RECEIVED
FEB 12 2015
EDMC

1228674

WASTE SITE RECLASSIFICATION FORM

Operable Unit: 100-DR-1 **Control No.:** 2014-101
Waste Site Code(s)/Subsite Code(s): 100-D-83:3

Reclassification Category: Interim ☒ Final ☐
Reclassification Status: Closed Out ☒ No Action ☐ Rejected ☐
RCRA Post-closure ☐ Consolidated ☐ None ☐
Approvals Needed: DOE ☒ Ecology ☒ EPA ☐

Description of current waste site condition:

The 100-D-83:3, 108-D Acid Addition Facility Pipelines subsite consisted of the pipeline segments associated with the 108-D Acid Addition Facility (100-D-101) and included a sulfuric acid pipeline and a process sewer pipeline. A short segment of 100-D-83:3 pipeline south of the former 108-D sulfuric acid tanks had been previously removed with the 100-D-31:3, 105-D Sewer Pipelines remediation. Because the 100-D-83:3 pipeline drained into the 100-D-31:3 pipeline, the elevation of the 100-D-83:3 segment would have been above the 100-D-31:3 pipeline and it would have been removed when the 100-D-31:3 pipeline was removed.

The 100-D-83:3 subsite was identified for remediation 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), and 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).

Remedial action at the 100-D-83:3 subsite was performed on April 7, 2014. The waste from the site included soil and debris including steel piping, concrete, and brick. A small amount of acid-stained soil was removed in the northern portion of the waste site. Excavation extended to a maximum depth of approximately 2.4 m (8 ft) below ground surface.

Approximately 150 bank cubic meters (196 bank cubic yards) of contaminated soil and debris was removed and staged at the staging pile area. The staging pile area received waste from the 100-D-83:3 subsite on April 7, 2014. Waste loadout with disposal at the Environmental Restoration Disposal Facility was completed on July 1, 2014. No anomalies were discovered during remediation.

Verification soil samples were collected at three decision units, the excavation and overburden areas on June 3, 2014, and the staging pile area on July 23, 2014. Remediation, verification sampling, and comparison of verification sample results against cleanup levels have been performed in accordance with the remedial action objectives and goals established by 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). The selected action involved (1) excavating the site to the extent required to meet specified soil cleanup levels, (2) disposing of contaminated excavation materials at the Environmental Restoration Disposal Facility, (3) demonstrating through verification sampling that cleanup goals have been achieved, and (4) proposing the site for reclassification to Interim Closed Out.

Basis for reclassification:

In accordance with this evaluation, the verification sampling and modeling results support a reclassification of the 100-D-83:3 subsite to Interim Closed Out. The current site conditions achieve the remedial action objectives and the corresponding remedial action goals established in the Remaining Sites ROD (EPA 1999) and the 100 Area RDR/RAWP (DOE-RL 2009b). The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bound by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). Contamination did not extend into the deep vadose zone (greater than 4.6 m [15 ft] deep); therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep vadose zone of the site are not required. The basis for reclassification is described in detail in the *Remaining Sites Verification Package for the 100-D-83:3, 108-D Acid Addition Facility Pipelines Subsite* (attached).

Closure ref - 12.2.8673

WASTE SITE RECLASSIFICATION FORM

Operable Unit: 100-DR-1 **Control No.:** 2014-101
Waste Site Code(s)/Subsite Code(s): 100-D-83:3

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		1/7/15
DOE Federal Project Director (printed)	Signature	Date
N. Menard		1/7/15
Ecology Project Manager (printed)	Signature	Date
N/A		
EPA Project Manager (printed)	Signature	Date

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-D-83:3, 108-D ACID ADDITION FACILITY PIPELINES SUBSITE

Attachment to Waste Site Reclassification Form 2014-101

January 2015

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-D-83:3, 108-D ACID ADDITION FACILITY PIPELINES SUBSITE

EXECUTIVE SUMMARY

The 100-D-83:3 subsite was identified for remediation in the *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington* (EPA 2009) and 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).

Remedial action at the 100-D-83:3 subsite was performed on April 7, 2014. The waste from the site included soil and debris including steel piping, concrete, and brick. A small amount of acid-stained soil was removed in the northern portion of the waste site. Excavation extended to a maximum depth of approximately 2.4 m (8 ft) below ground surface.

Approximately 150 bank cubic meters (196 bank cubic yards) of contaminated soil and debris was removed and staged at the staging pile area. The staging pile area received waste from the 100-D-83:3 subsite on April 7, 2014. Waste loadout with disposal at the Environmental Restoration Disposal Facility was completed on July 1, 2014. No anomalies were discovered during remediation.

Verification soil samples were collected at three decision units, the excavation and overburden areas on June 3, 2014, and the staging pile area on July 23, 2014. The verification sampling results indicate that the 100-D-83:3 subsite remedial action achieved compliance with the remedial action objectives and remedial action goals established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (100 Area RDR/RAWP) (DOE-RL 2009b) and the Remaining Sites ROD (EPA 1999).

A summary of the cleanup evaluation for the results from the verification sampling against the applicable criteria is presented in Table ES-1. The results of the verification sampling are used to make reclassification decisions for the 100-D-83:3 subsite in accordance with the TPA-MP-14 procedure in the *Tri-Party Agreement Handbook Management Procedures* (DOE-RL 2011).

Table ES-1. Summary of Remedial Action Goals for the 100-D-83:3 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-83:3 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 (1.4×10^{-2}) 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 9.8×10^{-7}.	
Groundwater/River Protection – Radionuclides	Attain single COPC groundwater and river RAGs.	Radionuclides were not COPCs for the 100-D-83:3 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.	Lead, selenium, benzo(a)anthracene, benzo(a)pyrene, 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 100 Area 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 100 Area RDR/RAWP (DOE-RL 2009b), residual concentrations of lead, selenium, benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene are predicted not to migrate more than 15 m (49 ft) vertically within 1,000 years (based on the contaminant with the lowest K_d of the contaminants exceeding the RAGs, selenium, with a K_d of 5 mL/g). The vadose zone underlying the soil below the waste site is approximately 22 m (72 ft) thick. Therefore, residual concentrations of these constituents are predicted to be protective of groundwater and consequently are protective of the Columbia River.

COPC = contaminant of potential concern
DOE = U.S. Department of Energy
K_d = distribution coefficient
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)

In accordance with this evaluation, the verification sampling and modeling results support a reclassification of this waste site to Interim Closed Out. The current site conditions achieve the remedial action objectives and the corresponding remedial action goals established in the 100 Area RDR/RAWP (DOE-RL 2009b) and the Remaining Sites ROD (EPA 1999). The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (surface to 4.6 m [15 ft] bgs) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River; 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 on a limited ecological risk assessment. Although not required by the Remaining Sites ROD (EPA 1999), a comparison against ecological risk screening levels has been made for the 100-D-83:3 subsite contaminants of potential concern and other constituents (Appendix A). The higher of the maximum or statistical values were considered for comparison. Those constituents exceeding an ecological screening level in the *Washington Administrative Code* (WAC) 173-340, "Model Toxics Control Act – Cleanup," are arsenic, boron, lead, mercury, selenium, and vanadium. The U.S. Environmental Protection Agency ecological soil screening levels are exceeded by antimony, lead, manganese, selenium, vanadium, and zinc. Exceeding screening values does not necessarily indicate the existence of risk to ecological receptors. Because concentrations of antimony, manganese, mercury, vanadium, and zinc are below 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 this site.

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-D-83:3, 108-D ACID ADDITION FACILITY PIPELINES SUBSITE

STATEMENT OF PROTECTIVENESS

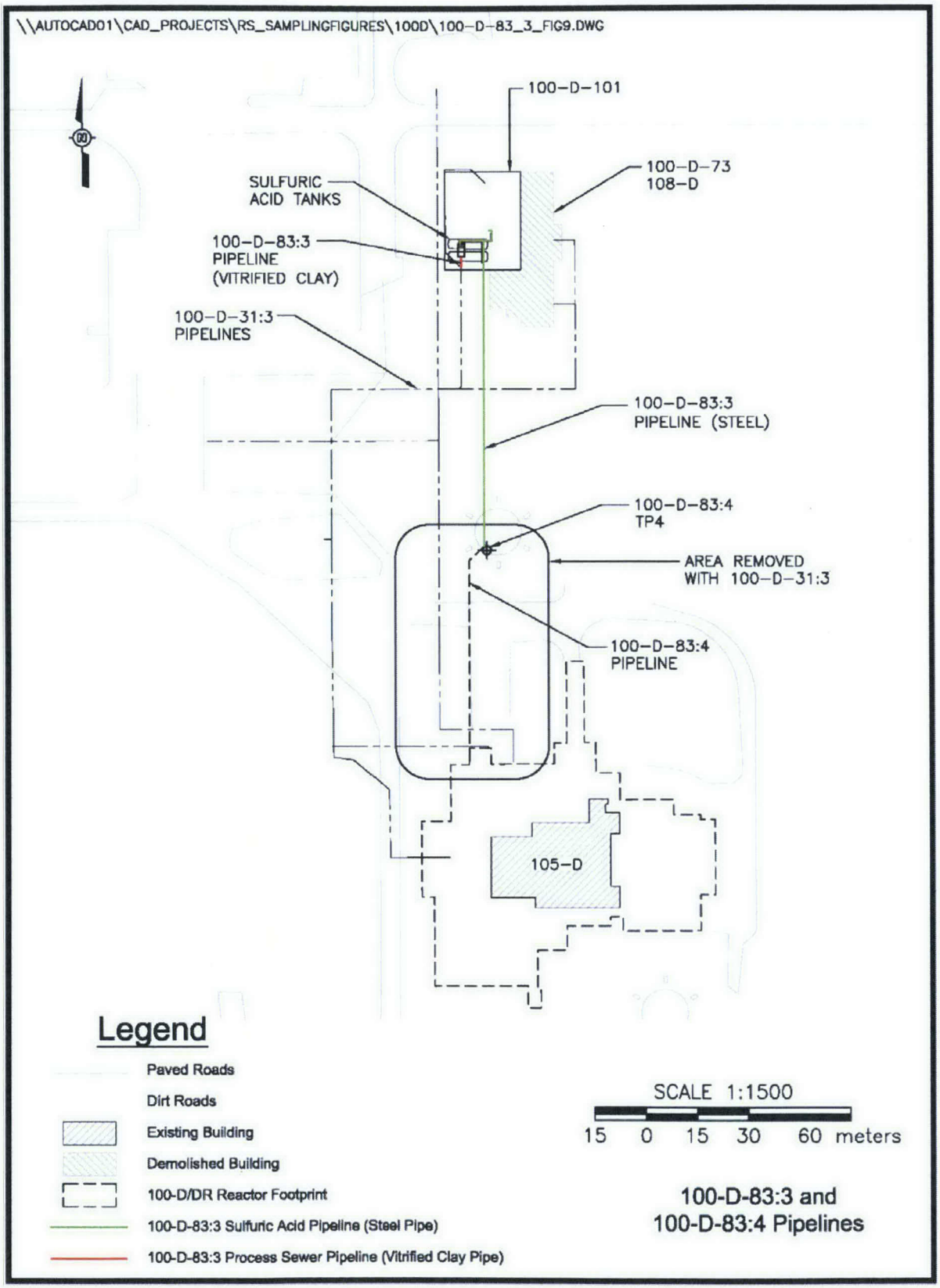
The 100-D-83:3, 108-D Acid Addition Facility Pipelines subsite verification sampling data, site evaluations, and supporting documentation demonstrate that this site meets the objectives to support a reclassification of this site to Interim Closed Out as established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (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). The results show that residual soil concentrations support 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; 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 (EPA 1999), a comparison against ecological risk screening levels has been made for the 100-D-83:3 subsite contaminants of concern and other constituents (Appendix A). The higher of the maximum or statistical values were considered for comparison. The U.S. Environmental Protection Agency (EPA) ecological soil screening levels were exceeded for antimony, lead, manganese, selenium, vanadium, and zinc. Ecological screening levels from *Washington Administrative Code* (WAC) 173-340, "Model Toxics Control Act – Cleanup," were exceeded for arsenic, boron, lead, mercury, selenium, and vanadium. Exceeding screening values is intended to trigger additional evaluation and does not necessarily indicate the existence of risk to ecological receptors. Because concentrations of antimony, manganese, mercury, vanadium, and zinc 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.

SITE LOCATION

The 100-D-83:3 subsite is located in the 100-DR-1 operable unit of the Hanford Site. The north end of the 100-D-83:3 subsite is approximately 10 m (33 ft) west of the 108-D Chemical Pump House (Figure 1).

Figure 1. 100-D-83:3 Subsite Location Map.



HISTORICAL INFORMATION

The 100-D-83:3 subsite includes the northern segments of a sulfuric acid pipeline (5-cm [2-in.]-diameter steel pipe) between the 108-D tanks and the 105-D Reactor and a process sewer pipeline (15-cm [6-in.] diameter vitrified clay pipe [VCP]) between the 108-D acid neutralization pit and the 100-D-31:3 pipelines (Figure 1). Sulfuric acid was added to the cooling water upstream of the reactor to lower the pH. This acid was stored in two aboveground storage tanks west of the 108-D Acid Addition Facility (100-D-101). The acid was carried to the 105-D Reactor Building by a 5-cm (2-in.)-diameter steel pipe (part of the 100-D-83:3 subsite). The acid neutralization pit at the 108-D facility was used to adjust the pH of waste acid so it could be disposed of. The pit drained to the process sewer (100-D-31:3) through a 15-cm (6-in.) diameter VCP (also part of the 100-D-83:3 subsite). The acid neutralization pit was within the 100-D-101, 108-D Acid Pit and Sump, 108-D Car Spot, 108-D Sodium Silicate Sump, 108-D Storage Tanks, Miscellaneous Structures waste site.

The southern segment of the pipelines between the 108-D tanks and the 105-D Reactor is 100-D-83:4. It was located south of the 187-D1 water tower and was investigated during confirmatory sampling of 100-D-83:4 at Test Pit 4 in August 2010. During the field investigation, no pipe was found south of the 187-D1 elevated water tank. This southern segment of pipelines was within the 100-D-31:3 remediation area and was determined to have been previously removed (WCH 2011). However, a concrete structure and vertical 61-cm (24-in.)-diameter VCP was found 2 m (6 ft) north of the 100-D-83:4 test pit 4 sample location at 1.2 m (4 ft) below ground surface (bgs). This location was within the footprint of the former 187-D1 Emergency Water Tank. The VCP and concrete structure found during confirmatory sampling were likely related to remaining subsurface 187-D1 structures or debris. The 100-D-83:4 subsite was reclassified to Interim No Action. The 100-D-83:3 pipelines were recommended for remedial action based upon the association with the 108-D tanks (WCH 2010).

REMEDIAL ACTION SUMMARY

Remedial action at the 100-D-83:3 subsite was performed on April 7, 2014. The waste from the site included soil and debris including steel piping, concrete, and brick. A small amount of acid-stained soil was removed in the northern portion of the waste site. Excavation extended to a maximum depth of approximately 2.4 m (8 ft) bgs.

Approximately 150 bank cubic meters (196 bank cubic yards) of contaminated soil and debris was removed and staged at the staging pile area (SPA). The SPA received waste from the 100-D-83:3 subsite on April 7, 2014. Waste loadout with disposal at the Environmental Restoration Disposal Facility was completed on July 1, 2014. No anomalies were discovered during remediation. Figures 2 and 3 show the excavated waste site along with the overburden pile and staging pile.

Figure 2. 100-D-83:3 Subsite Post Excavation and Staging Pile Area.

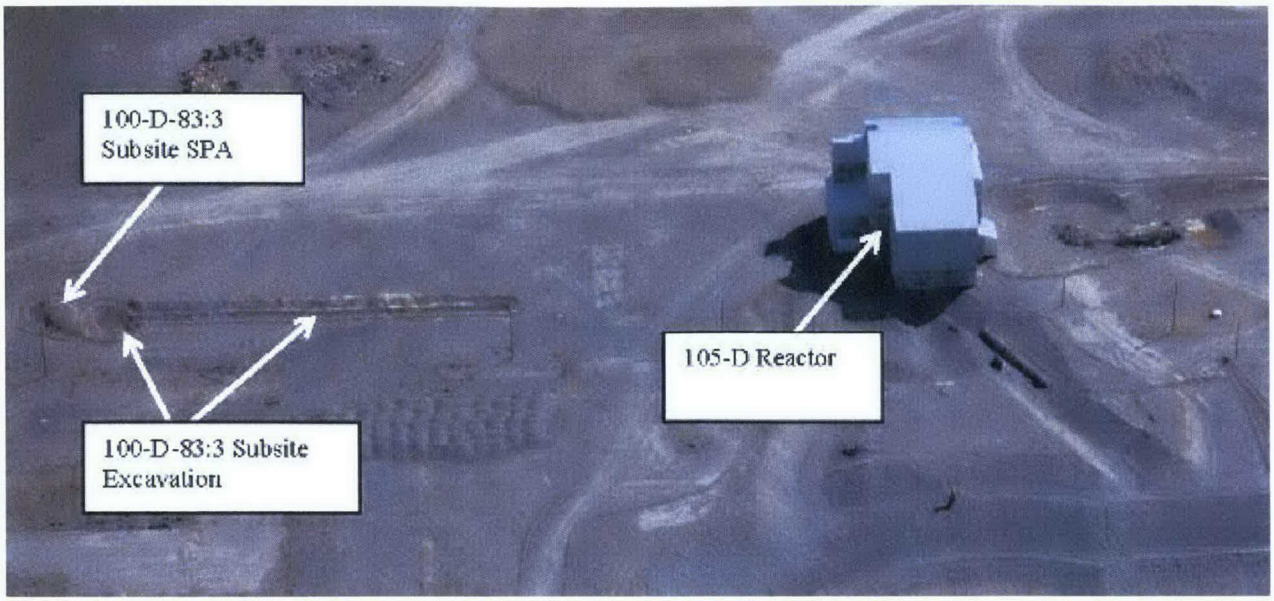
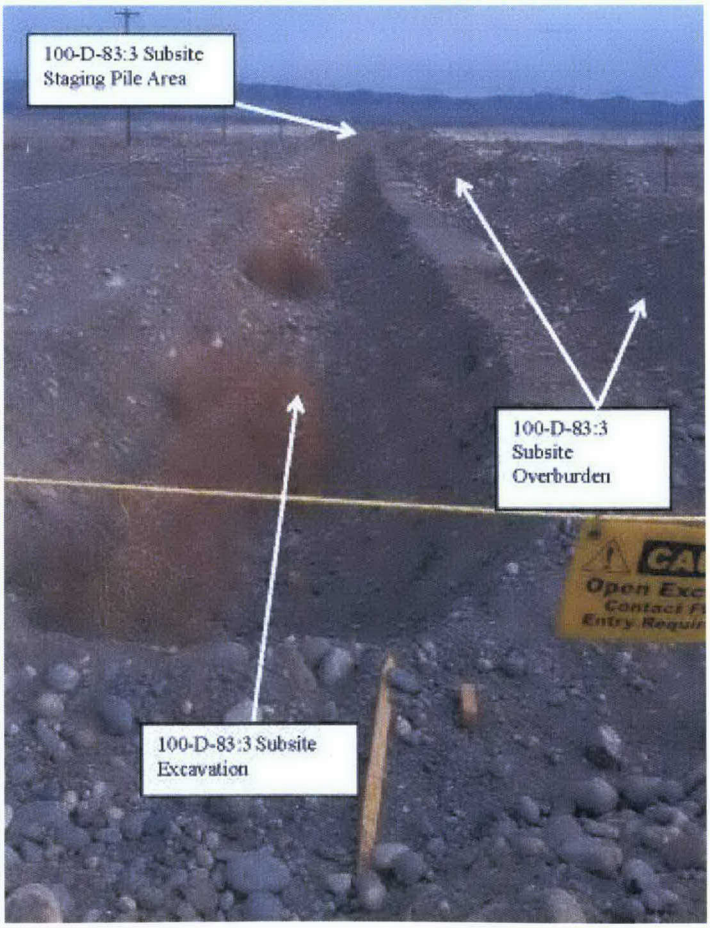


Figure 3. 100-D-83:3 Subsite Post Excavation, Overburden, and Staging Pile Area.



VERIFICATION SAMPLING ACTIVITIES

Verification soil samples were collected at three decision units, the excavation and overburden areas on June 3, 2014, and the staging pile area on July 23, 2014.

This section summarizes the statistical verification sampling designs for the 100-D-83:3 subsite excavation, overburden, and staging pile area. Table 1 provides a summary of the analytical methods used during sampling and Table 2 shows the individual samples collected and their locations.

Table 1. 100-D-83:3 Laboratory Analytical Methods.

Analytical Method	Contaminant of Potential Concern
ICP metals [a] – EPA Method 6010	Chromium (total), lead
Mercury – EPA Method 7471	Mercury
Hexavalent chromium – EPA Method 7196	Hexavalent chromium
IC anions – EPA Method 300.0 [b]	Nitrate, sulfate
Nitrate/nitrite – EPA Method 353.2	Nitrate
SVOA– EPA Method 8270	Semivolatile organic compounds
pH—EPA Method 9045	pH

[a] The expanded list of ICP metals was requested to include antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.
[b] The extended list of IC anions including bromide, chloride, fluoride, nitrate, nitrite, phosphate, and sulfate were requested. To preclude holding time issues for nitrate and nitrite with EPA Method 300.0. EPA Method 353.2 was also performed.

