendix B) indicate that all individual hazard quotients for noncarcinogenic constituents are less than 1.0. The cumulative hazard quotient for the noncarcinogenic constituents is 4.8×10^{-3}. All individual carcinogen risk values for carcinogenic constituents are less than 1.0×10^{-6}. The cumulative carcinogen risk value is 2.0×10^{-7}. Therefore, nonradionuclide risk requirements are met.

When using a statistical sampling approach, a RAG requirement for nonradionuclides is the WAC 173-340-740(7)(e) three-part test. However, this test is not applicable to the focused verification sampling results because maximum detected concentrations are used as the compliance basis and are evaluated individually against the cleanup criteria.

DATA QUALITY ASSESSMENT

Verification Sampling Data Quality Assessment

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 (WCH 2007c, Vanni 2007). A review of the sample designs (DOE-RL 2005a, WCH 2007c), the field logbook (WCH 2007b), and applicable analytical data packages has been performed as part of this DQA. This DQA was performed in accordance with site specific data quality objectives found in the SAP (DOE-RL 2005a).

To ensure quality data, the SAP data assurance requirements and the data validation procedures for chemical and radiochemical analysis (BHI 2000a, 2000b) 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 2000).

All samples were collected and analyzed per the verification sampling approach for the 100-D-2, Lead Sheeting waste site (WCH 2007c). The initial verification soil sampling was performed on October 8, 2007, with one soil sample collected adjacent to each side of the concrete pad. The analytical results indicated the presence of lead up to 578 mg/kg, exceeding the cleanup criteria. Additionally, a sample chipped from the surface of the concrete exhibited lead at a concentration of 32,900 mg/kg. Therefore, additional excavation to remove the concrete pad and surrounding soil was performed on October 15, 2007. Following excavation of the 100-D-2 waste site, a second round of verification sampling was performed on October 17, 2007, with one soil sample collected from each side of where the concrete monolith previously stood, with regulator concurrence per *100-D-2 Verification Sampling* (Vanni 2007, WCH 2007b). The second round of verification sample data collected at the 100-D-2 waste site was provided by the laboratories in sample delivery group (SDG) K1004. SDG K1004 was submitted for third-party validation (WCH 2007a). No major deficiencies were identified in the analytical data set. Minor deficiencies are discussed below.

SDG K1004

This SDG comprises five focused field samples (J15W10-J15W14) collected from where the 100-D-2 concrete pad had stood, and an equipment blank (J15W09). A field duplicate pair (J15W10/J15W11) is included in this SDG. These samples were analyzed for inductively coupled plasma (ICP) metals, mercury, hexavalent chromium, and pH. No alpha, beta, or gamma contamination above background was detected by field radiological survey instrumentation; therefore, radionuclides were not COPCs/COCs and were not analyzed. SDG K1004 was submitted for third-party validation. No major deficiencies were found in SDG K1004. Minor deficiencies found in SDG K1004 are as follows:

Calcium, lithium, sodium, and zinc were reported in the method blank (MB) at a concentration below the contractor required detection limit (CRQL) but not less than 1/5th of the concentration reported in the equipment blank, sample J15W09 (i.e., the field sample concentration is low enough that the MB concentration is of similar magnitude). Tin was reported in the MB at a concentration below the CRQL but not less than 1/5th of the concentration reported in all samples for SDG K1004. The calcium, lithium, sodium, and zinc result for sample J15W09, and the tin results for all samples in SDG K1004 are qualified by third-party validation as undetected and estimated and flagged "UJ". The data are useable for decision-making purposes.

In the ICP metals analysis, the matrix spike (MS) recoveries for three ICP metals (aluminum, iron, and silicon) are out of project acceptance criteria. For these analytes, the spiking concentration was insignificant compared to the native concentration in the sample from which the MS was prepared. The deficiency in the MS is a reflection of the analytical variability of the native concentration rather than a measure of the recovery from the sample. To confirm quantitation, post digestion spikes and serial dilutions were prepared for each analyte with results ranging between 94.1-106.9%. The data are useable for decision-making purposes.

The laboratory duplicate relative percent differences (RPDs) for boron and lead are 64.0% and 43.2%, respectively. These RPDs exceed the acceptance criteria (30%). The boron and lead data for SDG K1004 may be considered estimated. Estimated data are useable for decision-making purposes.

Field Quality Assurance/Quality Control

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. Field QA/QC samples, listed in the field logbook (WCH 2007b), are the 100-D-2 sample primary and duplicate (J15W10/J15W11). The main and QA/QC sample results are presented in Appendix A.

Field duplicate samples are collected to 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 duplicate samples for each COC. Only analytes with values above five times the detection limits for both the main and duplicate samples are compared. The relative percent difference (RPD) calculation brief in Appendix C provides details on duplicate pair evaluation and RPD calculation. As shown if the RPD calculation brief, none

of the analyte RPDs calculated for the field duplicates are above the acceptance criteria (30%). The data are suitable for the intended purpose of cleanup verification.

RPDs for the remaining analytes are not calculated because an evaluation of the data shows the analytes are not detected in both the main and duplicate sample at more than 5 times the target detection limit. RPDs of analytes detected at low concentrations (less than 5 times the detection limit) are not considered indicative of the analytical system performance. The data are useable for decision-making purposes.

