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

15-AMRP-0009

OCT 09 2014

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

Dear Ms. Hedges:

TRANSMITTAL OF APPROVED WASTE SITE RECLASSIFICATION FORM AND SUPPORTING DOCUMENTATION FOR THE 100-D-75:2, 152-E1-D SECONDARY ELECTRICAL SUBSTATION, SUBSTATION C4-S1 SUBSITE, REVISION 0

Attached for your use is the approved Waste Site Reclassification Form No. 2014-092 and supporting, "Remaining Sites Verification Package for the 100-D-75:2, 152-E1-D Secondary Electrical Substation, Substation C4-S1 Subsite," Rev. 0. If you have questions, please contact me or your staff may contact Tom Post, of my staff, at (509) 376-3232.

Sincerely,

Mark S. French, Director
River Corridor Division

AMRP:TCP

Attachment

cc w/attach:
N. M. Menard, Ecology
Administrative Record, H6-08

cc w/o attach:
R. D. Cantwell, WCH
S. L. Feaster, WCH
D. L. Plung, WCH
J. P. Shearer, CHPRC

WASTE SITE RECLASSIFICATION FORM

Operable Unit: 100-DR-1 **Control No.:** 2014-092

Waste Site Code(s)/Subsite Code(s). 100-D-75:2

Reclassification Category: Interim ☒ Final ☐

Reclassification Status: Closed Out ☐ No Action ☒ Rejected ☐

RCRA Postclosure ☐ Consolidated ☐ None ☐

Approvals Needed: DOE ☒ Ecology ☒ EPA ☐

Description of current waste site condition:

The 100-D-75:2 152-E1-D Secondary Electrical Substation, Substation C4-S1 subsite, located within the 100-DR-1 Operable Unit, near the 181-D River Pump House, consists of small fenced area with concrete pads for the former transformers and inactive electrical components.

The 100-D-75 waste site was added to 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), as a candidate site for confirmatory sampling. The 100-D-75 waste site was included in the *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington,* U.S. Environmental Protection Agency, Region 10, Seattle, Washington (EPA 2009). The 100-D-75 waste site was divided into three subsites: 100-D-75:1, 151-D Primary Electrical Substation; 100-D-75:2, 152-E1-D Secondary Electrical Substation, Substation C4-S1; and 100-D-75:3, 152-C1-D Secondary Electrical Substation. The 100-D-75:1 subsite is undergoing removal of electrical components and remediation of underlying soils. The 100-D-75:3 subsite was reclassified to Interim No Action in August 2011. The 100-D-75:2 subsite is the only subsite being addressed in this waste site reclassification form.

Confirmatory sampling was performed per the *Work Instruction for Confirmatory Sampling of the 100-D-75:2, 152-E1-D Secondary Electrical Substation*, Work Instruction No. 0100D-WI-G0099, Rev. 0, Washington Closure Hanford, Richland, Washington (WCH 2011), on May 8, 2014, at the 152-E1-D Secondary Electrical Substation area. The selected action for the 100-D-75:2 subsite involved (1) evaluating the subsite using available process information, (2) demonstrating through confirmatory sampling that cleanup goals have been achieved, and (3) proposing the site for reclassification to No Action.

Basis for reclassification:

The confirmatory sampling results for the 100-D-75:2 subsite were evaluated in comparison to the remedial action objectives (RAOs) and remedial action goals (RAGs) of the Remaining Sites ROD (EPA 1999) and the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (100 Area RDR/RAWP), DOE/RL 96-17, Rev. 6, U.S. Department of Energy, Richland Operations Office, Richland, Washington (DOE-RL 2009b). In accordance with this evaluation, the confirmatory sampling results support a reclassification of the 100-D-75:2 subsite to Interim No Action. The current subsite conditions achieve the RAOs and RAGs established by the Remaining Sites ROD (EPA 1999) and the 100 Area RDR/RAWP (DOE-RL 2009b). The results of confirmatory 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. Contamination above direct exposure levels was not observed in shallow zone soils and is concluded not to exist in deep zone soils. 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 100-D-75:2, 152-E1-D Secondary Electrical Substation, Substation C4-S1 Subsite* (attached).

WASTE SITE RECLASSIFICATION FORM

Operable Unit: 100-DR-1 **Control No.:** 2014-092

Waste Site Code(s)/Subsite Code(s). 100-D-75:2

Regulator comments:

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:

J. P. Neath	J P Neath	9/8/14
DOE Federal Project Director (printed)	Signature	Date
N. Menard	Nina M. Menard	9/30/14
Ecology Project Manager (printed)	Signature	Date
N/A		
EPA Project Manager (printed)	Signature	Date

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-D-75:2, 152-E1-D SECONDARY ELECTRICAL SUBSTATION, SUBSTATION C4-S1 SUBSITE

Attachment to Waste Site Reclassification Form 2014-092

October 2014

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-D-75:2, 152-E1-D SECONDARY ELECTRICAL SUBSTATION, SUBSTATION C4-S1 SUBSITE

EXECUTIVE SUMMARY

The 100-D-75:2, 152-E1-D Secondary Electrical Substation, Substation C4-S1 subsite, located within the 100-DR-1 Operable Unit, consists of a small fenced area with concrete pads for the former transformers and inactive electrical components. The 100-D-75 waste site was added to 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) as a candidate site for confirmatory sampling. The 100-D-75 waste site was included in *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington* (EPA 2009). The 100-D-75 waste site was divided into three subsites: 100-D-75:1, 151-D Primary Electrical Substation; 100-D-75:2, 152-E1-D Secondary Electrical Substation, Substation C4-S1; and 100-D-75:3, 152-C1-D Secondary Electrical Substation. The 100-D-75:1 subsite is undergoing removal of electrical components and remediation of underlying soils. The 100-D-75:3 subsite was reclassified to Interim No Action in August 2011. Only the 100-D-75:2 subsite is being addressed in this remaining sites verification package.

The 100-D-75:2 subsite confirmatory sampling was performed on May 8, 2014, per the *Work Instruction for Confirmatory Sampling of the 100-D-75:2, 152-E1-D Secondary Electrical Substation* (WCH 2011), as required by the *100 Area Remedial Action Sampling and Analysis Plan* (DOE-RL 2009a).

The confirmatory sampling results indicated that the 100-D-75:2 subsite achieved compliance with the remedial action objectives (RAOs) and remedial action goals (RAGs) of the Remaining Sites ROD (EPA 1999) and the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP) (DOE-RL 2009b). Therefore, remediation was not necessary. A summary of the cleanup evaluation for the soil analyses against the applicable RAGs is presented in Table ES-1. The results of the confirmatory sampling are used to make reclassification decisions for the 100-D-75:2 subsite in accordance with the TPA-MP-14 procedure in the *Tri-Party Agreement Handbook Management Procedures* (DOE-RL 2011).

In accordance with this evaluation, the confirmatory sampling results support a reclassification of the 100-D-75:2 subsite to Interim No Action. The current site conditions achieve the RAOs and the corresponding RAGs established in the RDR/RAWP (DOE-RL 2009b) 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.

Table ES-1. Summary of Remedial Action Goals for the 100-D-75:2 Subsite.

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Direct Exposure – Radionuclides	Attain a dose rate of <15 mrem/yr above background over 1,000 years.	Radionuclides were not COPCs for the 100-D-75:2 subsite.	NA
Direct Exposure – Nonradionuclides	Attain individual COPC direct exposure 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 (2.9×10^{-1}) is <1.	
	Attain an excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens.	All individual carcinogens have an excess risk below 1×10^{-6}.	
	Attain a cumulative excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.	The cumulative excess cancer risk is 2.2×10^{-7}.	
Groundwater/River Protection – Radionuclides	Attain single COPC groundwater and river RAGs.	Radionuclides were not COPCs for the 100-D-75:2 subsite.	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.	Antimony, cadmium, copper, lead, zinc, aroclor-1260, and benzo(b)fluoranthene are present at concentrations above soil RAGs for groundwater and/or Columbia River protection. However, based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b), it is predicted that these constituents will not reach groundwater (and thus the Columbia River) within 1,000 years [d].	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).

[d] Based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b), residual concentrations of antimony, cadmium copper, lead, zinc, aroclor-1260, and benzo(b)fluoranthene are predicted not to migrate more than 2.6 m (8.5 ft) vertically within 1,000 years (based on the lowest distribution coefficient [K_d] of the contaminants exceeding the RAGs, copper, with a K_d of 22 mL/g). The vadose zone underlying the soil below the waste site is approximately 24 m (79 ft) thick. Therefore, residual concentrations of these constituents are predicted to be protective of groundwater and consequently are protective of the Columbia River. The antimony concentration only exceeds the cleanup level for groundwater and river protection in the scabbled concrete samples (Table 4). As noted in footnote b of Table 4, an antimony K_d value of 45 mL/g is applied for concrete sample data evaluation.

COPC = contaminant of potential concern
MCL = maximum contaminant level
NA = not applicable
RAG = remedial action goal
RDR/RAWP = Remedial Design Report/Remedial Action Work Plan
RESRAD = RESidual RADioactivity (dose model)

Contamination above direct exposure levels was not observed in shallow zone soils and is concluded not to exist in deep zone soils. 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 100-D-75:2 subsite contaminants of potential concern and other constituents (Appendix A). Ecological screening levels from *Washington Administrative Code* 173-340 were exceeded for antimony, barium, boron, lead, vanadium and zinc. The U.S. Environmental Protection Agency's ecological soil screening levels were exceeded for antimony, cadmium, cobalt, lead, manganese, vanadium, and zinc. Exceedance of screening values is intended to trigger additional evaluation and does not necessarily indicate the existence of risk to ecological receptors. Because concentrations of barium, cobalt, manganese, and vanadium are below Hanford Site or Washington State background values (note that state background values are only used when Hanford Site background values are not available), it is believed that the presence of these constituents does not pose a risk to ecological receptors. All exceedances will be evaluated in the context of additional lines of evidence for risk to ecological receptors as part of the final closeout decision for this site.

