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

11-AMRC-0103

MAR 14 2011

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

Dear Mr. Faulk:

TRANSMITTAL OF THE APPROVED WASTE SITE RECLASSIFICATION FORM AND SUPPORTING DOCUMENTATION FOR THE 100-F-60, CAST IRON PIPE, REVISION 0

Attached for your use is the approved Waste Site Reclassification Form No. 2010-034 and supporting "Remaining Sites Verification Package for the 100-F-60, Cast Iron Pipe," Revision 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, Federal Project Director
for the River Corridor Closure Project

AMRC:TCP

Attachment

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

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

Date Submitted: 12/01/2010 Originator: M. L. Proctor Phone: 372-9227	**WASTE SITE RECLASSIFICATION FORM** Operable Unit(s): 100-FR-1 Waste Site Code: 100-F-60 Type of Reclassification Action: Closed Out ☐ Interim Closed Out ☐ No Action ☒ RCRA Postclosure ☐ Rejected ☐ Consolidated ☐	Control Number: 2010-034

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

Description of current waste site condition:

The 100-F-60, Cast Iron Pipe waste site was discovered in December 2004 while excavating a test pit (Test Pit 19) during the 100-F-26:9 confirmatory sampling activities. The discovered pipe was a 10-cm (4-in.)-diameter cast iron pipe, buried approximately 1.2 m (4 ft) below ground surface. This waste site is 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, as a candidate site for confirmatory sampling. Confirmatory sampling of this site has been performed in September 2010 in accordance with remedial action objectives and goals established by the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD), U.S. Environmental Protection Agency, Region 10, Seattle, Washington. The selected action involved (1) evaluating the site 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:

In accordance with this evaluation, the confirmatory sampling results support a reclassification of the 100-F-60 waste site to No Action. The current site conditions achieve the remedial action goals established by the Remaining Sites ROD. 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. Site contamination did not extend into the deep zone soils. 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-F-60, Cast Iron Pipe* (attached).

Waste Site Controls:

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

M. S. French DOE Federal Project Director (printed)	MS French Signature	2/22/11 Date
N/A Ecology Project Manager (printed)	Signature	Date
C. Guzzetti EPA Project Manager (printed)	Signature	3/2/11 Date

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-F-60, CAST IRON PIPE

Attachment to Waste Site Reclassification Form 2010-034

December 2010

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-F-60, CAST IRON PIPE

EXECUTIVE SUMMARY

The 100-F-60, Cast Iron Pipe waste site, located in the 100-FR-1 Operable Unit, consisted of a 10-cm (4-in.)-diameter cast iron pipe, buried approximately 1.2 m (4 ft) below ground surface. This waste site was discovered in December 2004 while excavating a test pit (Test Pit 19) during the 100-F-26:9 confirmatory sampling activities. The area was backfilled after the 100-F-26:9 sampling activities occurred. A site visit in April 2010 identified an area that is relatively flat, with no visible above ground structures.

Based on observations during the site visit, review of historical drawings, and former 100-F-26:9 confirmatory sampling activities that led to the discovery of the 100-F-60 waste site, confirmatory sampling was performed in September 2010. The results indicated that the waste site achieved compliance with the remedial action objectives (RAOs) and remedial action goals (RAGs) for the 100-F-60 waste site; 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-F-60 waste site in accordance with the TPA-MP-14 procedure in the *Tri-Party Agreement Handbook Management Procedures* (DOE-RL 2007).

In accordance with this evaluation, the confirmatory sampling results support a reclassification of this site to No Action. The current site conditions achieve the RAOs and the corresponding RAGs established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2009) and the *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 contaminant levels remaining in the soil are protective of groundwater and the Columbia River. The 100-F-60 waste site did not extend into the deep zone. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required.

Table ES-1. Summary of Remedial Action Goals for the 100-F-60 Waste Site.

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Direct Exposure – Radionuclides	Attain 15-mrem/yr dose rate above background over 1,000 years.	Radionuclides were not COPCs for the 100-F-60 waste site.	NA
Direct Exposure – Nonradionuclides	Attain individual COPC RAGs.	All individual COPC concentrations are below the direct exposure criteria.	Yes
Risk Requirements – Nonradionuclides	Attain a hazard quotient of <1 for all individual noncarcinogens.	The hazard quotients for individual nonradionuclide COPCs are <1.	Yes
	Attain a cumulative hazard quotient of <1 for noncarcinogens.	The cumulative hazard quotient for all sampling areas (1.0×10^{-2}) is <1.	
	Attain an excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens.	Excess cancer risk values for individual nonradionuclide COPCs are $<1 \times 10^{-6}$.	
	Attain a cumulative excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.	The total excess carcinogenic risk for all sampling areas (2.3×10^{-8}) is $<1 \times 10^{-5}$.	
Groundwater/River Protection – Radionuclides	Attain single COPC groundwater and river RAGs.	Radionuclides were not COPCs for the 100-F-60 waste site.	NA
	Attain National Primary Drinking Water Regulations: 4 mrem/yr (beta/gamma) dose standard to target receptor/organ [a].		
	Meet drinking water standards for alpha emitters: the more stringent of 15 pCi/L MCL or 1/25th of the derived concentration guide for DOE Order 5400.5 [b].		
	Meet total uranium standard of 21.2 pCi/L [c].		
Groundwater/River Protection – Nonradionuclides	Attain individual nonradionuclide groundwater and Columbia River cleanup requirements.	Lead and zinc 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 2009), 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] RESRAD modeling predicts that the residual concentrations of lead and zinc will not migrate more than 2 m (6.6 ft) vertically in 1,000 years (based on the distribution coefficient of lead and zinc of 30 mL/g). The vadose zone underlying the soil below the site at the deepest test pit location is approximately 11.92 m (39.1 ft) thick. Therefore, residual concentrations of lead and zinc are predicted to be protective of groundwater and the Columbia River.

COPC = contaminant of potential concern
DOE = U.S. Department of Energy
MCL = maximum contaminant level
NA = not applicable
RAG = remedial action goal
RDR/RAWP = *Remedial Design Report/Remedial Action Work Plan for the 100 Area*
RESRAD = RESidual RADioactivity

Soil cleanup levels were established in the Remaining Sites ROD (EPA 1999) based in part on a limited ecological risk assessment. Although not required by the Remaining Sites ROD, a comparison against ecological risk screening levels has been made for the site contaminants of potential concern and other constituents. Those constituents exceeding the ecological screening level in the *Washington Administrative Code* Chapter 173-340, Table 749-3 were boron, lead, vanadium, and zinc. U.S. Environmental Protection Agency ecological soil screening levels were exceeded for lead, manganese, vanadium, and zinc. Exceeding screening values is intended to trigger additional evaluation and does not necessarily indicate the existence of risk to ecological receptors. Because the maximum detected levels of manganese and vanadium were below Hanford Site background levels, 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 ecological effects as a part of the final closeout decision for the Columbia River corridor portion of the Hanford Site.