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 C) to indicate that a visual check of the data is required by the reviewer. For the 100-D-2 focused duplicate sample, the difference was less than 2 times the TDL (for all analytes with one or both of the samples less than 5 times the TDL), and did not require the visual check. However, a visual inspection of all of the data is also performed. No additional major or minor deficiencies are noted. The data are useable for decision-making purposes.

Summary

Limited, random, or sample matrix-specific influenced batch QC issues such as those discussed above, are a potential challenge 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 100-D-2 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 100-D-2 waste site concludes that the data are of the right type, quality, and quantity to support the intended use. The verification sample analytical data are stored in the ENRE project-specific database prior to archival in the HEIS database. The verification sample analytical data are also summarized in Appendix A.

SUMMARY FOR INTERIM CLOSURE

The 100-D-2 waste site has been evaluated and remediated in accordance with the Remaining Sites ROD (EPA 1999) and the RDR/RAWP (DOE-RL 2005b). Approximately 216 metric tons (239 US tons) of material was excavated, and disposed of at ERDF. Verification sampling was conducted and the results of the final sample effort conducted on October 17, 2007 were shown to meet the cleanup objectives for direct exposure, groundwater protection, and river protection. In accordance with this evaluation, the verification sampling results support a reclassification of the 100-D-2 site to Interim Closed Out. This site does not have a deep zone; therefore, no deep zone institutional controls are required.

REFERENCES

40 CFR 141, "National Primary Drinking Water Regulations," *Code of Federal Regulations*, as amended.

BHI, 2000a, *Data Validation Procedure for Chemical Analysis*, BHI-01435, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

BHI, 2000b, *Data Validation Procedure for Radiochemical Analysis*, BHI-01433, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

BHI, 2001, *Calculation of Total Uranium Activity Corresponding to a Maximum Contaminant Level for Total Uranium of 30 Micrograms per Liter in Groundwater*, 0100X-CA-V0038, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

Carpenter, R. W., 1993, *100-D Area Technical Baseline Report*, WCH-SD-EN-TI-181, Rev. 0, August 20, 1993, Westinghouse Hanford Company, Richland, Washington.

DOE Order 5400.5, *Radiation Protection of the Public and Environment*, as amended, U.S. Department of Energy, Washington, D.C.

DOE-RL, 1996, *Hanford Site Background: Part 2, Soil Background for Radionuclides*, DOE/RL-96-12, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2005a, *100 Area Remedial Action Sampling and Analysis Plan*, DOE/RL-96-22, Rev. 4, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2005b, *Remedial Design Report/Remedial Action Work Plan for the 100 Area,* DOE/RL-96-17, Rev. 5, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2007b, *Tri-Party Agreement Handbook Management Procedures,* RL-TPA-90-0001, Rev. 1, Guideline Number TPA-MP-14, "Maintenance of the Waste Information Data System (WIDS)," U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Ecology, 2005, *Cleanup Levels and Risk Calculations (CLARC) Database*, Washington State Department of Ecology, Olympia, Washington, <https://fortress.wa.gov/ecy/clarc.CLARCHome.aspx>.

ENV-1, *Environmental Monitoring & Management*, Washington Closure Hanford, Richland, Washington.

EPA, 1989, Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part A), EPA/540/1-89/002. U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1999, *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,* U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

EPA, 2000, *Guidance for Data Quality Assessment*, EPA QA/G-9, QA00 Update, U.S. Environmental Protection Agency, Office of Environmental Information, Washington, D.C.

HEW, 1944, *Plot Plan of Temporary Construction Facilities, 100-D Area*, Hanford Engineering Works, Richland, Washington.

Vanni, J, 2007, *100-D-2 Verification Sampling*, CCN 136185 dated October 17, 2007, to M. A. Buckmaster, Washington Closure Hanford, Richland, Washington.

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

WCH, 2007a, *Final Validation Package SDG K1004,* Washington Closure Hanford, Richland, Washington.

WCH, 2007b, *Remaining Site Field Sampling,* Logbook EL-1607-2, pp. 6, 61 Washington Closure Hanford, Richland, Washington.

WCH, 2007c, *Work Instruction for Verification Sampling of the 100-D-2 Lead Sheeting Waste Site*, 0100D-WI-G0026, Rev. 0, Washington Closure Hanford, Richland, Washington.

APPENDIX A

IN-PROCESS, WASTE CHARACTERIZATION AND VERIFICATION SAMPLING RESULTS

Table A-1. 100-D-2 Waste Characterization and In-process Sample Results for Inorganics.