EPA = U.S. Environmental Protection Agency
IC = ion chromatography
ICP = inductively coupled plasma
SVOA = semivolatile organic analysis

Table 2. 100-D-83:3 Verification Sample Summary. (2 Pages)

Sample Location	HEIS Sample Number	Washington State Plane Coordinates (m)		Sample Analysis [a]
		Northing	Easting	
EXC-1	J1TRK3	151685.3	573743.4	ICP metals [b], mercury, hexavalent chromium, IC anions, nitrate/nitrite, SVOA, and pH
EXC-2	J1TRK4	151696.5	573743.4	
EXC-3	J1TRK5	151707.8	573743.4	
EXC-4	J1TRK6	151719.1	573743.4	
EXC-5	J1TRK7	151730.4	573743.4	
EXC-6	J1TRK8	151741.7	573743.4	
EXC-7	J1TRK9	151752.9	573743.4	
EXC-8	J1TRL0	151764.2	573743.4	
EXC-9	J1TRL1	151769.8	573740.1	
EXC-10	J1TRL2	151769.8	573746.6	
EXC-11	J1TRL3	151775.5	573736.9	
EXC-12	J1TRL4	151775.5	573743.4	
Duplicate of J1TRK3	J1TRL5	151685.3	573743.4	

Table 2. 100-D-83:3 Verification Sample Summary. (2 Pages)

Sample Location	HEIS Sample Number	Washington State Plane Coordinates (m)		Sample Analysis [a]
		Northing	Easting	
OB-1	J1TRL6	151688.5	573746.7	ICP metals [b], mercury, hexavalent chromium, IC anions, nitrate/nitrite, SVOA, pH
OB-2	J1TRL7	151693.8	573749.5	
OB-3	J1TRL8	151699.0	573746.4	
OB-4	J1TRL9	151704.3	573749.3	
OB-5	J1TRM0	151709.5	573746.1	
OB-6	J1TRM1	151714.8	573749.0	
OB-7	J1TRM2	151720.0	573745.8	
OB-8	J1TRM3	151725.3	573748.7	
OB-9	J1TRM4	151735.8	573748.4	
OB-10	J1TRM5	151746.3	573748.1	
OB-11	J1TRM6	151756.8	573747.9	
OB-12	J1TRM7	151767.3	573747.6	
Duplicate of J1TRM7	J1TRM8	151767.3	573747.6	
SPA-1	J1TRM9	151779.7	573738.2	
SPA-2	J1TRN0	151779.7	573742.0	
SPA-3	J1TRN1	151779.7	573745.9	
SPA-4	J1TRN2	151783.1	573740.1	
SPA-5	J1TRN3	151783.1	573744.0	
SPA-6	J1TRN4	151783.1	573747.8	
SPA-7	J1TRN5	151783.1	573751.6	
SPA-8	J1TRN6	151786.4	573742.0	
SPA-9	J1TRN7	151786.4	573745.9	
SPA-10	J1TRN8	151786.4	573749.7	
SPA-11	J1TRN9	151786.4	573753.6	
SPA-12	J1TRP0	151789.7	573747.8	
Duplicate of J1TRM9	J1TRP1	151779.7	573738.2	
Equipment blank	J1TRP2	NA	NA	ICP metals [b], mercury, SVOA

[a] Grab samples were collected at each location and sample analysis were performed as defined in Table 1. All sampling was performed in accordance with ENV-1, *Environmental Monitoring and Management* consistent with the 100 Area SAP (DOE-RL 2009a) requirements.

[b] The expanded list of ICP metals requested included antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.

EXC = excavation
HEIS = Hanford Environmental Information System
IC = ion chromatography
ICP = inductively coupled plasma
NA = not applicable
OB = overburden
SAP = sampling and analysis plan
SPA = staging pile area
SVOA = semivolatile organic analysis

Contaminants of Potential Concern for Verification Sampling

The contaminants of potential concern (COPCs) for the 100-D-83:3 subsite were identified based on COPCs for the 100-D-83:4 and 100-D-101 waste sites and results from waste characterization sampling. For verification sampling, chromium (total), lead, zinc, hexavalent chromium, mercury, semivolatile organic compounds, nitrate, sulfate, and pH are the COPCs. Radionuclides are not COPCs at the 100-D-83:3 subsite. The analytical methods that were performed are provided in Table 1.

Verification Sampling Design

Figures 4 and 5 show the verification sample locations for the excavation, overburden, and staging pile areas.

Figure 4. Verification Sample Locations for the 100-D-83:3 Subsite Excavation and Overburden Areas.

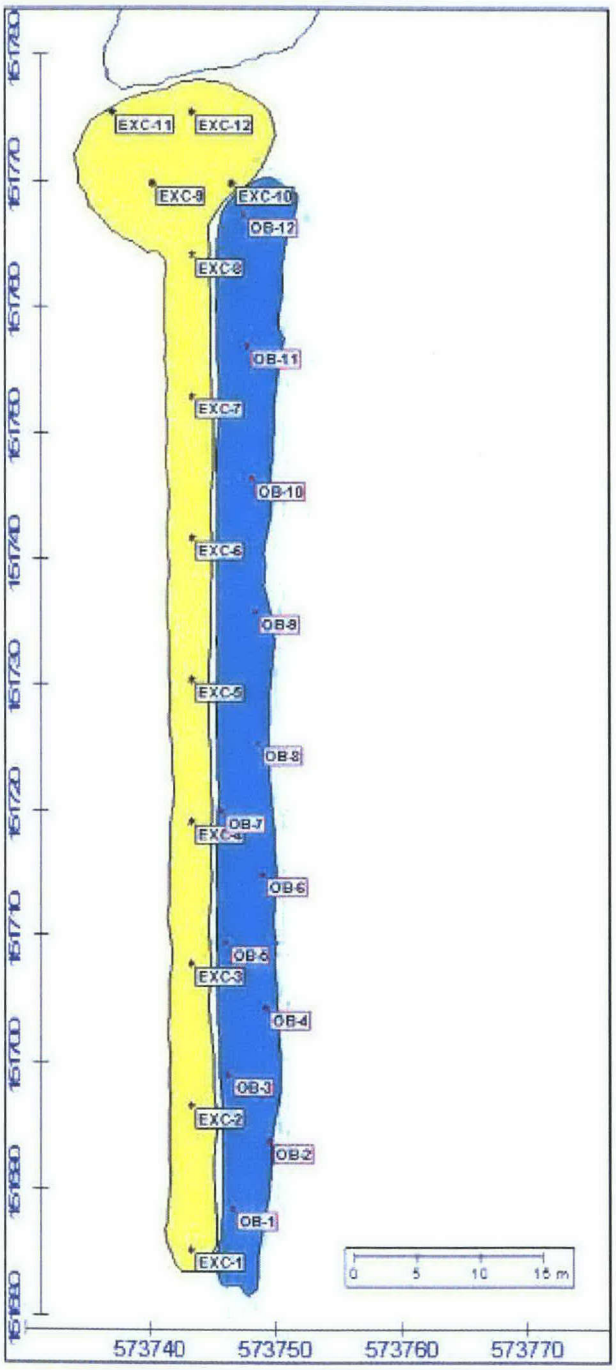
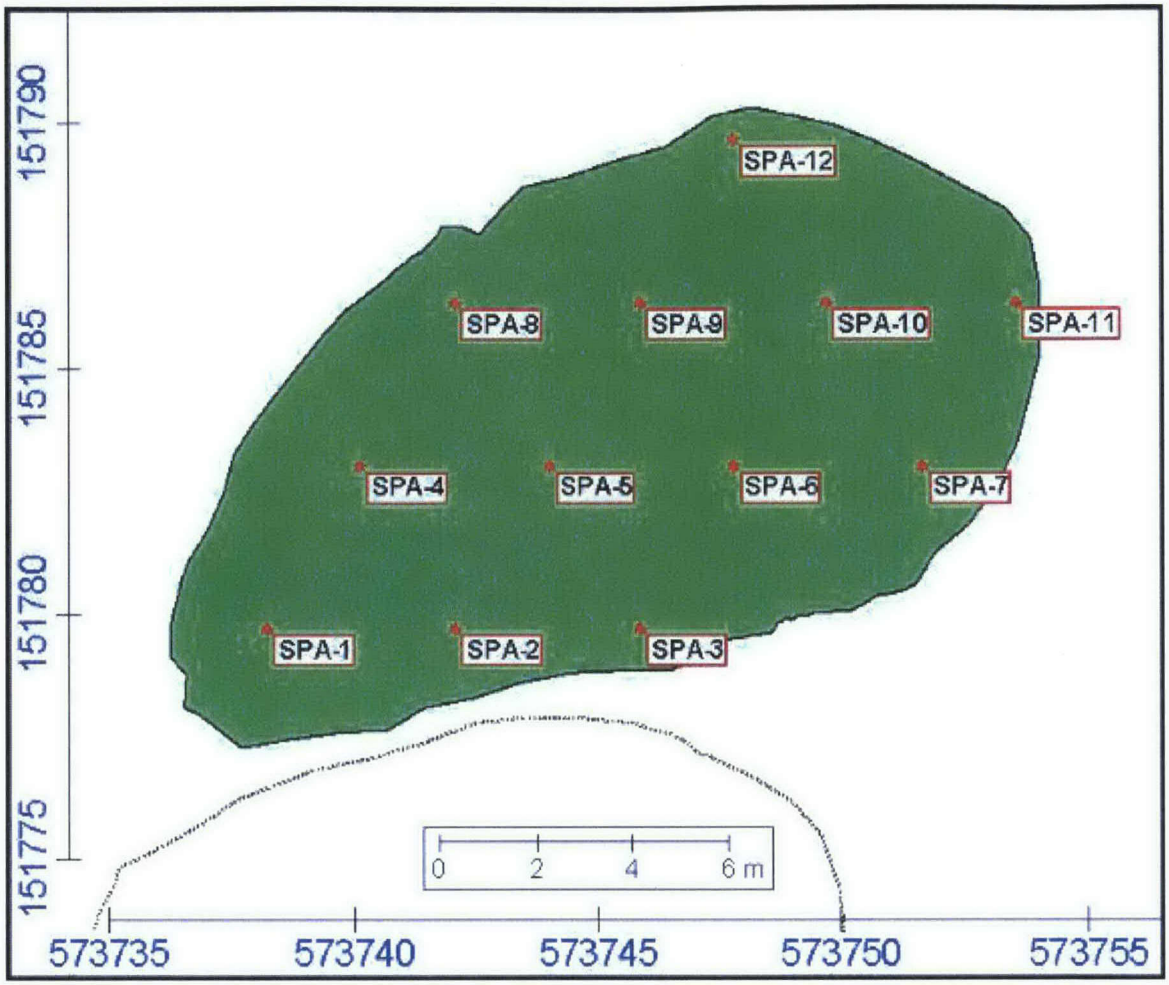


Figure 5. Verification Sample Locations for 100-D-83:3 Subsite Staging Pile Area.



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). Additional information related to the verification sampling can be found in the field sampling logbook (WCH 2014a). The Washington State plan coordinates, sample numbers, and sample analysis methods for the verification samples collected are provided in Table 2.

Verification Sample Results

All verification samples were analyzed using EPA-approved analytical methods. Evaluation of the verification data was performed by direct comparison of the statistical or maximum sample results for each COPC against the cleanup criteria. The primary statistical calculation to evaluate compliance with cleanup standards is the 95% upper confidence limit (UCL) on the arithmetic mean of the data. The 95% UCL values for each detected COPC are computed for each of the decision units as specified by the 100 Area RDR/RAWP (DOE-RL 2009b). The calculations are provided in Appendix B.

When a nonradionuclide COPC was detected in fewer than 50% of the verification samples collected for the decision unit, the maximum detected value was used for comparison to the remedial action goals (RAGs). If no detections for a given COPC were reported in the data set, then no statistical calculation or evaluation was performed for that COPC.

Comparisons of the results for site COPCs with the RAGs are summarized in Tables 3 through 5. Table 3 presents a summary using the statistical or maximum sample result for all the data collected from the excavation sampling area. Table 4 compares the results for the overburden decision unit and Table 5 compares the results for the SPA. 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 *Washington Administrative Code* (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 the tables. The complete laboratory results for all constituents are stored in the Washington Closure Hanford (WCH) project-specific database prior to archival in the Hanford Environmental Information System (HEIS). The verification sampling analyses are presented in the 95% UCL calculations (Appendix B).

Table 3. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-D-83:3 Subsite Excavation Statistical or Maximum Verification Sample Results. (2 Pages)

COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Antimony	0.50 (<BG)	32	5 [c]	5 [c]	No	--
Arsenic	2.3 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	66.6 (<BG)	5,600	200	400	No	--
Beryllium	0.046 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Boron [e]	1.3	7,200	320	-- [f]	No	--
Cadmium [g]	0.17 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	7.1 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	7.9 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	15.5 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [e]	0.389	2.1	4.8	2	No	--
Lead	8.4 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	299 (<BG)	3,760	512 [c]	512 [c]	No	--
Mercury	0.22 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Molybdenum [e]	0.32	400	8	-- [f]	No	--
Nickel	8.6 (<BG)	1,600	19.1 [c]	27.4	No	--
Vanadium	56.3 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	41.7 (<BG)	24,000	480	67.8 [c]	No	--
Chloride	9.8 (<BG)	--	25,000	--	No	--
Fluoride	0.98 (<BG)	4,800	96	400	No	--
Nitrogen as nitrate	2.0 (<BG)	128,000	1,000	2,000	No	--

Table 3. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-D-83:3 Subsite Excavation Statistical or Maximum Verification Sample Results. (2 Pages)

COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Nitrogen as nitrate and nitrite	1.7 (<BG)	128,000	1,000	2,000	No	--
Sulfate	93.5 (<BG)	--	25,000	--	No	--
Benzo(a)anthracene	0.078	1.37	0.015 [h]	0.015 [h]	Yes	Yes [i]
Benzo(a)pyrene	0.071	0.137	0.015 [h]	0.015 [h]	Yes	Yes [i]
Benzo(b)fluoranthene	0.094	1.37	0.015 [h]	0.015 [h]	Yes	Yes [i]
Benzo(ghi)perylene [j]	0.042	2,400	48	192	No	--
Chrysene	0.090	13.7	0.12	0.1 [h]	No	--
Dimethyl phthalate	0.038	80,000	1,600	14,400	No	--
Fluoranthene	0.14	3,200	64	18.0	No	--
Indeno(1,2,3-cd)pyrene	0.097	1.37	0.33 [h]	0.33 [h]	No	--
Phenanthrene [j]	0.070	24,000	240	1,920	No	--
Pyrene	0.046	2,400	48	192	No	--

[a] RAGs obtained from the 100 Area RDR/RAWP (DOE-RL 2009b).

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Appendix B (0100D-CA-V0542).

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (Ecology 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 2009b).

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

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

[f] No parameters (bioconcentration factors or AWQC values) are available from the Cleanup Levels and Risk Calculations Database (Ecology 2014) or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii] [Ecology 1996], [Method B for surface waters]).

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

[h] Where cleanup levels are less than RDLs, cleanup levels default to RDLs per WAC 173-340-707(2) (Ecology 1996). The cited RDLs are based on EPA-approved analytical methods that may not be available for rapid turnaround analyses. Prior notification and concurrence with the laboratory may be necessary to analyze to meet this RDL. Actual detection limits may differ from any RDL.

[i] Based on RESRAD modeling discussed in Appendix C of the 100 Area RDR/RAWP (DOE-RL 2009b), the residual concentrations of benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene are not predicted to migrate vertically within 1,000 years (based on the contaminant with the lowest distribution coefficient of the contaminants exceeding RAGs, benzo(a)anthracene, with a distribution coefficient value of 360 mL/g). The distance to groundwater from the bottom of the excavation area is 22 m (72 ft). Therefore, residual concentrations of these constituents are predicted to be protective of groundwater and the Columbia River.

[j] Toxicity data for this chemical are not available. Cleanup levels are based on surrogate chemicals:
Contaminant: benzo(g,h,i)perylene; surrogate: pyrene
Contaminant: phenanthrene; surrogate: anthracene

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COPC = contaminant of potential concern
EPA = U.S. Environmental Protection Agency
RAG = remedial action goal
RDL = required detection limit
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table 4. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-D-83:3 Subsite Overburden Statistical or Maximum Verification Samples. (2 Pages)

COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Antimony	0.68 (<BG)	32	5 [c]	5 [c]	No	--
Arsenic	3.3 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	79.1 (<BG)	5,600	200	400	No	--
Beryllium	0.059 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Boron [e]	1.2	7,200	320	-- [f]	No	--
Cadmium [g]	0.20 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	8.6 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	7.7 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	14.8 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [e]	0.399	2.1	4.8	2	No	--
Lead	9.9 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	302 (<BG)	3,760	512 [c]	512 [c]	No	--
Mercury	0.038 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Molybdenum [e]	0.32	400	8	-- [f]	No	--
Nickel	8.8 (<BG)	1,600	19.1 [c]	27.4	No	--
Vanadium	52.6 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	39.5 (<BG)	24,000	480	67.8 [c]	No	--
Chloride	5.9 (<BG)	--	25,000	--	No	--
Fluoride	0.88 (<BG)	4,800	96	400	No	--
Nitrogen as nitrate	1.3 (<BG)	128,000	1,000	2,000	No	--
Nitrogen as nitrate and nitrite	1.2 (<BG)	128,000	1,000	2,000	No	--
Sulfate	12.5 (<BG)	--	25,000	--	No	--
Benzo(a)anthracene	0.061	1.37	0.015 [h]	0.015 [h]	Yes	Yes [i]
Benzo(a)pyrene	0.047	0.137	0.015 [h]	0.015 [h]	Yes	Yes [i]
Benzo(b)fluoranthene	0.090	1.37	0.015 [h]	0.015 [h]	Yes	Yes [i]
Benzo(ghi)perylene [j]	0.028	2,400	48	192	No	--
Chrysene	0.069	13.7	0.12	0.1 [h]	No	--
Dimethyl phthalate	0.040	80,000	1,600	14,400	No	--
Fluoranthene	0.11	3,200	64	18.0	No	--
Indeno(1,2,3-cd)pyrene	0.030	1.37	0.33 [h]	0.33 [h]	No	--
Phenanthrene [j]	0.063	24,000	240	1,920	No	--

Table 4. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-D-83:3 Subsite Overburden Statistical or Maximum Verification Samples. (2 Pages)

COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Pyrene	0.12	2,400	48	192	No	--

[a] RAGs obtained from the 100 Area RDR/RAWP (DOE-RL 2009b).

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Appendix B (0100D-CA-V0542).

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (Ecology 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 2009b).

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

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

[f] No parameters (bioconcentration factors or AWQC values) are available from the Cleanup Levels and Risk Calculations Database (Ecology 2014) or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii] [Ecology 1996], [Method B for surface waters]).

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

[h] Where cleanup levels are less than RDLs, cleanup levels default to RDLs per WAC 173-340-707(2) (Ecology 1996). The cited RDLs are based on EPA-approved analytical methods that may not be available for rapid turnaround analyses. Prior notification and concurrence with the laboratory may be necessary to analyze to meet this RDL. Actual detection limits may differ from any RDL.

[i] Based on RESRAD modeling discussed in Appendix C of the 100 Area RDR/RAWP (DOE-RL 2009b), the residual concentrations of benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene are not predicted to migrate vertically within 1,000 years (based on the contaminant with the lowest distribution coefficient of the contaminants exceeding RAGs, benzo(a)anthracene, with a distribution coefficient value of 360 mL/g). The distance to groundwater from the bottom of the excavation area is 22 m (72 ft). Therefore, residual concentrations of these constituents are predicted to be protective of groundwater and the Columbia River.