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-F-60, CAST IRON PIPE

STATEMENT OF PROTECTIVENESS

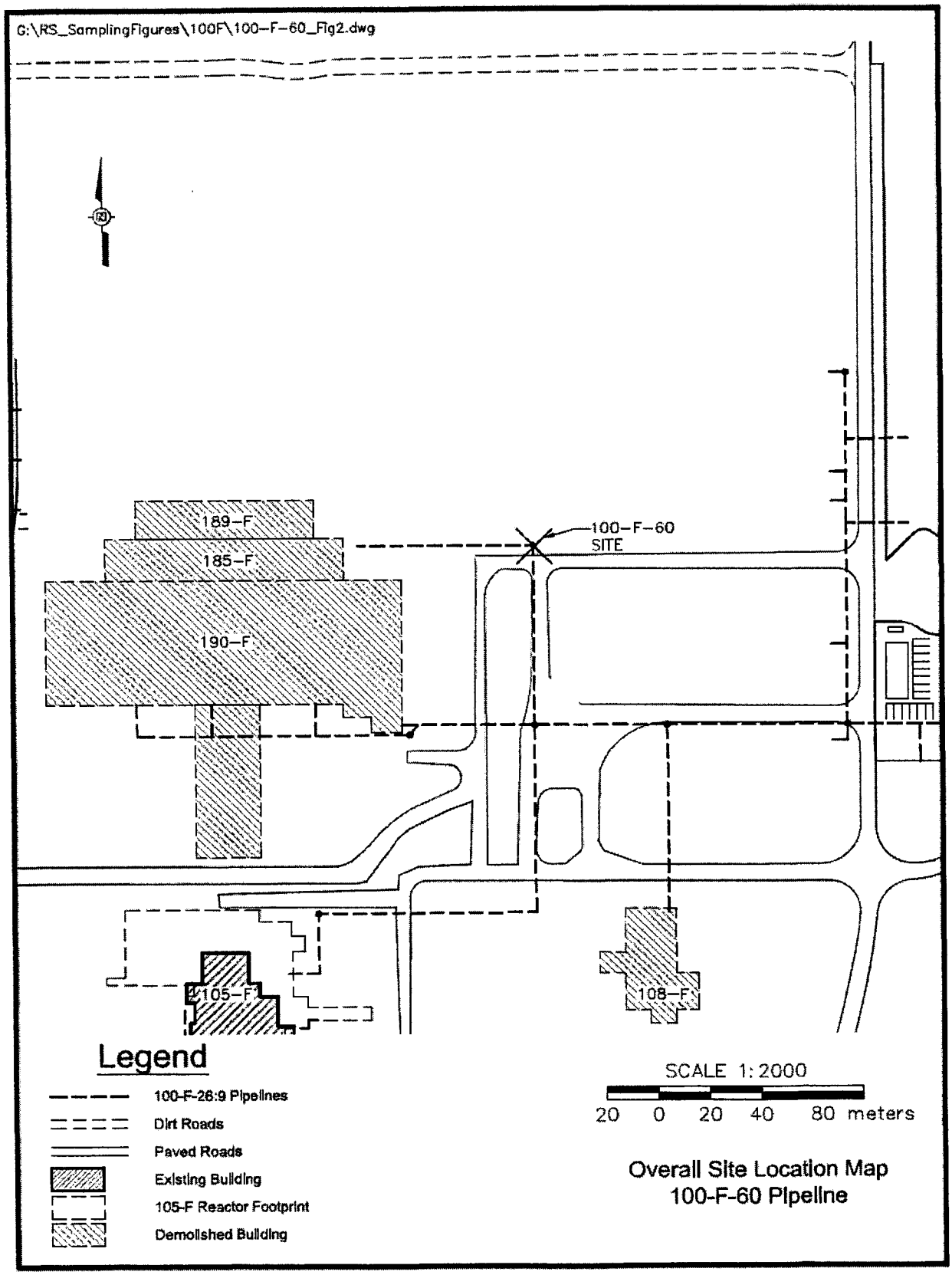
The 100-F-60, Cast Iron Pipe waste site confirmatory sampling data, site evaluations, and supporting documentation demonstrate that this site meets the objectives established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP) (DOE-RL 2009) and the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD) (EPA 1999). These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. This site does not extend into the deep zone. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required.

Soil cleanup levels were established in the Remaining Sites ROD (EPA 1999) based in part on a limited ecological risk assessment. Although not required by the Remaining Sites ROD, a comparison against ecological risk screening levels has been made for the site contaminants of potential concern and other constituents. Those constituents exceeding the ecological screening level in the *Washington Administrative Code* (WAC) Chapter 173-340, Table 749-3 were boron, lead, vanadium, and zinc. U.S. Environmental Protection Agency ecological soil screening levels were exceeded for lead, manganese, vanadium, and zinc. Exceeding screening values is intended to trigger additional evaluation and does not necessarily indicate the existence of risk to ecological receptors. Because the maximum detected levels of manganese and vanadium were below Hanford Site background levels, 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 ecological effects as a part of the final closeout decision for the Columbia River corridor portion of the Hanford Site.

GENERAL SITE INFORMATION AND BACKGROUND

The 100-F-60 waste site, located in the 100-FR-1 Operable Unit, approximately 75 m (246 ft) east of the 185-F Building, consisted of a 10-cm (4-in.)-diameter cast iron pipe, buried approximately 1.2 m (4 ft) below ground surface (bgs) (Figure 1). This waste site was discovered in December 2004 while excavating a test pit (Test Pit 19) during the 100-F-26:9 confirmatory sampling activities. The area was backfilled after the 100-F-26:9 sampling activities occurred. A site visit in April 2010 identified an area that is relatively flat, with no visible above ground structures. The Washington State Plane (WSP) coordinates for this waste site location are N 147780, E 580556.

Figure 1. The 100-F-60 Waste Site Location Map.