Sample Media	HEIS Number	Sample Date	Aluminum			Antimony			Arsenic			Barium			Beryllium			Bismuth			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	mg/kg	Q	PQL
Stained soil	J15240	8/15/07	4160		4.9	0.65	U	0.65	1.2	U	1.2	60.1	C	0.06	0.03	U	0.03	1.2	U	1.2	1.5		1.1
Soil	J15P94	9/25/07	5600	C	4.7	0.63	U	0.63	2.3		1.2	71.1	C	0.06	0.31		0.03	1.1	U	1.1	2.1		1
Concrete	J15P95	9/25/07	10600	C	4.7	3.2		0.62	4.7		1.2	147	C	0.06	0.25		0.03				16	C	4

Sample Media	HEIS Number	Sample Date	Cadmium			Calcium			Chromium			Cobalt			Copper			Hexavalent			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	mg/kg	Q	PQL
Stained soil	J15240	8/15/07	0.15	U	0.15	3750	C	2.1	12	C	0.3	4.4		0.24	12.7		0.27	0.25		0.2	21000		7.1
Soil	J15P94	9/25/07	0.14	U	0.14	5670	C	2	7.9		0.29	7		0.23	14.4		0.26				17400	C	6.8
Concrete	J15P95	9/25/07	0.69		0.14	1E+05	C	15.9	17.3	C	0.28	2.8		0.22	108	C	0.25				12100	C	6.7

Sample Media	HEIS Number	Sample Date	Lead			Lithium			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	mg/kg	Q	PQL
Stained soil	J15240	8/15/07	41.8		0.98	3.8		0.09	2620	C	2.4	140		0.21	0.02	U	0.02	0.47	U	0.47	7.2		0.8
Soil	J15P94	9/25/07	8		0.94	5.3	C	0.09	3820	C	2.3	302	C	0.2	0.01	U	0.01	0.46	U	0.46	10.3		0.77
Concrete	J15P95	9/25/07	32900		7.4				5190	C	2.3	144		0.2	0.01	U	0.01	1.3	C	0.45	9.7		0.76

Sample Media	HEIS Number	Sample Date	Phosphorus			Potassium			Selenium			Silicon			Silver			Sodium			Strontium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Stained soil	J15240	8/15/07	974		4.1	1150		9.5	1.3	U	1.3	1940		2.5	0.27	U	0.27	228	C	2.1	25.6	C	0.03
Soil	J15P94	9/25/07	948		4	1100		9.1	1.2	U	1.2	4240	C	2.5	0.26	U	0.26	195	C	2	25.6	C	0.03
Concrete	J15P95	9/25/07				2390	C	35.9	1.2	U	1.2	25100	C	9.6	0.88		0.25	938	C	7.9			

Sample Media	HEIS Number	Sample Date	Thallium			Tin			Titanium			Uranium			Vanadium			Zinc		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Stained soil	J15240	8/15/07	2.4	U	2.4	2.5	C	1.9	1290		0.12	4.3	U	4.3	38.1		0.24	47.3	C	0.12
Soil	J15P94	9/25/07	2.3	U	2.3	2		1.8				4.1	U	4.1	36.7		0.23	42.9	C	0.11
Concrete	J15P95	9/25/07													31.2		0.22	29.7	C	0.11

Table A-2. 100-D-2 In-Process Sample Results for Beta Radionuclides.

Sample Media	Sample Number	Sample Date	Carbon-14			Nickel-63			Tritium		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
Soil	J14XJ7	3/19/07	-0.872	U	2.3	1.38	U	3.7	0.320	U	2.6

MDA = minimum detectable activity
Q = qualifier
C = blank contamination (inorganic constituents)
U = undetected

Table A-2. 100-D-2 Phase I Verification Sample Results

Sample Type	Sample Number	Sample Date	Antimony			Arsenic			Barium			Beryllium			Boron			Cadmium			Chromium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Equipment Blank	J15F06	8/8/07	0.22	U	0.22	0.4	U	0.4	1.2	C	0.02	0.01	U	0.01	0.35	U	0.4	0.05	U	0.05	0.1	U	0.1
Soil	J15F07	8/8/07	0.63	U	0.63	2.8		1.2	60.1	C	0.06	0.03	U	0.03	1	U	1	0.14	U	0.14	6.5	C	0.29
Duplicate of J15F07	J15F08	8/8/07	0.64	U	0.64	1.8		1.2	40	C	0.06	0.03	U	0.03	1	U	1	0.15	U	0.15	3.5	C	0.29
Soil	J15F09	8/8/07	0.65	U	0.65	3		1.2	96.9	C	0.06	0.03	U	0.03	2.4		1.1	0.19		0.15	12.4	C	0.3
Soil	J15F10	8/8/07	0.66	U	0.66	2.5		1.2	85.6	C	0.06	0.03	U	0.03	2.4		1.1	0.15	U	0.15	10.8	C	0.3
Soil	J15F11	8/8/07	0.65		0.64	2.4		1.2	57.4	C	0.06	0.03	U	0.03	1.4		1.1	0.15	U	0.15	11.6	C	0.29

Sample Location	Sample Number	Sample Date	Cobalt			Copper			Hexavalent Chromium			Lead			Manganese			Mercury			Molybdenum		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Equipment Blank	J15F06	8/8/07	0.08	U	0.08	0.09	U	0.09				0.63		0.32	3.3		0.1	0.02	U	0.02	0.16	U	0.16
Soil	J15F07	8/8/07	7.5		0.23	13.8		0.26	0.3		0.2	147		0.95	270		0.2	0.01	U	0.01	0.46	U	0.46
Duplicate of J15F07	J15F08	8/8/07	4.4		0.23	9.7		0.26	0.26		0.2	94		0.95	170		0.4	0.02		0.01	0.46	U	0.46
Soil	J15F09	8/8/07	7.8		0.24	15.6		0.27	0.35		0.2	578		0.98	299		0.2	0.01	U	0.01	0.47	U	0.47
Soil	J15F10	8/8/07	6.6		0.24	13		0.27	0.2	U	0.2	267		0.98	251		0.2	0.05		0.02	0.48	U	0.48
Soil	J15F11	8/8/07	4.3		0.23	12.2		0.26	0.26		0.2	97.5		0.97	167		0.2	0.02	U	0.02	0.47		0.47