[j] Toxicity data for this chemical are not available. Cleanup levels are based on surrogate chemicals:
Contaminant: benzo(g,h,i)perylene; surrogate: pyrene
Contaminant: phenanthrene; surrogate: anthracene

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COPC = contaminant of potential concern
EPA = U.S. Environmental Protection Agency
RAG = remedial action goal
RDL = required detection limit
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table 5. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-D-83:3 Subsite Staging Pile Area Statistical or Maximum Verification Samples. (2 Pages)

COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Antimony	0.57 (<BG)	32	5 [c]	5 [c]	No	--
Arsenic	8.0	20 [c]	20 [c]	20 [c]	No	--
Barium	70.4 (<BG)	5,600	200	400	No	--
Beryllium	0.22 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Boron [e]	3.6	7,200	320	-- [f]	No	--
Cadmium [g]	0.19 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	10.9 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	8.3 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	17.4 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [e]	0.534	2.1	4.8	2	No	--
Lead	78.1	353	10.2 [c]	10.2 [c]	Yes	Yes [h]
Manganese	290 (<BG)	3,760	512 [c]	512 [c]	No	--
Mercury	0.071 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Molybdenum [e]	0.75	400	8	-- [f]	No	--
Nickel	12.0 (<BG)	1,600	19.1 [c]	27.4	No	--
Selenium	3.9	400	5	1	Yes	Yes [h]
Vanadium	53.1 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	47.2 (<BG)	24,000	480	67.8 [c]	No	--
Chloride	19.9 (<BG)	--	25,000	--	No	--
Fluoride	1.3 (<BG)	4,800	96	400	No	--
Nitrogen as nitrate	6.2 (<BG)	128,000	1,000	2,000	No	--
Nitrogen as nitrate and nitrite	5.4 (<BG)	128,000	1,000	2,000	No	--
Sulfate	172 (<BG)	--	25,000	--	No	--
Benzo(a)anthracene	0.025	1.37	0.015 [i]	0.015 [i]	Yes	Yes [h]
Benzo(a)pyrene	0.023	0.137	0.015 [i]	0.015 [i]	Yes	Yes [h]
Benzo(b)fluoranthene	0.036	1.37	0.015 [i]	0.015 [i]	Yes	Yes [h]
Chrysene	0.036	2,400	48	192	No	--
Fluoranthene	0.060	13.7	0.12	0.1 [i]	No	--
Indeno(1,2,3-cd)pyrene	0.069	80,000	1,600	14,400	No	--
Phenanthrene [j]	0.053	24,000	240	1,920	No	--

Table 5. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-D-83:3 Subsite Staging Pile Area Statistical or Maximum Verification Samples. (2 Pages)

COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Pyrene	0.051	1.37	0.33 [i]	0.33 [i]	No	--

[a] RAGs obtained from the 100 Area RDR/RAWP (DOE-RL 2009b).
[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Appendix B (0100D-CA-V0542).
[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (Ecology 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 2009b).
[d] Carcinogenic cleanup level calculated based on the inhalation exposure pathway per WAC 173-340-750(3) (Ecology 1996), (Method B for air quality) and an airborne particulate mass loading rate of 0.0001 g/m^3 (*Hanford Guidance for Radiological Cleanup* [WDOH 1997]).
[e] No Hanford Site-specific or Washington State background value available.
[f] No parameters (bioconcentration factors or AWQC values) are available from the Cleanup Levels and Risk Calculations Database (Ecology 2014) or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii] [Ecology 1996], [Method B for surface waters]).
[g] Hanford Site-specific background value is not available; it was not evaluated during background study. Value used is from *Natural Background Soil Metals Concentrations in Washington State* (Ecology 1994).
[h] Based on RESRAD modeling discussed in Appendix C of the 100 Area RDR/RAWP (DOE-RL 2009b), the residual concentrations of lead, selenium, benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene are not predicted to migrate more than 15 m (49.2 ft) vertically within 1,000 years (based on the contaminant with the lowest distribution coefficient of the contaminants exceeding RAGs, selenium, with a distribution coefficient value of 5 mL/g). The distance to groundwater from the bottom of the excavation area is 22 m (72 ft). Therefore, residual concentrations of these constituents are predicted to be protective of groundwater and the Columbia River.
[i] Where cleanup levels are less than RDLs, cleanup levels default to RDLs per WAC 173-340-707(2) (Ecology 1996). The cited RDLs are based on EPA-approved analytical methods that may not be available for rapid turnaround analyses. Prior notification and concurrence with the laboratory may be necessary to analyze to meet this RDL. Actual detection limits may differ from any RDL.
[j] Toxicity data for this chemical are not available. Cleanup levels are based on surrogate chemicals. Contaminant: phenanthrene; surrogate: anthracene.

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COPC = contaminant of potential concern
EPA = U.S. Environmental Protection Agency
RAG = remedial action goal
RDL = required detection limit
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

VERIFICATION SAMPLE DATA EVALUATION

This section demonstrates that remedial action at the 100-D-83:3 subsite achieves 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 100 Area RDR/RAWP (DOE-RL 2009b).

Attainment of Radionuclide RAGs

Radionuclides were not COPCs for the 100-D-83:3 subsite.

Attainment of Nonradionuclide RAGs

Direct Exposure RAGs

All COPCs for the 100-D-83:3 subsite were quantified below direct exposure RAGs.

Nonradionuclide Soil RAGs for Groundwater and River Protection Evaluation

All COPCs for the 100-D-83:3 subsite were quantified below groundwater and/or river protection RAGs with the exception of lead, selenium, benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene. However, based on RESidual RADioactivity (RESRAD) modeling discussed in Appendix C of the 100 Area RDR/RAWP, these COPCs are not expected to migrate vertically more than 15 m (49 ft) in 1,000 years based on the contaminant with the lowest distribution coefficient (K_d) of the contaminants exceeding the RAGs (selenium) with a K_d of 5 mL/g. The vadose zone underlying the soil is approximately 22 m (72 ft) thick. Therefore, residual concentrations of selenium are predicted to be protective of groundwater and the Columbia River.

Three-Part Test for Nonradionuclides

A RAG requirement for nonradionuclides is the WAC 173-340-740(7)(e) three-part test, which consists of the following criteria: (1) the cleanup verification 95% UCL value must be less than the cleanup level, (2) no single detection shall exceed two times the cleanup criteria, and (3) the percentage of samples exceeding the cleanup criteria must be less than 10% of the data set.

The application of the three-part test for the 100-D-83:3 subsite is included in the statistical calculations where half or more of the data set was detected (Appendix B). The results of this evaluation indicate that residual COPC concentrations pass the three-part test in comparison against applicable RAGs with the exception of lead, mercury, and selenium. However, based on RESRAD modeling discussed in Appendix C of the 100 Area RDR/RAWP, these COPCs are not expected to migrate vertically more than 15 m (49 ft) in 1,000 years based on the contaminant with the lowest K_d of the contaminants exceeding the RAGs (selenium) with a K_d of 5 mL/g. Therefore, residual concentrations of COPCs are predicted to be protective of groundwater and the Columbia River.

An additional application of the three-part test is included for the statistical data sets that default to the maximum because less than half of the data set was detected. The results of this evaluation indicate that residual COPC concentrations pass the three-part test in comparison against applicable RAGs with the exception of benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene. Benzo(a)anthracene with a K_d of 360 mL/g is not expected to migrate more than 1 m (3.3 ft) vertically in 1,000 years based on RESRAD modeling discussed in Appendix C of the 100 Area RDR/RAWP (DOE-RL 2009b). Therefore, residual concentrations of COPCs 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}. The risk values were not calculated for constituents that were either not detected or were detected at concentrations below Hanford Site or Washington State background. All individual hazard quotients for noncarcinogenic constituents were less than 1.0. The cumulative hazard quotient for those noncarcinogenic constituents above background or detected levels is 1.4×10^{-2}. All individual carcinogenic risk values were below 1×10^{-6}. The cumulative excess cancer risk value for the constituents detected above background was 9.8×10^{-7}, which is less than the cumulative cancer risk requirement of 1×10^{-5}. The 100-D-83:3 subsite meets the requirements for the direct contact hazard quotient and excess carcinogenic risk as identified in the 100 Area RDR/RAWP (DOE-RL 2009b).

Nonradionuclide Groundwater Hazard Quotient and Carcinogenic Risk RAGs Attained

Assessment of the risk requirements for the 100-D-83:3 subsite 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 100 Area RDR/RAWP (DOE-RL 2009b). Based on this model and a vadose zone of approximately 22 m (72 ft) thickness, a K_d of 3.4 or greater is required to show no predicted migration to groundwater in 1,000 years. All individual hazard quotients for noncarcinogenic constituents are less than 1.0. The cumulative hazard quotient for the 100-D-83:3 subsite is 1.2×10^{-1}, which is less than 1.0. The 100-D-83:3 subsite does not have any carcinogenic constituents subject to the groundwater cancer risk calculation; therefore, the criterion for excess cancer risk is met. Therefore, nonradionuclide risk requirements related to groundwater are met.

DATA QUALITY ASSESSMENT

A data quality assessment (DQA) was performed to compare the verification sampling approach (WCH 2014b), the field logbook (WCH 2014a), 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-83:3 subsite established that the data are of the right type, quality, and quantity to support site verification decisions within specified error tolerances. The evaluation

verified that the sample design was sufficient for the purpose of clean site verification. The cleanup verification sample analytical data are stored in the WCH project-specific database for data evaluation prior to its archival in the HEIS and are summarized in Appendix B. The detailed DQA is presented in Appendix C.

SUMMARY FOR INTERIM CLOSURE

The 100-D-83:3 subsite has been evaluated in accordance with the Remaining Sites ROD (EPA 1999) and the 100 Area RDR/RAWP (DOE-RL 2009b). Verification sampling was performed and the analytical results indicate that the residual concentrations of COPCs at this subsite meet the RAOs for direct exposure, groundwater protection, and river protection. In accordance with this evaluation, the verification sampling results support a reclassification of the 100-D-83:3 subsite to Interim Closed Out. 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.

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, 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.

DOE-RL, 2011, *Tri-Party Agreement Handbook Management Procedures,* RL-TPA-90-0001, Guideline Number TPA-MP-14, Rev. 2, "Maintenance of the Waste Information Data System (WIDS)," Rev. 2, 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, 2014, Cleanup Levels and Risk Calculations (CLARC) Database, Washington State Department of Ecology, Olympia, Washington, <https://fortress.wa.gov/ecy/clarc/CLARCHome.aspx>.

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

EPA, 1989, *Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part A), Interim Final*, EPA/540/1-89/002, Office of Emergency and Remedial Response, 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, 2010, "100-D-83:3 Remaining Site for Remedial Action," CCN 154172 to S. W. Callison from M. L. Proctor, Washington Closure Hanford, Richland, Washington, November 2.

WCH, 2011, *Remaining Sites Verification Package for the 100-D-83:4, Additional Treated Water Pipelines*, Attachment to Waste Site Reclassification Form 2010-093, Rev. 0, Washington Closure Hanford, Richland, Washington.

WCH, 2014a, *100D Field Remediation Miscellaneous Sampling Activities*, Logbook EL-1662-02, pp. 42-45, 71-73, Washington Closure Hanford, Richland, Washington.

WCH, 2014b, *Work Instruction for Verification Sampling of the 100-D-83:3, 108-D Acid Addition Facility Pipelines Waste Site*, 0100D-WI-G0135, Rev. 0, 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

Table A-1. Statistical or Maximum Contaminant Concentrations that Exceed Ecological Screening Levels for the 100-D-83:3 Subsite [a].

Hazardous Substance		2007 WAC 173-340 Table 749-3			EPA Ecological Soil Screening Levels [b]				Waste Site Analyses
		Plants	Soil Biota	Wildlife	Plants	Soil Biota	Avian [c]	Mammalian [c]	
Metals (mg/kg)									
	Background								
Antimony	5	5	--	--	--	78	--	0.27	0.68 (<BG)
Arsenic	6.5	--	--	7	18	--	43	46	8.0
Boron	--	0.5	--	--	--	--	--	--	3.6
Lead	10.2	50	500	118	120	1,700	11	56	78.1
Mercury	0.33	0.3	0.1	5.5	--	--	--	--	0.22 (<BG)
Selenium	0.78	1	70	0.3	0.52	4.1	1.2	0.63	3.9
Manganese	512	1,100 [d]	--	1,500	220	450	4,300	4,000	302 (<BG)
Vanadium	85.1	2	--	--	--	--	7.8	280	56.3 (<BG)
Zinc	67.8	86 [d]	200	360	160	120	46	79	47.2 (<BG)

NOTE: Shaded cells indicate screening values that are exceeded.

[a] Exceedance of screening values does not necessarily indicate the existence of risk to ecological receptors. All exceedances must be evaluated in the context of additional lines of evidence for ecological effects following a baseline risk assessment for the river corridor portion of the Hanford Site, which will include a more complete quantitative ecological risk assessment.

[b] Available on the Internet at www.epa.gov/ecotox/ecossl.

[c] Wildlife.

[d] Benchmark replaced by Washington State natural background concentration from Ecology, 1994, *Natural Background Soil Metals Concentrations in Washington State*, Publication 94-115, Washington State Department of Ecology, Olympia, Washington.

-- = not available
BG = background
EPA = U.S. Environmental Protection Agency
WAC = *Washington Administrative Code*

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-83:3 Subsite Cleanup Verification 95% UCL Calculation, 0100D-CA-V0542, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-D-83:3 Subsite Direct Contact Hazard Quotient and Carcinogenic Risk Calculations, 0100D-CA-V0541, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-D-83:3 Subsite Hazard Quotient and Carcinogenic Risk Calculation for Protection of Groundwater, 0100D-CA-V0540, 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-D Field Remediation **Job No. 14655**

Area: 100-D

Discipline: Environmental *Calculation No: 0100D-CA-V0542

Subject: 100-D-83:3 Subsite Cleanup Verification 95% UCL Calculation

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 Sheets = 26 Attm. 1 = 23 Total = 50	I. B. Berezovskiy	J. D. Skoglie	J. M. Capron	S. G. Wilkinson	10/27/14

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	I. B. Berezovskiy	**Date**	08/19/14	**Calc. No.**	0100D-CA-V0542	**Rev. No.**	0
Project	100-D Field Remediation	**Job No.**	14655	**Checked**	J. D. Skoglie	**Date**	08/19/14
Subject	100-D-83:3 Subsite Cleanup Verification 95% UCL Calculations					**Sheet No.**	1 of 26

Summary

Purpose:
Calculate the 95% upper confidence limit (UCL) values to evaluate compliance with cleanup standards for the subject site. Also, perform the *Washington Administrative Code* (WAC) 173-340-740(7)(e) Model Toxics Control Act (MTCA) 3-part test for nonradionuclide analytes and calculate the relative percent difference (RPD) for primary-duplicate sample pairs for each contaminant of concern (COC) and contaminant of potential concern (COPC), as necessary.

Table of Contents:
Sheets 1 to 5 - Calculation Sheet Summary
Sheets 6 to 15 - Calculation Sheet Verification Data Results - Excavation, Overburden and Staging Pile Area.
Sheets 16 to 23 - Ecology Software (MTCAStat) Results
Sheets 24 to 26 - Calculation Sheet Duplicate Analysis - Excavation, Overburden and staging Pile Area.
Attachment 1 - 100-D-83:3, Verification Sampling Results (23 pages).

Given/References:
1) Sample Results (Attachment 1).
2) DOE-RL, 2009a, *100 Area Remedial Action Sampling and Analysis Plan* (SAP), DOE/RL-96-22, Rev.5, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
3) DOE-RL, 2009b, *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP), DOE/RL-96-17, Rev. 6, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
4) Ecology, 1992, *Statistical Guidance for Ecology Site Managers,* Publication #92-54, Washington Department of Ecology, Olympia, Washington.
5) Ecology, 1993, *Statistical Guidance for Ecology Site Managers, Supplement S-6, Analyzing Site or Background Data with Below-detection Limit or Below-PQL Values (Censored Data Sets),* Publication #92-54, Washington Department of Ecology, Olympia, Washington.
6) Ecology, 2011, Cleanup Levels and Risk Calculations (CLARC) Database, Washington State Department of Ecology, Olympia, Washington, <https://fortress.wa.gov/ecy/clarc/CLARCHome.aspx>.
7) 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.
8) WAC 173-340, 1996, "Model Toxic Control Act - Cleanup," *Washington Administrative Code.*

Solution:
Calculation methodology is described in Ecology Pub. #92-54 (Ecology 1992, 1993), below, and in the RDR/RAWP (DOE-RL 2009b). Use data from attached worksheets to perform the 95% UCL calculation for each analyte, the WAC 173-340-740(7)(e) 3-part test for nonradionuclides, and the RPD calculations for each COC/COPC. The hazard quotient and carcinogenic risk calculations are located in a separate calculation brief as an appendix to the Remaining Sites Verification Package (RSVP).

Calculation Description:
The subject calculations were performed on statistical data from soil verification samples (Attachment 1) from the 100-D-83:3 subsite. The data were entered into an EXCEL 2010 spreadsheet and calculations performed by using the built-in spreadsheet functions and/or creating formulae within the cells. The statistical evaluation of data for use in accordance with the RDR/RAWP (DOE-RL 2009b) is documented by this calculation. Duplicate RPD results are used in evaluation of data quality within the RSVP for this site.

Methodology:
The 100-D-83:3 subsite underwent statistical sampling that consists of three decision units for verification sampling; excavation area, overburden stockpile and staging pile area.

Analytical results for all sampling locations are summarized in the tables provided on sheets 4 and 5. Further information of the sample data quality is presented in the data quality assessment section of the associated RSVP.

Washington Closure Hanford **CALCULATION SHEET**

Originator I. B. Berezovskiy	**Date** 08/19/14	**Calc. No.** 0100D-CA-V0542		**Rev. No.** 0	
Project 100-D Field Remediation	**Job No.** 14655	**Checked** J. D. Skoglie		**Date** 08/19/14	
Subject 100-D-83:3 Subsite Cleanup Verification 95% UCL Calculations				**Sheet No.** 2 of 26	

Summary (continued)

Methodology, continued:

For nonradioactive analytes with ≤50% of the data below detection limits, the statistical value calculated to evaluate the effectiveness of cleanup is the 95% UCL. For nonradioactive analytes with >50% of the data below detection limits, as determined by direct inspection of the sample results (Attachment 1), the maximum detected value for the data set is used instead of the 95% UCL, and no further calculations are performed for those data sets. For convenience, these maximum detected values are included in the summary tables that follow. The 95% UCL was not calculated for data sets with no reported detections. Calculated cleanup levels are not available in Ecology (2011) 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 COCs/COPCs and are also not included in these calculations.

All nonradionuclide data reported as being undetected are set to ½ the detection limit value for calculation of the statistics (Ecology 1993). For the statistical evaluation of duplicate sample pairs, the samples are averaged before being included in the data set, after adjustments for censored data as described above. For radionuclide data, calculation of the statistics is done using the reported value. In cases where the laboratory does not report a value below the minimum detectable activity (MDA), half of the MDA is used in the calculation. For the statistical evaluation of duplicate sample pairs, the samples are averaged before being included in the data set, after adjustments for censored data as described above.

For nonradionuclides, the WAC 173-340 statistical guidance suggests that a test for distributional form be performed on the data and the 95% UCL calculated on the appropriate distribution using Ecology software. For nonradionuclide small data sets (n<10), the calculations are performed assuming nonparametric distribution, so no tests for distribution are performed. For nonradionuclide data sets of ten or greater, as for the subject site, distributional testing is done using Ecology's MTCAStat software (Ecology 1993). Due to differences in addressing censored data between the RDR/RAWP (DOE-RL 2009b) and MTCAStat coding and due to a limitation in the MTCAStat coding (no direct capability to address variable quantitation limits within a data set), substitutions for censored data are performed before software input and the resulting data set treated as uncensored.

The WAC 173-340-740(7)(e) 3-part test is performed for nonradionuclide analytes only and determines if:
1) the 95% UCL exceeds the most stringent cleanup limit for each COPC/COC,
2) greater than 10% of the raw data exceed the most stringent cleanup limit for each COPC/COC,
3) the maximum value of the raw data set exceeds two times the most stringent cleanup limit for each COPC/COC.

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:

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

where, M = Main Sample Value S = Split (or duplicate) Sample Value

For quality assurance/quality control (QA/QC) split and duplicate RPD calculations, a value less than 30% indicates the data compare favorably. If the RPD is greater than 30%, further investigation regarding the usability of the data is performed. To assist in the identification of anomalous sample pairs, when an analyte is detected in the primary or duplicate sample, but was quantified at less than 5 times the TDL in one or both samples, an additional parameter is evaluated. In this case, if the difference between the primary and duplicate results exceeds a control limit of 2 times the TDL, further assessment regarding the usability of the data is performed. Additional discussion as necessary is provided in the data quality assessment section of the applicable RSVP.

Washington Closure Hanford **CALCULATION SHEET**

Originator	I. B. Berezovskiy	**Date**	08/19/14	**Calc. No.**	0100D-CA-V0542	**Rev. No.**	0
Project	100-D Field Remediation	**Job No.**	14655	**Checked**	J. D. Skoglie	**Date**	08/19/14
Subject	100-D-83:3 Subsite Cleanup Verification 95% UCL Calculations					**Sheet No.**	3 of 26

Summary (continued)

QUALIFIER LIST

B = blank contamination
D = dilution
J = estimate
M = sample duplicate precision not met
N = MS/MSD or LCS recovery is outside control limits
U = undetected
X = (metals) serial dilution in the analytical batch indicates that physical and chemical interferences are present
(organics) = >40% difference between primary and confirmation detector results.
R = rejected

ACRONYM LIST

-- = not applicable
DE = direct exposure
EXC = excavation
GW = groundwater
MTCA = *Model Toxics Control Act*
OB = overburden
PQL = practical quantitation limit
Q = qualifier
QA/QC = quality assurance/quality control
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
RPD = relative percent difference
RSVP = remaining sites verification package
SAP = sampling and analysis plan
SPA = staging pile area
TDL = target detection limit
UCL = upper confidence limit
WAC = Washington Administrative Code

Washington Closure Hanford

CALCULATION SHEET

Originator I. B. Berezovskiy **Date** 08/19/14 **Calc. No.** 0100D-CA-V0542 **Rev. No.** 0
Project 100-D Field Remediation **Job No.** 14655 **Checked** J. D. Skoglie **Date** 08/19/14
Subject 100-D-83:3 Subsite Cleanup Verification 95% UCL Calculations **Sheet No.** 4 of 26

Results:
The results presented in the tables that follow include the summary of the results of the 95% UCL calculations and/or maximum for the excavation area, overburden stockpile, staging pile area, the WAC 173-340-740(7)(e) 3-part test evaluation, and the RPD calculations, and are for use in risk analysis and the RSVP for this site.