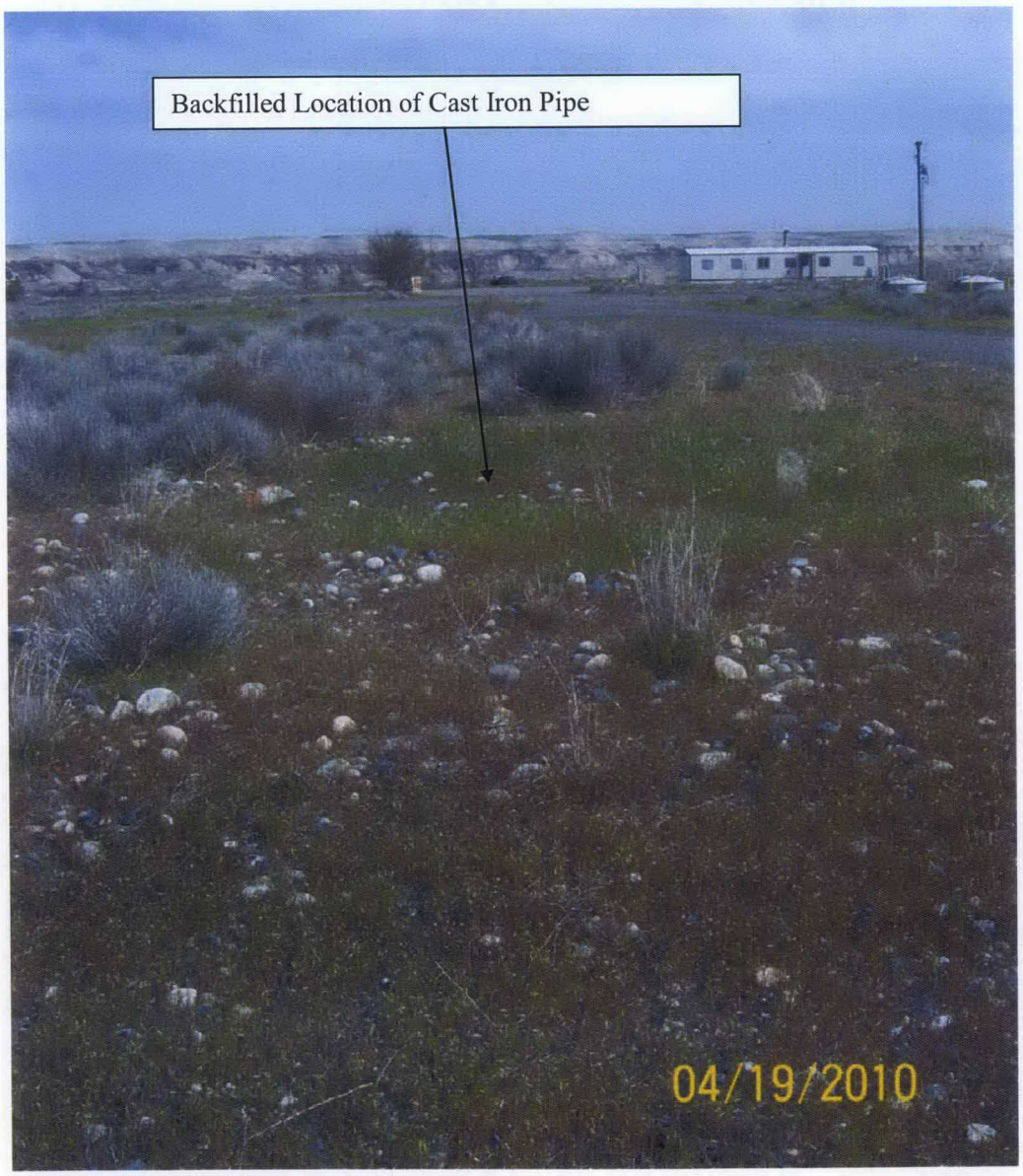


The pipe could not be correlated with previously documented pipelines in the area. A portion of the pipe was removed along with the junction box associated with the 100-F-26:9, 1607-F2 Sanitary Sewer Pipelines. The 100-F-60 pipe and its contents were not sampled during confirmatory sampling of 100-F-26:9 and the pieces of piping and other material were returned to the excavation, which was backfilled (WCH 2008).

Site Visit

A site visit was performed on April 19, 2010. As shown in Figure 2, the site area was found to be relatively flat, having been backfilled following the sampling activities for the 100-F-26:9 pipeline. No above-ground features or debris were observed at this waste site.

Figure 2. Photograph of 100-F-60, Cast Iron Pipe Location.



Ecological and Cultural

An ecological and cultural resources review was performed for the 100-F-60 waste site in July 2010. The waste site is located within a previously disturbed area, but the surrounding areas have revegetated naturally with native vegetation. Existing roads were to be used as much as possible when accessing the site, to reduce the spread of noxious weeds and minimize impacts to existing vegetation. Nesting birds such as killdeer and nighthawks sometimes use these heavily disturbed areas for nesting, and workers were advised to watch for nesting activity. No nests or nesting activity were observed during confirmatory sampling.

No archaeological sites were known or expected to exist in the 100-F project area near the 100-F-60 waste site. All workers were directed to watch for cultural materials (e.g., bones, stone tools, mussel shells, cans, bottles, Hanford era artifacts) during all work activities. No ecologically or culturally significant materials were encountered during confirmatory sampling.

Geophysical Survey

A geophysical survey of this site was performed prior to excavation to detect possible subsurface interferences in support of an excavation permit.

CONFIRMATORY SAMPLING SUMMARY

Two focused samples from the excavated test pit were used to evaluate the 100-F-60 waste site. The cast iron pipe was uncovered 3 m (9.8 ft) to the northwest of the expected location at WSP coordinates N 147783, E 580552. The pipe was 4 ft (1.3 m) bgs and appeared to be intact. One focused sample was collected from the pipeline contents. There was not enough soil and sediment present inside the pipeline; therefore, the duplicate was collected from the soil underlying the pipeline. Field surveys for radiological contamination and volatile organic compounds (VOCs) were conducted during sampling. No radiological activity or VOCs were detected. Confirmatory sampling determined that environmental contamination was not present at this waste site. Based on confirmatory sampling at the 100-F-60 waste site, remedial action was determined to be unnecessary, and the confirmatory sampling data has been used to document this waste site for reclassification as a No Action site. Tables 1 and 2 identify the location and analyses for confirmatory sampling. No anomalous features were identified during confirmatory sampling.

Table 1. 100-F-60 Confirmatory Sampling Summary Table. (2 Pages)

Sample Location	Sample Media	HEIS Number	Washington State Plane Coordinates		Sample Analysis
			Northing (m)	Easting (m)	
Pipe contents	Soil and sediment	J1C389	147783	580552	ICP metals [a], mercury, SVOA, PCBs, pesticides
Soil underlying pipe	Underlying soil	J1C390	147783	580552	

Table 1. 100-F-60 Confirmatory Sampling Summary Table. (2 Pages)

Sample Location	Sample Media	HEIS Number	Washington State Plane Coordinates		Sample Analysis
			Northing (m)	Easting (m)	
Duplicate of J1C390	Underlying soil	J1C391	147783	580552	ICP metals [a], mercury, SVOA, PCBs, pesticides
Equipment blank	Silica sand	J1C388	NA	NA	ICP metals [a], mercury, SVOA

[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
PCB = polychlorinated biphenyl
SVOA = semivolatile organic analysis

Table 2. 100-F-60 Laboratory Analytical Methods.

Analytical Method	Contaminant of Potential Concern
ICP metals [a] – EPA Method 6010	Expanded list [a]
Mercury – EPA Method 7471	Mercury
PCB – EPA Method 8082	Polychlorinated biphenyls
Pesticides – EPA Method 8081	Pesticides
SVOA – EPA Method 8260	Volatile organic compounds

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

EPA = U.S. Environmental Protection Agency
ICP = inductively coupled plasma
PCB = polychlorinated biphenyl
SVOA = semivolatile organic analysis

Contaminants of Potential Concern

The contaminants of potential concern (COPCs) for the 100-F-60 waste site were determined based on potential hazardous constituents associated with the cast iron pipe and its likely uses during operation. The COPCs included the expanded list of inductively coupled plasma (ICP) metals, mercury, pesticides, polychlorinated biphenyls (PCBs), and semivolatile organic compounds (SVOCs). Mercury was included because evidence of mercury-contaminated sulfuric acid has been found at other waste sites in the 100 Area. Because no VOCs were detected in the field, the volatile organic analysis was not performed. 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 analyses for radionuclides were not performed.

Confirmatory Sample Results

Confirmatory samples were analyzed using U.S. Environmental Protection Agency-approved analytical methods. Evaluation of the 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 100-F-60 are presented in Table 3. Contaminants that were not detected by laboratory analysis are excluded from these tables. Calculated cleanup levels for aluminum, calcium, iron, magnesium, potassium, silicon, and sodium are not presented in the RDR/RAWP (DOE-RL 2009). Parameters to calculate cleanup levels for these constituents are not presented in the Cleanup Levels and Risk Calculations (CLARC) Database (Ecology 2009) under WAC 173-340-740(3) or other reference databases; therefore, these constituents are not considered COPCs and are not included in the tables. The laboratory-reported data results for all constituents are stored in the Environmental Restoration (ENRE) project-specific database prior to provision to the Hanford Environmental Information System (HEIS) and are presented as an attachment to the direct contact hazard quotient and relative percent difference (RPD) calculation in Appendix A.

Table 3. Comparison of Maximum Contaminant Concentrations to Remedial Action Goals for the 100-F-60 Confirmatory Sampling Data. (2 Pages)

COPC	Maximum Result (mg/kg)	Remedial Action Goals [a] (mg/kg)			Does the Maximum Result Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	2.5 (<BG)	20 [b]	20 [b]	20 [b]	No	--
Barium	100 (<BG)	5,600	200	400	No	--
Beryllium	0.20 (<BG)	10.4 [c]	1.51 [b]	1.51 [b]	No	--
Boron [d]	3.3	7,200	320	-- [e]	No	--
Cadmium [f]	0.045 (<BG)	13.9 [c]	0.81 [b]	0.81 [b]	No	--
Chromium (total)	9.9 (<BG)	80,000	18.5 [b]	18.5 [b]	No	--
Cobalt	5.8 (<BG)	24	15.7 [b]	-- [e]	No	--
Copper	13.7 (<BG)	2,960	59.2	22.0 [b]	No	--
Lead	112	353	10.2 [b]	10.2 [b]	Yes	Yes [g]
Manganese	282 (<BG)	3,760	512 [b]	512 [b]	No	--
Mercury	0.10 (<BG)	24	0.33 [b]	0.33 [b]	No	--
Molybdenum [d]	0.31	400	8	-- [e]	No	--
Nickel	10.1 (<BG)	1,600	19.1 [b]	27.4	No	--
Silver	0.21 (<BG)	400	8	0.73 [b]	No	--
Vanadium	40.7 (<BG)	560	85.1 [b]	-- [e]	No	--
Zinc	99.6	24,000	480	67.8 [b]	Yes	Yes [g]