Sample Location	Sample Number	Sample Date	Nickel			Selenium			Silver			Vanadium			Zinc			pH		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	pH units	Q	PQL
Equipment Blank	J15F06	8/8/07	0.26	U	0.26	0.42	U	0.42	0.09	U	0.09	0.08	U	0.08	2.4	C	0			
Soil	J15F07	8/8/07	8.7		0.77	1.2	U	1.2	0.26	U	0.26	36.8		0.23	39.6	C	0.1	8.7		0.01
Duplicate of J15F07	J15F08	8/8/07	5.8		0.77	1.2	U	1.2	0.26	U	0.26	24		0.23	25.8	C	0.1	8.5		0.01
Soil	J15F09	8/8/07	11.6		0.8	1.3	U	1.3	0.27	U	0.27	45.2		0.24	78.7	C	0.1	8.6		0.01
Soil	J15F10	8/8/07	10.1		0.8	1.3	U	1.3	0.27	U	0.27	38.1		0.24	61.6	C	0.1	7.4		0.01
Soil	J15F11	8/8/07	8.2		0.79	1.3	U	1.3	0.26	U	0.26	30.9		0.23	34.1	C	0.1	7.6		0.01

C = blank contamination (inorganic constituents)
PQL = practical quantification limit
Q = qualifier
U = undetected

Table A-3. 100-D-2 Phase II Verification Sample Results (2 pages)

Sample Media	HEIS Number	Sample Date	Aluminum			Antimony			Arsenic			Barium			Beryllium			Bismuth			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	mg/kg	Q	PQL
Equipment Blank	J15W09	10/17/07	58.2		3.8	0.3		0.29	0.48	U	0.48	1.5		0.1	0.05	U	0.05	0.58	U	0.58	0.61		0.48
Soil	J15W10	10/17/07	4640		12.2	0.92	U	0.92	1.8		1.5	63.2		0.31	0.19		0.15	1.8	U	1.8	2.1		1.5
Duplicate of J15W10	J15W11	10/17/07	4940		11.5	0.86	U	0.86	1.6		1.4	63.1		0.29	0.17		0.14	1.7	U	1.7	1.4	U	1.4
Soil	J15W12	10/17/07	4820		11.9	0.89	U	0.89	1.8		1.5	61.1		0.3	0.19		0.15	1.8	U	1.8	1.5		1.5
Soil	J15W13	10/17/07	5410		11.6	0.87	U	0.87	1.5	U	1.5	65		0.29	0.19		0.15	1.7	U	1.7	1.6		1.5
Soil	J15W14	10/17/07	5150		11.4	0.85	U	0.85	2.1		1.4	61.1		0.28	0.19		0.14	1.7	U	1.7	3.3		1.4

Sample Media	HEIS Number	Sample Date	Cadmium			Calcium			Chromium			Cobalt			Copper			Hexavalent Chromium			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	mg/kg	Q	PQL
Equipment Blank	J15W09	10/17/07	0.1	U	0.1	29.4	C	3.8	0.19	U	0.19	0.19	U	0.19	0.19	U	0.19	0.2	U	0.2	123	C	4.3
Soil	J15W10	10/17/07	0.31	U	0.31	5660	C	12.2	7.1		0.61	6.7		0.61	13.6		0.61	0.21	U	0.2	19900	C	13.8
Duplicate of J15W10	J15W11	10/17/07	0.29	U	0.29	6550	C	11.5	6.5		0.58	7		0.58	13.8		0.58	0.2	U	0.2	21200	C	13
Soil	J15W12	10/17/07	0.3	U	0.3	6800	C	11.9	6.2		0.59	6.4		0.59	14.5		0.59	0.2	U	0.2	19000	C	13.4
Soil	J15W13	10/17/07	0.29	U	0.29	5020	C	11.6	6.8		0.58	6.5		0.58	13.9		0.58	0.2	U	0.2	20000	C	13.1
Soil	J15W14	10/17/07	0.28	U	0.28	5520	C	11.4	7.3		0.57	6.7		0.57	14		0.57	0.41		0.2	18900	C	12.8