Results Summary [a]

Analyte	Excavation 95% UCL Result	Excavation Maximum Result	Overburden 95% UCL Result	Overburden Maximum Result	SPA 95% UCL Result	SPA Maximum Result	Units
Antimony	--	0.50	--	0.68	0.57	--	mg/kg
Arsenic	2.3	--	3.3	--	8.0	--	mg/kg
Barium	66.6	--	79.1	--	70.4	--	mg/kg
Beryllium	--	0.046	--	0.059	0.22	--	mg/kg
Boron	--	1.3	1.2	--	3.6	--	mg/kg
Cadmium	0.17	--	0.20	--	--	0.19	mg/kg
Chromium	7.1	--	8.6	--	10.9	--	mg/kg
Cobalt	7.9	--	7.7	--	8.3	--	mg/kg
Copper	15.5	--	14.8	--	17.4	--	mg/kg
Hexavalent chromium	0.389	--	0.399	--	0.534	--	mg/kg
Lead	8.4	--	9.9	--	78.1	--	mg/kg
Manganese	299	--	302	--	290	--	mg/kg
Mercury	0.22	--	0.038	--	0.071	--	mg/kg
Molybdenum	--	0.32	--	0.32	0.75	--	mg/kg
Nickel	8.6	--	8.8	--	12.0	--	mg/kg
Selenium	--	--	--	--	--	3.9	mg/kg
Vanadium	56.3	--	52.6	--	53.1	--	mg/kg
Zinc	41.7	--	39.5	--	47.2	--	mg/kg
Chloride	9.8	--	5.9	--	19.9	--	mg/kg
Fluoride	--	0.98	0.88	--	1.3	--	mg/kg
Nitrogen as nitrate	2.0	--	1.3	--	6.2	--	mg/kg
Nitrogen in nitrite and nitrate	1.7	--	1.2	--	5.4	--	mg/kg
Sulfate	93.5	--	12.5	--	172	--	mg/kg
Benzo(a)anthracene	--	0.078	--	0.061	--	0.025	mg/kg
Benzo(a)pyrene	--	0.071	--	0.047	--	0.023	mg/kg
Benzo(b)fluoranthene	--	0.094	--	0.090	--	0.036	mg/kg
Benzo(ghi)perylene	--	0.042	--	0.028	--	--	mg/kg
Chrysene	--	0.090	--	0.069	--	0.036	mg/kg
Dimethyl phthalate	--	0.038	0.040	--	--	--	mg/kg
Fluoranthene	--	0.14	--	0.11	--	0.060	mg/kg
Indeno(1,2,3-cd)pyrene	--	0.097	--	0.030	--	0.069	mg/kg
Phenanthrene	--	0.070	--	0.063	--	0.053	mg/kg
Pyrene	0.046	--	--	0.12	--	0.051	mg/kg

WAC 173-340-740(7)(e) Evaluation:

WAC 173-340 3-Part Test for most stringent RAG:	EXC		OB		SPA	
95% UCL or maximum> Cleanup Limit?	NO	YES	NO	YES	YES	YES
> 10% above Cleanup Limit?	NO	YES	NO	YES	YES	YES
Any sample > 2x Cleanup Limit?	YES	YES	NO	YES	YES	YES

[a] The 95% UCL result or maximum value, depending on data censorship, as described in the methodology section.

Washington Closure Hanford **CALCULATION SHEET**

Originator	I. B. Berezovskiy	**Date**	08/19/14	**Calc. No.**	0100D-CA-V0542
Project	100-D Field Remediation	**Job No.**	14655	**Checked**	J. D. Skoglie
Subject	100-D-83:3 Subsite Cleanup Verification 95% UCL Calculations				

Rev. No. 0
Date 08/19/14
Sheet No. 5 of 26

Results:
The results presented in the tables that follow include the summary of the results of the 95% UCL calculations and/or maximum for the excavation area, overburden stockpile, staging pile area, the WAC 173-340-740(7)(e) 3-part test evaluation, and the RPD calculations, and are for use in risk analysis and the RSVP for this site.

Relative Percent Difference Results and QA/QC Analysis[a]

Analyte	Duplicate Analysis		
	Excavation	Overburden	SPA
Aluminum	0.4%	6.1%	4.3%
Barium	6.6%	0.5%	7.1%
Calcium	1.2%	5.5%	2.8%
Chromium	3.0%	10.0%	0.9%
Copper	12.4%	3.5%	5.3%
Iron	0.9%	0.4%	3.6%
Magnesium	4.5%	2.1%	0.9%
Manganese	0.3%	5.4%	1.7%
Silicon	2.0%	25.1%	13.7%
Sodium	--	--	**31.1%**
Vanadium	4.1%	2.0%	8.6%
Zinc	0.5%	1.3%	3.1%
Chloride	--	7.4%	25.5%
Sulfate	--	--	**66.4%**

[a]RPD listed where result produced, based on criteria. If RPD not required, no value is listed. The significance of the reported RPD values, including values greater than 30%, is addressed in the data quality assessment section of the RSVP.

CALCULATION SHEET

Washington Closure Hanford

Originator I. B. Berezovskiy
Project 100-D Field Remediation
Subject 100-D-83:3 Subsite Cleanup Verification 95% UCL Calculations

Date 08/19/14
Job No. 14655

Calc. No. 0100D-CA-V0542
Checked J. D. Skoglie

Rev. No. 0
Date 08/19/14
Sheet No. 6 of 26

1 **100-D-83:3 Statistical Calculations**

2 **Verification Data - Excavation**

3				Arsenic			Barium			Cadmium			Chromium			Cobalt			Copper			Hexavalent Chromium			Lead			Manganese		
4	Sample Area	Sample Number	Sample Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
5	EXC-1	J1TRK3	6/3/14	2.0		0.59	75.5	X	0.068	0.18		0.037	6.5	X	0.052	7.3	X	0.090	15.4	X	0.19	0.461		0.155	12.6	X	0.24	287	X	0.09
6	Duplicate of J1TRK3	J1TRL5	6/3/14	2.3		0.58	70.7	X	0.067	0.15	B	0.036	6.7	X	0.051	7.4	X	0.088	13.6	X	0.19	0.376		0.155	12.7	X	0.24	286	X	0.088
7	EXC-2	J1TRK4	6/3/14	2.1		0.61	64.7	X	0.070	0.17	B	0.038	6.2	X	0.053	7.8	X	0.092	14.1	X	0.20	0.314		0.155	9.6	X	0.25	292	X	0.092
8	EXC-3	J1TRK5	6/3/14	2.4		0.63	77.1	X	0.073	0.19		0.039	7.3	X	0.056	7.4	X	0.096	14.0	X	0.21	0.399		0.155	7.7	X	0.26	323	X	0.096
9	EXC-4	J1TRK6	6/3/14	2.4		0.61	65.7	X	0.070	0.16	B	0.038	7.8	X	0.053	7.5	X	0.092	14.6	X	0.20	0.438		0.155	6.8	X	0.25	288	X	0.092
10	EXC-5	J1TRK7	6/3/14	2.3		0.58	55.0	X	0.067	0.13	B	0.036	6.3	X	0.051	7.2	X	0.088	13.0	X	0.19	0.295		0.155	3.6	X	0.24	279	X	0.088
11	EXC-6	J1TRK8	6/3/14	1.9		0.56	66.2	X	0.065	0.15	B	0.035	6.8	X	0.050	7.1	X	0.086	14.6	X	0.19	0.454		0.155	7.5	X	0.23	273	X	0.086
12	EXC-7	J1TRK9	6/3/14	1.5		0.66	56.0	X	0.076	0.13	B	0.041	4.5	X	0.058	8.0	X	0.10	13.9	X	0.22	0.295		0.155	2.7	X	0.27	294	X	0.10
13	EXC-8	J1TRL0	6/3/14	1.9		0.59	63.1	X	0.068	0.15	B	0.037	6.3	X	0.052	8.1	X	0.089	14.4	X	0.19	0.315		0.155	4.1	X	0.24	307	X	0.089
14	EXC-9	J1TRL1	6/3/14	1.8		0.62	59.3	X	0.072	0.14	B	0.039	4.9	X	0.055	8.5	X	0.094	14.5	X	0.20	0.313		0.155	3.6	X	0.25	295	X	0.094
15	EXC-10	J1TRL2	6/3/14	2.0		0.64	59.0	X	0.074	0.16	B	0.040	6.9	X	0.057	7.7	X	0.097	14.9	X	0.21	0.314		0.155	3.7	X	0.26	295	X	0.097
16	EXC-11	J1TRL3	6/3/14	2.4		0.66	56.2	X	0.076	0.14	B	0.041	6.7	X	0.058	7.8	X	0.10	13.9	X	0.22	0.375		0.155	4.0	X	0.27	288	X	0.10
17	EXC-12	J1TRL4	6/3/14	2.8		0.58	58.5	X	0.067	0.20		0.036	8.1	X	0.051	7.5	X	0.088	19.8	X	0.19	0.397		0.155	7.4	X	0.24	283	X	0.088

18 **Statistical Computation Input Data**

19	Sample Area	Sample Number	Sample Date	Arsenic mg/kg	Barium mg/kg	Cadmium mg/kg	Chromium mg/kg	Cobalt mg/kg	Copper mg/kg	Hexavalent Chromium mg/kg	Lead mg/kg	Manganese mg/kg
20												
21	EXC-1	J1TRK3/J1TRL5	6/3/14	2.2	73.1	0.17	6.6	7.4	14.5	0.419	12.7	287
22	EXC-2	J1TRK4	6/3/14	2.1	64.7	0.17	6.2	7.8	14.1	0.314	9.6	292
23	EXC-3	J1TRK5	6/3/14	2.4	77.1	0.19	7.3	7.4	14.0	0.399	7.7	323
24	EXC-4	J1TRK6	6/3/14	2.4	65.7	0.16	7.8	7.5	14.6	0.438	6.8	288
25	EXC-5	J1TRK7	6/3/14	2.3	55.0	0.13	6.3	7.2	13.0	0.295	3.6	279
26	EXC-6	J1TRK8	6/3/14	1.9	66.2	0.15	6.8	7.1	14.6	0.454	7.5	273
27	EXC-7	J1TRK9	6/3/14	1.5	56.0	0.13	4.5	8.0	13.9	0.295	2.7	294
28	EXC-8	J1TRL0	6/3/14	1.9	63.1	0.15	6.3	8.1	14.4	0.315	4.1	307
29	EXC-9	J1TRL1	6/3/14	1.8	59.3	0.14	4.9	8.5	14.5	0.313	3.6	295
30	EXC-10	J1TRL2	6/3/14	2.0	59.0	0.16	6.9	7.7	14.9	0.314	3.7	295
31	EXC-11	J1TRL3	6/3/14	2.4	56.2	0.14	6.7	7.8	13.9	0.375	4.0	288
32	EXC-12	J1TRL4	6/3/14	2.8	58.5	0.20	8.1	7.5	19.8	0.397	7.4	283

33 **Statistical Computations**

34		Arsenic	Barium	Cadmium	Chromium	Cobalt	Copper	Hexavalent Chromium	Lead	Manganese
35	95% UCL based on	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat normal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.
36	N	12	12	12	12	12	12	12	12	12
37	% < Detection limit	0%	0%	0%	0%	0%	0%	0%	0%	0%
38	Mean	2.1	62.8	0.16	6.5	7.7	14.7	0.361	6.1	292
39	Standard deviation	0.35	6.9	0.022	1.0	0.40	1.7	0.059	3.0	13.1
40	95% UCL on mean	2.3	66.6	0.17	7.1	7.9	15.5	0.389	8.4	299
41	Maximum value	2.8	77.1	0.20	8.1	8.5	19.8	0.461	12.7	323
42	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)**	20 DE, GW & River Protection	200 GW Protection	0.81 GW & River Protection	18.5 GW & River Protection	15.7 GW Protection	22.0 River Protection	2 River Protection	10.2 GW & River Protection	512 GW & River Protection
43	**WAC 173-340 3-PART TEST**									
44	95% UCL > Cleanup Limit?	NA	NA	NA	NA	NA	NA	NO	NO	NA
45	> 10% above Cleanup Limit?	NA	NA	NA	NA	NA	NA	NO	NO	NA
46	Any sample > 2X Cleanup Limit?	NA	NA	NA	NA	NA	NA	NO	NO	NA
47	**WAC 173-340 Compliance?**	Because all values are below background (6.5 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (132 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (0.81 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (18.5 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (15.7 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (22.0 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	Because all values are below background (512 mg/kg) the WAC 173-340 3-part test is not required.

48 **Acronyms and qualifiers are defined on sheet 3.**

CALCULATION SHEET

Washington Closure Hanford

Originator I. B. Berezovskiy
Project 100-D Field Remediation
Subject 100-D-83:3 Subsite Cleanup Verification 95% UCL Calculations

Date 08/19/14
Job No. 14655

Calc. No. 0100D-CA-V0542
Checked J. D. Skoglie

Rev. No. 0
Date 08/19/14
Sheet No. 7 of 26

1 **100-D-83:3 Statistical Calculations**

2 **Verification Data - Excavation**

3	Sample	Sample	Sample	Mercury			Nickel			Vanadium			Zinc			Chloride			Nitrogen in Nitrate			Nitrogen in Nitrite and Nitrate			Sulfate			Pyrene		
4	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	ug/kg	Q	PQL
5	EXC-1	J1TRK3	6/3/14	1.1	N	0.011	7.7	X	0.11	50.3	X	0.084	38.9	XJ	0.36	3.0	B	2.0	1.4	BJ	0.31	0.37	B	0.36	7.5		1.7	83	J	12
6	Duplicate of J1TRK3	J1TRL5	6/3/14	0.78		0.0057	8.4	X	0.11	48.3	X	0.082	39.1	XJ	0.35	2.9	B	2.0	1.2	BJ	0.31	0.58	B	0.36	7.3		1.7	13	J	12
7	EXC-2	J1TRK4	6/3/14	0.040		0.0059	7.8	X	0.11	51.5	X	0.086	38.9	XJ	0.37	3.1	B	2.0	1.5	BJ	0.31	0.70	B	0.36	7.6		1.7	17	J	12
8	EXC-3	J1TRK5	6/3/14	0.010	B	0.0055	8.5	X	0.12	44.9	X	0.090	36.1	XJ	0.38	3.5	B	2.1	2.8	J	0.33	1.9		0.38	10.0		1.8	12	U	12
9	EXC-4	J1TRK6	6/3/14	0.014	B	0.0055	8.5	X	0.11	51.7	X	0.086	42.5	XJ	0.37	5.3		1.9	2.0	BJ	0.31	1.5		0.36	8.9		1.7	18	J	12
10	EXC-5	J1TRK7	6/3/14	0.0077	B	0.0056	8.5	X	0.11	53.4	X	0.083	36.1	XJ	0.35	15.0		1.9	2.0	BJ	0.30	1.7		0.36	12.3		1.6	14	J	12
11	EXC-6	J1TRK8	6/3/14	0.027		0.0060	7.6	X	0.11	49.8	X	0.080	39.5	XJ	0.34	7.1		2.0	1.7	BJ	0.31	1.0		0.36	17.3		1.7	160	J	12
12	EXC-7	J1TRK9	6/3/14	0.0057	B	0.0057	6.5	X	0.12	60.1	X	0.094	38.3	XJ	0.40	8.4		2.0	2.5	J	0.31	1.7		0.36	25.7		1.7	14	J	12
13	EXC-8	J1TRL0	6/3/14	0.036		0.0061	9.0	X	0.11	58.9	X	0.084	39.2	XJ	0.36	5.2		2.0	1.1	BJ	0.31	0.36	U	0.36	9.4		1.7	12	U	12
14	EXC-9	J1TRL1	6/3/14	0.0093	B	0.0055	7.7	X	0.12	59.0	X	0.089	50.5	XJ	0.38	3.9	B	1.9	1.3	BJ	0.31	0.39	B	0.36	242		1.7	11	U	11
15	EXC-10	J1TRL2	6/3/14	0.0073	B	0.0049	8.4	X	0.12	56.1	X	0.092	38.6	XJ	0.39	10.4		2.0	1.1	BJ	0.31	0.37	B	0.36	9.9		1.7	12	U	12
16	EXC-11	J1TRL3	6/3/14	0.0093	B	0.0058	8.4	X	0.12	56.9	X	0.094	39.6	XJ	0.40	9.6		1.9	1.0	BJ	0.30	0.48	B	0.36	236		1.6	12	U	12
17	EXC-12	J1TRL4	6/3/14	0.013	B	0.0060	9.2	X	0.11	52.6	X	0.083	41.1	XJ	0.35	7.9		1.9	1.3	BJ	0.30	0.84		0.36	35.4		1.6	12	U	12

18 **Statistical Computation Input Data**

19	Sample	Sample	Sample	Mercury	Nickel	Vanadium	Zinc	Chloride	Nitrogen in Nitrate	Nitrogen in Nitrite and Nitrate	Sulfate	Pyrene
20	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	ug/kg
21	EXC-1	J1TRK3/J1TRL5	6/3/14	0.94	8.1	49.3	39.0	3.0	1.3	0.5	7.4	48
22	EXC-2	J1TRK4	6/3/14	0.040	7.8	51.5	38.9	3.1	1.5	0.7	7.6	17
23	EXC-3	J1TRK5	6/3/14	0.010	8.5	44.9	36.1	3.5	2.8	1.9	10.0	6.0
24	EXC-4	J1TRK6	6/3/14	0.014	8.5	51.7	42.5	5.3	2.0	1.5	8.9	18
25	EXC-5	J1TRK7	6/3/14	0.0077	8.5	53.4	36.1	15.0	2.0	1.7	12.3	14
26	EXC-6	J1TRK8	6/3/14	0.027	7.6	49.8	39.5	7.1	1.7	1.0	17.3	160
27	EXC-7	J1TRK9	6/3/14	0.0057	6.5	60.1	38.3	8.4	2.5	1.7	25.7	14
28	EXC-8	J1TRL0	6/3/14	0.036	9.0	58.9	39.2	5.2	1.1	0.2	9.4	6.0
29	EXC-9	J1TRL1	6/3/14	0.0093	7.7	59.0	50.5	3.9	1.3	0.4	242	5.5
30	EXC-10	J1TRL2	6/3/14	0.0073	8.4	56.1	38.6	10.4	1.1	0.4	9.9	6.0
31	EXC-11	J1TRL3	6/3/14	0.0093	8.4	56.9	39.6	9.6	1.0	0.5	236	6.0
32	EXC-12	J1TRL4	6/3/14	0.013	9.2	52.6	41.1	7.9	1.3	0.8	35.4	6.0

33 **Statistical Computations**

34		Mercury	Nickel	Vanadium	Zinc	Chloride	Nitrogen in Nitrate	Nitrogen in Nitrite and Nitrate	Sulfate	Pyrene
35	95% UCL based on	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), use MTCAStat normal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.
36	N	12	12	12	12	12	12	12	12	12
37	% < Detection limit	0%	0%	0%	0%	0%	0%	8%	0%	50%
38	Mean	0.093	8.2	53.7	40.0	6.9	1.6	0.94	51.8	25.5
39	Standard deviation	0.27	0.72	4.6	3.8	3.6	0.58	0.61	87.8	44
40	95% UCL on mean	0.22	8.6	56.3	41.7	9.8	2.0	1.7	93.5	46
41	Maximum value	1.1	9.2	60.1	50.5	15.0	2.8	1.9	242	160
42	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)**	0.33 GW & River Protection	19.1 GW Protection	85.1 GW Protection	67.8 River Protection	25000 GW Protection	1000 GW Protection	1000 GW Protection	25000 GW Protection	48000 GW Protection
43	**WAC 173-340 3-PART TEST**									
44	95% UCL > Cleanup Limit?	NO	NA	NA	NA	NA	NA	NA	NO	NO
45	> 10% above Cleanup Limit?	NO	NA	NA	NA	NA	NA	NA	NO	NO
46	Any sample > 2X Cleanup Limit?	YES	NA	NA	NA	NA	NA	NA	NO	NO
47	**WAC 173-340 Compliance?**	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	Because all values are below background (19.1 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (85.1 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (67.8 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (100 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (11.8 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (11.8 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.