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-D-75:2, 152-E1-D SECONDARY ELECTRICAL SUBSTATION, SUBSTATION C4-S1 SUBSITE

STATEMENT OF PROTECTIVENESS

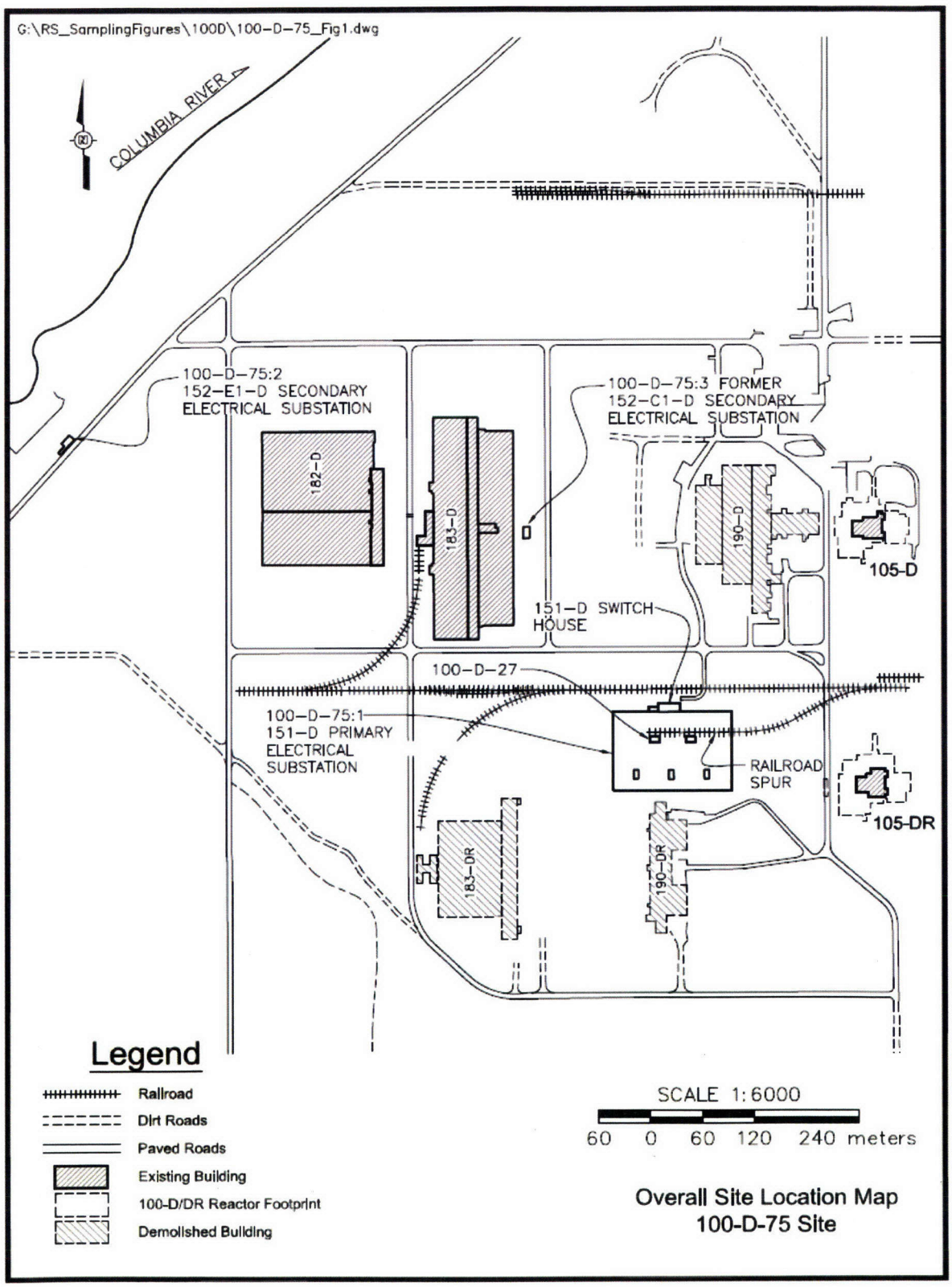
The 100-D-75:2, 152-E1-D Secondary Electrical Substation subsite confirmatory data, site evaluations, and supporting documentation demonstrate that this site meets the remedial action goals (RAGs) and remedial action objectives (RAOs) established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP) (DOE-RL 2009b) 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. Contamination above direct exposure levels was not observed in shallow zone soils and is concluded not to exist in deep zone soils. 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 100-D-75:2 subsite contaminants of potential concern (COPCs) and other constituents (Appendix A). Ecological screening levels from *Washington Administrative Code* (WAC) 173-340 were exceeded for antimony, barium, boron, lead, vanadium, and zinc. The U.S. Environmental Protection Agency's (EPA's) ecological soil screening levels were exceeded for antimony, cadmium, cobalt, lead, manganese, vanadium, and zinc. Exceedance of screening values is intended to trigger additional evaluation and does not necessarily indicate the existence of risk to ecological receptors. Because concentrations of barium, cobalt, manganese, and vanadium are below Hanford Site or Washington State background values (note that state background values are only used when Hanford Site background values are not available), it is believed that the presence of these constituents does not pose a risk to ecological receptors. All exceedances will be evaluated in the context of additional lines of evidence for risk to ecological receptors as part of the final closeout decision for this site.

GENERAL SITE INFORMATION AND BACKGROUND

The 100-D-75:2 subsite, located within the 100-DR-1 Operable Unit, consisted of a small fenced area with concrete pads for the former transformers and inactive electrical components (Figure 1).

Figure 1. The 100-D-75 Waste Site Location Map.



The 100-D-75:2, 152-E1-D Secondary Electrical Substation subsite is approximately 25 m (80 ft) long and 8 m (25 ft) wide. Based on the historical photograph (Figure 2), the two transformers were originally located behind the power poles that remain today (Figure 3) at surface sample locations SS 1 and SS 2, indicated in Figure 4. No transformer pads were observed at these sample locations. According to the 100-D Area National Code Inspector, two concrete pads that are currently located at this secondary substation (surface sample locations SS 3 and SS 4) are suspected to have housed two smaller transformers after downsizing to provide power for the 181-D River Pump House. The transformers have since been removed, but the two concrete pads remain. Two samples of concrete were scabbled from these pads, CS 5 and CS 6.

Figure 2. Historical Photograph of the 100-D-75:2, 152-E1-D Secondary Electrical Substation.

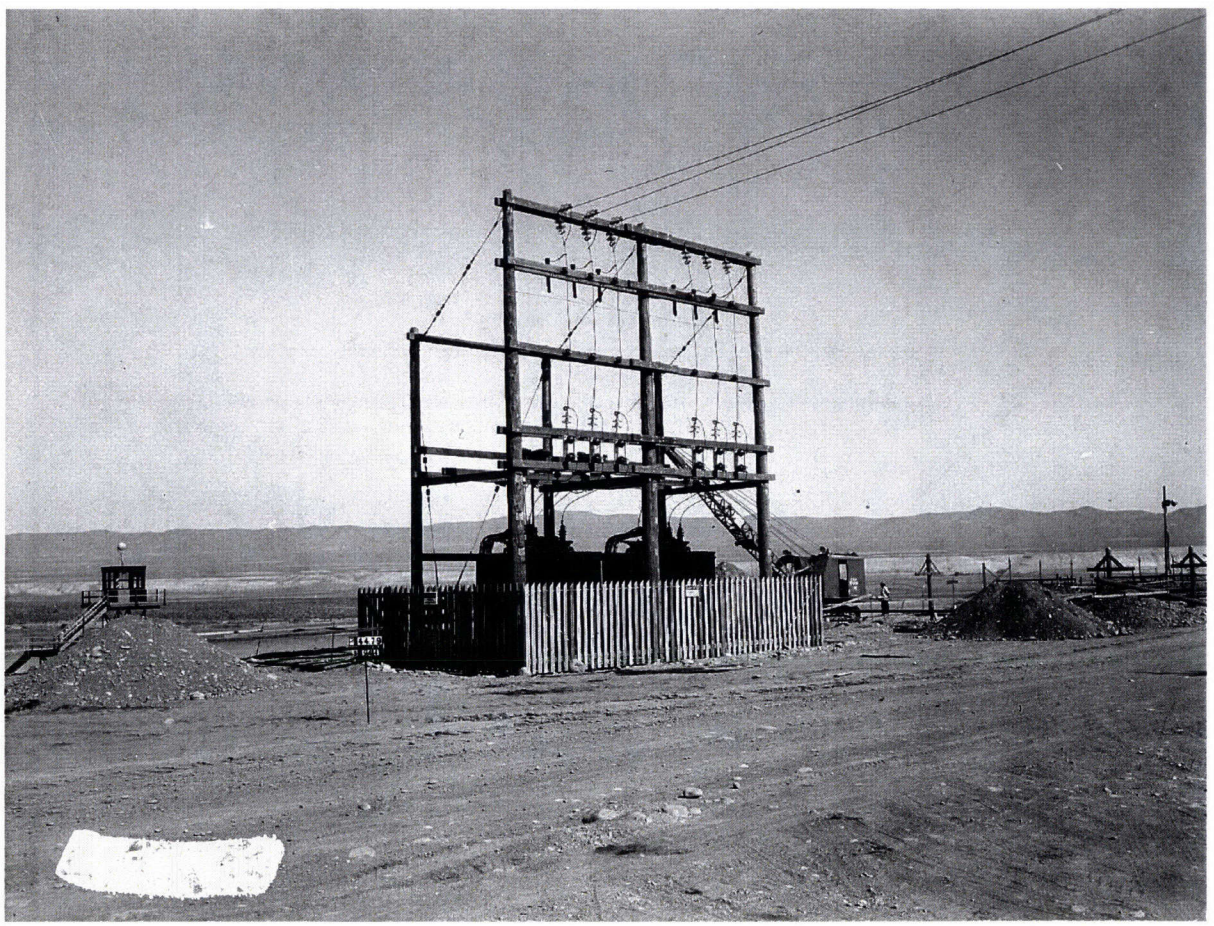


Figure 3. Photograph of 100-D-75:2, 152-E1-D Secondary Electrical Substation Current Conditions.