Sample Media	HEIS Number	Sample Date	Lead			Lithium			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	mg/kg	Q	PQL
Equipment Blank	J15W09	10/17/07	0.29	U	0.29	0.17	C	0.04	10.1		2.4	4	C	0.04	0.02	U	0.01	0.29	U	0.29	0.19	U	0.19
Soil	J15W10	10/17/07	3.6		0.92	4.2	C	0.12	4170		7.6	284	C	0.12	0.02	U	0.01	0.92		0.92	9.2		0.61
Duplicate of J15W10	J15W11	10/17/07	3.9		0.86	4.3	C	0.12	4090		7.2	292	C	0.12	0.02	U	0.01	0.86		0.86	8.8		0.58
Soil	J15W12	10/17/07	8.8		0.89	4.3	C	0.12	3790		7.4	272	C	0.12	0.02	U	0.01	0.89	U	0.89	8.2		0.59
Soil	J15W13	10/17/07	7.1		0.87	4.6	C	0.12	3930		7.3	285	C	0.12	0.01	U	0	0.87	U	0.87	10.1		0.58
Soil	J15W14	10/17/07	8.9		0.85	4.7	C	0.11	3990		7.1	294	C	0.11	0.01	U	0	0.85	U	0.85	11.8		0.57

Table A-3. 100-D-2 Phase II Verification Sample Results (2 pages)

Sample Media	HEIS Number	Sample Date	Phosphorus			Potassium			Selenium			Silicon			Silver			Sodium			Strontium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Equipment Blank	J15W09	10/17/07	4.8	U	4.8	31		3.8	0.58	U	0.58	77.5		3.8	0.1	U	0.1	13.6	C	1.9	0.33	C	0.03
Soil	J15W10	10/17/07	1160		15.3	800		12.2	1.8	U	1.8	2680		12.2	0.31	U	0.31	209	C	6.1	22.5	C	0.09
Duplicate of J15W10	J15W11	10/17/07	1130		14.4	842		11.5	1.7	U	1.7	2380		11.5	0.29	U	0.29	212	C	5.8	24.6	C	0.09
Soil	J15W12	10/17/07	1030		14.9	890		11.9	1.8	U	1.8	3270		11.9	0.3	U	0.3	249	C	5.9	24.4	C	0.09
Soil	J15W13	10/17/07	984		14.5	1050		11.6	1.7	U	1.7	2820		11.6	0.29	U	0.29	237	C	5.8	24	C	0.09
Soil	J15W14	10/17/07	992		14.2	1050		11.4	1.7	U	1.7	2920		11.4	0.28	U	0.28	200	C	5.7	21.8	C	0.09

Sample Media	HEIS Number	Sample Date	Thallium			Tin			Uranium			Vanadium			Zinc			pH		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	pH units	Q	PQL
Equipment Blank	J15W09	10/17/07	0.58	U	0.58	1	C	0.58	4.8	U	4.8	0.13	U	0.13	1.6	C	0.58	7.2		0.1
Soil	J15W10	10/17/07	1.8	U	1.8	2.3	C	1.8	15.3	U	15.3	45.2		0.43	37.3	C	1.8	8.6		0.1
Duplicate of J15W10	J15W11	10/17/07	1.7	U	1.7	2.4	C	1.7	14.4	U	14.4	50.1		0.4	40.4	C	1.7	8.6		0.1
Soil	J15W12	10/17/07	1.8	U	1.8	2	C	1.8	14.9	U	14.9	41.1		0.42	39.9	C	1.8	8.7		0.1
Soil	J15W13	10/17/07	1.7	U	1.7	1.8	C	1.7	14.5	U	14.5	45.5		0.41	41.9	C	1.7	8.2		0.1
Soil	J15W14	10/17/07	1.7	U	1.7	2.4	C	1.7	14.2	U	14.2	39.9		0.4	51.3	C	1.7	8.4		0.1

APPENDIX B

HAZARD QUOTIENT AND CARCINOGENIC RISK CALCULATIONS

APPENDIX B

HAZARD QUOTIENT AND CARCINOGENIC RISK CALCULATIONS

The calculation in this appendix is kept in the active Washington Closure Hanford project files and is available upon request. When the project is completed, the files will be stored in a U.S. Department of Energy, Richland Operations Office repository. This calculation has been prepared in accordance with ENG-1, *Engineering Services*, ENG-1-4.5, "Project Calculations," Washington Closure Hanford, Richland, Washington. The following calculation is provided in this appendix:

100-D-2 Waste Site Cleanup Verification Hazard Quotient and Carcinogenic Risk Calculation, 0100D-CA-V0277, Rev. 0, Washington Closure Hanford, Richland, Washington.

DISCLAIMER FOR CALCULATIONS

The calculation provided in this appendix has been generated to document compliance with established cleanup levels. This calculation should be used in conjunction with other relevant documents in the administrative record.

Acrobat 8.0

CALCULATION COVER SHEET

Project Title: 100-D Area Field Remediation **Job No. 14655**

Area: 100-D

Discipline: Environmental *Calculation No: 0100D-CA-V0277

Subject: 100-D-2 Waste Site Cleanup Verification 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 = 3	W. S. Thompson	H. M. Sullivan	NA	M. A. Buckmaster	1/21/08

SUMMARY OF REVISION

WCH-DE-018 (05/08/2007) *Obtain Calc. No. from Document Control and Form from Intranet

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	W. S. Thompson	Date:	01/21/08	Calc. No.:	0100D CA V0277	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	H. M. Sulloway	Date:	1/21/08
Subject:	100-D-2 Waste Site Cleanup Verification Hazard Quotient and Carcinogenic Risk Calculation					Sheet No.	1 of 3

PURPOSE:

Provide documentation to support the calculation of the hazard quotient (HQ) and carcinogenic (excess cancer) risk for the 100-D-2 waste site. In accordance with the remedial action goals (RAGs) in the remedial design report/remedial action work plan (RDR/RAWP) (DOE-RL 2005), 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.