Table 3. Comparison of Maximum Contaminant Concentrations to Remedial Action Goals for the 100-F-60 Confirmatory 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-1254	0.0074	0.5	0.017[c]	0.017[c]	No	--
Aroclor-1260	0.0042	0.5	0.017[c]	0.017[c]	No	--
Diethylphthalate	0.440	64,000	1,280	4,600	No	--

[a] RAGs obtained from the RDR/RAWP (DOE-RL 2009) unless otherwise noted.
[b] Where cleanup levels are less than background, cleanup levels default to background 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 100 Area RDR/RAWP (DOE-RL 2009).
[c] Where cleanup levels are less than RDLs, cleanup levels default to RDLs per WAC 173-340-707(2) (Ecology 1996).
[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 2009) or other databases to calculate cleanup levels (WAC 173-340-730(3)(a)(iii), 1996 [Method B for surface waters]).
[f] Hanford Site-specific background value is not available; it was not evaluated during background study. Value used is from *Natural Background Soil Metals Concentrations in Washington State* (Ecology 1994).
[g] Based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009), the residual concentrations of lead and zinc are not expected to migrate more than 2 m (6.6 ft) vertically in 1,000 years (based on the distribution coefficient of lead and zinc of 30 mL/g). The vadose zone underlying the soil below the site at the deepest test pit location is approximately 11.92 m (39.1 ft) thick. Therefore, residual concentrations of lead and zinc are predicted to be protective of groundwater and the Columbia River.

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

DATA EVALUATION

Nonradionuclides

Table 3 compares the confirmatory sample values to the applicable soil RAGs for direct exposure, protection of groundwater, and protection of the Columbia River.

Assessment of the risk requirements for the 100-F-60 waste site was determined by calculation of the hazard quotient and excess carcinogenic risk values for direct contact (Appendix B). 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-F-60 waste site, these risk values were not calculated for constituents that were either not detected or were detected at concentrations below Hanford Site or Washington State background levels. The calculations indicated that all individual hazard quotients for noncarcinogenic constituents are less than 1.0. The cumulative noncarcinogenic hazard quotient is 1.0×10^{-2}. All individual carcinogen risk values for carcinogenic constituents are less than 1×10^{-6}. The cumulative direct contact excess cancer risk is 2.3×10^{-8}. Therefore, nonradionuclide risk requirements are met.

Lead and zinc were quantified at concentrations exceeding soil RAGs for groundwater and river protection. Data were not collected on the vertical extent of these contaminants, but given the soil-partitioning coefficient for these constituents (30 mL/g), they are not predicted to migrate more than 2 m (6.6 ft) vertically in 1,000 years, based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009). The vadose zone underlying the 100-F-60 waste site is approximately 11.92 m (39.11 ft) thick; therefore, residual concentrations of these constituents are predicted to be protective of groundwater. The only pathway for contaminant migration to the Columbia River is via groundwater; therefore, residual concentrations of these constituents are also predicted to be protective of the Columbia River. All other confirmatory data values are less than the applicable RAGs.

DATA QUALITY ASSESSMENT

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

The DQA for the 100-F-60 waste site 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 ENRE project-specific database for data evaluation prior to archival in the HEIS and are provided as an attachment to the direct contact hazard quotient RPD calculation in Appendix A. The detailed DQA is presented in Appendix B.

SUMMARY FOR NO ACTION DETERMINATION

The 100-F-60 waste site has been evaluated in accordance with the Remaining Sites ROD (EPA 1999) and the RDR/RAWP (DOE-RL 2009). 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 verification sampling results support a reclassification of the 100-F-60 waste site to No Action.

REFERENCES

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

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

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

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

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.

Ecology, 1994, *Natural Background Soil Metals Concentrations in Washington State,* Publication No. 94-115, Washington State Department of Ecology, Olympia, Washington.

Ecology, 1996, "Model Toxics Control Act – Cleanup," *Washington Administrative Code* (WAC) 173-340, Washington State Department of Ecology, Olympia, Washington.

Ecology, 2009, Cleanup Levels and Risk Calculations (CLARC) Database, Washington State Department of Ecology, Olympia, Washington, https://fortress.wa.gov/ecy/clarc.CLARCHome.aspx.

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.

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

WCH, 2008, Waste Site Reclassification Form 2008-029, and Attachment *Remaining Sites Verification Package for the 100-F-26:9, 1607-F2 Sanitary Sewer Pipelines,* Rev. 0, Washington Closure Hanford, Richland, Washington.

WCH, 2010a, *100 Area Confirmatory Sampling,* Logbook EL-1649, pp. 49-51, Washington Closure Hanford, Richland, Washington.

WCH, 2010b, *Work Instruction for Confirmatory Sampling of 100-F-60, Cast Iron Pipe,* 0100F-WI-G0072, Rev. 0, Washington Closure Hanford, Richland, Washington.

APPENDIX A

RELATIVE PERCENT DIFFERENCE (RPD)

AND

DIRECT CONTACT HAZARD QUOTIENT AND CARCINOGENIC RISK CALCULATION

Acrobat 8.0

CALCULATION COVER SHEET

Project Title: 100-F Area Confirmatory Sampling **Job No. 14655**

Area: 100-F

Discipline: Environmental Calculation No: 0100F-CA-~~0~~0367, V 12/2/10

Subject: 100-F-60 Relative Percent Difference (RPD) and Direct Contact Hazard Quotient and Carcinogenic Risk Calculation

Computer Program: Excel Program No: Excel 2003

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

Committed Calculation ☒ Preliminary ☐ Superseded ☐ Voided ☐

Rev.	Sheet Numbers	Originator	Checker	Reviewer	Approval	Date
0	Cover = 1 Summary = 6 Attachment 1 = 4 Total = 11	I. B. Berezovskiy	T. E. Queen	J. D. Skoglie	D. F. Obenauer	12/1/10

SUMMARY OF REVISION

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

DE01-437.03

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	I. B. Berezovskiy	Date:	12/2/2010	Calc. No.:	0100F-CA-V0367	Rev.:	0
Project:	100-F Field Remediation	Job No:	14655	Checked:	T. E. Queen	Date:	12/2/2010
Subject:	100-F-60 Relative Percent Difference (RPD) 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-F-60 waste site. In accordance with the remedial action goals (RAGs) in the remedial design report/remedial action work plan (RDR/RAWP) (DOE-RL 2009a), the following criteria must be met:

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

Also, calculate the relative percent difference (RPD) for primary-duplicate sample pairs from 100-F-60 confirmatory sampling, as necessary.

GIVEN/REFERENCES:

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

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

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

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

5) WCH, 2010, *Remaining Sites Verification Package for the 100-F-60, Cast Iron Pipe,* Attachment to Waste Site Reclassification Form 2010-034, Washington Closure Hanford, Inc., Richland, Washington.

SOLUTION:

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

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

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

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	I. B. Berezovskiy	Date:	12/2/2010	Calc. No.:	0100F-CA-V0367	Rev.:	0
Project:	100-F Field Remediation	Job No:	14655	Checked:	T. E. Queen	Date:	12/2/2010
Subject:	100-F-60 Relative Percent Difference (RPD) 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 of <1 x 10^{-5}.

5) Use data from WCH (2010) to perform the RPD calculations for primary-duplicate sample pairs, as required.