48 **Acronyms and qualifiers are defined on sheet 3.**

MAXIMUM VALUE 3-PART TEST CALCULATION SHEET

Washington Closure Hanford

Originator I. B. Berezovskiy
Project 100-D Field Remediation
Subject 100-D-83:3 Subsite Cleanup Verification 95% UCL Calculations

Date 08/19/14
Job No. 14655

Calc. No. 0100D-CA-V0542
Checked J. D. Skoglie

Rev. No. 0
Date 08/19/14
Sheet No. 8 of 26

100-D-83:3 Subsite Maximum Calculations

Verification Data - Excavation

Sample Area	Sample Number	Sample Date	Antimony mg/kg	Antimony Q	Antimony PQL	Beryllium mg/kg	Beryllium Q	Beryllium PQL	Boron mg/kg	Boron Q	Boron PQL	Molybdenum mg/kg	Molybdenum Q	Molybdenum PQL	Fluoride mg/kg	Fluoride Q	Fluoride PQL
EXC-1	J1TRK3	6/3/14	0.35	BJ	0.34	0.030	U	0.030	0.88	UN	0.88	0.32	B	0.23	0.81	UJ	0.81
Duplicate of J1TRK3	J1TRL5	6/3/14	0.33	UJ	0.33	0.029	U	0.029	0.86	U	0.86	0.23	U	0.23	0.81	UJ	0.81
EXC-2	J1TRK4	6/3/14	0.35	UJ	0.35	0.030	U	0.030	0.96	B	0.90	0.27	B	0.24	0.82	UNJ	0.82
EXC-3	J1TRK5	6/3/14	0.36	UJ	0.36	0.046	B	0.032	1.3	B	0.94	0.25	U	0.25	0.85	UJ	0.85
EXC-4	J1TRK6	6/3/14	0.35	UJ	0.35	0.030	U	0.030	1.3	B	0.90	0.24	B	0.24	0.80	UJ	0.80
EXC-5	J1TRK7	6/3/14	0.33	UJ	0.33	0.029	U	0.029	0.86	U	0.86	0.23	U	0.23	0.95	BJ	0.79
EXC-6	J1TRK8	6/3/14	0.33	UJ	0.33	0.028	U	0.028	0.89	B	0.84	0.22	U	0.22	0.81	UJ	0.81
EXC-7	J1TRK9	6/3/14	0.50	BJ	0.38	0.033	U	0.033	0.98	U	0.98	0.26	U	0.26	0.81	UJ	0.81
EXC-8	J1TRL0	6/3/14	0.34	UJ	0.34	0.029	U	0.029	0.88	U	0.88	0.23	U	0.23	0.98	BJ	0.81
EXC-9	J1TRL1	6/3/14	0.36	UJ	0.36	0.031	U	0.031	0.92	U	0.92	0.25	U	0.25	0.94	BJ	0.80
EXC-10	J1TRL2	6/3/14	0.37	UJ	0.37	0.032	U	0.032	0.96	U	0.96	0.25	U	0.25	0.83	BJ	0.82
EXC-11	J1TRL3	6/3/14	0.38	UJ	0.38	0.033	U	0.033	0.98	U	0.98	0.26	U	0.26	0.80	UJ	0.80
EXC-12	J1TRL4	6/3/14	0.41	BJ	0.33	0.029	U	0.029	0.86	U	0.86	0.29	B	0.23	0.78	UNJ	0.78

Sample Area	Benzo(a)anthracene ug/kg	Benzo(a)anthracene Q	Benzo(a)anthracene PQL	Benzo(a)pyrene ug/kg	Benzo(a)pyrene Q	Benzo(a)pyrene PQL	Benzo(b)fluoranthene ug/kg	Benzo(b)fluoranthene Q	Benzo(b)fluoranthene PQL	Benzo(ghi)perylene ug/kg	Benzo(ghi)perylene Q	Benzo(ghi)perylene PQL
EXC-1	40	J	20	31	J	20	42	J	26	17	J	16
Duplicate of J1TRK3	19	U	19	19	U	19	25	U	25	15	U	15
EXC-2	20	U	20	20	U	20	26	U	26	16	U	16
EXC-3	20	U	20	20	U	20	27	U	27	16	U	16
EXC-4	19	U	19	19	U	19	25	U	25	15	U	15
EXC-5	19	U	19	19	U	19	25	U	25	16	U	16
EXC-6	78	J	20	71	J	20	94	J	26	42	J	16
EXC-7	19	U	19	19	U	19	25	U	25	16	U	16
EXC-8	20	U	20	20	U	20	26	U	26	16	U	16
EXC-9	19	U	19	19	U	19	24	U	24	15	U	15
EXC-10	20	U	20	20	U	20	26	U	26	16	U	16
EXC-11	20	U	20	20	U	20	26	U	26	16	U	16
EXC-12	20	U	20	20	U	20	26	U	26	16	U	16

Statistical Computations

	Antimony	Beryllium	Boron	Molybdenum	Fluoride	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(ghi)perylene
% < Detection limit	75%	92%	67%	67%	67%	83%	83%	83%	83%
Maximum value	0.50	0.046	1.3	0.32	0.98	78	71	94	42
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless otherwise noted	5 GW & River Protection	1.51 GW & River Protection	320 GW Protection	8 GW Protection	96 GW Protection	15 ug/kg GW & River Protection	15 ug/kg GW & River Protection	15 ug/kg GW & River Protection	48000 ug/kg GW Protection
3-PART TEST									
Maximum > Cleanup Limit?	NA	NA	NO	NO	NA	YES	YES	YES	NO
> 10% above Cleanup Limit?	NA	NA	NO	NO	NA	YES	YES	YES	NO
Any sample > 2X Cleanup Limit?	NA	NA	NO	NO	NA	YES	YES	YES	NO
3-Part Test Compliance?	Because all values are below background (5 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (1.51 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	Because all values are below background (2.81 mg/kg) the WAC 173-340 3-part test is not required.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.

100-D-83:3 Subsite Maximum Calculations

Verification Data - Excavation

Sample Area	Sample Number	Sample Date	Chrysene ug/kg	Chrysene Q	Chrysene PQL	Dimethyl phthalate ug/kg	Dimethyl phthalate Q	Dimethyl phthalate PQL	Fluoranthene ug/kg	Fluoranthene Q	Fluoranthene PQL	Indeno(1,2,3-cd)pyrene ug/kg	Indeno(1,2,3-cd)pyrene Q	Indeno(1,2,3-cd)pyrene PQL	Phenanthrene ug/kg	Phenanthrene Q	Phenanthrene PQL
EXC-1	J1TRK3	6/3/14	47	J	27	23	U	23	79	J	36	75	J	22	36	J	17
Duplicate of J1TRK3	J1TRL5	6/3/14	26	U	26	31	J	22	35	U	35	21	U	21	16	U	16
EXC-2	J1TRK4	6/3/14	27	U	27	23	U	23	36	U	36	22	U	22	17	U	17
EXC-3	J1TRK5	6/3/14	27	U	27	38	J	23	37	U	37	22	U	22	17	U	17
EXC-4	J1TRK6	6/3/14	26	U	26	22	U	22	35	U	35	21	U	21	16	U	16
EXC-5	J1TRK7	6/3/14	26	U	26	22	U	22	35	U	35	21	U	21	17	U	17
EXC-6	J1TRK8	6/3/14	90	J	27	23	U	23	140	J	35	97	J	22	70	J	17
EXC-7	J1TRK9	6/3/14	26	U	26	22	U	22	35	U	35	21	U	21	16	U	16
EXC-8	J1TRL0	6/3/14	27	U	27	23	U	23	35	U	35	22	U	22	17	U	17
EXC-9	J1TRL1	6/3/14	25	U	25	21	U	21	33	U	33	20	U	20	16	U	16
EXC-10	J1TRL2	6/3/14	27	U	27	23	U	23	36	U	36	22	U	22	17	U	17
EXC-11	J1TRL3	6/3/14	27	U	27	23	U	23	35	U	35	22	U	22	17	U	17
EXC-12	J1TRL4	6/3/14	26	U	26	22	U	22	35	U	35	22	U	22	17	U	17

Statistical Computations

	Chrysene	Dimethyl phthalate	Fluoranthene	Indeno(1,2,3-cd)pyrene	Phenanthrene
% < Detection limit	83%	83%	83%	83%	83%
Maximum value	90	38	140	97	70
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless otherwise noted	100 ug/kg River Protection	1600000 ug/kg GW & River Protection	18000 ug/kg River Protection	330 ug/kg GW & River Protection	240000 ug/kg GW Protection
3-PART TEST					
Maximum > Cleanup Limit?	NO	NO	NO	NO	NO
> 10% above Cleanup Limit?	NO	NO	NO	NO	NO
Any sample > 2X Cleanup Limit?	NO	NO	NO	NO	NO
3-Part Test Compliance?	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator I. B. Berezovskiy
Project 100-D Field Remediation
Subject 100-D-83:3 Subsite Cleanup Verification 95% UCL Calculations

Date 08/19/14
Job No. 14655

Calc. No. 0100D-CA-V0542
Checked J. D. Skoglie

Rev. No. 0
Date 08/19/14
Sheet No. 9 of 26

1 **100-D-83:3 Statistical Calculations**

2 **Verification Data - Overburden**

3	Sample	Sample	Sample	Arsenic			Barium			Boron			Cadmium			Chromium			Cobalt			Copper			Hexavalent Chromium			Lead			Manganese		
4	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
5	OB-12	J1TRM7	6/3/14	2.0		0.58	59.0	X	0.067	0.86	U	0.86	0.14	B	0.036	5.7	X	0.051	7.8	X	0.088	14.4	X	0.19	0.337		0.155	3.9	X	0.24	288	X	0.088
6	Duplicate of J1TRM7	J1TRM8	6/3/14	2.4		0.60	59.3	X	0.069	0.86	U	0.86	0.17	B	0.037	6.3	X	0.052	7.9	X	0.090	13.9	X	0.20	0.315		0.155	4.4	X	0.24	304	X	0.090
7	OB-1	J1TRL6	6/3/14	2.4		0.61	132	XM	0.070	0.89	U	0.89	0.17	B	0.038	6.8	X	0.053	7.8	X	0.092	14.9	X	0.20	0.481		0.155	15.3	XM	0.25	302	X	0.092
8	OB-2	J1TRL7	6/3/14	2.2		0.65	56.7	X	0.075	1.2	B	0.9	0.16	B	0.040	5.4	X	0.057	7.7	X	0.098	14.0	X	0.21	0.415		0.155	7.5	X	0.27	282	X	0.098
9	OB-3	J1TRL8	6/3/14	2.1		0.57	58.7	X	0.066	1.1	B	0.96	0.15	B	0.036	7.9	X	0.050	7.7	X	0.087	14.2	X	0.19	0.378		0.155	6.5	X	0.23	298	X	0.087
10	OB-4	J1TRL9	6/3/14	2.6		0.59	70.5	X	0.068	0.85	U	0.85	0.21		0.037	8.4	X	0.052	6.9	X	0.090	14.4	X	0.20	0.417		0.155	6.9	X	0.24	296	X	0.090
11	OB-5	J1TRM0	6/3/14	3.4		0.67	77.1	X	0.077	1.5	B	0.88	0.20		0.041	7.8	X	0.059	7.6	X	0.10	16.0	X	0.22	0.155	U	0.155	15.6	X	0.27	306	X	0.10
12	OB-6	J1TRM1	6/3/14	1.8		0.64	63.1	X	0.074	2.1		0.99	0.18	B	0.040	6.2	X	0.056	7.9	X	0.097	14.0	X	0.21	0.356		0.155	5.8	X	0.26	301	X	0.097
13	OB-7	J1TRM2	6/3/14	2.2		0.58	62.0	X	0.067	0.95	B	0.95	0.25		0.036	8.8	X	0.051	6.8	X	0.089	13.5	X	0.19	0.155	U	0.155	4.3	X	0.24	290	X	0.089
14	OB-8	J1TRM3	6/3/14	2.0		0.59	56.4	X	0.068	1.1	B	0.87	0.15	B	0.037	5.9	X	0.052	7.2	X	0.089	14.3	X	0.19	0.292		0.155	3.6	X	0.24	282	X	0.089
15	OB-9	J1TRM4	6/3/14	3.1		0.65	70.9	X	0.074	0.88	U	0.88	0.18	B	0.040	12.8	X	0.057	7.1	X	0.098	15.8	X	0.21	0.497		0.155	4.3	X	0.26	305	X	0.098
16	OB-10	J1TRM5	6/3/14	6.5		0.63	58.5	X	0.073	1.1	B	0.96	0.19		0.039	7.5	X	0.056	6.8	X	0.096	13.3	X	0.21	0.418		0.155	6.5	X	0.26	282	X	0.096
17	OB-11	J1TRM6	6/3/14	1.4		0.67	65.5	X	0.077	0.97	B	0.94	0.14	B	0.041	4.3	X	0.059	8.1	X	0.10	13.1	X	0.22	0.274		0.155	2.5	X	0.27	316	X	0.10

18 **Statistical Computation Input Data**

19	Sample	Sample	Sample	Arsenic	Barium	Boron	Cadmium	Chromium	Cobalt	Copper	Hexavalent Chromium	Lead	Manganese
20	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
21	OB-12	J1TRM7/J1TRM8	6/3/14	2.2	59.2	0.43	0.16	6.0	7.9	14.2	0.326	4.2	296
22	OB-1	J1TRL6	6/3/14	2.4	132	0.45	0.17	6.8	7.8	14.9	0.481	15.3	302
23	OB-2	J1TRL7	6/3/14	2.2	56.7	1.2	0.16	5.4	7.7	14.0	0.415	7.5	282
24	OB-3	J1TRL8	6/3/14	2.1	58.7	1.1	0.15	7.9	7.7	14.2	0.378	6.5	298
25	OB-4	J1TRL9	6/3/14	2.6	70.5	0.43	0.21	8.4	6.9	14.4	0.417	6.9	296
26	OB-5	J1TRM0	6/3/14	3.4	77.1	1.5	0.20	7.8	7.6	16.0	0.078	15.6	306
27	OB-6	J1TRM1	6/3/14	1.8	63.1	2.1	0.18	6.2	7.9	14.0	0.356	5.8	301
28	OB-7	J1TRM2	6/3/14	2.2	62.0	0.95	0.25	8.8	6.8	13.5	0.078	4.3	290
29	OB-8	J1TRM3	6/3/14	2.0	56.4	1.1	0.15	5.9	7.2	14.3	0.292	3.6	282
30	OB-9	J1TRM4	6/3/14	3.1	70.9	0.44	0.18	12.8	7.1	15.8	0.497	4.3	305
31	OB-10	J1TRM5	6/3/14	6.5	58.5	1.1	0.19	7.5	6.8	13.3	0.418	6.5	282
32	OB-11	J1TRM6	6/3/14	1.4	65.5	0.97	0.14	4.3	8.1	13.1	0.274	2.5	316

33 **Statistical Computations**

34		Arsenic	Barium	Boron	Cadmium	Chromium	Cobalt	Copper	Hexavalent Chromium	Lead	Manganese
35	95% UCL based on	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.
36	N	12	12	12	12	12	12	12	12	12	12
37	% < Detection limit	0%	0%	33%	0%	0%	0%	0%	17%	0%	0%
38	Mean	2.7	69.2	0.98	0.18	7.3	7.5	14.3	0.334	6.9	296
39	Standard deviation	1.3	20.8	0.51	0.031	2.2	0.47	0.89	0.138	4.3	10.7
40	95% UCL on mean	3.3	79.1	1.2	0.20	8.6	7.7	14.8	0.399	9.9	302
41	Maximum value	6.5	132	2.1	0.25	12.8	8.1	16.0	0.497	15.6	316
42	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)**	20 DE, GW & River Protection	200 GW Protection	320 GW Protection	0.81 GW & River Protection	18.5 GW & River Protection	15.7 GW Protection	22.0 River Protection	2 River Protection	10.2 GW & River Protection	512 GW & River Protection
43	**WAC 173-340 3-PART TEST**										
44	95% UCL > Cleanup Limit?	NA	NA	NO	NA	NA	NA	NA	NO	NO	NA
45	> 10% above Cleanup Limit?	NA	NA	NO	NA	NA	NA	NA	NO	NO	NA
46	Any sample > 2X Cleanup Limit?	NA	NA	NO	NA	NA	NA	NA	NO	NO	NA
47	**WAC 173-340 Compliance?**	Because all values are ≤ background (6.5 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are ≤ background (132 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	Because all values are below background (0.81 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (18.5 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (15.7 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (22.0 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	Because all values are below background (512 mg/kg) the WAC 173-340 3-part test is not required.

48 **Acronyms and qualifiers are defined on sheet 3.**

CALCULATION SHEET

Washington Closure Hanford

Originator I. B. Berezovskiy
Project 100-D Field Remediation
Subject 100-D-83:3 Subsite Cleanup Verification 95% UCL Calculations

Date 08/19/14
Job No. 14655

Calc. No. 0100D-CA-V0542
Checked J. D. Skoglie

Rev. No. 0
Date 08/19/14
Sheet No. 10 of 26

1 **100-D-83:3 Statistical Calculations**

2 **Verification Data - Overburden**

3	Sample	Sample	Sample	Mercury			Nickel			Vanadium			Zinc			Chloride			Fluoride			Nitrogen in Nitrate			Nitrogen in Nitrite and Nitrate			Sulfate			Dimethyl phalate		
4	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	ug/kg	Q	PQL
5	OB-12	J1TRM7	6/3/14	0.0089	B	0.0049	7.4	X	0.11	54.5	X	0.083	38.0	X	0.35	13.0		1.9	0.80	U	0.80	1.1	B	0.31	1.5		0.36	11.1		1.7	23	U	23
6	Duplicate of J1TRM7	J1TRM8	6/3/14	0.0091	B	0.0051	9.1	X	0.11	53.4	X	0.085	37.5	X	0.36	14.0		2.0	0.81	UN	0.81	1.2	B	0.31	1.0		0.36	12.4		1.7	23	U	23
7	OB-1	J1TRL6	6/3/14	0.10		0.0053	8.6	X	0.11	51.5	X	0.086	41.4	X	0.36	2.8	B	2.0	0.81	UN	0.81	1.3	BN	0.31	0.68	B	0.36	5.9	N	1.7	22	U	22
8	OB-2	J1TRL7	6/3/14	0.057		0.0054	7.5	X	0.12	51.4	X	0.092	37.6	X	0.39	2.8	B	2.0	0.85	B	0.84	1.2	B	0.32	0.44	B	0.37	6.7		1.7	37	J	23
9	OB-3	J1TRL8	6/3/14	0.0094	B	0.0059	9.3	X	0.11	54.0	X	0.082	39.0	X	0.35	2.7	B	2.0	0.81	U	0.81	1.1	B	0.31	0.47	B	0.36	7.9		1.7	22	U	22
10	OB-4	J1TRL9	6/3/14	0.011	B	0.0055	8.7	X	0.11	46.9	X	0.085	38.8	X	0.36	2.9	B	2.0	0.81	B	0.81	1.4	B	0.31	1.1		0.36	7.6		1.7	72	J	22
11	OB-5	J1TRM0	6/3/14	0.017		0.0053	8.5	X	0.12	49.3	X	0.095	42.5	X	0.40	2.8	B	1.9	1.0	B	0.78	1.4	B	0.30	1.4		0.36	8.0		1.6	37	J	21
12	OB-6	J1TRM1	6/3/14	0.011	B	0.0048	8.4	X	0.12	51.5	X	0.091	38.2	X	0.39	3.3	B	1.9	0.80	U	0.80	1.2	B	0.31	0.96		0.36	7.1		1.7	36	J	23
13	OB-7	J1TRM2	6/3/14	0.0073	B	0.0053	9.3	X	0.11	46.0	X	0.083	36.1	X	0.35	4.2	B	2.0	1.0	B	0.82	1.5	B	0.31	1.3		0.36	8.4		1.7	49	J	23
14	OB-8	J1TRM3	6/3/14	0.0073	B	0.0050	7.6	X	0.11	47.8	X	0.084	34.8	X	0.36	5.9		2.0	0.90	B	0.81	1.4	B	0.31	1.4		0.36	10.2		1.7	61	J	23
15	OB-9	J1TRM4	6/3/14	0.011	B	0.0049	9.2	X	0.12	45.4	X	0.092	35.9	X	0.39	3.7	B	2.0	1.5	B	0.81	1.1	B	0.31	0.48	B	0.36	16.9		1.7	22	U	22
16	OB-10	J1TRM5	6/3/14	0.045		0.0051	7.4	X	0.12	50.5	X	0.090	39.8	X	0.38	4.5	B	2.0	0.81	U	0.81	1.1	B	0.31	0.62	B	0.36	14.2		1.7	22	U	22
17	OB-11	J1TRM6	6/3/14	0.0067	B	0.0052	7.8	X	0.12	58.6	X	0.095	38.3	X	0.40	5.1		1.9	0.79	U	0.79	1.2	B	0.30	0.86		0.36	16.3		1.6	23	U	23

18 **Statistical Computation Input Data**

19	Sample	Sample	Sample	Mercury	Nickel	Vanadium	Zinc	Chloride	Fluoride	Nitrogen in Nitrate	Nitrogen in Nitrite and Nitrate	Sulfate	Dimethyl phalate
20	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	ug/kg
21	OB-12	J1TRM7/J1TRM8	6/3/14	0.0090	8.3	54.0	37.8	13.5	0.40	1.2	1.3	11.8	12
22	OB-1	J1TRL6	6/3/14	0.10	8.6	51.5	41.4	2.8	0.41	1.3	0.68	5.9	11
23	OB-2	J1TRL7	6/3/14	0.057	7.5	51.4	37.6	2.8	0.85	1.2	0.44	6.7	37
24	OB-3	J1TRL8	6/3/14	0.0094	9.3	54.0	39.0	2.7	0.41	1.1	0.47	7.9	11
25	OB-4	J1TRL9	6/3/14	0.011	8.7	46.9	38.8	2.9	0.81	1.4	1.1	7.6	72
26	OB-5	J1TRM0	6/3/14	0.017	8.5	49.3	42.5	2.8	1.0	1.4	1.4	8.0	37
27	OB-6	J1TRM1	6/3/14	0.011	8.4	51.5	38.2	3.3	0.40	1.2	1.0	7.1	36
28	OB-7	J1TRM2	6/3/14	0.0073	9.3	46.0	36.1	4.2	1.0	1.5	1.3	8.4	49
29	OB-8	J1TRM3	6/3/14	0.0073	7.6	47.8	34.8	5.9	0.90	1.4	1.4	10.2	61
30	OB-9	J1TRM4	6/3/14	0.011	9.2	45.4	35.9	3.7	1.5	1.1	0.48	16.9	11
31	OB-10	J1TRM5	6/3/14	0.045	7.4	50.5	39.8	4.5	0.41	1.1	0.62	14.2	11
32	OB-11	J1TRM6	6/3/14	0.0067	7.8	58.6	38.3	5.1	0.40	1.2	0.86	16.3	12

33 **Statistical Computations**

34		Mercury	Nickel	Vanadium	Zinc	Chloride	Fluoride	Nitrogen in Nitrate	Nitrogen in Nitrite and Nitrate	Sulfate	Dimethyl phalate
35	95% UCL based on	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.
36	N	12	12	12	12	12	12	12	12	12	12
37	% < Detection limit	0%	0%	0%	0%	0%	50%	0%	0%	0%	50%
38	Mean	0.024	8.4	50.6	38.3	4.5	0.71	1.3	0.91	10.1	30
39	Standard deviation	0.029	0.69	3.8	2.2	3.0	0.36	0.14	0.37	3.8	22
40	95% UCL on mean	0.038	8.8	52.6	39.5	5.9	0.88	1.3	1.2	12.5	40
41	Maximum value	0.10	9.3	58.6	42.5	14	1.5	1.5	1.5	16.9	72
42	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless otherwise noted**	0.33 GW & River Protection	19.1 GW Protection	85.1 GW Protection	67.8 River Protection	25000 GW Protection	96 GW Protection	1000 GW Protection	1000 GW Protection	25000 GW Protection	1600000 ug/kg GW Protection
43	**WAC 173-340 3-PART TEST**										
44	95% UCL > Cleanup Limit?	NA	NA	NA	NA	NA	NA	NA	NA	NA	NO
45	> 10% above Cleanup Limit?	NA	NA	NA	NA	NA	NA	NA	NA	NA	NO
46	Any sample > 2X Cleanup Limit?	NA	NA	NA	NA	NA	NA	NA	NA	NA	NO
47	**WAC 173-340 Compliance?**	Because all values are below background (0.33 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (19.1 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (85.1 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (67.8 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (100 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (2.81 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (11.8 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (11.8 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (237 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.