GIVEN/REFERENCES:

1) DOE-RL, 2005, *Remedial Design Report/Remedial Action Work Plan for the 100 Areas,* DOE/RL-96-17, Rev. 5, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

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

3) WCH, 2007, *Remaining Sites Verification Package for the 100-D-2 Lead Sheeting Waste Site*, Attachment to Waste Site Reclassification Form 2007-030, Washington Closure Hanford, Inc., Richland, Washington.

4) EPA, 1989, Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part A), EPA/540/1-89/002, U.S. Environmental Protection Agency, Washington, D.C.

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 2005).

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 2005).

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

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	W. S. Thompson	Date:	01/21/08	Calc. No.:	0100D-CA-V0277	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	H. M. Sulloway	Date:	1/28/08
Subject:	100-D-2 Waste Site Cleanup Verification Hazard Quotient and Carcinogenic Risk Calculation					Sheet No.	2 of 3

METHODOLOGY:

The hazard quotient and carcinogenic risk calculations for the 100-D-2 waste site were conservatively calculated using the highest of the focused Phase II verification sampling results for each analyte (WCH 2007). Boron, hexavalent chromium, molybdenum, strontium, and tin require HQ and risk calculations because these analytes were detected and a Washington State or Hanford Site background value is not available. All other site nonradionuclide COCs were not detected or were quantified below background levels. Phosphorous was detected in the samples, but is present as an essential nutrient (phosphate) and therefore not included (EPA 1989). An example of the HQ and risk calculations is presented below:

1) For example, the maximum value for boron is 3.3 mg/kg, divided by the noncarcinogenic RAG value of 16,000 mg/kg (boron is identified as a noncarcinogen in WAC 173-340-740[3]), is 2.1×10^{-4}. Comparing this value, and all other individual values, to the requirement of <1.0, this criteria is met.

2) After the HQ calculation is completed for the appropriate analytes, the cumulative HQ can be obtained by summing the individual values. The sum of the HQ values is 4.8×10^{-3}. Comparing this value to the requirement of <1.0, this criteria is met.

3) To calculate the excess cancer risk, the maximum value is divided by the carcinogenic RAG value, then multiplied by 1×10^{-6}. For example, the maximum value for hexavalent chromium is 0.41 mg/kg, divided by 2.1 mg/kg, and multiplied as indicated, is 2.0×10^{-7}. Comparing this value and all other individual values to the requirement of $<1 \times 10^{-6}$, this criteria 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. The sum of the excess cancer risk values is 2.0×10^{-7}. Comparing this value to the requirement of $<1 \times 10^{-5}$, this criterion is met.

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 $>1 \times 10^{-6}$: None
4) List the cumulative excess cancer risk for carcinogens $>1 \times 10^{-5}$: None.

Table 1 shows the results of the calculations.

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	W. S. Thompson	Date:	01/21/08	Calc. No.:	0100D-CA-V0217	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	H. M. Sulloway	Date:	1/21/08
Subject:	100-D-2 Waste Site Cleanup Verification Hazard Quotient and Carcinogenic Risk Calculation					Sheet No.	3 of 3

Table 1. Hazard Quotient and Excess Cancer Risk Results for the 100-D-2 Waste Site.

Contaminants of Concern[a]	Maximum Value[a] (mg/kg)	Noncarcinogen RAG[b] (mg/kg)	Hazard Quotient	Carcinogen RAG[b] (mg/kg)	Carcinogen Risk
Metals					
Boron	3.3	16,000	2.1E-04	--	--
Chromium, hexavalent[c]	0.41	240	1.7E-03	2.1	2.0E-07
Molybdenum	0.92	400	2.3E-03	--	--
Strontium	24.6	48,000	5.1E-04		
Tin	2.4	48,000	5.0E-05	--	--
Totals					
Cumulative Hazard Quotient:			**4.8E-03**		
Cumulative Excess Cancer Risk:					**2.0E-07**

Notes:

[a] = From WCH (2007).

[b] = Value obtained from the RDR/RAWP (DOE-RL 2005) or *Washington Administrative Code* (WAC) 173-340-740(3), Method B, 1996, unless otherwise noted.

[c] = Value for the carcinogen RAG calculated based on the inhalation exposure pathway WAC 173-340-750(3), 1996.

-- = not applicable

RAG = remedial action goal

CONCLUSION:

This calculation demonstrates that the 100-D-2 waste site meets the requirements for the hazard quotients and carcinogenic (excess cancer) risk as identified in the RDR/RAWP (DOE-RL 2005).

APPENDIX C

RELATIVE PERCENT DIFFERENCE (RPD) CALCULATIONS

APPENDIX C

RELATIVE PERCENT DIFFERENCE (RPD) CALCULATIONS

The calculation in this appendix is kept in the active Washington Closure Hanford project files and is available upon request. When the project is completed, the files will be stored in a U.S. Department of Energy, Richland Operations Office repository. This calculation has been prepared in accordance with ENG-1, *Engineering Services*, ENG-1-4.5, "Project Calculations," Washington Closure Hanford, Richland, Washington. The following calculation is provided in this appendix:

100-D-2 Relative Percent Difference Calculations, 0100D-CA-V0282, Rev. 0, Washington Closure Hanford, Richland, Washington.