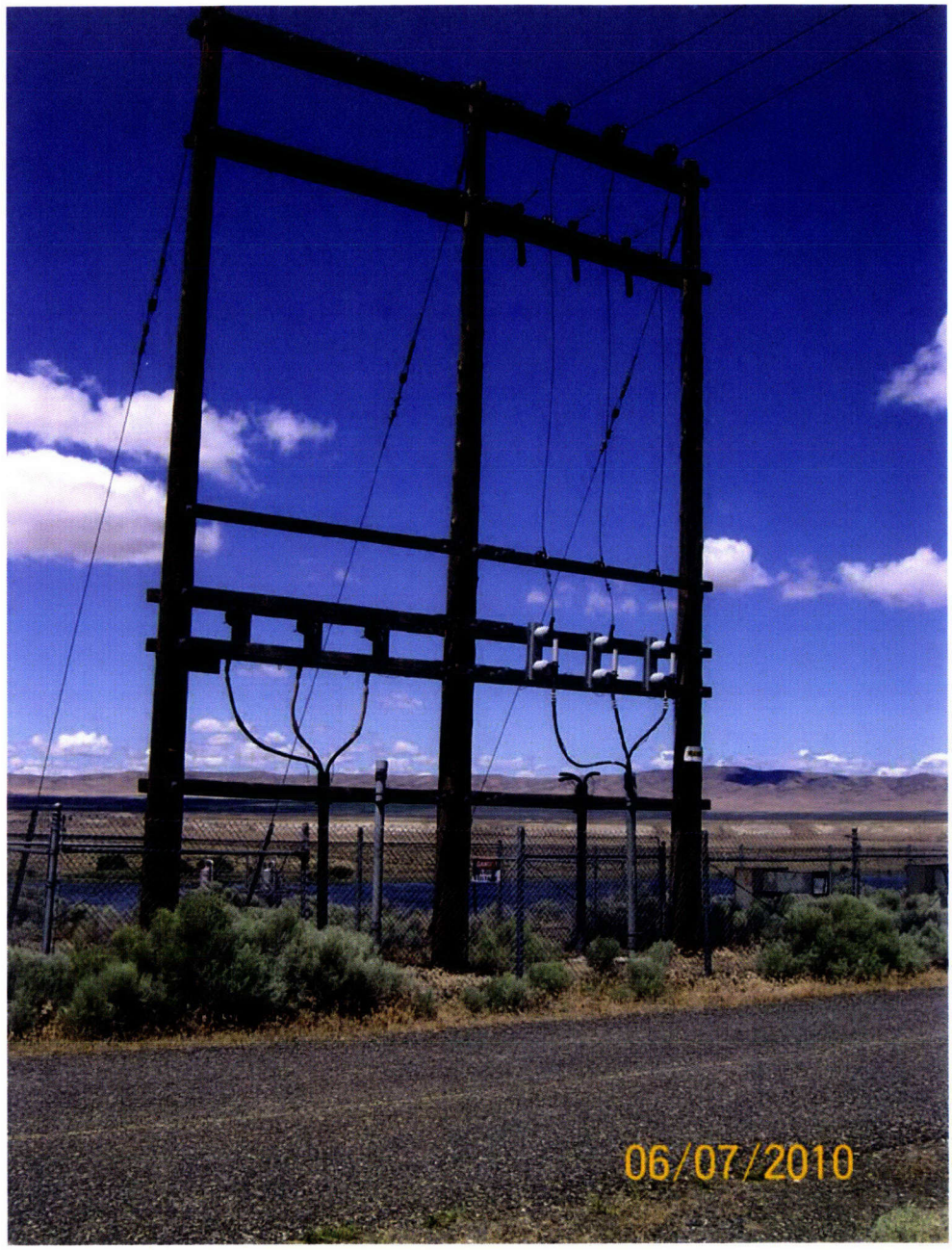
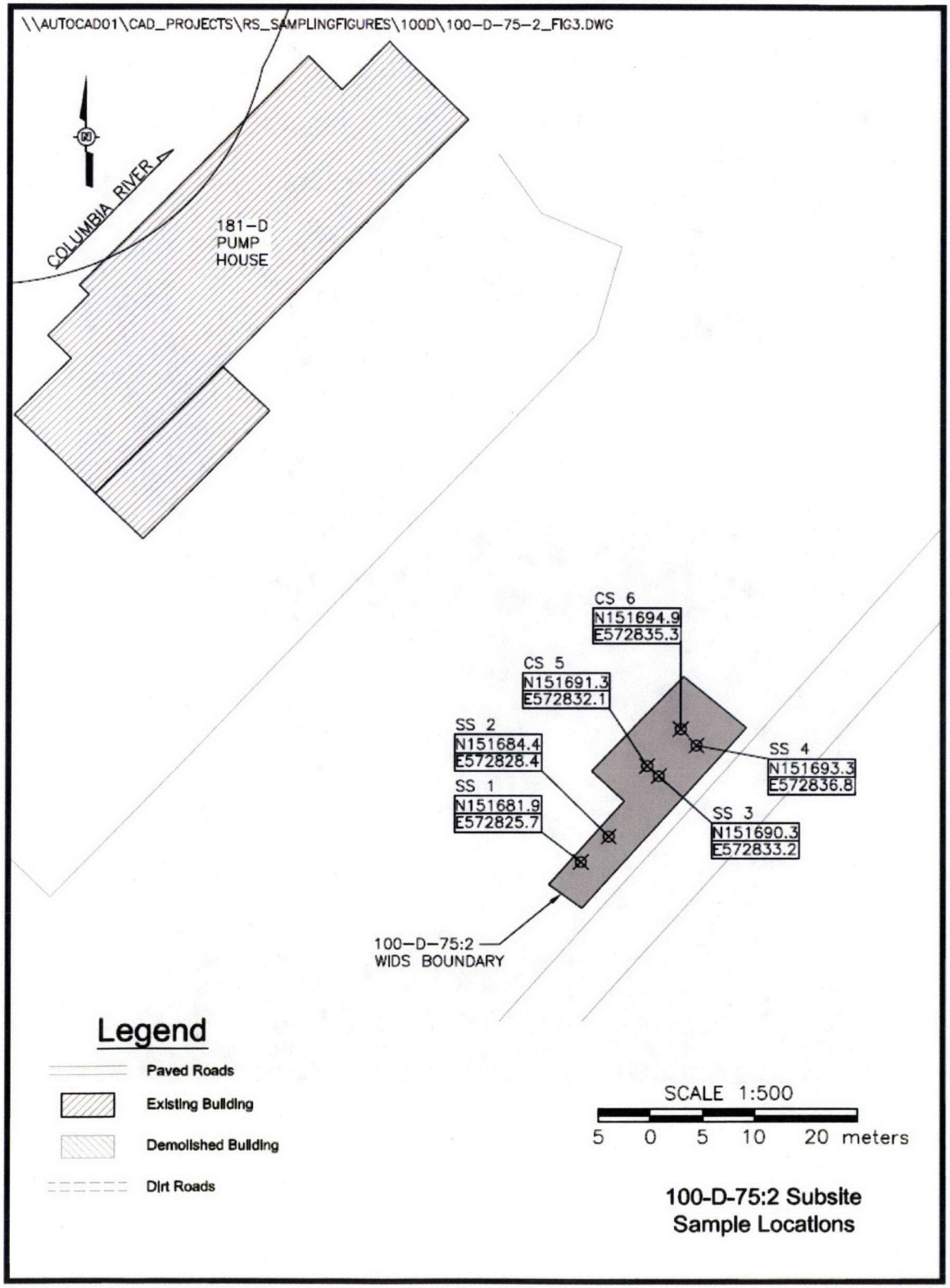


Figure 4. The 100-D-75:2 Subsite Confirmatory Sampling Location Map.



Oil containing polychlorinated biphenyls (PCBs) was transferred, as needed, from oil trucks through over-ground hoses to smaller transformers at the secondary and distribution substations. Electrical substations are identified as Waste Information Data System discovery sites because, historically, leaks and spills of PCBs from the electrical transformers, circuit breakers, and transfer systems during the early years of operation went unreported.

Ecological and Cultural Resources

An ecological and cultural resources review was performed for the 100-D-75:2 subsite on May 21, 2013, for the purposes of confirmatory sampling of the 100-D-75:2 subsite. The ecological resources survey and review indicated that no adverse impacts to ecological resources were anticipated during confirmatory sampling of the 100-D-75:2 subsite.

Although no cultural resources were anticipated within the project area, all workers were directed to watch for cultural materials (e.g., bones, stone tools, mussel shell) during all work activities. If any cultural materials were encountered, work in the vicinity of the discovery had to stop until a cultural resources specialist has been notified; the significance of the find assessed; the appropriate Tribes notified; and, if necessary, arrangements made for mitigation of the find (WCH 2013). No ecologically or culturally significant materials were encountered during confirmatory sampling.

CONFIRMATORY SAMPLING SUMMARY

Confirmatory sampling was performed at the 100-D-75:2 subsite on May 8, 2014, per the *Work Instruction for Confirmatory Sampling of the 100-D-75:2, 152-E1-D Secondary Electrical Substation* (WCH 2011). Confirmatory sampling of the 100-D-75:2 subsite was performed to support evaluation of the site against the RAGs specified in the Remaining Sites ROD (EPA 1999). The analytical results were evaluated against the cleanup criteria specified in the RDR/RAWP (DOE-RL 2009b) to support a No Action or Remedial Action decision. The following sections describe the COPCs, sample design, sampling activities, and sample results.

Contaminants of Potential Concern

The COPCs for the 100-D-75:2 subsite were identified based on potential hazardous constituents associated with leaks and spills from the electrical transformers, circuit breakers, and transfer systems. The COPCs included the expanded list of inductively coupled plasma (ICP) metals, mercury, total petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAH), and PCBs.

Field screening for volatile organic compounds (VOCs) was performed and no VOCs were detected; therefore, volatile organic analysis was not requested. Because no suspected asbestos-containing material was observed during confirmatory sampling, analysis was not performed for asbestos. Radiological activity was not detected in the field during confirmatory sampling activities; therefore, no analysis for radionuclides was performed.

Confirmatory samples were analyzed using EPA-approved methods. Tables 1 and 2 identify the location and analysis selected for confirmatory sampling.

Table 1. Laboratory Analytical Methods for the 100-D-75:2 Subsite.

Analytical Method	Contaminant of Potential Concern
ICP metals [a] – EPA Method 6010	Metals
Mercury – EPA Method 7471	Mercury
PCB – EPA Method 8082	Polychlorinated biphenyls
PAH – EPA Method 8310	Polycyclic aromatic hydrocarbons
TPH – NWTPH-Dx [b]	Total petroleum hydrocarbons

[a] The expanded list of ICP metals was performed and included antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.
[b] The TPH method NWTPH-Dx included motor oil range organics and diesel 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
PCB = polychlorinated biphenyl
TPH = total petroleum hydrocarbons

Table 2. 100-D-75:2 Subsite Confirmatory Sampling Summary Table.

Sample	Sample Location Description	Sample Media	HEIS Number	Approximate WSP Location Coordinates	Sample Analysis
SS 1	At former transformer location	Soil	J1T349	N 151681.9, E 572825.7	ICP metals [a], mercury, PCBs, PAH, TPH
SS 2	At former transformer location	Soil	J1T350	N 151684.4, E 572828.4	
SS 3	At concrete pad #1	Soil	J1T351	N 151690.3, E 572833.2	
SS 4	At concrete pad #2	Soil	J1T352	N 151693.3, E 572836.8	
CS 5	At concrete pad #1	Scabbled concrete	J1T365	N 151691.3, E 572832.1	
CS 6	At concrete pad #2	Scabbled concrete	J1T366	N 151694.9, E 572835.3	
Duplicate of J1T351	At concrete pad #1	Soil	J1T353	N 151690.3, E 572833.2	ICP metals [a], mercury, PCBs, PAH, TPH
Equipment blank	NA	Silica sand	J1T354	NA	ICP metals [a], mercury, PAH

[a] Sample analysis for ICP metals included 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
PCB = polychlorinated biphenyl
TBD = to be determined
TPH = total petroleum hydrocarbons
WSP = Washington State Plane

Confirmatory Sample Design

Four focused soil samples and two scabbled concrete samples were used to characterize the area of the 100-D-75:2 subsite (Table 2). The sample locations and sample design details are discussed in the confirmatory sampling work instruction (WCH 2011). Prior to confirmatory sampling at the 100-D-75:2 subsite, a walkdown of the area was performed to inspect the concrete pads and surrounding soils for any staining. No soil or concrete staining was identified (WCH 2014).

Confirmatory Sampling Activities

Confirmatory sampling was performed as described in the confirmatory sampling work instruction (WCH 2011). All sampling was performed in accordance with ENV-1, *Environmental Monitoring & Management*, to fulfill the requirements of the *100 Area Remedial Action Sampling and Analysis Plan* (DOE-RL 2009a). Field observations during sampling are provided in the field logbook (WCH 2014). A summary of the samples collected for the 100-D-75:2 subsite confirmatory sampling is provided in Table 2.

Confirmatory sampling data for the 100-D-75:2 subsite are presented in Appendix B. The laboratory-reported confirmatory data results for all samples and constituents associated with the 100-D-75:2 subsite are stored in the Washington Closure Hanford (WCH) project-specific database prior to archival in the Hanford Environmental Information System (HEIS). A summary of field observations and sample collection at the 100-D-75:2 subsite location is provided below.

Confirmatory sampling of the 100-D-75:2 subsite was performed on May 8, 2014. A walkdown of the 152-E1-D substation area was performed, and stained soil was not observed at the 100-D-75:2 subsite. Four focused soil samples were collected from the 100-D-75:2 subsite (Figure 4). One duplicate soil sample was collected at concrete pad #1 location. In addition, two concrete scabble samples (J1T365 and J1T366) were collected from two concrete pads located on the north side. No staining was observed during soil and concrete scabble sampling (WCH 2014).