48 **Acronyms and qualifiers are defined on sheet 3.**

MAXIMUM VALUE 3-PART TEST CALCULATION SHEET

Washington Closure Hanford

Originator I. B. Berezovskiy
Project 100-D Field Remediation
Subject 100-D-83:3 Subsite Cleanup Verification 95% UCL Calculations

Date 08/19/14
Job No. 14655

Calc. No. 0100D-CA-V0542
Checked J. D. Skoglie

Rev. No. 0
Date 08/19/14
Sheet No. 11 of 26

100-D-83:3 Subsite Maximum Calculations
Verification Data - Overburden

Sample Area	Sample Number	Sample Date	Antimony			Beryllium			Molybdenum			Benzo(a)anthracene			Benzo(a)pyrene			Benzo(b)fluoranthene			Benzo(ghi)perylene		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
OB-12	J1TRM7	6/3/14	0.33	U	0.33	0.029	U	0.029	0.23	B	0.23	20	U	20	20	U	20	26	U	26	16	U	16
Duplicate of J1TRM7	J1TRM8	6/3/14	0.46	B	0.34	0.030	U	0.030	0.30	B	0.23	20	U	20	20	U	20	26	U	26	16	U	16
OB-1	J1TRL6	6/3/14	0.68		0.35	0.030	U	0.030	0.32	B	0.24	19	J	19	22	J	19	27	JX	25	15	U	15
OB-2	J1TRL7	6/3/14	0.37	U	0.37	0.032	U	0.032	0.29	B	0.26	20	U	20	20	U	20	27	U	27	16	U	16
OB-3	J1TRL8	6/3/14	0.33	U	0.33	0.029	U	0.029	0.23	B	0.23	19	U	19	19	U	19	25	U	25	15	U	15
OB-4	J1TRL9	6/3/14	0.34	U	0.34	0.030	U	0.030	0.23	U	0.23	19	U	19	19	U	19	25	U	25	15	U	15
OB-5	J1TRM0	6/3/14	0.38	U	0.38	0.033	U	0.033	0.26	U	0.26	23	J	19	21	J	19	38	JX	24	15	U	15
OB-6	J1TRM1	6/3/14	0.44	B	0.37	0.032	U	0.032	0.25	U	0.25	20	U	20	20	U	20	26	U	26	16	U	16
OB-7	J1TRM2	6/3/14	0.34	U	0.34	0.029	U	0.029	0.23	U	0.23	20	U	20	20	U	20	26	U	26	16	U	16
OB-8	J1TRM3	6/3/14	0.34	U	0.34	0.030	U	0.030	0.23	U	0.23	20	U	20	20	U	20	26	U	26	16	U	16
OB-9	J1TRM4	6/3/14	0.37	U	0.37	0.059	B	0.032	0.25	U	0.25	19	U	19	19	U	19	25	U	25	15	U	15
OB-10	J1TRM5	6/3/14	0.36	U	0.36	0.032	U	0.032	0.25	U	0.25	61	J	19	47	J	19	90	JX	25	28	J	15
OB-11	J1TRM6	6/3/14	0.38	U	0.38	0.033	U	0.033	0.26	U	0.26	20	U	20	20	U	20	26	U	26	16	U	16

Statistical Computations

	Antimony		Beryllium		Molybdenum		Benzo(a)anthracene		Benzo(a)pyrene		Benzo(b)fluoranthene		Benzo(ghi)perylene	
% < Detection limit	75%		92%		67%		75%		75%		75%		92%	
Maximum value	0.68		0.059		0.32		61		47		90		28	
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless otherwise noted	5	GW & River Protection	1.51	GW & River Protection	8	GW Protection	15 ug/kg	GW & River Protection	15 ug/kg	GW & River Protection	15 ug/kg	GW & River Protection	48000 ug/kg	GW Protection
3-PART TEST														
Maximum > Cleanup Limit?	NA		NA		NO		YES		YES		YES		NO	
> 10% above Cleanup Limit?	NA		NA		NO		YES		YES		YES		NO	
Any sample > 2X Cleanup Limit?	NA		NA		NO		YES		YES		YES		NO	
3-Part Test Compliance?	Because all values are below background (5 mg/kg) the WAC 173-340 3-part test is not required.		Because all values are below background (1.51 mg/kg) the WAC 173-340 3-part test is not required.		The data set meets the 3-part test criteria when compared to the most stringent RAG.		A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.		A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.		A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.		The data set meets the 3-part test criteria when compared to the most stringent RAG.	

100-D-83:3 Subsite Maximum Calculations
Verification Data - Overburden

Sample Area	Sample Number	Sample Date	Chrysene			Fluoranthene			Indeno(1,2,3-cd)pyrene			Phenanthrene			Pyrene		
			ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
OB-12	J1TRM7	6/3/14	27	U	27	36	U	36	22	U	22	17	U	17	12	U	12
Duplicate of J1TRM7	J1TRM8	6/3/14	27	U	27	36	U	36	22	U	22	17	U	17	12	U	12
OB-1	J1TRL6	6/3/14	26	U	26	35	U	35	21	U	21	16	U	16	25	J	12
OB-2	J1TRL7	6/3/14	27	U	27	36	U	36	22	U	22	17	U	17	12	U	12
OB-3	J1TRL8	6/3/14	26	U	26	34	U	34	21	U	21	16	U	16	11	U	11
OB-4	J1TRL9	6/3/14	25	U	25	34	U	34	21	U	21	16	U	16	11	U	11
OB-5	J1TRM0	6/3/14	26	J	25	34	U	34	20	U	20	16	U	16	31	J	11
OB-6	J1TRM1	6/3/14	27	U	27	36	U	36	22	U	22	17	U	17	15	J	12
OB-7	J1TRM2	6/3/14	27	U	27	36	U	36	22	U	22	17	U	17	12	U	12
OB-8	J1TRM3	6/3/14	27	U	27	36	U	36	22	U	22	17	U	17	12	U	12
OB-9	J1TRM4	6/3/14	26	U	26	34	U	34	21	U	21	16	U	16	11	U	11
OB-10	J1TRM5	6/3/14	69	J	26	110	J	35	30	J	21	63	J	16	120	J	12
OB-11	J1TRM6	6/3/14	27	U	27	36	U	36	22	U	22	17	U	17	12	U	12

Statistical Computations

	Chrysene		Fluoranthene		Indeno(1,2,3-cd)pyrene		Phenanthrene		Pyrene	
% < Detection limit	83%		92%		92%		92%		67%	
Maximum value	69		110		30		63		120	
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless otherwise noted	100 ug/kg	River Protection	18000 ug/kg	River Protection	330 ug/kg	GW & River Protection	240000 ug/kg	GW Protection	48000 ug/kg	GW Protection
3-PART TEST										
Maximum > Cleanup Limit?	NO		NO		NO		NO		NO	
> 10% above Cleanup Limit?	NO		NO		NO		NO		NO	
Any sample > 2X Cleanup Limit?	NO		NO		NO		NO		NO	
3-Part Test Compliance?	The data set meets the 3-part test criteria when compared to the most stringent RAG.		The data set meets the 3-part test criteria when compared to the most stringent RAG.		The data set meets the 3-part test criteria when compared to the most stringent RAG.		The data set meets the 3-part test criteria when compared to the most stringent RAG.		The data set meets the 3-part test criteria when compared to the most stringent RAG.	

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator I. B. Berezovskiy
Project 100-D Field Remediation
Subject 100-D-83:3 Subsite Cleanup Verification 95% UCL Calculations

Date 08/19/14
Job No. 14655

Calc. No. 0100D-CA-V0542
Checked J. D. Skoglie

Rev. No. 0
Date 08/19/14
Sheet No. 12 of 26

1 **100-D-83:3 Statistical Calculations**

2 **Verification Data - SPA**

3	Sample	Sample	Sample	Antimony			Arsenic			Barium			Beryllium			Boron			Chromium			Cobalt			Copper			Hexavalent Chromium		
4	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
5	SPA-1	J1TRM9	7/23/14	0.78	M	0.38	5.3	M	0.66	62.6		0.076	0.26	M	0.033	3.2	M	0.98	11.7		0.058	6.6	X	0.10	11.6		0.22	0.192		0.155
6	Duplicate of J1TRM9	J1TRP1	7/23/14	0.38	U	0.38	3.6		0.66	58.3		0.076	0.19	B	0.033	1.2	B	0.98	11.6		0.058	5.7	X	0.10	11.0		0.22	0.229		0.155
7	SPA-2	J1TRN0	7/23/14	0.42	B	0.34	4.5		0.60	68.7		0.069	0.15	B	0.030	4.4		0.88	13.7		0.052	8.3	X	0.090	29.4		0.20	0.651		0.155
8	SPA-3	J1TRN1	7/23/14	0.80		0.35	3.4		0.61	68.4		0.070	0.16	B	0.030	2.3		0.90	9.1		0.053	8.5	X	0.092	15.3		0.20	0.594		0.155
9	SPA-4	J1TRN2	7/23/14	0.45	B	0.36	5.6		0.62	68.5		0.071	0.19		0.031	2.9		0.92	11.2		0.054	7.7	X	0.094	19.7		0.20	0.450		0.155
10	SPA-5	J1TRN3	7/23/14	0.47	B	0.34	3.7		0.59	74.0		0.068	0.17	B	0.029	2.1		0.88	10.2		0.052	8.4	X	0.089	15.7		0.19	0.550		0.155
11	SPA-6	J1TRN4	7/23/14	0.54		0.34	2.9		0.59	58.4		0.068	0.17	B	0.029	1.7	B	0.87	9.9		0.052	8.0	X	0.089	12.1		0.19	0.487		0.155
12	SPA-7	J1TRN5	7/23/14	0.56		0.34	3.4		0.60	61.1		0.069	0.17	B	0.030	1.4	B	0.89	9.4		0.052	8.7	X	0.090	13.4		0.20	0.370		0.155
13	SPA-8	J1TRN6	7/23/14	0.35	B	0.35	3.2		0.61	66.9		0.071	0.22		0.031	1.2	B	0.91	8.4		0.054	8.8	X	0.093	14.0		0.20	0.389		0.155
14	SPA-9	J1TRN7	7/23/14	0.52	B	0.34	15.8		0.59	69.9		0.068	0.27		0.029	1.9		0.88	10.5		0.052	7.2	X	0.089	14.0		0.19	0.155		0.155
15	SPA-10	J1TRN8	7/23/14	0.37	U	0.37	16.1		0.63	82.6		0.073	0.26		0.032	4.7		0.94	11.1		0.056	6.9	X	0.096	12.5		0.21	0.155		0.155
16	SPA-11	J1TRN9	7/23/14	0.62		0.33	1.7		0.58	54.6		0.066	0.13	B	0.029	0.85	U	0.85	4.8		0.051	8.3	X	0.087	10.3		0.19	0.249		0.155
17	SPA-12	J1TRP0	7/23/14	0.55	B	0.37	3.9		0.64	60.4		0.074	0.16	B	0.032	1.1	B	0.95	6.9		0.056	8.4	X	0.097	12.1		0.21	0.267		0.155

18 **Statistical Computation Input Data**

19	Sample	Sample	Sample	Antimony	Arsenic	Barium	Beryllium	Boron	Chromium	Cobalt	Copper	Hexavalent Chromium
20	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
21	SPA-1	J1TRM9/J1TRP1	7/23/14	0.49	4.5	60.5	0.23	2.2	11.7	6.2	11.3	0.211
22	SPA-2	J1TRN0	7/23/14	0.42	4.5	68.7	0.15	4.4	13.7	8.3	29.4	0.651
23	SPA-3	J1TRN1	7/23/14	0.80	3.4	68.4	0.16	2.3	9.1	8.5	15.3	0.594
24	SPA-4	J1TRN2	7/23/14	0.45	5.6	68.5	0.19	2.9	11.2	7.7	19.7	0.450
25	SPA-5	J1TRN3	7/23/14	0.47	3.7	74.0	0.17	2.1	10.2	8.4	15.7	0.550
26	SPA-6	J1TRN4	7/23/14	0.54	2.9	58.4	0.17	1.7	9.9	8.0	12.1	0.487
27	SPA-7	J1TRN5	7/23/14	0.56	3.4	61.1	0.17	1.4	9.4	8.7	13.4	0.370
28	SPA-8	J1TRN6	7/23/14	0.35	3.2	66.9	0.22	1.2	8.4	8.8	14.0	0.389
29	SPA-9	J1TRN7	7/23/14	0.52	15.8	69.9	0.27	1.9	10.5	7.2	14.0	0.155
30	SPA-10	J1TRN8	7/23/14	0.19	16.1	82.6	0.26	4.7	11.1	6.9	12.5	0.155
31	SPA-11	J1TRN9	7/23/14	0.62	1.7	54.6	0.13	0.43	4.8	8.3	10.3	0.249
32	SPA-12	J1TRP0	7/23/14	0.55	3.9	60.4	0.16	1.1	6.9	8.4	12.1	0.267

33 **Statistical Computations**

34		Antimony	Arsenic	Barium	Beryllium	Boron	Chromium	Cobalt	Copper	Hexavalent Chromium
35	95% UCL based on	Large data set (n ≥ 10), use MTCAStat normal distribution.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat normal distribution.	Large data set (n ≥ 10), use MTCAStat normal distribution.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.
36	N	12	12	12	12	12	12	12	12	12
37	% < Detection limit	8%	0%	0%	0%	8%	0%	0%	0%	0%
38	Mean	0.50	5.7	66.2	0.19	2.2	9.7	7.9	15.0	0.377
39	Standard deviation	0.15	4.9	7.7	0.044	1.3	2.3	0.81	5.2	0.172
40	95% UCL on mean	0.57	8.0	70.4	0.22	3.6	10.9	8.3	17.4	0.534
41	Maximum value	0.80	16.1	82.6	0.27	4.7	13.7	8.8	29.4	0.651
42	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)**	5 GW & River Protection	20 DE, GW & River Protection	200 GW Protection	1.51 GW & River Protection	320 GW Protection	18.5 GW & River Protection	15.7 GW Protection	22.0 River Protection	2 River Protection
43	**WAC 173-340 3-PART TEST**									
44	95% UCL > Cleanup Limit?	NA	NO	NA	NA	NO	NA	NA	NO	NO
45	> 10% above Cleanup Limit?	NA	NO	NA	NA	NO	NA	NA	NO	NO
46	Any sample > 2X Cleanup Limit?	NA	NO	NA	NA	NO	NA	NA	NO	NO
47	**WAC 173-340 Compliance?**	Because all values are below background (5 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	Because all values are below background (132 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (1.51 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	Because all values are below background (18.5 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (15.7 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.

48 **Acronyms and qualifiers are defined on sheet 3.**

CALCULATION SHEET

Washington Closure Hanford

Originator I. B. Berezovskiy
Project 100-D Field Remediation
Subject 100-D-83:3 Subsite Cleanup Verification 95% UCL Calculations

Date 08/19/14
Job No. 14655

Calc. No. 0100D-CA-V0542
Checked J. D. Skoglie

Rev. No. 0
Date 08/19/14
Sheet No. 13 of 26

1 **100-D-83:3 Statistical Calculations**

2 **Verification Data - SPA**

3	Sample	Sample	Sample	Lead			Manganese			Mercury			Molybdenum			Nickel			Vanadium			Zinc			Chloride			Fluoride		
4	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
5	SPA-1	J1TRM9	7/23/14	4.2		0.27	236		0.10	0.0072	B	0.0055	2.1	M	0.26	11.6	X	0.12	32.7		0.094	29.6	X	0.40	14.6	M	2.0	0.83	UN	0.83
6	Duplicate of J1TRM9	J1TRP1	7/23/14	3.4		0.27	232		0.10	0.0066	B	0.0051	0.26	U	0.26	11.3	X	0.12	30.0		0.094	28.7	X	0.40	11.3	N	2.0	0.82	UN	0.82
7	SPA-2	J1TRN0	7/23/14	98.6		0.24	334		0.090	0.036		0.0056	2.1		0.23	14.6	X	0.11	48.4		0.085	45.4	X	0.36	14.9		2.0	0.94	B	0.82
8	SPA-3	J1TRN1	7/23/14	15.2		0.25	281		0.092	0.053		0.0058	0.43	B	0.24	10.2	X	0.11	56.3		0.086	46.2	X	0.37	39.9		2.0	0.89	B	0.83
9	SPA-4	J1TRN2	7/23/14	16.8		0.25	281		0.094	0.031		0.0047	0.43	B	0.24	12.2	X	0.12	46.5		0.088	48.9	X	0.37	18.0		2.0	1.0	B	0.81
10	SPA-5	J1TRN3	7/23/14	15.4		0.24	284		0.089	0.074		0.0052	0.39	B	0.23	11.5	X	0.11	54.9		0.084	57.5	X	0.36	14.9		1.9	1.1	B	0.80
11	SPA-6	J1TRN4	7/23/14	6.9		0.24	263		0.089	0.072		0.0051	0.27	B	0.23	12.8	X	0.11	49.3		0.084	46.1	X	0.35	8.7		1.9	1.2	B	0.78
12	SPA-7	J1TRN5	7/23/14	9.2		0.24	288		0.090	0.066		0.0060	0.26	B	0.24	9.7	X	0.11	55.0		0.085	42.6	X	0.36	17.2		1.9	1.3	B	0.80
13	SPA-8	J1TRN6	7/23/14	7.0		0.25	294		0.093	0.015		0.0048	0.24	U	0.24	10.2	X	0.11	50.9		0.087	40.8	X	0.37	16.6		1.9	1.3	B	0.79
14	SPA-9	J1TRN7	7/23/14	67.3		0.24	268		0.089	0.020		0.0055	0.23	U	0.23	11.0	X	0.11	39.2		0.084	41.6	X	0.36	16.6		2.0	1.5	B	0.81
15	SPA-10	J1TRN8	7/23/14	66.7		0.26	262		0.096	0.017		0.0052	0.25	U	0.25	11.0	X	0.12	36.0		0.090	37.8	X	0.38	11.3		2.0	1.6	B	0.81
16	SPA-11	J1TRN9	7/23/14	3.6		0.24	257		0.087	0.0085	B	0.0061	0.23	U	0.23	9.0	X	0.11	59.8		0.082	37.8	X	0.35	10.4		1.9	1.3	B	0.79
17	SPA-12	J1TRP0	7/23/14	13.1		0.26	278		0.097	0.013	B	0.0054	0.25	U	0.25	9.1	X	0.12	54.5		0.091	42.7	X	0.39	11.1		2.0	1.4	B	0.81

18 **Statistical Computation Input Data**

19	Sample	Sample	Sample	Lead	Manganese	Mercury	Molybdenum	Nickel	Vanadium	Zinc	Chloride	Fluoride
20	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
21	SPA-1	J1TRM9/J1TRP1	7/23/14	3.8	234	0.0069	1.1	11.5	31.4	29.2	13.0	0.41
22	SPA-2	J1TRN0	7/23/14	98.6	334	0.036	2.1	14.6	48.4	45.4	14.9	0.94
23	SPA-3	J1TRN1	7/23/14	15.2	281	0.053	0.43	10.2	56.3	46.2	39.9	0.89
24	SPA-4	J1TRN2	7/23/14	16.8	281	0.031	0.43	12.2	46.5	48.9	18.0	1.0
25	SPA-5	J1TRN3	7/23/14	15.4	284	0.074	0.39	11.5	54.9	57.5	14.9	1.1
26	SPA-6	J1TRN4	7/23/14	6.9	263	0.072	0.27	12.8	49.3	46.1	8.7	1.2
27	SPA-7	J1TRN5	7/23/14	9.2	288	0.066	0.26	9.7	55.0	42.6	17.2	1.3
28	SPA-8	J1TRN6	7/23/14	7.0	294	0.015	0.12	10.2	50.9	40.8	16.6	1.3
29	SPA-9	J1TRN7	7/23/14	67.3	268	0.020	0.12	11.0	39.2	41.6	16.6	1.5
30	SPA-10	J1TRN8	7/23/14	66.7	262	0.017	0.13	11.0	36.0	37.8	11.3	1.6
31	SPA-11	J1TRN9	7/23/14	3.6	257	0.0085	0.12	9.0	59.8	37.8	10.4	1.3
32	SPA-12	J1TRP0	7/23/14	13.1	278	0.013	0.13	9.1	54.5	42.7	11.1	1.4

33 **Statistical Computations**

34		Lead	Manganese	Mercury	Molybdenum	Nickel	Vanadium	Zinc	Chloride	Fluoride
35	95% UCL based on	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat normal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), use MTCAStat normal distribution.
36	N	12	12	12	12	12	12	12	12	12
37	% < Detection limit	0%	0%	0%	42%	0%	0%	0%	0%	8%
38	Mean	27.0	277	0.034	0.47	11.1	48.5	43.0	16.0	1.2
39	Standard deviation	31.8	24.3	0.025	0.59	1.6	8.8	6.9	8.1	0.32
40	95% UCL on mean	78.1	290	0.071	0.75	12.0	53.1	47.2	19.9	1.3
41	Maximum value	98.6	334	0.074	2.1	14.6	59.8	57.5	39.9	1.6
42	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)**	10.2 GW & River Protection	512 GW & River Protection	0.33 GW & River Protection	8 GW Protection	19.1 GW Protection	85.1 GW Protection	67.8 River Protection	25000 GW Protection	96 GW Protection
43	**WAC 173-340 3-PART TEST**									
44	95% UCL > Cleanup Limit?	YES	NA	NA	NO	NA	NA	NA	NA	NA
45	> 10% above Cleanup Limit?	YES	NA	NA	NO	NA	NA	NA	NA	NA
46	Any sample > 2X Cleanup Limit?	YES	NA	NA	NO	NA	NA	NA	NA	NA
47	**WAC 173-340 Compliance?**	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	Because all values are below background (512 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (0.33 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	Because all values are below background (19.1 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (85.1 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (67.8 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (100 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (2.81 mg/kg) the WAC 173-340 3-part test is not required.