DISCLAIMER FOR CALCULATIONS

The calculation provided in this appendix has been generated to document compliance with established cleanup levels. This calculation should be used in conjunction with other relevant documents in the administrative record.

Acrobat 8.0

CALCULATION COVER SHEET

Project Title: 100-D Area Field Remediation **Job No. 14655**

Area: 100-D

Discipline: Environmental Calculation No: 0100D-CA-V0282

Subject: 100-D-2 Relative Percent Difference (RPD) 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 = 4	E. J. Farris	H. M. Sulloway		M. A. Buckmaster	1/22/08

SUMMARY OF REVISION

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

DE01-437.03

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	E. J. Farris	Date:	1/22/08	Calc. No.:	0100D-CA-V0282	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	H. M. Sulloway	Date:	1/22/08
Subject:	100-D-2 Relative Percent Difference (RPD) Calculations					Sheet No.	1 of 4

PURPOSE:

Calculate the relative percent difference (RPD) for primary-duplicate sample pairs from 100-D-2 verification sampling, as necessary.

GIVEN/REFERENCES:

1) WCH, 2007, *Remaining Sites Verification Package for the 100-D-2 Lead Sheeting Waste Site*, Attachment to Waste Site Reclassification Form 2007-030, Washington Closure Hanford, Richland, Washington.

2) DOE-RL, 2005, *100 Area Remedial Action Sampling and Analysis Plan*, DOE/RL-96-22, Rev. 4, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

SOLUTION:

1) Use data from WCH (2007) to perform the RPD calculations for primary-duplicate sample pairs, as required.

METHODOLOGY:

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 laboratory detection limit pre-determined for each analytical method and is listed in Table II-1 of the SAP (DOE-RL 2005). 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

To assist in the identification of anomalous sample pairs, 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. If the RPD is greater than 30%, further investigation regarding the usability of the data is performed. Additional discussion is provided in the data quality assessment section of the applicable RSVP, as necessary.

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	E. J. Farris EJFarris	Date:	1/22/08	Calc. No.:	0100D-CA-V0282	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14635	Checked:	H. M. Sulloway HMS	Date:	1/22/08
Subject:	100-D-2 Relative Percent Difference (RPD) Calculations					Sheet No. 2 of 4	

RESULTS:

None of the RPDs calculated in the field duplicate pair for sample delivery group (SDG) K1004 are above the acceptance criteria (30%). The evaluation of the QA/QC duplicate RPD calculations is performed within the data quality assessment section of the RSVP (WCH 2007). Table 1 provides the results of the calculations for SDG K1004.

CONCLUSION:

The RPD calculations indicate the verification sample results are suitable for use in the RSVP for the 100-D-2 site.

Table 1. Relative Percent Difference Calculations for SDG K1004. (3 pages)

Sampling Area	Sample Number	Sample Date	Aluminum			Antimony			Arsenic			Barium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
West side soil	J15W10	10/17/07	4640		12.2	0.92	U	0.92	1.8		1.5	63.2		0.31
Duplicate of J15W10	J15W11	10/17/07	4940		11.5	0.86	U	0.86	1.6		1.4	63.1		0.29

Analysis:

TDL		5	0.6	1	2
Duplicate Analysis	Both > PQL?	**Yes (continue)**	No-Stop (acceptable)	**Yes (continue)**	**Yes (continue)**
	Both >5xTDL?	**Yes (calc RPD)**		No-Stop (acceptable)	**Yes (calc RPD)**
	RPD	6.3%			0.2%
	Difference > 2 TDL?	Not applicable	No - acceptable	No - acceptable	Not applicable

Sampling Area	Sample Number	Sample Date	Beryllium			Bismuth			Boron			Cadmium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
West side soil	J15W10	10/17/07	0.19		0.15	1.8	U	1.8	2.1		1.5	0.31	U	0.31
Duplicate of J15W10	J15W11	10/17/07	0.17		0.14	1.7	U	1.7	1.4	U	1.4	0.29	U	0.29

Analysis:

TDL		0.5	10	2	0.5
Duplicate Analysis	Both > PQL?	**Yes (continue)**	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)
	Both >5xTDL?	No-Stop (acceptable)			
	RPD				
	Difference > 2 TDL?	No - acceptable	No - acceptable	No - acceptable	No - acceptable

Sampling Area	HEIS Number	Sample Date	Calcium			Chromium			Cobalt			Copper		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
West side soil	J15W10	10/17/07	5660	C	12.2	7.1		0.61	6.7		0.61	13.6		0.61
Duplicate of J15W10	J15W11	10/17/07	6550	C	11.5	6.5		0.58	7		0.58	13.8		0.58

Analysis:

TDL		100	1	2	1
Duplicate Analysis	Both > PQL?	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**
	Both >5xTDL?	**Yes (calc RPD)**	**Yes (calc RPD)**	No-Stop (acceptable)	**Yes (calc RPD)**
	RPD	14.6%	8.8%		1.5%
	Difference > 2 TDL?	Not applicable	Not applicable	No - acceptable	Not applicable