METHODOLOGY:

The 100-F-60 waste site was comprised of one test pit for confirmatory sampling. The direct contact hazard quotient and carcinogenic risk calculations for the 100-F-60 waste site were conservatively calculated for the entire waste site using the one confirmatory soil sample (WCH 2010). Of the contaminants of potential concern (COPCs) for this site, zinc requires an HQ and risk calculations because this analyte was detected above the background value. In addition, boron, molybdenum, aroclor-1254, aroclor-1260 and diethylphthalate require HQ and risk calculations because these analytes were detected and a Washington state or Hanford Site background value is not available. Lead was detected above background; however, lead does not have a reference dose for calculation of a hazard quotient because toxic effects of lead are correlated with blood-lead levels rather than exposure levels or daily intake. 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 zinc is 99.6 mg/kg, divided by the noncarcinogenic RAG value of 24,000 mg/kg (calculated in accordance with the noncarcinogenic toxics effects formula in WAC 173-340-740[3]), is 4.2 x 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 1.0 x 10^{-2}. 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 x 10^{-6}. For example, the maximum value for aroclor-1254 is 0.0074 mg/kg, divided by 0.5 mg/kg, and multiplied as indicated, is 1.5 x 10^{-8}. Comparing this value, and all other individual values, to the requirement of <1 x 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 2.3 x 10^{-8}. Comparing this value to the requirement of <1 x 10^{-5}, this criterion is met.

5) The RPD is calculated when both the primary value and the duplicate value for a given analyte are above detection limits and are greater than 5 times the target detection limit (TDL). The TDL is a laboratory detection limit pre-determined for each analytical method and is listed for certain analytes in Table II-1 of the SAP (DOE-RL 2009b). Other analytes will have their own pre-determined constituents and will have their own TDLs based on the laboratory and method used. Where direct evaluation of the attached sample data showed that a given analyte was not detected in the primary

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	I. B. Berezovskiy	Date:	12/2/2010	Calc. No.:	0100F-CA-V0367	Rev.:	0
Project:	100-F Field Remediation	Job No:	14655	Checked:	T. E. Queen	Date:	12/2/2010
Subject:	100-F-60 Relative Percent Difference (RPD) and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 3 of 6	

and/or duplicate sample, further evaluation of the RPD value was not performed. The RPD calculations use the following formula:

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

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

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

For quality assurance/quality control (QA/QC) duplicate RPD calculations, a value less than 30% indicates the data compare favorably. For regulatory splits, a threshold of 35% is used (EPA 1994). If the RPD is greater than 30% (or 35% for regulatory split data), further investigation regarding the usability of the data is performed. No split samples were collected for cleanup verification of the subject site. Additional discussion is provided in the data quality assessment section of the applicable RSVP (WCH 2010), 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 and excess cancer risk calculations.

Table 2 shows the results of the RPD calculations for the 100-F-60 waste site. The evaluation of the QA/QC duplicate RPD calculations is performed within the data quality assessment section of the RSVP.

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	I. B. Berezovskiy	Date:	12/2/2010	Calc. No.:	0100F-CA-V0367	Rev.:	0
Project:	100-F Field Remediation	Job No:	14655	Checked:	T. E. Queen	Date:	12/2/2010
Subject:	100-F-60 Relative Percent Difference (RPD) and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 4 of 6	

Table 1. Direct Contact Hazard Quotient and Excess Cancer Risk Results for the 100-F-60 Waste Site.

Contaminants of Potential Concern	Maximum Value[a] (mg/kg)	Noncarcinogen RAG[b] (mg/kg)	Hazard Quotient	Carcinogen RAG[b] (mg/kg)	Carcinogen Risk
Metals					
Boron	3.3	7,200	4.6E-04	--	--
Lead[c]	112	353	--	--	--
Molybdenum	0.31	400	7.8E-04	--	--
Zinc	99.6	24,000	4.2E-03	--	--
Semivolatiles					
Diethylphthalate	0.440	64,000	6.9E-06	--	--
Polychlorinated Biphenyls					
Aroclor-1254	0.0074	1.6	4.6E-03	0.5	1.5E-08
Aroclor-1260	0.0042	--	--	0.5	8.4E-09
Totals					
Cumulative Hazard Quotient:			**1.0E-02**		
Cumulative Excess Cancer Risk:					**2.3E-08**

Notes:

[a] = From WCH (2010).

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

[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.

-- = not applicable

RAG = remedial action goal

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	I. B. Berezovskiy	Date:	12/2/2010	Calc. No.:	0100F-CA-V0367	Rev.:	0
Project:	100-F Field Remediation	Job No:	14655	Checked:	T. E. Queen	Date:	12/2/2010
Subject:	100-F-60 Relative Percent Difference (RPD) and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 5 of 6	

Table 2. Relative Percent Difference Calculations for the 100-F-60 Waste Site. (2 pages)

100-F-60 Duplicate Analysis

Sampling Area	HEIS Number	Sample Date	Aluminum			Arsenic			Barium			Beryllium			Boron		
			mg/kg	Q	MDL	mg/kg	Q	MDL	mg/kg	Q	MDL	mg/kg	Q	MDL	mg/kg	Q	MDL
Underlying soil	J1C390	9/15/10	6070	J	1.5	1.8		0.65	81.9		0.075	0.20		0.033	3.3		0.97
Duplicate of J1C390	J1C391	9/15/10	6220	J	1.5	2.1		0.62	83.0		0.072	0.17	B	0.031	3.1		0.93

Analysis:

	TDL	5	10	2	0.2	2
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)
	RPD	2.4%		1.3%		
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable

100-F-60 Duplicate Analysis

Sampling Area	HEIS Number	Sample Date	Cadmium			Calcium			Chromium			Cobalt			Copper		
			mg/kg	Q	MDL	mg/kg	Q	MDL	mg/kg	Q	MDL	mg/kg	Q	MDL	mg/kg	Q	MDL
Underlying soil	J1C390	9/15/10	0.045	B	0.043	5210		14.0	9.9	J	0.057	5.1		0.099	11.3		0.21
Duplicate of J1C390	J1C391	9/15/10	0.039	B	0.037	5580		13.3	9.6	J	0.055	5.1		0.095	12.2		0.21

Analysis:

	TDL	0.2	100	1	2	1
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)
	RPD		6.9%	3.1%		7.7%
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable

100-F-60 Duplicate Analysis

Sampling Area	HEIS Number	Sample Date	Iron			Lead			Magnesium			Manganese			Mercury		
			mg/kg	Q	MDL	mg/kg	Q	MDL	mg/kg	Q	MDL	mg/kg	Q	MDL	mg/kg	Q	MDL
Underlying soil	J1C390	9/15/10	14700	J	3.8	22.9		0.27	3820		3.7	238	J	0.099	0.0093	BM	0.0051
Duplicate of J1C390	J1C391	9/15/10	15200	J	3.6	26.0		0.26	3770		3.5	248	J	0.095	0.0099	B	0.0052

Analysis:

	TDL	5	5	75	5	0.2
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)
	RPD	3.3%		1.3%	4.1%	
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable

100-F-60 Duplicate Analysis

Sampling Area	HEIS Number	Sample Date	Nickel			Potassium			Silicon			Sodium			Vanadium		
			mg/kg	Q	MDL	mg/kg	Q	MDL	mg/kg	Q	MDL	mg/kg	Q	MDL	mg/kg	Q	MDL
Underlying soil	J1C390	9/15/10	10.1		0.12	954		40.6	272	J	2.1	254		58.4	36.3		0.093
Duplicate of J1C390	J1C391	9/15/10	9.3		0.12	993		38.8	261	J	2.0	218		55.8	38.6		0.089

Analysis:

	TDL	4	400	2	50	2.5
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)
	RPD			4.1%		6.1%
	Difference > 2 TDL?	No - acceptable	No - acceptable	Not applicable	No - acceptable	Not applicable

B = estimated result. Result is less than the RL but greater than the MDL.
J = estimated result.
HEIS = Hanford Environmental Information System
M = sample duplicate precision not met
PQL = practical quantitation limit.
Q = qualifier.
RPD = relative percent difference.
TDL = target detection limit