48 **Acronyms and qualifiers are defined on sheet 3.**

CALCULATION SHEET

Washington Closure Hanford

Originator I. B. Berezovskiy
Project 100-D Field Remediation
Subject 100-D-83:3 Subsite Cleanup Verification 95% UCL Calculations

Date 08/19/14
Job No. 14655

Calc. No. 0100D-CA-V0542
Checked J. D. Skoglie

Rev. No. 0
Date 08/19/14
Sheet No. 14 of 26

1 **100-D-83:3 Statistical Calculations**

2 **Verification Data - SPA**

3	Sample	Sample	Sample	Nitrogen in Nitrate			Nitrogen in Nitrite and Nitrate			Sulfate		
4	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
5	SPA-1	J1TRM9	7/23/14	1.6	B	0.32	1.3		0.37	60.2	N	1.7
6	Duplicate of J1TRM9	J1TRP1	7/23/14	1.4	B	0.31	1.9		0.37	30.2	N	1.7
7	SPA-2	J1TRN0	7/23/14	2.4	B	0.31	2.2		0.36	105		1.7
8	SPA-3	J1TRN1	7/23/14	4.4		0.32	5.2		0.37	55.8		1.7
9	SPA-4	J1TRN2	7/23/14	4.5		0.31	5.4		0.36	388		1.7
10	SPA-5	J1TRN3	7/23/14	2.6		0.31	1.5		0.36	57.5		1.7
11	SPA-6	J1TRN4	7/23/14	1.4	B	0.30	1.6		0.36	90.0		1.6
12	SPA-7	J1TRN5	7/23/14	11.7		0.30	8.2		0.36	191		1.7
13	SPA-8	J1TRN6	7/23/14	2.7		0.30	2.9		0.36	102		1.6
14	SPA-9	J1TRN7	7/23/14	3.2		0.31	2.4		0.36	47.4		1.7
15	SPA-10	J1TRN8	7/23/14	7.8		0.31	6.7		0.36	36.0		1.7
16	SPA-11	J1TRN9	7/23/14	1.9	B	0.3	1.9		0.36	25.7		1.6
17	SPA-12	J1TRP0	7/23/14	3.7		0.31	2.9		0.36	61.1		1.7

18 **Statistical Computation Input Data**

19	Sample	Sample	Sample	Nitrogen in Nitrate	Nitrogen in Nitrite and Nitrate	Sulfate
20	Area	Number	Date	mg/kg	mg/kg	mg/kg
21	SPA-1	J1TRM9/J1TRP1	7/23/14	1.5	1.6	45.2
22	SPA-2	J1TRN0	7/23/14	2.4	2.2	105
23	SPA-3	J1TRN1	7/23/14	4.4	5.2	55.8
24	SPA-4	J1TRN2	7/23/14	4.5	5.4	388
25	SPA-5	J1TRN3	7/23/14	2.6	1.5	57.5
26	SPA-6	J1TRN4	7/23/14	1.4	1.6	90.0
27	SPA-7	J1TRN5	7/23/14	11.7	8.2	191
28	SPA-8	J1TRN6	7/23/14	2.7	2.9	102
29	SPA-9	J1TRN7	7/23/14	3.2	2.4	47.4
30	SPA-10	J1TRN8	7/23/14	7.8	6.7	36.0
31	SPA-11	J1TRN9	7/23/14	1.9	1.9	25.7
32	SPA-12	J1TRP0	7/23/14	3.7	2.9	61.1

33 **Statistical Computations**

34		Nitrogen in Nitrate	Nitrogen in Nitrite and Nitrate	Sulfate
35	95% UCL based on	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.
36	N	12	12	12
37	% < Detection limit	0%	0%	0%
38	Mean	4.0	3.5	100
39	Standard deviation	3.0	2.3	101
40	95% UCL on mean	6.2	5.4	172
41	Maximum value	11.7	8.2	388
42	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)**	1000 GW Protection	1000 GW Protection	25000 GW Protection
43	**WAC 173-340 3-PART TEST**			
44	95% UCL > Cleanup Limit?	NA	NA	NO
45	> 10% above Cleanup Limit?	NA	NA	NO
46	Any sample > 2X Cleanup Limit?	NA	NA	NO
47	**WAC 173-340 Compliance?**	Because all values are below background (11.8 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (11.8 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.

48 **Acronyms and qualifiers are defined on sheet 3.**

MAXIMUM VALUE 3-PART TEST CALCULATION SHEET

Washington Closure Hanford

Originator I. B. Berezovskiy
Project 100-D Field Remediation
Subject 100-D-83:3 Subsite Cleanup Verification 95% UCL Calculations

Date 08/19/14
Job No. 14655

Calc. No. 0100D-CA-V0542
Checked J. D. Skoglie

Rev. No. 0
Date 08/19/14
Sheet No. 15 of 26

100-D-83:3 Subsite Maximum Calculations
Verification Data - SPA

Sample Area	Sample Number	Sample Date	Cadmium			Selenium			Benzo(a)anthracene			Benzo(a)pyrene			Benzo(b)fluoranthene			Chrysene			Fluoranthene			Indeno(1,2,3-cd)pyrene			Phenanthrene		
			mg/kg	Q	PQL	mg/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
SPA-1	J1TRM9	7/23/14	0.19	B	0.041	3.9		0.86	20	U	20	20	U	20	26	U	26	27	U	27	36	U	36	22	U	22	17	U	17
Duplicate of J1TRM9	J1TRP1	7/23/14	0.041	U	0.041	0.86	U	0.86	20	U	20	20	U	20	26	U	26	27	U	27	36	U	36	22	U	22	17	U	17
SPA-2	J1TRN0	7/23/14	0.037	U	0.037	0.78	U	0.78	19	U	19	19	U	19	24	U	24	25	U	25	34	U	34	21	U	21	16	U	16
SPA-3	J1TRN1	7/23/14	0.038	U	0.038	0.79	U	0.79	19	U	19	19	U	19	25	U	25	26	U	26	35	U	35	21	U	21	17	U	17
SPA-4	J1TRN2	7/23/14	0.039	U	0.039	0.81	U	0.81	19	U	19	19	U	19	25	U	25	25	U	25	34	U	34	21	U	21	16	U	16
SPA-5	J1TRN3	7/23/14	0.037	U	0.037	0.77	U	0.77	20	U	20	20	U	20	26	U	26	27	U	27	36	U	36	22	U	22	17	U	17
SPA-6	J1TRN4	7/23/14	0.037	U	0.037	0.77	U	0.77	20	U	20	20	U	20	26	U	26	26	U	26	35	U	35	68	J	22	17	U	17
SPA-7	J1TRN5	7/23/14	0.037	U	0.037	0.78	U	0.78	19	U	19	19	U	19	25	U	25	26	U	26	34	U	34	21	U	21	16	U	16
SPA-8	J1TRN6	7/23/14	0.038	U	0.038	0.80	U	0.80	25	J	20	23	J	20	36	J	26	36	J	27	60	J	36	69	J	22	53	J	17
SPA-9	J1TRN7	7/23/14	0.037	U	0.037	0.77	U	0.77	19	U	19	19	U	19	25	U	25	26	U	26	34	U	34	21	U	21	16	U	16
SPA-10	J1TRN8	7/23/14	0.039	U	0.039	0.83	U	0.83	22	J	19	19	U	19	25	U	25	26	U	26	41	J	34	21	U	21	46	J	16
SPA-11	J1TRN9	7/23/14	0.036	U	0.036	0.75	U	0.75	20	U	20	20	U	20	26	U	26	27	U	27	36	U	36	22	U	22	17	U	17
SPA-12	J1TRP0	7/23/14	0.040	U	0.040	0.83	U	0.83	20	U	20	20	U	20	26	U	26	26	U	26	35	U	35	21	U	21	17	U	17

Statistical Computations

	Cadmium	Selenium	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Chrysene	Fluoranthene	Indeno(1,2,3-cd)pyrene	Phenanthrene
% < Detection limit	92%	92%	83%	92%	92%	92%	83%	83%	83%
Maximum value	0.19	3.9	25	23	36	36	60	69	53
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless otherwise noted	0.81 GW & River Protection	1 River Protection	15 ug/kg GW & River Protection	15 ug/kg GW & River Protection	15 ug/kg GW & River Protection	100 ug/kg River Protection	18000 ug/kg River Protection	330 ug/kg GW & River Protection	240000 ug/kg GW Protection
3-PART TEST									
Maximum > Cleanup Limit?	NA	YES	YES	YES	YES	NO	NO	NO	NO
> 10% above Cleanup Limit?	NA	YES	YES	YES	YES	NO	NO	NO	NO
Any sample > 2X Cleanup Limit?	NA	YES	YES	YES	YES	NO	NO	NO	NO
3-Part Test Compliance?	Because all values are below background (0.81 mg/kg) the WAC 173-340 3-part test is not required.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.

100-D-83:3 Subsite Maximum Calculations
Verification Data - SPA

Sample Area	Sample Number	Sample Date	Pyrene		
			ug/kg	Q	PQL
SPA-1	J1TRM9	7/23/14	12	U	12
Duplicate of J1TRM9	J1TRP1	7/23/14	12	U	12
SPA-2	J1TRN0	7/23/14	11	U	11
SPA-3	J1TRN1	7/23/14	12	U	12
SPA-4	J1TRN2	7/23/14	11	U	11
SPA-5	J1TRN3	7/23/14	12	U	12
SPA-6	J1TRN4	7/23/14	15	J	12
SPA-7	J1TRN5	7/23/14	12	U	12
SPA-8	J1TRN6	7/23/14	51	J	12
SPA-9	J1TRN7	7/23/14	16	J	11
SPA-10	J1TRN8	7/23/14	45	J	12
SPA-11	J1TRN9	7/23/14	14	J	12
SPA-12	J1TRP0	7/23/14	12	U	12

Statistical Computations

	Pyrene
% < Detection limit	58%
Maximum value	51
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless otherwise noted	48000 ug/kg GW Protection
3-PART TEST	
Maximum > Cleanup Limit?	NO
> 10% above Cleanup Limit?	NO
Any sample > 2X Cleanup Limit?	NO
3-Part Test Compliance?	The data set meets the 3-part test criteria when compared to the most stringent RAG.

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator I. B. Berezovskiy
Project 100-D Field Remediation
Subject 100-D-83:3 Subsite Cleanup Verification 95% UCL Calculations

Date 08/19/14
Job No. 14655

Calc. No. 0100D-CA-V0542
Checked J. D. Skoglie

Rev. No. 0
Date 08/19/14
Sheet No. 16 of 26

Ecology Software (MTCAStat) Results, 100-D-83:3 Subsite Excavation

Arsenic 95% UCL Calculation

DATA	ID
2.2	J1TRK3/J1TRL5
2.1	J1TRK4
2.4	J1TRK5
2.4	J1TRK6
2.3	J1TRK7
1.9	J1TRK8
1.5	J1TRK9
1.9	J1TRL0
1.8	J1TRL1
2.0	J1TRL2
2.4	J1TRL3
2.8	J1TRL4

Number of samples		Uncensored values	
Uncensored	12	Mean	2.1
Censored		Lognormal mean	2.1
Detection limit or PQL		Std. devn.	0.35
Method detection limit		Median	2.1
TOTAL	12	Min.	1.5
		Max.	2.8

Lognormal distribution? r-squared is: 0.959
Normal distribution? r-squared is: 0.967
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 2.3

Barium 95% UCL Calculation

DATA	ID
73.1	J1TRK3/J1TRL5
64.7	J1TRK4
77.1	J1TRK5
65.7	J1TRK6
55.0	J1TRK7
66.2	J1TRK8
56.0	J1TRK9
63.1	J1TRL0
59.3	J1TRL1
59.0	J1TRL2
56.2	J1TRL3
58.5	J1TRL4

Number of samples		Uncensored values	
Uncensored	12	Mean	62.8
Censored		Lognormal mean	62.8
Detection limit or PQL		Std. devn.	6.9
Method detection limit		Median	61.2
TOTAL	12	Min.	55.0
		Max.	77.1

Lognormal distribution? r-squared is: 0.932
Normal distribution? r-squared is: 0.913
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 66.6

Cadmium 95% UCL Calculation

DATA	ID
0.17	J1TRK3/J1TRL5
0.17	J1TRK4
0.19	J1TRK5
0.16	J1TRK6
0.13	J1TRK7
0.15	J1TRK8
0.13	J1TRK9
0.15	J1TRL0
0.14	J1TRL1
0.16	J1TRL2
0.14	J1TRL3
0.20	J1TRL4

Number of samples		Uncensored values	
Uncensored	12	Mean	0.16
Censored		Lognormal mean	0.16
Detection limit or PQL		Std. devn.	0.022
Method detection limit		Median	0.16
TOTAL	12	Min.	0.13
		Max.	0.20

Lognormal distribution? r-squared is: 0.961
Normal distribution? r-squared is: 0.943
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 0.17

Chromium 95% UCL Calculation

DATA	ID
6.6	J1TRK3/J1TRL5
6.2	J1TRK4
7.3	J1TRK5
7.8	J1TRK6
6.3	J1TRK7
6.8	J1TRK8
4.5	J1TRK9
6.3	J1TRL0
4.9	J1TRL1
6.9	J1TRL2
6.7	J1TRL3
8.1	J1TRL4

Number of samples		Uncensored values	
Uncensored	12	Mean	6.5
Censored		Lognormal mean	6.5
Detection limit or PQL		Std. devn.	1.0
Method detection limit		Median	6.7
TOTAL	12	Min.	4.5
		Max.	8.1

Lognormal distribution? r-squared is: 0.895
Normal distribution? r-squared is: 0.934
Recommendations:
Use normal distribution.

UCL (based on t-statistic) is 7.1

Cobalt 95% UCL Calculation

DATA	ID
7.4	J1TRK3/J1TRL5
7.8	J1TRK4
7.4	J1TRK5
7.5	J1TRK6
7.2	J1TRK7
7.1	J1TRK8
8.0	J1TRK9
8.1	J1TRL0
8.5	J1TRL1
7.7	J1TRL2
7.8	J1TRL3
7.5	J1TRL4

Number of samples		Uncensored values	
Uncensored	12	Mean	7.7
Censored		Lognormal mean	7.7
Detection limit or PQL		Std. devn.	0.40
Method detection limit		Median	7.6
TOTAL	12	Min.	7.1
		Max.	8.5

Lognormal distribution? r-squared is: 0.972
Normal distribution? r-squared is: 0.964
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 7.9

Copper 95% UCL Calculation

DATA	ID
14.5	J1TRK3/J1TRL5
14.1	J1TRK4
14.0	J1TRK5
14.6	J1TRK6
13.0	J1TRK7
14.6	J1TRK8
13.9	J1TRK9
14.4	J1TRL0
14.5	J1TRL1
14.9	J1TRL2
13.9	J1TRL3
19.8	J1TRL4

Number of samples		Uncensored values	
Uncensored	12	Mean	14.7
Censored		Lognormal mean	14.7
Detection limit or PQL		Std. devn.	1.7
Method detection limit		Median	14.5
TOTAL	12	Min.	13.0
		Max.	19.8

Lognormal distribution? r-squared is: 0.617
Normal distribution? r-squared is: 0.568
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 15.5

Hexavalent Chromium 95% UCL Calculation

DATA	ID
0.419	J1TRK3/J1TRL5
0.314	J1TRK4
0.399	J1TRK5
0.438	J1TRK6
0.295	J1TRK7
0.454	J1TRK8
0.295	J1TRK9
0.315	J1TRL0
0.313	J1TRL1
0.314	J1TRL2
0.375	J1TRL3
0.397	J1TRL4

Number of samples		Uncensored values	
Uncensored	12	Mean	0.36
Censored		Lognormal mean	0.36
Detection limit or PQL		Std. devn.	0.059
Method detection limit		Median	0.35
TOTAL	12	Min.	0.30
		Max.	0.45

Lognormal distribution? r-squared is: 0.890
Normal distribution? r-squared is: 0.889
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.39

Lead 95% UCL Calculation

DATA	ID
12.7	J1TRK3/J1TRL5
9.6	J1TRK4
7.7	J1TRK5
6.8	J1TRK6
3.6	J1TRK7
7.5	J1TRK8
2.7	J1TRK9
4.1	J1TRL0
3.6	J1TRL1
3.7	J1TRL2
4.0	J1TRL3
7.4	J1TRL4

Number of samples		Uncensored values	
Uncensored	12	Mean	6.1
Censored		Lognormal mean	6.2
Detection limit or PQL		Std. devn.	3.0
Method detection limit		Median	5.5
TOTAL	12	Min.	2.7
		Max.	12.7

Lognormal distribution? r-squared is: 0.929
Normal distribution? r-squared is: 0.885
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 8.4

Manganese 95% UCL Calculation

DATA	ID
287	J1TRK3/J1TRL5
292	J1TRK4
323	J1TRK5
288	J1TRK6
279	J1TRK7
273	J1TRK8
294	J1TRK9
307	J1TRL0
295	J1TRL1
295	J1TRL2
288	J1TRL3
283	J1TRL4

Number of samples		Uncensored values	
Uncensored	12	Mean	292
Censored		Lognormal mean	292
Detection limit or PQL		Std. devn.	13.1
Method detection limit		Median	290
TOTAL	12	Min.	273
		Max.	323

Lognormal distribution? r-squared is: 0.914
Normal distribution? r-squared is: 0.900
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 299

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator I. B. Berezovskiy

Project 100-D Field Remediation

Subject 100-D-83:3 Subsite Cleanup Verification 95% UCL Calculations

Date 08/19/14

Job No. 14655

Calc. No. 0100D-CA-V0542

Checked J. D. Skoglie

Rev. No. 0

Date 08/19/14

Sheet No. 17 of 26

Ecology Software (MTCAStat) Results, 100-D-83:3 Subsite Excavation

Mercury 95% UCL Calculation

DATA	ID
0.94	J1TRK3/J1TRL5
0.040	J1TRK4
0.010	J1TRK5
0.014	J1TRK6
0.0077	J1TRK7
0.027	J1TRK8
0.0057	J1TRK9
0.036	J1TRL0
0.0093	J1TRL1
0.0073	J1TRL2
0.0093	J1TRL3
0.013	J1TRL4

Number of samples		Uncensored values	
Uncensored	12	Mean	0.093
Censored		Lognormal mean	0.049
Detection limit or PQL		Std. devn.	0.27
Method detection limit		Median	0.012
TOTAL	12	Min.	0.0057
		Max.	0.94

Lognormal distribution? r-squared is: 0.711

Normal distribution? r-squared is: NA

Recommendations:

Reject BOTH lognormal and normal distributions.

Unable to analyze probability plot for normal case.

UCL (based on Z-statistic) is 0.22

Nickel 95% UCL Calculation

DATA	ID
8.1	J1TRK3/J1TRL5
7.8	J1TRK4
8.5	J1TRK5
8.5	J1TRK6
8.5	J1TRK7
7.6	J1TRK8
6.5	J1TRK9
9.0	J1TRL0
7.7	J1TRL1
8.4	J1TRL2
8.4	J1TRL3
9.2	J1TRL4

Number of samples		Uncensored values	
Uncensored	12	Mean	8.2
Censored		Lognormal mean	8.2
Detection limit or PQL		Std. devn.	0.72
Method detection limit		Median	8.4
TOTAL	12	Min.	6.5
		Max.	9.2

Lognormal distribution? r-squared is: 0.877

Normal distribution? r-squared is: 0.907

Recommendations:

Use normal distribution.

UCL (based on t-statistic) is 8.6

Vanadium 95% UCL Calculation

DATA	ID
49.3	J1TRK3/J1TRL5
51.5	J1TRK4
44.9	J1TRK5
51.7	J1TRK6
53.4	J1TRK7
49.8	J1TRK8
60.1	J1TRK9
58.9	J1TRL0
59.0	J1TRL1
56.1	J1TRL2
56.9	J1TRL3
52.6	J1TRL4

Number of samples		Uncensored values	
Uncensored	12	Mean	53.7
Censored		Lognormal mean	53.7
Detection limit or PQL		Std. devn.	4.6
Method detection limit		Median	53.0
TOTAL	12	Min.	44.9
		Max.	60.1

Lognormal distribution? r-squared is: 0.957

Normal distribution? r-squared is: 0.964

Recommendations:

Use lognormal distribution.

UCL (Land's method) is 56.3

Zinc 95% UCL Calculation

DATA	ID
39.0	J1TRK3/J1TRL5
38.9	J1TRK4
36.1	J1TRK5
42.5	J1TRK6
36.1	J1TRK7
39.5	J1TRK8
38.3	J1TRK9
39.2	J1TRL0
50.5	J1TRL1
38.6	J1TRL2
39.6	J1TRL3
41.1	J1TRL4

Number of samples		Uncensored values	
Uncensored	12	Mean	40.0
Censored		Lognormal mean	40.0
Detection limit or PQL		Std. devn.	3.8
Method detection limit		Median	39.1
TOTAL	12	Min.	36.1
		Max.	50.5

Lognormal distribution? r-squared is: 0.776

Normal distribution? r-squared is: 0.734

Recommendations:

Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 41.7

Chloride 95% UCL Calculation

DATA	ID
3.0	J1TRK3/J1TRL5
3.1	J1TRK4
3.5	J1TRK5
5.3	J1TRK6
15.0	J1TRK7
7.1	J1TRK8
8.4	J1TRK9
5.2	J1TRL0
3.9	J1TRL1
10.4	J1TRL2
9.6	J1TRL3
7.9	J1TRL4

Number of samples		Uncensored values	
Uncensored	12	Mean	6.9
Censored		Lognormal mean	6.9
Detection limit or PQL		Std. devn.	3.6
Method detection limit		Median	6.2
TOTAL	12	Min.	3.0
		Max.	15.0

Lognormal distribution? r-squared is: 0.966

Normal distribution? r-squared is: 0.914

Recommendations:

Use lognormal distribution.