No suspected asbestos-containing material was observed and no radiological activity was detected during confirmatory sampling at any of the sample locations.

Confirmatory Sample Results

Confirmatory samples were analyzed using EPA-approved analytical methods. Evaluation of the soil sample data was performed by direct comparison of the maximum detected value for each COPC against the RAGs. If no detections for a given COPC were reported in the data set, then no comparisons were performed for that COPC.

Comparisons of the maximum results for COPCs and the site RAGs for the 100-D-75:2 subsite are presented in Tables 3 and 4.

Table 3. Comparison of Maximum Contaminant Concentrations to Remedial Action Goals for the 100-D-75:2 Subsite Confirmatory Soil 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		
Antimony	3.64 (<BG)	32	5 [b]	5 [b]	No	--
Arsenic	4.97 (<BG)	20 [b]	20 [b]	20 [b]	No	--
Barium	86.0 (<BG)	5,600	200	400	No	--
Beryllium	0.907 (<BG)	10.4 [c]	1.51 [b]	1.51 [b]	No	--
Boron [d]	3.23	7,200	320	-- [e]	No	--
Cadmium	0.991	13.9	0.81	0.81	Yes	Yes [f]
Chromium (total)	8.36 (<BG)	80,000	18.5 [b]	18.5 [b]	No	--
Cobalt	15.3 (<BG)	24	15.7 [b]	-- [e]	No	--
Copper	24.0	2,960	59.2	22.0 [b]	Yes	Yes [f]
Lead	89.2	353	10.2 [b]	10.2 [b]	Yes	Yes [f]
Manganese	339 (<BG)	3,760	512 [b]	512 [b]	No	--
Mercury	0.0238 (<BG)	24	0.33 [b]	0.33 [b]	No	--
Molybdenum [d]	1.12	400	8	-- [e]	No	--
Nickel	11.8 (<BG)	1,600	19.1 [b]	27.4	No	--
Vanadium	73.8 (<BG)	560	85.1 [b]	-- [e]	No	--
Zinc	140	24,000	480	67.8 [b]	Yes	Yes [f]
TPH – motor oil	6.8	200	200	200	No	--
Benzo(a)anthracene	0.00598	1.37	0.015 [g]	0.015 [g]	No	--
Benzo(a)pyrene	0.00484	0.137	0.015 [g]	0.015 [g]	No	--
Benzo(b)fluoranthene	0.0169	1.37	0.015 [g]	0.015 [g]	Yes	Yes [f]
Benzo(ghi)perylene [h]	0.00483	2,400	48	192	No	--
Benzo(k)fluoranthene	0.00886	1.37	0.015 [g]	0.015 [g]	No	--
Chrysene	0.0200	13.7	0.12	0.1 [g]	No	--
Dibenz[a,h]anthracene	0.000812	1.37	0.03 [g]	0.03 [g]	No	--
Fluoranthene	0.0379	3,200	64	18.0	No	--
Phenanthrene [h]	0.0390	24,000	240	1,920	No	--
Pyrene	0.0336	2,400	48	192	No	--

Table 3. Comparison of Maximum Contaminant Concentrations to Remedial Action Goals for the 100-D-75:2 Subsite Confirmatory Soil 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		
Aroclor-1260	0.0262	0.5	0.017 [g]	0.017 [g]	Yes	Yes [f]

[a] RAGs obtained from the RDR/RAWP (DOE-RL 2009b).
[b] Where cleanup levels are less than background, cleanup levels default to background per 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 2009b).
[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 2014) or other databases to calculate cleanup levels (WAC 173-340-730(3)(a)(iii), 1996 [Method B for surface waters]).
[f] Based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b), the residual concentrations of cadmium, copper, lead, zinc, aroclor-1260, and benzo(b)fluoranthene are not predicted to migrate more than 2.6 m (8.5 ft) vertically in 1,000 years (based on the contaminant with the lowest distribution coefficient [K_d], copper, with a K_d value of 22 mL/g). The vadose zone soil underlying the 100-D-75:2 subsite is approximately 24 m (79 ft) thick. Therefore, residual concentrations of these constituents are predicted to be protective of groundwater and the Columbia River.
[g] Where cleanup levels are less than RDLs, cleanup levels default to RDLs per WAC 173-340-707(2) (1996) and the RDR/RAWP (DOE-RL 2009b).
[h] Toxicity data for this chemical are not available. Cleanup levels are based on surrogate chemicals:
contaminant: benzo(g,h,i)perylene; surrogate: pyrene
contaminant: phenathrene; 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
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 100-D-75:2 Subsite Confirmatory Scabbled Concrete Sample 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		
Antimony [b]	8.13	32	5 [c]	5 [c]	Yes	Yes [d]
Arsenic	3.21 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	131 (<BG)	5,600	200	400	No	--
Beryllium	0.519 (<BG)	10.4 [e]	1.51 [c]	1.51 [c]	No	--
Boron [f]	8.40	7,200	320	-- [g]	No	--
Cadmium	1.43	13.9 [e]	0.81 [c]	0.81 [c]	Yes	Yes [d]
Chromium (total)	17.6 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	12.0 (<BG)	24	15.7 [c]	-- [g]	No	--
Copper	23.2	2,960	59.2	22.0 [c]	Yes	Yes [d]

Table 4. Comparison of Maximum Contaminant Concentrations to Remedial Action Goals for the 100-D-75:2 Subsite Confirmatory Scabbled Concrete Sample 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		
Lead	8.16 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	259 (<BG)	3,760	512 [c]	512 [c]	No	--
Molybdenum [f]	1.28	400	8	-- [g]	No	--
Nickel	8.86 (<BG)	1,600	19.1 [c]	27.4	No	--
Silver	0.158 (<BG)	400	8	0.73 [c]	No	--
Vanadium	76.8 (<BG)	560	85.1 [c]	-- [g]	No	--
Zinc	112	24,000	480	67.8 [c]	Yes	Yes [d]
TPH – diesel range	76	200	200	200	No	--
TPH – motor oil	136	200	200	200	No	--
Fluoranthene	0.547	3,200	64	18.0	No	--
Aroclor-1260	0.0174	0.5	0.017 [h]	0.017 [h]	Yes	Yes [d]

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

[b] Based on the discussion of distribution coefficient (K_d) for antimony in Appendix E of the RDR/RAWP (DOE-RL 2009b) and the K_d value provided by the Cleanup Levels and Risk Calculations Database (Ecology 2014), a K_d value of 45 mL/g is applied for concrete media.

[c] Where cleanup levels are less than background, cleanup levels default to background per 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 2009b).

[d] Based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b), the residual concentrations of antimony, cadmium, copper, zinc, and aroclor-1260 are not predicted to migrate more than 2.6 m (8.5 ft) vertically in 1,000 years (based on the contaminant with the lowest distribution coefficient [K_d], copper, with a K_d value of 22 mL/g). As noted in footnote b, above, an antimony K_d value of 45 mL/g is applied for concrete sample data evaluation. The vadose zone soil underlying the 100-D-75:2 subsite is approximately 24 m (79 ft) thick. Therefore, residual concentrations of these constituents are predicted to be protective of groundwater and the Columbia River.

[e] 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]).

[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 2014) or other databases to calculate cleanup levels (WAC 173-340-730(3)(a)(iii), 1996 [Method B for surface waters]).

[h] Where cleanup levels are less than RDLs, cleanup levels default to RDLs per WAC 173-340-707(2) (1996) and the RDR/RAWP (DOE-RL 2009b).

-- = 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
RESRAD = RESidual RADioactivity (dose model)
TPH = total petroleum hydrocarbons
WAC = *Washington Administrative Code*

Contaminants that were not detected by laboratory analysis are excluded from these tables. Calculated cleanup levels are not presented in the Cleanup Levels and Risk Calculations Database (Ecology 2014) under WAC 173-340-740(3) for calcium, magnesium, potassium, silicon, and sodium. The EPA's *Risk Assessment Guidance for Superfund* (EPA 1989)

recommends that aluminum and iron not be considered in site risk evaluations. Therefore, aluminum, calcium, iron, magnesium, potassium, silicon, and sodium are not considered site COPCs and are also not included in Tables 3 or 4.

The laboratory-reported data results for all constituents are stored in the WCH project-specific database prior to provision to HEIS and are presented as an attachment to the 100-D-75:2 subsite relative percent difference and direct contact hazard quotient and carcinogenic risk calculation in Appendix B.

CONFIRMATORY SAMPLE DATA EVALUATION

This section demonstrates that contaminant concentrations at the 100-D-75:2 subsite 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 2009b).

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

Table 3 compares the maximum detected confirmatory soil sample results to the applicable soil RAGs for direct exposure, protection of groundwater, and protection of the Columbia River. Table 4 compares the maximum detected scabbled concrete data results to the applicable soil RAGs for direct exposure, protection of groundwater, and protection of the Columbia River. All COPCs for all sampling areas were quantified below their respective direct exposure soil RAGs.

Antimony, cadmium, copper, lead, zinc, aroclor-1260, and benzo(b)fluoranthene are present at maximum concentrations above soil RAGs for groundwater and/or Columbia River protection. However, based on RESidual RADioactivity (RESRAD) modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b), it is predicted that these constituents will not migrate more than 2.6 m (8.5 ft) vertically in 1,000 years (based on the lowest distribution coefficients [K_ds] of the contaminant exceeding the RAGs, copper, with K_ds of 22 mL/g). The antimony concentration only exceeds the cleanup level for groundwater and river protection in the scabbled concrete samples (Table 4). As noted in footnote b of Table 4, an antimony K_d value of 45 mL/g is applied for concrete sample data evaluation. The vadose zone underlying the soil below the site is approximately 24 m (79 ft). Therefore, residual concentrations of these constituents are predicted to be protective of groundwater and the Columbia River.

Nonradionuclide Direct Contact Hazard Quotient and Carcinogenic Risk RAGs Attained

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 100-D-75:2 subsite, 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. The cumulative noncarcinogenic hazard quotient is 2.9×10^{-1}, which is less than 1.0.

All individual carcinogen risk values for carcinogenic constituents are less than 1×10^{-6}. The cumulative direct contact excess cancer risk is 2.2×10^{-7}. Therefore, nonradionuclide risk requirements are met.

Nonradionuclide Groundwater Hazard Quotient and Carcinogenic Risk RAGs Attained

Assessment of the risk requirements for the 100-D-75:2 waste site included calculation of the hazard quotient and carcinogenic (excess cancer) risk values for groundwater protection for nonradionuclides. The requirements include an individual and cumulative hazard quotient of less than 1.0, an individual excess carcinogenic risk of less than 1×10^{-6}, and a cumulative excess carcinogenic risk of less than 1×10^{-5}. These risk values were conservatively calculated for the entire subsite using the highest value for each COPC from each of the decision units. Risk values were calculated for constituents that were detected at concentrations above Hanford Site or Washington State background values or for which there is no background value. In addition, the K_d values for these contaminants are less than that necessary to show no migration to groundwater in 1,000 years based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b).

Based on this model and a vadose zone of approximately 24 m (79 ft) in thickness at the excavation, a K_d of 3.1 or greater is required to show no predicted migration to groundwater within 1,000 years. Boron, the only constituent with a K_d lower than 3.1 and no background value, required hazard quotient calculation. The individual hazard quotient for boron is less than 1.0. The cumulative hazard quotient for boron is 1.0×10^{-2}, which is less than 1.0. The 100-D-75:2 subsite does not have any carcinogenic constituents subject to the groundwater cancer risk calculation; therefore, the criterion for excess cancer risk is met. Nonradionuclide risk requirements related to groundwater are met.