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	I. B. Berezovskiy	Date:	12/2/2010	Calc. No.:	0100F-CA-V0367	Rev.:	0
Project:	100-F Field Remediation	Job No:	14655	Checked:	T. E. Queen	Date:	12/2/2010
Subject:	100-F-60 Relative Percent Difference (RPD) and Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 6 of 6	

Table 2. Relative Percent Difference Calculations for the 100-F-60 Waste Site. (2 pages)

100-F-60 Duplicate Analysis

Sampling Area	HEIS Number	Sample Date	Zinc		
			mg/kg	Q	MDL
Underlying soil	J1C390	9/15/10	35.2		0.39
Duplicate of J1C390	J1C391	9/15/10	37.0		0.38

Analysis:

TDL		1
Duplicate Analysis	Both > PQL?	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)
	RPD	5.0%
	Difference > 2 TDL?	Not applicable

CONCLUSION:

The calculations in Tables 1 and 2 demonstrate that the 100-F-60 waste site meets the requirements for the hazard quotients and carcinogenic (excess cancer) risk and RPDs, respectively, as identified in the RDR/RAWP (DOE-RL 2009a) and SAP (DOE-RL 2009b). The hazard quotients and carcinogenic (excess cancer) risk and RPD calculations are for use in the RSVP for this site.

Attachment 1. 100-F-60 Waste Site Confirmatory Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Aluminum			Antimony			Arsenic			Barium		
			mg/kg	Q	MDL	mg/kg	Q	MDL	mg/kg	Q	MDL	mg/kg	Q	MDL
Underlying soil	J1C390	9/15/10	6070	J	1.5	0.38	U	0.38	1.8		0.65	81.9		0.075
Duplicate of J1C390	J1C391	9/15/10	6220	J	1.5	0.36	U	0.36	2.1		0.62	83.0		0.072
Pipe contents	J1C389	9/15/10	5970	J	1.5	0.38	U	0.38	2.5		0.66	100		0.076
Equipment Blank	J1C388	9/15/10	190	NJ	1.4	0.34	U	0.34	0.59	U	0.59	2.7		0.068

Sample Location	HEIS Number	Sample Date	Beryllium			Boron			Cadmium			Calcium		
			mg/kg	Q	MDL	mg/kg	Q	MDL	mg/kg	Q	MDL	mg/kg	Q	MDL
Underlying soil	J1C390	9/15/10	0.20		0.033	3.3		0.97	0.045	B	0.043	5210		14.0
Duplicate of J1C390	J1C391	9/15/10	0.17	B	0.031	3.1		0.93	0.039	B	0.037	5580		13.3
Pipe contents	J1C389	9/15/10	0.15	B	0.033	2.2		0.97	0.043	B	0.040	5530		14.0
Equipment Blank	J1C388	9/15/10	0.043	B	0.029	0.88	U	0.88	0.039	UJ	0.039	60.1	M	12.6

Sample Location	HEIS Number	Sample Date	Chromium			Cobalt			Copper			Iron		
			mg/kg	Q	MDL	mg/kg	Q	MDL	mg/kg	Q	MDL	mg/kg	Q	MDL
Underlying soil	J1C390	9/15/10	9.9	J	0.057	5.1		0.099	11.3		0.21	14700	J	3.8
Duplicate of J1C390	J1C391	9/15/10	9.6	J	0.055	5.1		0.095	12.2		0.21	15200	J	3.6
Pipe contents	J1C389	9/15/10	9.2	J	0.058	5.8		0.099	13.7		0.22	27100	J	3.8
Equipment Blank	J1C388	9/15/10	0.17	UBJC	0.052	0.11	B	0.089	0.40	BM	0.19	427	MJ	3.4

Sample Location	HEIS Number	Sample Date	Lead			Magnesium			Manganese			Mercury		
			mg/kg	Q	MDL	mg/kg	Q	MDL	mg/kg	Q	MDL	mg/kg	Q	MDL
Underlying soil	J1C390	9/15/10	22.9		0.27	3820		3.7	238	J	0.099	0.0093	BM	0.0051
Duplicate of J1C390	J1C391	9/15/10	26.0		0.26	3770		3.5	248	J	0.095	0.0099	B	0.0052
Pipe contents	J1C389	9/15/10	112		0.27	3730		3.7	282	J	0.099	0.10		0.0054
Equipment Blank	J1C388	9/15/10	0.68		0.24	25.2		3.3	9.8	JM	0.089	0.0050	U	0.0050

Sample Location	HEIS Number	Sample Date	Molybdenum			Nickel			Potassium			Selenium		
			mg/kg	Q	MDL	mg/kg	Q	MDL	mg/kg	Q	MDL	mg/kg	Q	MDL
Underlying soil	J1C390	9/15/10	0.26	U	0.26	10.1		0.12	954		40.6	0.85	U	0.85
Duplicate of J1C390	J1C391	9/15/10	0.25	U	0.25	9.3		0.12	993		38.8	0.81	U	0.81
Pipe contents	J1C389	9/15/10	0.31	B	0.26	10.1		0.12	929		40.8	0.85	U	0.85
Equipment Blank	J1C388	9/15/10	0.23	U	0.23	0.11	U	0.11	46.6	B	36.6	0.83	B	0.77

Sample Location	HEIS Number	Sample Date	Silicon			Silver			Sodium			Vanadium		
			mg/kg	Q	MDL	mg/kg	Q	MDL	mg/kg	Q	MDL	mg/kg	Q	MDL
Underlying soil	J1C390	9/15/10	272	J	2.1	0.16	U	0.16	254		58.4	36.3		0.093
Duplicate of J1C390	J1C391	9/15/10	261	J	2.0	0.15	U	0.15	218		55.8	38.6		0.089
Pipe contents	J1C389	9/15/10	260	J	2.1	0.21		0.16	273		58.7	40.7		0.093
Equipment Blank	J1C388	9/15/10	117	J	1.9	0.14	U	0.14	52.7	U	52.7	0.43	B	0.084

Sample Location	HEIS Number	Sample Date	Zinc		
			mg/kg	Q	MDL
Underlying soil	J1C390	9/15/10	35.2		0.39
Duplicate of J1C390	J1C391	9/15/10	37.0		0.38
Pipe contents	J1C389	9/15/10	99.6		0.40
Equipment Blank	J1C388	9/15/10	1.6		0.36

Note: Gray cells indicate not applicable.
B = estimated result; result is less than the RL but greater than the MDL
C = detected in both sample and blank
HEIS = Hanford Environmental Information System
J = estimated reuslt
M = sample duplicate precision not met
N = Recovery exceeds upper and lower control limits

PQL = practical quantitatio
Q = qualifier
R = data unusable
U = undetected

Attachment	1	Sheet No.	1 of 4
Originator	I. B. Berezovskiy	Date	12/2/10
Checked	T. E. Queen	Date	12/2/10
Calc. No.	0100F-CA-V0367	Rev. No.	0

Attachment 1. 100-F-60 Waste Site Confirmatory Sample Results (Organics).