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	E. J. Farris EJFarris	Date:	1/22/08	Calc. No.:	0100D-CA-V0282	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	H. M. Sulloway HMS	Date:	1/22/08
Subject:	100-D-2 Relative Percent Difference (RPD) Calculations					Sheet No. 3 of 4	

Table 1. Relative Percent Difference Calculations for SDG K1004. (3 pages)

Sampling Area	HEIS Number	Sample Date	Hexavalent Chromium			Iron			Lead			Lithium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
West side soil	J15W10	10/17/07	0.21	U	0.2	10000	C	13.8	3.6		0.92	4.2	C	0.12
Duplicate of J15W10	J15W11	10/17/07	0.2	U	0.2	21200	C	13.0	3.9		0.86	4.3	C	0.12

Analysis:

TDL		0.6	5	5	2.5
Duplicate Analysis	Both > PQL?	No-Stop (acceptable)	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**
	Both >5xTDL?		**Yes (calc RPD)**	No-Stop (acceptable)	No-Stop (acceptable)
	RPD		6.3%		
	Difference > 2 TDL?	No - acceptable	Not applicable	No - acceptable	No - acceptable

Sampling Area	HEIS Number	Sample Date	Magnesium			Manganese			Mercury			Molybdenum		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
West side soil	J15W10	10/17/07	4170		7.6	284	C	0.12	0.02	U	0.01	0.92		0.92
Duplicate of J15W10	J15W11	10/17/07	4090		7.2	292	C	0.12	0.02	U	0.01	0.86		0.86

Analysis:

TDL		75	5	0.2	2
Duplicate Analysis	Both > PQL?	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	No-Stop (acceptable)
	Both >5xTDL?	**Yes (calc RPD)**	**Yes (calc RPD)**	No-Stop (acceptable)	
	RPD	1.9%	2.8%		
	Difference > 2 TDL?	Not applicable	Not applicable	No - acceptable	No - acceptable

Sampling Area	HEIS Number	Sample Date	Nickel			Phosphorus			Potassium			Selenium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
West side soil	J15W10	10/17/07	9.2		0.61	1160		15.3	800		12.2	1.8	U	1.7
Duplicate of J15W10	J15W11	10/17/07	8.8		0.58	1130		14.4	842		11.5	1.7	U	1.8

Analysis:

TDL		4	10	400	1
Duplicate Analysis	Both > PQL?	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	No-Stop (acceptable)
	Both >5xTDL?	No-Stop (acceptable)	**Yes (calc RPD)**	No-Stop (acceptable)	
	RPD		2.6%		
	Difference > 2 TDL?	No - acceptable	Not applicable	No - acceptable	No - acceptable

Sampling Area	HEIS Number	Sample Date	Silicon			Silver			Sodium			Strontium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
West side soil	J15W10	10/17/07	2680		12.2	0.31	U	0.31	209	C	6.1	22.5	C	0.09
Duplicate of J15W10	J15W11	10/17/07	2380		11.5	0.29	U	0.29	212	C	5.8	24.6	C	0.09

Analysis:

TDL		2	0.2	50	1
Duplicate Analysis	Both > PQL?	**Yes (continue)**	No-Stop (acceptable)	**Yes (continue)**	**Yes (continue)**
	Both >5xTDL?	**Yes (calc RPD)**		No-Stop (acceptable)	**Yes (calc RPD)**
	RPD	11.9%			8.9%
	Difference > 2 TDL?	Not applicable	No - acceptable	No - acceptable	Not applicable

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	E. J. Farris	Date:	1/22/08	Calc. No.:	0100D-CA-V0282	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	H. M. Sulloway	Date:	1/22/08
Subject:	100-D-2 Relative Percent Difference (RPD) Calculations					Sheet No. 4 of 4	

Table 1. Relative Percent Difference Calculations for SDG K1004. (3 pages)

Sampling Area	HEIS Number	Sample Date	Thallium			Tin			Uranium			Vanadium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
West side soil	J15W10	10/17/07	1.8	U	1.8	2.3	C	1.8	15.3	U	15.3	45.2		0.43
Duplicate of J15W10	J15W11	10/17/07	1.7	U	1.7	2.4	C	1.7	14.4	U	14.4	50.1		0.40

Analysis:

TDL		5	10	1	2.5
Duplicate Analysis	Both > PQL?	No-Stop (acceptable)	**Yes (continue)**	No-Stop (acceptable)	**Yes (continue)**
	Both >5xTDL?		No-Stop (acceptable)	**Yes (calc RPD)**	**Yes (calc RPD)**
	RPD				10.3%
	Difference > 2 TDL?	No - acceptable	No - acceptable	Not applicable	Not applicable

Sampling Area	HEIS Number	Sample Date	Zinc		
			mg/kg	Q	PQL
West side soil	J15W10	10/17/07	37.3	C	1.8
Duplicate of J15W10	J15W11	10/17/07	40.4	C	1.7

Analysis:

TDL		1
Duplicate Analysis	Both > PQL?	**Yes (continue)**
	Both >5xTDL?	**Yes (calc RPD)**
	RPD	8.0%
	Difference > 2 TDL?	Not applicable