DATA QUALITY ASSESSMENT

A data quality assessment (DQA) was performed to compare the confirmatory sampling approach (WCH 2011), the field logbook (WCH 2014), and resulting analytical data with the sampling and data quality requirements specified by the project objectives and performance specifications.

The DQA for the 100-D-75:2 subsite established that the data are of the right type, quality, and quantity to support site closeout decisions within specified error tolerances. The evaluation verified that the sample design was sufficient for the purpose of clean site confirmation. The confirmatory sample analytical data are stored in the WCH project-specific database for data evaluation prior to archival in HEIS and are provided as an attachment to the relative percent difference and direct contact hazard quotient calculation in Appendix B. The detailed DQA is presented in Appendix C.

SUMMARY FOR NO ACTION DETERMINATION

The 100-D-75:2 subsite has been evaluated in accordance with the Remaining Sites ROD (EPA 1999) and the RDR/RAWP (DOE-RL 2009b). Confirmatory sampling was performed, and the analytical results indicate that the residual concentrations of COPCs at this site meet the RAGs and associated RAOs for direct exposure, groundwater protection, and river protection. In accordance with this evaluation, the confirmatory sampling results support a reclassification of the 100-D-75:2 subsite to Interim No Action. Contamination above direct exposure levels was not observed in shallow zone soils and is concluded not to exist in deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required.

REFERENCES

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

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

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

DOE-RL, 2009b, *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.

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Ecology, 2014, Cleanup Levels and Risk Calculations (CLARC) Database, Washington State Department of Ecology, Olympia, Washington, <https://fortress.wa.gov/ecy/clarc/CLARCHome.aspx>.

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EPA, 1989, *Risk Assessment Guidance for Superfund: Volume 1, Human Health Evaluation Manual, Part A; Interim Final*, 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, 2009, *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

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

WCH, 2011, *Work Instruction for Confirmatory Sampling of the 100-D-75:2, 152-E1-D Secondary Electrical Substation,* 0100D-WI-G0099, Rev. 0, Washington Closure Hanford, Richland, Washington.

WCH, 2013, "Ecological and Cultural Resources Review for Confirmatory Sampling at 100-D Area (13-ER-007, HCRC #2011-100-056)," CCN 171209 to I. B. Berezovskiy from J. E. Thomson, Washington Closure Hanford, Richland, Washington, May 21.

WCH, 2014, *IU-2/6 and Segment 4 Miscellaneous Restoration Sites*, Logbook EL-1667-01, pp. 78-81, Washington Closure Hanford, Richland, Washington.

WDOH, 1997, *Hanford Guidance for Radiological Cleanup*, WDOH/320-015, Rev. 1, Washington State Department of Health, Olympia, Washington.

APPENDIX A

ECOLOGICAL RISK COMPARISON TABLE

APPENDIX B

CALCULATIONS

APPENDIX B

CALCULATIONS

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

100-D-75:2 Subsite Relative Percent Difference (RPD) and Direct Contact Hazard Quotient and Carcinogenic Risk Calculation, 0100D-CA-V0535, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-D-75:2 Subsite Hazard Quotient and Carcinogenic Risk Calculations for Protection of Groundwater, 0100D-CA-V0536, Rev. 0, Washington Closure Hanford, Richland, Washington.

DISCLAIMER FOR CALCULATIONS

The calculations provided in this appendix have been generated to document compliance with established cleanup levels. These calculations should be used in conjunction with other relevant documents.

Acrobat 8.0

CALCULATION COVER SHEET

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

Area: 100-D

Discipline: Environmental *Calculation No: 0100D-CA-V0535

Subject: 100-D-75:2 Subsite Relative Percent Difference (RPD) and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations

Computer Program: Excel Program No: Excel 2010

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 = 6 Attachment = 3 Total = 10	J. D. Skoglie	J. M. Capron	I. B. Berezovskiy	S. G. Wilkinson	9/30/14

SUMMARY OF REVISION

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

Washington Closure Hanford CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	7/22/2014	Calc. No.:	0100D-CA-V0535	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	J. M. Capron	Date:	7/22/2014
Subject:	100-D-75:2 Subsite Relative Percent Difference and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 1 of 6	

PURPOSE:

Provide documentation to support the calculation of the direct contact hazard quotient (HQ) and excess carcinogenic risk for the 100-D-75:2 subsite. In accordance with the remedial action goals (RAGs) in the remedial design report/remedial action work plan (RDR/RAWP) (DOE-RL 2009b), 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 the primary-duplicate sample pairs from the 100-D-75:2 subsite confirmatory sampling, as necessary.

GIVEN/REFERENCES:

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

2) DOE-RL, 2009b, *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.

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, 2014, *Remaining Sites Verification Package for the 100-D-75:2, 152-E1-D Secondary Electrical Substation C4-S1 Subsite,* Attachment to Waste Site Reclassification Form 2014-092, Washington Closure Hanford, 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 criterion of <1.0 (DOE-RL 2009b).

2) Sum the HQs and compare this value to the cumulative HQ criterion 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 criterion of $<1 \times 10^{-6}$ (DOE-RL 2009b).

Washington Closure Hanford CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	7/22/2014	Calc. No.:	0100D-CA-V0535	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	J. M. Capron	Date:	7/22/2014
Subject:	100-D-75:2 Subsite Relative Percent Difference and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 2 of 6	

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

5) Use data from WCH (2013) to perform the RPD calculations for primary-duplicate sample pairs, as required.

METHODOLOGY:

The 100-D-75:2 subsite underwent discrete focused sampling at six locations (4 soil samples and 2 concrete samples) for the purpose of confirmatory sampling. One duplicate sample was collected. The direct contact hazard quotient and carcinogenic risk calculations for the 100-D-75:2 subsite were conservatively calculated for the entire waste site using the greatest of the maximum soil or concrete sample results (WCH 2014). Of the contaminants of potential concern (COPCs) for this site, antimony, cadmium, copper, and zinc require HQ and risk calculations because these analytes were detected above a Washington State or Hanford Site background value. Boron, molybdenum, the detected polycyclic aromatic hydrocarbons, and aroclor-1260 require HQ and risk calculations because these analytes were detected and a Washington State or Hanford Site background value is not available. Lead was quantitated at a concentration above Hanford Site background; however, 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 range + 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. 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 8.40 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]), produces an HQ value of 1.2×10^{-3}. 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 2.9×10^{-1}. 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 cadmium is 1.43 mg/kg, divided by 13.9 mg/kg, and multiplied as indicated, is 1.0×10^{-7}. 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 2.2×10^{-7}. Comparing this value to the requirement of $<1 \times 10^{-5}$, this criterion is met.

Washington Closure Hanford CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	7/22/2014	Calc. No.:	0100D-CA-V0535	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	J. M. Capron	Date:	7/22/2014
Subject:	100-D-75:2 Subsite Relative Percent Difference and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 3 of 6	

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 TDLs are pre-determined values for analytical methods and constituents with cleanup levels as listed in Table 2-1 of the SAP (DOE-RL 2009a). Table 2-1 includes nominal TDLs for identified methods based organic analyses. The nominal TDLs are also used in support of the RPD calculation for the methods based analytes. TDLs not included in Table 2-1 are based on the laboratory and/or methods 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 the confirmatory sampling of the subject site. Additional discussion is provided in the data quality assessment section of the applicable RSVP (WCH 2014), 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 direct contact hazard quotient calculations.

5) The evaluation of the QA/QC duplicate RPD calculations is performed within the data quality assessment section of the RSVP.

Table 2 shows the results of the RPD calculations for the 100-D-75:2 subsite.

Washington Closure Hanford CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	7/22/2014	Calc. No.:	0100D-CA-V0535	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	J. M. Capron	Date:	7/22/2014
Subject:	100-D-75:2 Subsite Relative Percent Difference and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 4 of 6	

Table 1. Direct Contact HQ and Excess Cancer Risk Results for the 100-D-75:2 Subsite.

Contaminants of Potential Concern	Maximum Value [a] (mg/kg)	Noncarcinogen RAG [b] (mg/kg)	Hazard Quotient	Carcinogen RAG [b] (mg/kg)	Carcinogen Risk
Metals					
Antimony	8.13	32	2.5E-01	--	--
Boron	8.40	7,200	1.2E-03	--	--
Cadmium	1.43	80	1.8E-02	13.9	1.0E-07
Copper	24.0	2,960	8.1E-03	--	--
Lead [c]	89.2	353	--	--	--
Molybdenum	1.28	400	3.2E-03	--	--
Zinc	140	24,000	5.8E-03	--	--
Polycyclic Aromatic Hydrocarbons					
Benzo(a)anthracene	0.00598	--	--	1.37	4.4E-09
Benzo(a)pyrene	0.00484	--	--	0.137	3.5E-08
Benzo(b)fluoranthene	0.0169	--	--	1.37	1.2E-08
Benzo(k)fluoranthene	0.00886	--	--	1.37	6.5E-09
Benzo(ghi)perylene [d]	0.00483	2,400	2.0E-06	--	--
Chrysene	0.0200	--	--	13.7	1.5E-09
Dibenz(a,h)anthracene	0.000812	--	--	1.37	5.9E-10
Fluoranthene	0.0379	3,200	1.2E-05	--	--
Phenanthrene [d]	0.0390	24,000	1.6E-06	--	--
Pyrene	0.0336	2,400	1.4E-05	--	--
Polychlorinated Biphenyls					
Aroclor-1260	0.0262	--	--	0.5	5.2E-08
Total Petroleum Hydrocarbons					
TPH (Diesel Range + Motor Oil) [e]	212	200	--	--	--
Totals					
Cumulative Hazard Quotient:			**2.9E-01**		
Cumulative Excess Cancer Risk:					**2.2E-07**

Notes:

[a] = From WCH (2014).

[b] = Value obtained from the RDR/RAWP (DOE-RL 2009b) 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] = Toxicity data for this chemical is not available. The cleanup level is based on the use of a surrogate chemical.
benzo(g,h,i)perylene surrogate: pyrene
phenanthrene surrogate: anthracene

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

-- = not applicable

RAG = remedial action goal

Washington Closure Hanford CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	7/22/2014	Calc. No.:	0100D-CA-V0535	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	J. M. Capron	Date:	7/22/2014
Subject:	100-D-75:2 Subsite Relative Percent Difference and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 5 of 6	

Table 2. Relative Percent Difference Calculations for the 100-D-75:2 Subsite (2 pages).