Constituents	Underlying soil J1C390 9/15/2010			Duplicate J1C391 9/15/2010			Pipe contents J1C389 9/15/2010			Equipment Blank J1C388 9/15/2010		
	ug/kg	Q	MDL	ug/kg	Q	MDL	ug/kg	Q	MDL	ug/kg	Q	MDL
SEMIVOLATILE ORGANIC COMPOUNDS (SVOCs)												
1,2,4-Trichlorobenzene	29	U	29	29	U	29	28	U	28	27	U	27
1,2-Dichlorobenzene	23	U	23	23	U	23	22	U	22	21	U	21
1,3-Dichlorobenzene	12	U	12	13	U	13	12	U	12	12	U	12
1,4-Dichlorobenzene	14	U	14	14	U	14	13	U	13	13	U	13
2,4,5-Trichlorophenol	10	U	10	10	U	10	9.9	U	9.9	9.7	U	9.7
2,4,6-Trichlorophenol	10	U	10	10	U	10	9.9	U	9.9	9.7	U	9.7
2,4-Dichlorophenol	10	U	10	10	U	10	9.9	U	9.9	9.7	U	9.7
2,4-Dimethylphenol	69	U	69	69	U	69	65	U	65	64	U	64
2,4-Dinitrophenol	350	U	350	350	U	350	330	U	330	320	U	320
2,4-Dinitrotoluene	69	U	69	69	U	69	65	U	65	64	U	64
2,6-Dinitrotoluene	29	U	29	29	U	29	28	U	28	27	U	27
2-Chloronaphthalene	10	U	10	10	U	10	9.9	U	9.9	9.7	U	9.7
2-Chlorophenol	22	U	22	22	U	22	21	U	21	20	U	20
2-Methylnaphthalene	20	U	20	20	U	20	19	U	19	19	U	19
2-Methylphenol (cresol, o-)	14	U	14	14	U	14	13	U	13	13	U	13
2-Nitroaniline	52	U	52	52	U	52	49	U	49	49	U	49
2-Nitrophenol	10	U	10	10	U	10	9.9	U	9.9	9.7	U	9.7
3+4 Methylphenol (cresol, m+p)	34	U	34	34	U	34	33	U	33	32	U	32
3,3'-Dichlorobenzidine	94	U	94	94	U	94	89	U	89	88	U	88
3-Nitroaniline	76	U	76	76	U	76	72	U	72	71	U	71
4,6-Dinitro-2-methylphenol	340	U	340	340	U	340	330	U	330	320	U	320
4-Bromophenylphenyl ether	20	U	20	20	U	20	19	U	19	19	U	19
4-Chloro-3-methylphenol	69	U	69	69	U	69	65	U	65	64	U	64
4-Chloroaniline	85	U	85	85	U	85	81	U	81	80	U	80
4-Chlorophenylphenyl ether	22	U	22	22	U	22	21	U	21	20	U	20
4-Nitroaniline	76	U	76	76	U	76	72	U	72	71	U	71
4-Nitrophenol	100	U	100	100	U	100	96	U	96	94	U	94
Acenaphthene	11	U	11	11	U	11	10	U	10	10	U	10
Acenaphthylene	18	U	18	18	U	18	17	U	17	17	U	17
Anthracene	18	U	18	18	U	18	17	U	17	17	U	17
Benzo(a)anthracene	21	U	21	21	U	21	20	U	20	19	U	19
Benzo(a)pyrene	21	U	21	21	U	21	20	U	20	19	U	19
Benzo(b)fluoranthene	27	U	27	27	U	27	26	U	26	26	U	26
Benzo(ghi)perylene	17	U	17	17	U	17	16	U	16	16	U	16
Benzo(k)fluoranthene	42	U	42	42	U	42	40	U	40	39	U	39
Bis(2-chloro-1-methylethyl)ether	24	U	24	24	U	24	23	U	23	22	U	22
Bis(2-Chloroethoxy)methane	24	U	24	24	U	24	23	U	23	22	U	22
Bis(2-chloroethyl) ether	17	U	17	17	U	17	16	U	16	16	U	16
Bis(2-ethylhexyl) phthalate	48	U	48	48	U	48	45	U	45	45	U	45
Butylbenzylphthalate	45	U	45	45	U	45	42	U	42	42	U	42
Carbazole	37	U	37	38	U	38	36	U	36	35	U	35
Chrysene	28	U	28	28	U	28	27	U	27	26	U	26
Di-n-butylphthalate	30	U	30	30	U	30	29	U	29	28	U	28
Di-n-octylphthalate	15	U	15	15	U	15	14	U	14	14	U	14
Dibenz[a,h]anthracene	20	U	20	20	U	20	19	U	19	19	U	19
Dibenzofuran	21	U	21	21	U	21	20	U	20	19	U	19
Diethyl phthalate	27	U	27	27	U	27	440		26	550		25
Dimethyl phthalate	24	U	24	24	U	24	23	U	23	28	J	22
Fluoranthene	37	U	37	38	U	38	36	U	36	35	U	35
Fluorene	19	U	19	19	U	19	18	U	18	18	U	18
Hexachlorobenzene	30	U	30	30	U	30	29	U	29	28	U	28
Hexachlorobutadiene	10	U	10	10	U	10	9.9	U	9.9	9.7	U	9.7
Hexachlorocyclopentadiene	52	U	52	52	U	52	49	U	49	49	U	49
Hexachloroethane	22	U	22	22	U	22	21	U	21	21	U	21
Indeno(1,2,3-cd)pyrene	23	U	23	23	U	23	22	U	22	21	U	21
Isophorone	18	U	18	18	U	18	17	U	17	17	U	17
N-Nitroso-di-n-dipropylamine	32	U	32	32	U	32	31	U	31	30	U	30
N-Nitrosodiphenylamine	22	U	22	22	U	22	21	U	21	20	U	20
Naphthalene	32	U	32	32	U	32	31	U	31	30	U	30
Nitrobenzene	23	U	23	23	U	23	22	U	22	21	U	21
Pentachlorophenol	340	U	340	340	U	340	330	U	330	320	U	320
Phenanthrene	18	U	18	18	U	18	17	U	17	17	U	17
Phenol	19	U	19	19	U	19	18	U	18	18	U	18
Pyrene	13	U	13	13	U	13	12	U	12	12	U	12

Attachment	1	Sheet No.	2 of 4
Originator	I. B. Berezovskiy	Date	12/2/10
Checked	T. E. Queen	Date	12/2/10
Calc. No.	0100F-CA-V0367	Rev. No.	0

Attachment 1. 100-F-60 Waste Site Confirmatory Sample Results (Organics).

Constituents	Underlying soil J1C390 9/15/2010			Duplicate J1C391 9/15/2010			Pipe contents J1C389 9/15/2010			Equipment Blank J1C388 9/15/2010		
	ug/kg	Q	MDL	ug/kg	Q	MDL	ug/kg	Q	MDL	ug/kg	Q	MDL
PESTICIDES												
Aldrin	0.26	UJ	0.26	0.26	UJ	0.26	0.25	UJ	0.25			
Alpha-BHC	0.22	UJ	0.22	0.22	UJ	0.22	0.21	UJ	0.21			
alpha-Chlordane	0.34	UJ	0.34	0.33	UJ	0.33	0.32	UJ	0.32			
beta-1,2,3,4,5,6-Hexachlorocyclohexane	0.69	UJ	0.69	0.69	UJ	0.69	0.66	UJ	0.66			
Delta-BHC	0.42	UJ	0.42	0.41	UJ	0.41	0.40	UJ	0.40			
Dichlorodiphenyldichloroethane	0.57	UJ	0.57	0.56	UJ	0.56	0.54	UJ	0.54			
Dichlorodiphenyldichloroethylene	0.25	UJ	0.25	0.25	UJ	0.25	0.24	UJ	0.24			
Dichlorodiphenyltrichloroethane	0.61	UJ	0.61	0.61	UJ	0.61	0.58	UJ	0.58			
Dieldrin	0.22	UJ	0.22	0.22	UJ	0.22	0.21	UJ	0.21			
Endosulfan I	0.18	UJ	0.18	0.18	UJ	0.18	0.17	UJ	0.17			
Endosulfan II	0.30	UJ	0.30	0.30	UJ	0.30	0.28	UJ	0.28			
Endosulfan sulfate	0.29	UJ	0.29	0.28	UJ	0.28	0.27	UJ	0.27			
Endrin	0.32	UJ	0.32	0.32	UJ	0.32	0.30	UJ	0.30			
Endrin aldehyde	0.18	UJ	0.18	0.18	UJ	0.18	0.17	UJ	0.17			
Endrin ketone	0.51	UJ	0.51	0.50	UJ	0.50	0.48	UJ	0.48			
Gamma-BHC (Lindane)	0.48	UJ	0.48	0.48	UJ	0.48	0.46	UJ	0.46			
gamma-Chlordane	0.28	UJ	0.28	0.27	UJ	0.27	0.26	UJ	0.26			
Heptachlor	0.22	UJ	0.22	0.22	UJ	0.22	0.21	UJ	0.21			
Heptachlor epoxide	0.44	UJ	0.44	0.44	UJ	0.44	0.42	UJ	0.42			
Methoxychlor	0.47	UJ	0.47	0.46	UJ	0.46	0.45	UJ	0.45			
Toxaphene	16	UJ	16	16	UJ	16	16	UJ	16			
POLYCHLORINATED BIPHENYLS (PCBs)												
Aroclor-1016	2.8	U	2.8	2.7	U	2.7	2.8	U	2.8			
Aroclor-1221	8.2	U	8.2	7.7	U	7.7	8.2	U	8.2			
Aroclor-1232	2.1	U	2.1	1.9	U	1.9	2.0	U	2.0			
Aroclor-1242	4.8	U	4.8	4.5	U	4.5	4.8	U	4.8			
Aroclor-1248	4.8	U	4.8	4.5	U	4.5	4.8	U	4.8			
Aroclor-1254	2.7	U	2.7	2.5	U	2.5	7.4	J	2.7			
Aroclor-1260	2.7	U	2.7	2.5	U	2.5	4.2	J	2.7			