100-D-75:2 Subsite Duplicate Analysis

Sampling Area	HEIS Number	Sample Date	Aluminum mg/kg	Q	PQL	Antimony mg/kg	Q	PQL	Barium mg/kg	Q	PQL	Beryllium mg/kg	Q	PQL
SS 3	J1T351	5/8/14	3420	*J	6.02	1.33	*J	0.292	39.0	*J	0.0886	0.345	B	0.0886
Duplicate of J1T351	J1T353	5/8/14	3810	*J	6.76	2.53	*J	0.328	66.7	*J	0.0994	0.540		0.0994

Analysis:

TDL		5	0.6	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	10.8%		52.4%	
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable

100-D-75:2 Subsite Duplicate Analysis

Sampling Area	HEIS Number	Sample Date	Boron mg/kg	Q	PQL	Cadmium mg/kg	Q	PQL	Calcium mg/kg	Q	PQL	Chromium mg/kg	Q	PQL
SS 3	J1T351	5/8/14	2.05	B	0.886	0.386	B	0.0886	2380	*J	7.09	6.10	*J	0.133
Duplicate of J1T351	J1T353	5/8/14	1.67	B	0.994	0.598		0.0994	3940	*J	7.95	4.30	*J	0.149

Analysis:

TDL		2	0.2	100	1
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)
	RPD			49.4%	
	Difference > 2 TDL?	No - acceptable	No - acceptable	Not applicable	No - acceptable

100-D-75:2 Subsite Duplicate Analysis

Sampling Area	HEIS Number	Sample Date	Cobalt mg/kg	Q	PQL	Copper mg/kg	Q	PQL	Iron mg/kg	Q	PQL	Lead mg/kg	Q	PQL
SS 3	J1T351	5/8/14	6.76	*J	0.133	21.3	*J	0.266	11700	*J	7.09	46.9	*	0.292
Duplicate of J1T351	J1T353	5/8/14	8.52	*J	0.149	17.8	*J	0.298	16200	*J	7.95	26.1	*	0.328

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)	Yes (calc RPD)
	RPD		17.9%	32.3%	57.0%
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	Not applicable

100-D-75:2 Subsite Duplicate Analysis

Sampling Area	HEIS Number	Sample Date	Magnesium mg/kg	Q	PQL	Manganese mg/kg	Q	PQL	Molybdenum mg/kg	Q	PQL	Nickel mg/kg	Q	PQL
SS 3	J1T351	5/8/14	2370	*J	7.53	181	*J	0.177	0.569	B	0.177	6.59	*	0.133
Duplicate of J1T351	J1T353	5/8/14	2260	*J	8.45	181	*J	0.199	0.77	B	0.199	5.58	*	0.149

Analysis:

TDL		75	5	2	4
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)
	RPD	4.8%	0.0%		
	Difference > 2 TDL?	Not applicable	Not applicable	No - acceptable	No - acceptable

100-D-75:2 Subsite Duplicate Analysis

Sampling Area	HEIS Number	Sample Date	Potassium mg/kg	Q	PQL	Silicon mg/kg	Q	PQL	Sodium mg/kg	Q	PQL	Vanadium mg/kg	Q	PQL
SS 3	J1T351	5/8/14	589	*JN	5.67	1090	*J	1.33	208	*JN	6.20	32.1	*JN	0.0886
Duplicate of J1T351	J1T353	5/8/14	844	*JN	6.36	1130	*J	1.49	330	*JN	6.96	47.3	*JN	0.0994

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)	No-Stop (acceptable)	Yes (calc RPD)
	RPD		3.6%		38.3%
	Difference > 2 TDL?	No - acceptable	Not applicable	Yes - assess further	Not applicable

Washington Closure Hanford CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	7/22/2014	Calc. No.:	0100D-CA-V0535	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	J. M. Capron	Date:	7/22/2014
Subject:	100-D-75:2 Subsite Relative Percent Difference and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No.	6 of 6

Table 2. Relative Percent Difference Calculations for the 100-D-75:2 Subsite (2 pages).

100-D-75:2 Subsite Duplicate Analysis

Sampling Area	HEIS Number	Sample Date	Zinc			TPH - motor oil (high boiling)			Benzo(a)pyrene			Benzo(b)fluoranthene		
			mg/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
SS 3	J1T351	5/8/14	63.6	*JN	0.354	5740	J	2250	1.28	J	0.552	2.52		0.552
Duplicate of J1T351	J1T353	5/8/14	51.4	*JN	0.398	6820	J	2230	2.21		0.547	7.07		0.547

Analysis:

TDL		1	5000	15	15
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)
	RPD	21.2%			
	Difference > 2 TDL?	Not applicable	No - acceptable	No - acceptable	No - acceptable

100-D-75:2 Subsite Duplicate Analysis

Sampling Area	HEIS Number	Sample Date	Chrysene			Fluoranthene			Pyrene			Aroclor-1260		
			ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
SS 3	J1T351	5/8/14	2.42		0.552	4.38		0.552	5.60		0.552	7.82		1.15
Duplicate of J1T351	J1T353	5/8/14	11.5		0.547	29.9		0.547	26.7		0.547	11.2		1.14

Analysis:

TDL		15	15	15	20
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)
	RPD				
	Difference > 2 TDL?	No - acceptable	No - acceptable	No - acceptable	No - acceptable

See sheet 1 in Attachment 1 for qualifier definitions

CONCLUSION:

The calculations in Tables 1 and 2 demonstrate that the 100-D-75:2 subsite meets the requirements for the direct contact hazard quotients and carcinogenic (excess cancer) risk and RPDs, respectively, as identified in the RDR/RAWP (DOE-RL 2009b). The hazard quotient and carcinogenic (excess cancer) risk and RPD calculations are for use in the RSVP for this site.

Attachment 1. 100-D-75:2 Subsite Confirmatory Sample Results (Metals and TPH).

Sample Location	HEIS Number	Sample Date	Aluminum			Antimony			Arsenic			Barium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
SS 3	J1T351	5/8/14	3420	*J	6.02	1.33	*J	0.292	0.443	U	0.443	39.0	*J	0.0886
Duplicate of J1T351	J1T353	5/8/14	3810	*J	6.76	2.53	*J	0.328	4.97	UD	4.97	66.7	*J	0.0994
SS 1	J1T349	5/8/14	5900	*J	6.06	3.08	*J	0.294	4.46	UD	4.46	86.0	*J	0.0891
SS 2	J1T350	5/8/14	6460	*J	6.37	3.64	*J	0.309	4.68	UD	4.68	75.1	*J	0.0937
SS 4	J1T352	5/8/14	4480	*J	6.66	1.52	*J	0.323	0.490	U	0.490	54.0	*J	0.0980
CS 5	J1T365	5/8/14	9860		6.59	6.91	BDN	3.20	3.21	N	0.484	131	N	0.0969
CS 6	J1T366	5/8/14	9410		5.78	8.13	BDN	2.81	0.675	BN	0.425	110	N	0.0850
Equipment Blank	J1T354	5/8/14	153	*J	6.31	0.306	*UJ	0.306	0.464	U	0.464	2.75	*J	0.0928

Sample Location	HEIS Number	Sample Date	Beryllium			Boron			Cadmium			Calcium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
SS 3	J1T351	5/8/14	0.345	B	0.0886	2.05	B	0.886	0.386	B	0.0886	2380	*J	7.09
Duplicate of J1T351	J1T353	5/8/14	0.540		0.0994	1.67	B	0.994	0.598		0.0994	3940	*J	7.95
SS 1	J1T349	5/8/14	0.802		0.0891	2.97	B	0.891	0.788		0.0891	4900	*J	7.13
SS 2	J1T350	5/8/14	0.907		0.0937	1.65	B	0.937	0.991		0.0937	6220	*J	7.49
SS 4	J1T352	5/8/14	0.517		0.0980	3.23	B	0.980	0.643		0.0980	3860	*J	7.84
CS 5	J1T365	5/8/14	0.467	BN	0.0969	8.40	N	0.969	1.43	N	0.0969	92800	D	77.5
CS 6	J1T366	5/8/14	0.519	N	0.0850	5.87	N	0.850	0.880	N	0.0850	73300	D	68.0
Equipment Blank	J1T354	5/8/14	0.0928	U	0.0928	0.928	U	0.928	0.0928	U	0.0928	40.5	*J	7.42

Sample Location	HEIS Number	Sample Date	Chromium			Cobalt			Copper			Iron		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
SS 3	J1T351	5/8/14	6.10	*J	0.133	6.76	*J	0.133	21.3	*J	0.266	11700	*J	7.09
Duplicate of J1T351	J1T353	5/8/14	4.30	*J	0.149	8.52	*J	0.149	17.8	*J	0.298	16200	*J	7.95
SS 1	J1T349	5/8/14	8.36	*J	0.134	13.3	*J	0.134	20.4	*J	0.267	21900	*J	7.13
SS 2	J1T350	5/8/14	8.12	*J	0.141	15.3	*J	0.141	20.1	*J	0.281	24100	*J	7.49
SS 4	J1T352	5/8/14	5.07	*J	0.147	10.9	*J	0.147	24.0	*J	0.294	15600	*J	7.84
CS 5	J1T365	5/8/14	17.6	N	0.145	12.0	N	0.145	23.2	N	0.291	21100		7.75
CS 6	J1T366	5/8/14	15.2	N	0.128	10.8	N	0.128	21.0	N	0.255	19100		6.80
Equipment Blank	J1T354	5/8/14	0.139	*UJ	0.139	0.139	*UJ	0.139	0.278	*UJ	0.278	648	*J	7.42

Sample Location	HEIS Number	Sample Date	Lead			Magnesium			Manganese			Mercury		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
SS 3	J1T351	5/8/14	46.9	*	0.292	2370	*J	7.53	181	*J	0.177	0.0145		0.00380
Duplicate of J1T351	J1T353	5/8/14	26.1	*	0.328	2260	*J	8.45	181	*J	0.199	0.00414	U	0.00414
SS 1	J1T349	5/8/14	11.7	*	0.294	4010	*J	7.58	339	*J	0.178	0.00701	B	0.00398
SS 2	J1T350	5/8/14	10.7	*	0.309	4960	*J	7.96	326	*J	0.187	0.00441	B	0.00405
SS 4	J1T352	5/8/14	89.2	*	0.323	5250	*J	8.33	245	*J	0.196	0.0238		0.00378
CS 5	J1T365	5/8/14	8.16	N	0.320	4990		8.24	259		0.194	0.00383	U	0.00383
CS 6	J1T366	5/8/14	7.53	N	0.281	4140		7.23	232		0.170	0.00389	U	0.00389
Equipment Blank	J1T354	5/8/14	1.07	*	0.306	16.9	*JB	7.89	7.66	*J	0.186	0.0039	U	0.0039

Acronyms and notes apply to all tables in attachment.
Gray cells indicate not applicable.
Note: Data qualified with B, C, J, and/or N are considered acceptable values.

Attachment	1	Sheet No.	1 of 3
Originator	J. D. Skoglie	Date	7/22/14
Checked	J. M. Capron	Date	7/22/14
Calc. No.	0100D-CA-V053	Rev. No.	0

* = duplicate analysis not within control limits
B = blank contamination (organic constituents) = Estimated (inorganic).
CS = concrete sample
D = dilution
HEIS = Hanford Environmental Information
J = estimate
N = recovery is outside control limits.
PQL = practical quantitation limit
Q = qualifier
SS = soil sample
U = undetected

Attachment 1. 100-D-75:2 Subsite Confirmatory Sample Results (Metals and TPH).

Sample Location	HEIS Number	Sample Date	Molybdenum			Nickel			Potassium			Selenium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
SS 3	J1T351	5/8/14	0.569	B	0.177	6.59	*	0.133	589	*JN	5.67	0.306	UD	0.306
Duplicate of J1T351	J1T353	5/8/14	0.770	B	0.199	5.58	*	0.149	844	*JN	6.36	0.319	UD	0.319
SS 1	J1T349	5/8/14	1.02		0.178	9.66	*	0.134	1290	*JN	5.71	0.325	UD	0.325
SS 2	J1T350	5/8/14	1.12		0.187	11.7	*	0.141	1550	*JN	6.00	0.313	UD	0.313
SS 4	J1T352	5/8/14	0.609	B	0.196	11.8	*	0.147	873	*JN	6.27	0.310	UD	0.310
CS 5	J1T365	5/8/14	1.10	N	0.194	8.86	N	0.145	2220	D	62.0	0.484	NU	0.484
CS 6	J1T366	5/8/14	1.28	N	0.170	7.86	N	0.128	2370	D	54.4	0.425	NU	0.425
Equipment Blank	J1T354	5/8/14	0.186	U	0.186	0.243	*B	0.139	56.3	*JN	5.94	0.296	UD	0.296

Sample Location	HEIS Number	Sample Date	Silicon			Silver			Sodium			Vanadium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
SS 3	J1T351	5/8/14	1090	*J	1.33	0.886	UD	0.886	208	*JN	6.20	32.1	*JN	0.0886
Duplicate of J1T351	J1T353	5/8/14	1130	*J	1.49	0.994	UD	0.994	330	*JN	6.96	47.3	*JN	0.0994
SS 1	J1T349	5/8/14	1260	*J	1.34	0.891	UD	0.891	284	*JN	6.24	67.5	*JN	0.0891
SS 2	J1T350	5/8/14	1370	*J	1.41	0.937	UD	0.937	307	*JN	6.56	73.8	*JN	0.0937
SS 4	J1T352	5/8/14	917	*J	1.47	0.980	UD	0.980	380	*JN	6.86	32.4	*JN	0.0980
CS 5	J1T365	5/8/14	3120	*	1.45	0.158	BN	0.0969	2020		6.78	76.8	N	0.0969
CS 6	J1T366	5/8/14	2420	*	1.28	0.144	BN	0.0850	2240		5.95	65.0	N	0.0850
Equipment Blank	J1T354	5/8/14	258	*J	1.39	0.0928	U	0.0928	10.6	*JBN	6.50	0.683	*JN	0.0928

Sample Location	HEIS Number	Sample Date	Zinc			TPH - Diesel			TPH - motor oil (high boiling)		
			mg/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
SS 3	J1T351	5/8/14	63.6	*JN	0.354	2250	U	2250	5740	J	2250
Duplicate of J1T351	J1T353	5/8/14	51.4	*JN	0.398	2230	U	2230	6820	J	2230
SS 1	J1T349	5/8/14	140	*JN	0.357	2180	U	2180	6810		2180
SS 2	J1T350	5/8/14	78.9	*JN	0.375	2170	U	2170	5680	J	2170
SS 4	J1T352	5/8/14	125	*JN	0.392	2190	U	2190	4160	J	2190
CS 5	J1T365	5/8/14	112	N	0.388	28500		2160	59800		2160
CS 6	J1T366	5/8/14	41.4	N	0.340	76000	D	10700	136000	D	10700
Equipment Blank	J1T354	5/8/14	3.33	*JN	0.371						

Attachment	1	Sheet No.	2 of 3
Originator	J. D. Skoglie	Date	7/22/14
Checked	J. M. Capron	Date	7/22/14
Calc. No.	0100D-CA-V0535	Rev. No.	0

Attachment 1. 100-D-75:2 Subsite Confirmatory Sample Results (Organics).

CONSTITUENT	CLASS	SS-3 - J1T351			Duplicate of J1T351 - J1T353			SS-1 - J1T349			SS-2 - J1T350		
		5/8/14			5/8/14			5/8/14			5/8/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	5.18	U	5.18	5.13	U	5.13	5.09	U	5.09	5.05	U	5.05
Acenaphthylene	PAH	5.18	U	5.18	5.13	U	5.13	5.09	U	5.09	5.05	U	5.05
Anthracene	PAH	1.73	U	1.73	1.71	U	1.71	1.70	U	1.70	1.68	U	1.68
Benzo(a)anthracene	PAH	0.552	U	0.552	0.547	U	0.547	0.543	U	0.543	0.539	U	0.539
Benzo(a)pyrene	PAH	1.28	J	0.552	2.21		0.547	4.84		0.543	1.46	J	0.539
Benzo(b)fluoranthene	PAH	2.52		0.552	7.07		0.547	16.9		0.543	4.91		0.539
Benzo(ghi)perylene	PAH	0.552	U	0.552	0.547	U	0.547	4.83		0.543	0.539	U	0.539
Benzo(k)fluoranthene	PAH	0.276	U	0.276	3.60		0.274	8.86		0.271	2.60		0.269
Chrysene	PAH	2.42		0.552	11.5		0.547	20.0		0.543	5.82		0.539
Dibenz[a,h]anthracene	PAH	0.552	U	0.552	0.547	U	0.547	0.812	J	0.543	0.539	U	0.539
Fluoranthene	PAH	4.38		0.552	29.9		0.547	37.9		0.543	11.6		0.539
Fluorene	PAH	5.18	U	5.18	5.13	U	5.13	5.09	U	5.09	5.05	U	5.05
Indeno(1,2,3-cd)pyrene	PAH	0.552	U	0.552	0.547	U	0.547	0.543	U	0.543	0.539	U	0.539
Naphthalene	PAH	5.18	U	5.18	5.13	U	5.13	5.09	U	5.09	5.05	U	5.05
Phenanthrene	PAH	5.18	U	5.18	39.0		5.13	16.3	J	5.09	8.60	J	5.05
Pyrene	PAH	5.60		0.552	26.7		0.547	33.6		0.543	10.2		0.539
Aroclor-1016	PCB	1.15	U	1.15	1.14	U	1.14	1.13	U	1.13	1.11	U	1.11
Aroclor-1221	PCB	1.15	U	1.15	1.14	U	1.14	1.13	U	1.13	1.11	U	1.11
Aroclor-1232	PCB	1.15	U	1.15	1.14	U	1.14	1.13	U	1.13	1.11	U	1.11
Aroclor-1242	PCB	1.15	U	1.15	1.14	U	1.14	1.13	U	1.13	1.11	U	1.11
Aroclor-1248	PCB	1.15	U	1.15	1.14	U	1.14	1.13	U	1.13	1.11	U	1.11
Aroclor-1254	PCB	1.15	U	1.15	1.14	U	1.14	1.13	U	1.13	1.11	U	1.11
Aroclor-1260	PCB	7.82		1.15	11.2		1.14	1.13	U	1.13	2.69	J	1.11

CONSTITUENT	CLASS	SS-4 - J1T352			CS-5 - J1T365			CS-6 - J1T366			Equipment Blank		
		5/8/14			5/8/14			5/8/14			5/8/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	5.10	U	5.10	4.97	U	4.97	4.97	U	4.97	4.99	U	4.99
Acenaphthylene	PAH	5.10	U	5.10	4.97	U	4.97	4.97	U	4.97	4.99	U	4.99
Anthracene	PAH	1.70	U	1.70	1.66	U	1.66	1.66	U	1.66	1.66	U	1.66
Benzo(a)anthracene	PAH	5.98		0.544	0.531	U	0.531	0.530	U	0.530	0.533	U	0.533
Benzo(a)pyrene	PAH	3.30		0.544	0.531	U	0.531	0.530	U	0.530	0.533	U	0.533
Benzo(b)fluoranthene	PAH	5.55		0.544	0.531	U	0.531	0.530	U	0.530	0.533	U	0.533
Benzo(ghi)perylene	PAH	2.54		0.544	0.531	U	0.531	0.530	U	0.530	0.533	U	0.533
Benzo(k)fluoranthene	PAH	0.272	U	0.272	0.265	U	0.265	0.265	U	0.265	0.266	U	0.266
Chrysene	PAH	5.07		0.544	0.531	U	0.531	0.530	U	0.530	0.533	U	0.533
Dibenz[a,h]anthracene	PAH	0.544	U	0.544	0.531	U	0.531	0.530	U	0.530	0.533	U	0.533
Fluoranthene	PAH	0.544	U	0.544	0.531	U	0.531	0.547	JP	0.530	0.533	U	0.533
Fluorene	PAH	5.10	U	5.10	4.97	U	4.97	4.97	U	4.97	4.99	U	4.99
Indeno(1,2,3-cd)pyrene	PAH	0.544	U	0.544	0.531	U	0.531	0.530	U	0.530	0.533	U	0.533
Naphthalene	PAH	5.10	U	5.10	4.97	U	4.97	4.97	U	4.97	4.99	U	4.99
Phenanthrene	PAH	8.61	J	5.10	4.97	U	4.97	4.97	U	4.97	4.99	U	4.99
Pyrene	PAH	0.544	U	0.544	0.531	U	0.531	0.530	U	0.530	0.533	U	0.533
Aroclor-1016	PCB	1.13	U	1.13	1.11	U	1.11	1.10	U	1.10			
Aroclor-1221	PCB	1.13	U	1.13	1.11	U	1.11	1.10	U	1.10			
Aroclor-1232	PCB	1.13	U	1.13	1.11	U	1.11	1.10	U	1.10			
Aroclor-1242	PCB	1.13	U	1.13	1.11	U	1.11	1.10	U	1.10			
Aroclor-1248	PCB	1.13	U	1.13	1.11	U	1.11	1.10	U	1.10			
Aroclor-1254	PCB	1.13	U	1.13	1.11	U	1.11	1.10	U	1.10			
Aroclor-1260	PCB	26.2		1.13	17.4		1.11	2.49	J	1.10			

Attachment	1	Sheet No.	3 of 3
Originator	J. D. Skoglie	Date	7/22/14
Checked	J. M. Capron	Date	7/22/14
Calc. No.	0100D-CA-V0535	Rev. No.	0

Acrobat 8.0

CALCULATION COVER SHEET

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

Area: 100-D

Discipline: Environmental *Calculation No: 0100D-CA-V0536

Subject: 100-D-75:2 Subsite Hazard Quotient and Carcinogenic Risk Calculations for Protection of Groundwater

Computer Program: Excel Program No: Excel 2010

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 ☐

0	Cover = 1 Summary = 3 Total = 4	J. D. Skoglie	J. M. Capron	I. B. Berezovskiy	S. G. Wilkinson	10/2/14

SUMMARY OF REVISION

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

Washington Closure Hanford CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	7/7/2014	Calc. No.:	0100D-CA-V0536	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	J. M. Capron	Date:	7/7/2014
Subject:	100-D-75:2 Subsite Hazard Quotient and Carcinogenic Risk Calculations for Protection of Groundwater					Sheet No.	1 of 3

PURPOSE:

Provide documentation to support the calculation of the hazard quotient (HQ) and excess carcinogenic risk associated with soil contaminant levels compared to soil cleanup levels for protection of groundwater for the 100-D-75:2 subsite. In accordance with the remedial action goals (RAGs) in the remedial design report/remedial action work plan (RDR/RAWP) (DOE-RL 2009), 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 $\leq 1 \times 10^{-6}$ for individual carcinogens
4) A cumulative excess cancer risk of $\leq 1 \times 10^{-5}$ for carcinogens.

GIVEN/REFERENCES:

1) BHI, 2005, *100 Area Analogous Sites RESRAD Evaluation*, Calculation No. 0100X-CA-V0050 Rev 0, Bechtel Hanford, Inc., Richland, Washington.