Attachment	1	Sheet No.	3 of 4
Originator	I. B. Berezovskiy	Date	12/2/10
Checked	T. E. Queen	Date	12/2/10
Calc. No.	0100F-CA-V0367	Rev. No.	0

Attachment 1. 100-F-60 Waste Site Confirmatory Sample Results (TCLP - Metals).

Sample Location	HEIS Number	Sample Date	Arsenic			Barium			Cadmium			Chromium		
			mg/kg	Q	MDL	mg/kg	Q	MDL	mg/kg	Q	MDL	mg/kg	Q	MDL
Underlying soil	J1C390	9/15/10												
Duplicate of J1C390	J1C391	9/15/10												
Pipe contents	J1C389	9/15/10	0.022	U	0.022	0.62	BJ	0.0020	0.0020	U	0.0020	0.0031	B	0.0030
Equipment Blank	J1C388	9/15/10												

Sample Location	HEIS Number	Sample Date	Lead			Mercury			Selenium			Silver		
			mg/kg	Q	MDL	mg/kg	Q	MDL	mg/kg	Q	MDL	mg/kg	Q	MDL
Underlying soil	J1C390	9/15/10												
Duplicate of J1C390	J1C391	9/15/10												
Pipe contents	J1C389	9/15/10	0.83		0.013	0.000082	BJN	0.000030	0.035	B	0.024	0.0040	U	0.0040
Equipment Blank	J1C388	9/15/10												

Attachment	1	Sheet No.	4 of 4
Originator	I. B. Berezovskiy	Date	12/2/10
Checked	T. E. Queen	Date	12/2/10
Calc. No.	0100F-CA-V0367	Rev. No.	0

APPENDIX B

DATA QUALITY ASSESSMENT

APPENDIX B

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 (WHC 2010b). This DQA was performed in accordance with site-specific data quality objectives found in the *100 Area Remedial Action Sampling and Analysis Plan* (SAP) (DOE-RL 2009).

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

Confirmatory sample data collected at the 100-F-60 waste site were provided by the laboratory in sample delivery group (SDG) J00860. SDG J00860 comprises three samples (J1C389-J1C391). A duplicate pair (J1C390/J1C391) is included in this SDG. These samples were analyzed for inductively couples plasma (ICP) metals, mercury, semivolatile organic compounds (SVOCs), pesticides, and polychlorinated biphenyls (PCBs). In addition, one equipment blank (J1C388) was collected and analyzed for ICP metals, mercury, and SVOCs. Sampling delivery group J00860 was submitted for third-party validation. No major deficiencies were identified in the analytical data set. Minor deficiencies are discussed 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.

In the pesticides analysis, the preparation holding time was exceeded by less than twice the limit of 14 days. Third-party validation flagged the pesticide results as estimated with a "J" flag. The samples were collected on September 15, 2010, and prepared on September 29, 2010. The data are useable for decision-making purposes.

All of the toxaphene data in SDG J00860 were qualified by third-party validation as estimated with "J" flags, due to lack of a matrix spike (MS), matrix spike duplicate (MSD), or lab control sample (LCS) analysis for the analyte. Estimated, or "J"-flagged, data are acceptable for decision-making purposes.

In the ICP metals analysis, the chromium result for sample J1C388 (the equipment blank) is of similar magnitude as the method blank result. Third-party validation qualified the result for

chromium in sample J1C388 as undetected and flagged "UJ" due to method blank contamination. The data are useable for decision-making purposes.

In the ICP metals analysis, the MS recoveries were out of project acceptance criteria for aluminum, iron, and silicon. For iron, the spiking concentration is insignificant compared to the native concentration in the sample from which the MS was prepared. The deficiency in the MS result is a reflection of the analytical variability of the native concentration rather than a measure of the recovery from the sample. Aluminum and silicon did not have mismatched spike and native concentrations in the original MS. The original MS recoveries for aluminum and silicon were 325% and 35%, respectively. All aluminum and silicon data for SDG J00860 were considered estimated and flagged "J" by third-party validation due to the MS recoveries outside the quality control (QC) limits. Estimated data are useable for decision-making purposes.

In the ICP metals analysis, all silicon results were qualified as estimates and flagged "J" by third-party validation, due to an LCS below QC limits at 26%. Estimated data are useable for decision-making purposes.

In the ICP metals analysis, all iron and manganese results were qualified as estimates and flagged "J" by third-party validation, due to relative percent differences (RPDs) above QC limits at 49% and 82%, respectively. Estimated data are useable for decision-making purposes.

FIELD QUALITY ASSURANCE/QUALITY CONTROL

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

Field quality assurance/quality control (QA/QC) measures are used to assess potential sources of error and cross contamination of samples that could bias results. Field QA/QC samples listed in the field logbook (WCH 2010a) are the 100-F-60 primary and duplicate samples (J1C390/J1C391). The main and QA/QC sample results are presented in Appendix A.

Field duplicate samples are collected to provide a relative measure of the degree of local heterogeneity in the sampling medium, unlike laboratory duplicates that are used to evaluate precision in the analytical process. The field duplicates are evaluated by computing the RPD of the sample/duplicate pair(s) for each contaminant of potential concern. The RPDs are not calculated for analytes that are not detected in both the main and duplicate sample at more than 5 times the target detection limit. The RPDs of analytes detected at low concentrations (less than 5 times the detection limit) are not considered to be indicative of the analytical system performance. The RPD calculation brief in Appendix B provides details on duplicate pair evaluation and RPD calculation.

No RPDs in the field duplicate sample are above the acceptance criteria (30%). A secondary check of the data variability is used when one or both of the samples being evaluated (main and duplicate) is less than 5 times the target detection limit (TDL), including undetected analytes. In

these cases, a control limit of ± 2 times the TDL is used (Appendix A) to indicate that a visual check of the data is required by the reviewer. No data 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 useable 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-F-60 waste site 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-F-60 waste site 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 Environmental Restoration (ENRE) project-specific database prior to being submitted for inclusion in the Hanford Environmental Information System (HEIS) database. The confirmatory sample analytical data are also summarized in Appendix A.

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, 2010a, *100 Area Confirmatory Sampling*, Logbook EL-1649, pp. 49-50, Washington Closure Hanford, Richland, Washington.

WCH, 2010b, *Work Instruction for Confirmatory Sampling of the 100-F-60, Cast Iron Pipe,* Work Instruction No. 0100F-WI-G0072, Rev. 0, Washington Closure Hanford, Richland, Washington.