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

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

4) WCH, 2014, *Remaining Sites Verification Package for the 100-D-75:2, 152-E1-D Secondary Electrical Substation C4-S1 Subsite,* Attachment to Waste Site Reclassification Form 2014-092, Washington Closure Hanford, Richland, Washington.

SOLUTION:

1) Generate a HQ for each noncarcinogenic constituent detected above background in soil and with a K_d less than that required to show no migration to groundwater in 1,000 years using the RESRAD generic site model (BHI 2005).

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

3) Generate an excess cancer risk value for each carcinogenic constituent detected above background in soil and with a K_d less than that required to show no migration to groundwater in 1,000 years using the RESRAD generic site model (BHI 2005).

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

Washington Closure Hanford CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	10/1/2014	Calc. No.:	0100D-CA-V0536	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	J. M. Capron	Date:	10/1/2014
Subject:	100-D-75:2 Subsite Hazard Quotient and Carcinogenic Risk Calculations for Protection of Groundwater					Sheet No.	2 of 3

METHODOLOGY:

The 100-D-75:2 subsite underwent discrete focused sampling at four locations for the purpose of confirmatory sampling. One duplicate sample was collected. The protection of groundwater hazard quotient and carcinogenic risk calculations for the 100-D-75:2 subsite were conservatively calculated for the entire waste site using the greatest of the maximum soil sample results (WCH 2014). Of the contaminants of potential concern (COPCs) for this site boron required an HQ and risk calculation because this analyte was detected and a Washington State or Hanford Site background value is not available, and the distribution coefficient is less than that necessary to show no migration to groundwater in 1,000 years using the generic site RESRAD model (BHI 2005). Based on this model and a vadose zone of approximately 24 m (79 ft) thickness, a K_d of 3.1 or greater is required to show no predicted migration to groundwater in 1,000 years. All other site nonradionuclide COPCs were not detected, quantified below background levels, or have a K_d greater than or equal to 3.1. An example of the HQ and risk calculations for soil constituents with a potential impact to groundwater is presented below:

1) The hazard quotient is defined as the ratio of the dose of a substance obtained over a specified time (mg/kg/day) to a reference dose for the same substance derived over the same specified time (mg/kg/day). The hazard quotient can also be calculated as the ratio of the concentration in soil (maximum or statistical value) (mg/kg) to the soil RAG (mg/kg) for protection of groundwater, where the RAG is the groundwater cleanup level (mg/L) (calculated with, and related to the hazard quotient through, WAC 173-340-720(3)(a)(ii)(A), 1996) x 100 x 1 mg/1000 mg (conversion factor). This is based on the "100 times rule" of WAC 173-340-740(3)(a)(ii)(A) (1996). For example, the maximum value for boron of 3.23 mg/kg, divided by the noncarcinogenic RAG value of 320 mg/kg is 1.0×10^{-2}. Comparing this value 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 cumulative HQ for the 100-D-75:2 subsite is 1.0×10^{-2}. Comparing this value to the requirement of ≤1.0, this criterion is met.

3) To calculate the excess cancer risk, the maximum value is divided by the carcinogenic RAG value and multiplied by 1×10^{-6}. For this site, there were not any constituents detected above background and/or above a Kd value of 3.1 that had a carcinogenic RAG. Therefore, the requirement of $\leq 1 \times 10^{-6}$ 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. For this site, there were not any constituents detected above background and/or above a Kd value of 3.1 that had a carcinogenic RAG. Therefore, the requirement of $\leq 1 \times 10^{-5}$ is met.

5) The soil cleanup RAGs for protection of groundwater are based on the "100 times" provision in WAC 173-340-740(3)(a)(ii)(A). WAC 173-340-740(3)(a)(ii)(A) (1996) provides the "100 times rule" but also states "unless it can be demonstrated that a higher soil concentration is protective of

Washington Closure Hanford CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	7/7/2014	Calc. No.:	0100D-CA-V0536	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	J. M. Capron	Date:	7/7/2014
Subject:	100-D-75:2 Subsite Hazard Quotient and Carcinogenic Risk Calculations for Protection of Groundwater					Sheet No. 3 of 3	

ground water at the site." When the "100 times rule" values are exceeded, RESRAD was used to demonstrate that higher soil concentrations may be protective of groundwater.

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 calculations.

Table 1. Hazard Quotient and Excess Cancer Risk Results for the 100-D-75:2 Subsite.

Contaminants of Potential Concern	Maximum or Statistical Value[a] (mg/kg)	Noncarcinogen RAG[b] (mg/kg)	Hazard Quotient	Carcinogen RAG[b] (mg/kg)	Carcinogen Risk
Metals					
Boron	3.23	320	1.0E-02	--	--
Totals					
Cumulative Hazard Quotient:			**1.0E-02**		
Cumulative Excess Cancer Risk:					**0.0E+00**

Notes:
[a] = From WCH (2014).
[b] = Value obtained from the Cleanup Levels and Risk Calculations (CLARC) database using Groundwater, Method B, results and the "100 times" model.
-- = not applicable
RAG = remedial action goal

CONCLUSION:

This calculation demonstrates that the 100-D-75:2 subsite meets the requirements for the hazard quotients and excess carcinogenic risk as identified in the RDR/RAWP (DOE-RL 2009).

APPENDIX C

DATA QUALITY ASSESSMENT

APPENDIX C

DATA QUALITY ASSESSMENT

CONFIRMATORY SAMPLING

A data quality assessment (DQA) was performed to compare the confirmatory sampling approach and resulting analytical data with the sampling and data requirements specified in the site-specific sample design (WCH 2011). 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 2011), the field logbook (WCH 2014), and applicable analytical data packages has been performed as part of this DQA. To ensure quality data, the SAP data assurance requirements and the data validation procedures 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).

Confirmatory sample data collected at the 100-D-75:2 subsite were provided by the laboratory in two sample delivery groups (SDGs): SDG X0045 and X0046. SDG X0045 was submitted for third-party validation. No major deficiencies were identified in the analytical data set. Minor deficiencies are discussed for the 100-D-75:2 subsite data set, as follows below. If no comments are made about a specific analysis, it should be assumed that no deficiencies affecting the quality of the data were found.

SDG X0045

This SDG comprises four focused soil samples (J1T349, J1T350, J1T351, and J1T352) from the confirmatory sampling at the staked locations at the 100-D-75:2 subsite. This SDG includes one field duplicate pair (J1T351/J1T353). These samples were analyzed for inductively coupled plasma (ICP) metals, mercury, total petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAH), and polychlorinated biphenyls (PCBs). In addition, one field equipment blank (J1T354) was collected and analyzed for ICP metals, mercury, and PAH. SDG X0045 was submitted for third-party validation. Minor deficiencies are as follows:

In the ICP metals analysis, the MS recoveries are out of project acceptance criteria for three analytes (potassium [133%], sodium [159%], and zinc [153%]). All potassium, sodium, and zinc results in SDG X0045 are qualified as estimates, by third-party validation, with "J" flags. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the laboratory duplicate relative percent differences (RPDs) for aluminum (33.6%), antimony (61.8%), barium (51.3%), calcium (51.3%), chromium (35.7%), cobalt (50.6%), copper (48.5%), iron (48%), magnesium (44.4%), manganese (51.4%),

silicon (32.2%), vanadium (55.7%), and zinc (32.8%) are above the acceptance criteria of 30%. Elevated RPDs in environmental soil samples are generally attributed to natural heterogeneities in the sample matrix. Third-party validation qualified all aluminum, antimony, barium, calcium, chromium, cobalt, copper, iron, magnesium, manganese, silicon, vanadium, and zinc data results in SDG X0045 as estimated, with "J" flags. Estimated data are usable for decision-making purposes.

SDG X0046

This SDG comprises two focused other solid (scabbled concrete) samples (J1T365 and J1T366) from the 100-D-75:2 subsite. These samples were analyzed for ICP metals, mercury, TPH, PAH, and PCBs. Minor deficiencies are as follows.

In the ICP metals analysis, the MS recoveries are out of project acceptance criteria for antimony (0%), arsenic (0%), barium (33.5%), beryllium (0%), boron (0%), cadmium (0.241%), chromium (4.61%), cobalt (1.73%), copper (2.58%), lead (2.69%), molybdenum (0.303%), nickel (1.86%), selenium (0%), silver (0.466%), vanadium (10.9%), and zinc (15.4%). To confirm quantitation, a post-digestion spike and serial dilution was prepared for all subject analytes. Recovery was acceptable for all analytes. Although not qualified due to the MS recoveries outside the QC limits, all results for arsenic, barium, beryllium, boron, cadmium, chromium, molybdenum, nickel, potassium, selenium, silicon, and sodium may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the laboratory duplicate RPD for silver (80.1%) is above the project acceptance criteria of 30%. Elevated RPDs in environmental samples are generally attributed to natural heterogeneities in the sample matrix. Although not qualified for the RPD above the QC limits, all silver data results in SDG X0046 may be considered estimated. Estimated data are usable for decision-making purposes.

In the TPH analysis, sample J1T366 was diluted at 1:5 due to the presence of over-range target analytes. The MS and matrix spike duplicate recoveries are within the project acceptance criteria. The data are usable for decision-making purposes.

FIELD QUALITY ASSURANCE/QUALITY CONTROL

Relative percent difference 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 (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 logbooks (WCH 2014), are shown in Table C-1. The main and QA/QC sample results are presented in Appendix B.

Table C-1. Field Quality Assurance/Quality Control Sample.

Sample Area	Main Sample	Duplicate Sample
100-D-75:2 Subsite (SS 3)	J1T351	J1T353

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 sample/duplicate pair(s) for each COPC. Relative percent differences are not calculated for analytes that are not detected in both the main and duplicate sample at more than five times the target detection limit (TDL). Relative percent differences of analytes detected at low concentrations (less than five times the detection limit) are not considered to be indicative of the analytical system performance. The calculation brief in Appendix B provides details on duplicate pair evaluation and RPD calculation.

Five of the RPDs calculated for the field duplicate sample are above the acceptance criteria (30%) including barium (52.4%), calcium (49.4%), iron (32.3%), lead (57.0%), and vanadium (38.3%). A secondary check of the data variability is used when one or both of the samples being evaluated (main and duplicate) is less than five times the TDL, including undetected analytes. In these cases, a control limit of ±2 times the TDL is used (Appendix B) to indicate that a visual check of the data is required by the reviewer. Sodium required this check. 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 100-D-75:2 subsite confirmatory 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-75:2 subsite concludes that the reviewed data are of the right type, quality, and quantity to support the intended use. The analytical data were found acceptable for decision-making purposes.

The confirmatory sample analytical data are stored in the Washington Closure Hanford project-specific database prior to being submitted for inclusion in the Hanford Environmental Information System database. The confirmatory sample analytical data are also summarized in Appendix B.

REFERENCES

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

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

EPA, 2006, *Guidance on Systematic Planning using the Data Quality Objectives Process*, EPA QA/G-4, U.S. Environmental Protection Agency, Office of Environmental Information, Washington, D.C.

WCH, 2011, *Work Instruction for Confirmatory Sampling of the 100-D-75:2, 152-E1-D Secondary Electrical Substation,* 0100D-WI-G0099, Rev. 0, Washington Closure Hanford, Richland, Washington.

WCH, 2014, *IU-2/6 and Segment 4Miscellaneous Restoration Sites*, Logbook EL-1667-01, pp. 78-81, Washington Closure Hanford, Richland, Washington.