UCL (Land's method) is 9.8

Nitrogen in Nitrate 95% UCL Calculation

DATA	ID
1.3	J1TRK3/J1TRL5
1.5	J1TRK4
2.8	J1TRK5
2.0	J1TRK6
2.0	J1TRK7
1.7	J1TRK8
2.5	J1TRK9
1.1	J1TRL0
1.3	J1TRL1
1.1	J1TRL2
1.0	J1TRL3
1.3	J1TRL4

Number of samples		Uncensored values	
Uncensored	12	Mean	1.6
Censored		Lognormal mean	1.6
Detection limit or PQL		Std. devn.	0.58
Method detection limit		Median	1.4
TOTAL	12	Min.	1.0
		Max.	2.8

Lognormal distribution? r-squared is: 0.946

Normal distribution? r-squared is: 0.899

Recommendations:

Use lognormal distribution.

UCL (Land's method) is 2.0

Nirogen in Nitrite and Nitrate 95% UCL Calculation

DATA	ID
0.48	J1TRK3/J1TRL5
0.70	J1TRK4
1.9	J1TRK5
1.5	J1TRK6
1.7	J1TRK7
1.0	J1TRK8
1.7	J1TRK9
0.18	J1TRL0
0.39	J1TRL1
0.37	J1TRL2
0.48	J1TRL3
0.84	J1TRL4

Number of samples		Uncensored values	
Uncensored	12	Mean	0.94
Censored		Lognormal mean	0.98
Detection limit or PQL		Std. devn.	0.61
Method detection limit		Median	0.77
TOTAL	12	Min.	0.18
		Max.	1.9

Lognormal distribution? r-squared is: 0.946

Normal distribution? r-squared is: 0.908

Recommendations:

Use lognormal distribution.

UCL (Land's method) is 1.7

Sulfate 95% UCL Calculation

DATA	ID
7.4	J1TRK3/J1TRL5
7.6	J1TRK4
10.0	J1TRK5
8.9	J1TRK6
12.3	J1TRK7
17.3	J1TRK8
25.7	J1TRK9
9.4	J1TRL0
242	J1TRL1
9.9	J1TRL2
236	J1TRL3
35.4	J1TRL4

Number of samples		Uncensored values	
Uncensored	12	Mean	51.8
Censored		Lognormal mean	44.3
Detection limit or PQL		Std. devn.	87.8
Method detection limit		Median	11.2
TOTAL	12	Min.	7.4
		Max.	242

Lognormal distribution? r-squared is: 0.765

Normal distribution? r-squared is: 0.536

Recommendations:

Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 93.5

Pyrene 95% UCL Calculation

DATA	ID
48	J1TRK3/J1TRL5
17	J1TRK4
6.0	J1TRK5
18	J1TRK6
14	J1TRK7
160	J1TRK8
14	J1TRK9
6.0	J1TRL0
5.5	J1TRL1
6.0	J1TRL2
6.0	J1TRL3
6.0	J1TRL4

Number of samples		Uncensored values	
Uncensored	12	Mean	26
Censored		Lognormal mean	22
Detection limit or PQL		Std. devn.	44
Method detection limit		Median	10
TOTAL	12	Min.	5.5
		Max.	160

Lognormal distribution? r-squared is: 0.784

Normal distribution? r-squared is: 0.481

Recommendations:

Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 46

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator I. B. Berezovskiy
Project 100-D Field Remediation
Subject 100-D-83:3 Subsite Cleanup Verification 95% UCL Calculations

Date 08/19/14
Job No. 14655

Calc. No. 0100D-CA-V0542
Checked J. D. Skoglie

Rev. No. 0
Date 08/19/14
Sheet No. 18 of 26

Ecology Software (MTCAStat) Results, 100-D-83:3 Subsite Overburden

Arsenic 95% UCL Calculation

DATA	ID
2.2	J1TRM7/J1TRM8
2.4	J1TRL6
2.2	J1TRL7
2.1	J1TRL8
2.6	J1TRL9
3.4	J1TRM0
1.8	J1TRM1
2.2	J1TRM2
2.0	J1TRM3
3.1	J1TRM4
6.5	J1TRM5
1.4	J1TRM6

Number of samples		Uncensored values	
Uncensored	12	Mean	2.7
Censored		Lognormal mean	2.6
Detection limit or PQL		Std. devn.	1.3
Method detection limit		Median	2.2
TOTAL	12	Min.	1.4
		Max.	6.5

Lognormal distribution? r-squared is: 0.856
Normal distribution? r-squared is: 0.674
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 3.3

Barium 95% UCL Calculation

DATA	ID
59.2	J1TRM7/J1TRM8
132	J1TRL6
56.7	J1TRL7
58.7	J1TRL8
70.5	J1TRL9
77.1	J1TRM0
63.1	J1TRM1
62.0	J1TRM2
56.4	J1TRM3
70.9	J1TRM4
58.5	J1TRM5
65.5	J1TRM6

Number of samples		Uncensored values	
Uncensored	12	Mean	69.2
Censored		Lognormal mean	69.1
Detection limit or PQL		Std. devn.	20.8
Method detection limit		Median	62.6
TOTAL	12	Min.	56.4
		Max.	132

Lognormal distribution? r-squared is: 0.682
Normal distribution? r-squared is: 0.576
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 79.1

Boron 95% UCL Calculation

DATA	ID
0.43	J1TRM7/J1TRM8
0.45	J1TRL6
1.2	J1TRL7
1.1	J1TRL8
0.43	J1TRL9
1.5	J1TRM0
2.1	J1TRM1
0.95	J1TRM2
1.1	J1TRM3
0.44	J1TRM4
1.1	J1TRM5
0.97	J1TRM6

Number of samples		Uncensored values	
Uncensored	12	Mean	0.98
Censored		Lognormal mean	1.0
Detection limit or PQL		Std. devn.	0.51
Method detection limit		Median	1.0
TOTAL	12	Min.	0.43
		Max.	2.1

Lognormal distribution? r-squared is: 0.880
Normal distribution? r-squared is: 0.882
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 1.22

Cadmium 95% UCL Calculation

DATA	ID
0.16	J1TRM7/J1TRM8
0.17	J1TRL6
0.16	J1TRL7
0.15	J1TRL8
0.21	J1TRL9
0.20	J1TRM0
0.18	J1TRM1
0.25	J1TRM2
0.15	J1TRM3
0.18	J1TRM4
0.19	J1TRM5
0.14	J1TRM6

Number of samples		Uncensored values	
Uncensored	12	Mean	0.18
Censored		Lognormal mean	0.18
Detection limit or PQL		Std. devn.	0.031
Method detection limit		Median	0.18
TOTAL	12	Min.	0.14
		Max.	0.25

Lognormal distribution? r-squared is: 0.955
Normal distribution? r-squared is: 0.917
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 0.20

Chromium 95% UCL Calculation

DATA	ID
6.0	J1TRM7/J1TRM8
6.8	J1TRL6
5.4	J1TRL7
7.9	J1TRL8
8.4	J1TRL9
7.8	J1TRM0
6.2	J1TRM1
8.8	J1TRM2
5.9	J1TRM3
12.8	J1TRM4
7.5	J1TRM5
4.3	J1TRM6

Number of samples		Uncensored values	
Uncensored	12	Mean	7.3
Censored		Lognormal mean	7.3
Detection limit or PQL		Std. devn.	2.2
Method detection limit		Median	7.2
TOTAL	12	Min.	4.3
		Max.	12.8

Lognormal distribution? r-squared is: 0.955
Normal distribution? r-squared is: 0.879
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 8.6

Cobalt 95% UCL Calculation

DATA	ID
7.9	J1TRM7/J1TRM8
7.8	J1TRL6
7.7	J1TRL7
7.7	J1TRL8
6.9	J1TRL9
7.6	J1TRM0
7.9	J1TRM1
6.8	J1TRM2
7.2	J1TRM3
7.1	J1TRM4
6.8	J1TRM5
8.1	J1TRM6

Number of samples		Uncensored values	
Uncensored	12	Mean	7.5
Censored		Lognormal mean	7.5
Detection limit or PQL		Std. devn.	0.47
Method detection limit		Median	7.7
TOTAL	12	Min.	6.8
		Max.	8.1

Lognormal distribution? r-squared is: 0.910
Normal distribution? r-squared is: 0.915
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 7.7

Copper 95% UCL Calculation

DATA	ID
14.2	J1TRM7/J1TRM8
14.9	J1TRL6
14.0	J1TRL7
14.2	J1TRL8
14.4	J1TRL9
16.0	J1TRM0
14.0	J1TRM1
13.5	J1TRM2
14.3	J1TRM3
15.8	J1TRM4
13.3	J1TRM5
13.1	J1TRM6

Number of samples		Uncensored values	
Uncensored	12	Mean	14.3
Censored		Lognormal mean	14.3
Detection limit or PQL		Std. devn.	0.89
Method detection limit		Median	14.2
TOTAL	12	Min.	13.1
		Max.	16.0

Lognormal distribution? r-squared is: 0.933
Normal distribution? r-squared is: 0.921
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 14.8

Hexavalent Chromium 95% UCL Calculation

DATA	ID
0.326	J1TRM7/J1TRM8
0.481	J1TRL6
0.415	J1TRL7
0.378	J1TRL8
0.417	J1TRL9
0.078	J1TRM0
0.356	J1TRM1
0.078	J1TRM2
0.292	J1TRM3
0.497	J1TRM4
0.418	J1TRM5
0.274	J1TRM6

Number of samples		Uncensored values	
Uncensored	12	Mean	0.334
Censored		Lognormal mean	0.358
Detection limit or PQL		Std. devn.	0.138
Method detection limit		Median	0.367
TOTAL	12	Min.	0.078
		Max.	0.497

Lognormal distribution? r-squared is: 0.718
Normal distribution? r-squared is: 0.882
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.399

Lead 95% UCL Calculation

DATA	ID
4.2	J1TRM7/J1TRM8
15.3	J1TRL6
7.5	J1TRL7
6.5	J1TRL8
6.9	J1TRL9
15.6	J1TRM0
5.8	J1TRM1
4.3	J1TRM2
3.6	J1TRM3
4.3	J1TRM4
6.5	J1TRM5
2.5	J1TRM6

Number of samples		Uncensored values	
Uncensored	12	Mean	6.9
Censored		Lognormal mean	6.9
Detection limit or PQL		Std. devn.	4.3
Method detection limit		Median	6.2
TOTAL	12	Min.	2.5
		Max.	15.6

Lognormal distribution? r-squared is: 0.930
Normal distribution? r-squared is: 0.783
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 9.9

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator I. B. Berezovskiy
Project 100-D Field Remediation
Subject 100-D-83:3 Subsite Cleanup Verification 95% UCL Calculations

Date 08/19/14
Job No. 14655

Calc. No. 0100D-CA-V0542
Checked J. D. Skoglie

Rev. No. 0
Date 08/19/14
Sheet No. 19 of 26

Ecology Software (MTCAStat) Results, 100-D-83:3 Subsite Overburden

Manganese 95% UCL Calculation

DATA	ID
296	J1TRM7/J1TRM8
302	J1TRL6
282	J1TRL7
298	J1TRL8
296	J1TRL9
306	J1TRM0
301	J1TRM1
290	J1TRM2
282	J1TRM3
305	J1TRM4
282	J1TRM5
316	J1TRM6

Number of samples		Uncensored values	
Uncensored	12	Mean	296
Censored		Lognormal mean	296
Detection limit or PQL		Std. devn.	10.7
Method detection limit		Median	297
TOTAL	12	Min.	282
		Max.	316

Lognormal distribution? r-squared is: 0.942
Normal distribution? r-squared is: 0.944
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 302

Mercury 95% UCL Calculation

DATA	ID
0.0090	J1TRM7/J1TRM8
0.10	J1TRL6
0.057	J1TRL7
0.0094	J1TRL8
0.011	J1TRL9
0.017	J1TRM0
0.011	J1TRM1
0.0073	J1TRM2
0.0073	J1TRM3
0.011	J1TRM4
0.045	J1TRM5
0.0067	J1TRM6

Number of samples		Uncensored values	
Uncensored	12	Mean	0.024
Censored		Lognormal mean	0.023
Detection limit or PQL		Std. devn.	0.029
Method detection limit		Median	0.011
TOTAL	12	Min.	0.0067
		Max.	0.10

Lognormal distribution? r-squared is: 0.816
Normal distribution? r-squared is: 0.651
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.038

Nickel 95% UCL Calculation

DATA	ID
8.3	J1TRM7/J1TRM8
8.6	J1TRL6
7.5	J1TRL7
9.3	J1TRL8
8.7	J1TRL9
8.5	J1TRM0
8.4	J1TRM1
9.3	J1TRM2
7.6	J1TRM3
9.2	J1TRM4
7.4	J1TRM5
7.8	J1TRM6

Number of samples		Uncensored values	
Uncensored	12	Mean	8.4
Censored		Lognormal mean	8.4
Detection limit or PQL		Std. devn.	0.69
Method detection limit		Median	8.5
TOTAL	12	Min.	7.4
		Max.	9.3

Lognormal distribution? r-squared is: 0.943
Normal distribution? r-squared is: 0.944
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 8.8

Vanadium 95% UCL Calculation

DATA	ID
54.0	J1TRM7/J1TRM8
51.5	J1TRL6
51.4	J1TRL7
54.0	J1TRL8
46.9	J1TRL9
49.3	J1TRM0
51.5	J1TRM1
46.0	J1TRM2
47.8	J1TRM3
45.4	J1TRM4
50.5	J1TRM5
58.6	J1TRM6

Number of samples		Uncensored values	
Uncensored	12	Mean	50.6
Censored		Lognormal mean	50.6
Detection limit or PQL		Std. devn.	3.8
Method detection limit		Median	51.0
TOTAL	12	Min.	45.4
		Max.	58.6

Lognormal distribution? r-squared is: 0.962
Normal distribution? r-squared is: 0.952
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 52.6

Zinc 95% UCL Calculation

DATA	ID
37.8	J1TRM7/J1TRM8
41.4	J1TRL6
37.6	J1TRL7
39.0	J1TRL8
38.8	J1TRL9
42.5	J1TRM0
38.2	J1TRM1
36.1	J1TRM2
34.8	J1TRM3
35.9	J1TRM4
39.8	J1TRM5
38.3	J1TRM6

Number of samples		Uncensored values	
Uncensored	12	Mean	38.3
Censored		Lognormal mean	38.4
Detection limit or PQL		Std. devn.	2.2
Method detection limit		Median	38.3
TOTAL	12	Min.	34.8
		Max.	42.5

Lognormal distribution? r-squared is: 0.976
Normal distribution? r-squared is: 0.972
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 39.5

Chloride 95% UCL Calculation

DATA	ID
13.5	J1TRM7/J1TRM8
2.8	J1TRL6
2.8	J1TRL7
2.7	J1TRL8
2.9	J1TRL9
2.8	J1TRM0
3.3	J1TRM1
4.2	J1TRM2
5.9	J1TRM3
3.7	J1TRM4
4.5	J1TRM5
5.1	J1TRM6

Number of samples		Uncensored values	
Uncensored	12	Mean	4.5
Censored		Lognormal mean	4.4
Detection limit or PQL		Std. devn.	3.0
Method detection limit		Median	3.5
TOTAL	12	Min.	2.7
		Max.	13.5

Lognormal distribution? r-squared is: 0.791
Normal distribution? r-squared is: 0.598
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 5.9

Fluoride 95% UCL Calculation

DATA	ID
0.40	J1TRM7/J1TRM8
0.41	J1TRL6
0.85	J1TRL7
0.41	J1TRL8
0.81	J1TRL9
1.0	J1TRM0
0.40	J1TRM1
1.0	J1TRM2
0.90	J1TRM3
1.5	J1TRM4
0.41	J1TRM5
0.40	J1TRM6

Number of samples		Uncensored values	
Uncensored	12	Mean	0.71
Censored		Lognormal mean	0.71
Detection limit or PQL		Std. devn.	0.36
Method detection limit		Median	0.61
TOTAL	12	Min.	0.40
		Max.	1.5

Lognormal distribution? r-squared is: 0.821
Normal distribution? r-squared is: 0.818
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.88

Nitrogen in Nitrate 95% UCL Calculation

DATA	ID
1.2	J1TRM7/J1TRM8
1.3	J1TRL6
1.2	J1TRL7
1.1	J1TRL8
1.4	J1TRL9
1.4	J1TRM0
1.2	J1TRM1
1.5	J1TRM2
1.4	J1TRM3
1.1	J1TRM4
1.1	J1TRM5
1.2	J1TRM6

Number of samples		Uncensored values	
Uncensored	12	Mean	1.3
Censored		Lognormal mean	1.3
Detection limit or PQL		Std. devn.	0.14
Method detection limit		Median	1.2
TOTAL	12	Min.	1.1
		Max.	1.5

Lognormal distribution? r-squared is: 0.908
Normal distribution? r-squared is: 0.902
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 1.3

Nitrogen in Nitrite and Nitrate 95% UCL Calculation

DATA	ID
1.3	J1TRM7/J1TRM8
0.68	J1TRL6
0.44	J1TRL7
0.47	J1TRL8
1.1	J1TRL9
1.4	J1TRM0
1.0	J1TRM1
1.3	J1TRM2
1.4	J1TRM3
0.48	J1TRM4
0.62	J1TRM5
0.86	J1TRM6

Number of samples		Uncensored values	
Uncensored	12	Mean	0.91
Censored		Lognormal mean	0.93
Detection limit or PQL		Std. devn.	0.37
Method detection limit		Median	0.91
TOTAL	12	Min.	0.44
		Max.	1.4

Lognormal distribution? r-squared is: 0.919
Normal distribution? r-squared is: 0.926
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 1.2

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford
Originator I. B. Berezovskiy
Project 100-D Field Remediation
Subject 100-D-83:3 Subsite Cleanup Verification 95% UCL Calculations

Date 08/19/14
Job No. 14655

Calc. No. 0100D-CA-V0542
Checked J. D. Skoglie

Rev. No. 0
Date 08/19/14
Sheet No. 20 of 26

Ecology Software (MTCAStat) Results, 100-D-83:3 Subsite Overburden

	DATA	ID	Sulfate 95% UCL Calculation			
1	DATA	ID				
2	11.8	J1TRM7/J1TRM8				
3	5.9	J1TRL6				
4	6.7	J1TRL7	Number of samples		Uncensored values	
5	7.9	J1TRL8	Uncensored	12	Mean	10.1
6	7.6	J1TRL9	Censored		Lognormal mean	10.1
7	8.0	J1TRM0	Detection limit or PQL		Std. devn.	3.8
8	7.1	J1TRM1	Method detection limit		Median	8.2
9	8.4	J1TRM2	TOTAL	12	Min.	5.9
10	10.2	J1TRM3			Max.	16.9
11	16.9	J1TRM4				
12	14.2	J1TRM5				
13	16.3	J1TRM6				
14			Lognormal distribution?		Normal distribution?	
15			r-squared is:	0.928	r-squared is:	0.876
16			Recommendations:			
17			Use lognormal distribution.			
18						
19			UCL (Land's method) is		12.5	
20						

DATA	ID	Dimethyl phthalate 95% UCL Calculation			
12	J1TRM7/J1TRM8				
11	J1TRL6				
37	J1TRL7	Number of samples		Uncensored values	
11	J1TRL8	Uncensored	12	Mean	30
72	J1TRL9	Censored		Lognormal mean	31
37	J1TRM0	Detection limit or PQL		Std. devn.	22
36	J1TRM1	Method detection limit		Median	24
49	J1TRM2	TOTAL	12	Min.	11
61	J1TRM3			Max.	72
11	J1TRM4				
11	J1TRM5				
12	J1TRM6				
		Lognormal distribution?		Normal distribution?	
		r-squared is:	0.815	r-squared is:	0.835
		Recommendations:			
		Reject BOTH lognormal and normal distributions.			
		UCL (based on Z-statistic) is		40	

21 **Acronyms and qualifiers are defined on sheet 3.**

CALCULATION SHEET

Washington Closure Hanford

Originator I. B. Berezovskiy **Date** 08/19/14 **Calc. No.** 0100D-CA-V0542 **Rev. No.** 0

Project 100-D Field Remediation **Job No.** 14655 **Checked** J. D. Skoglie **Date** 08/19/14

Subject 100-D-83:3 Subsite Cleanup Verification 95% UCL Calculations **Sheet No.** 21 of 26

Ecology Software (MTCAStat) Results, 100-D-83:3 Subsite Staging Pile Area

Antimony 95% UCL Calculation

DATA	ID
0.49	J1TRM9/J1TRP1
0.42	J1TRN0
0.80	J1TRN1
0.45	J1TRN2
0.47	J1TRN3
0.54	J1TRN4
0.56	J1TRN5
0.35	J1TRN6
0.52	J1TRN7
0.19	J1TRN8
0.62	J1TRN9
0.55	J1TRP0

Number of samples		Uncensored values	
Uncensored	12	Mean	0.50
Censored		Lognormal mean	0.50
Detection limit or PQL		Std. devn.	0.15
Method detection limit		Median	0.50
TOTAL	12	Min.	0.19
		Max.	0.80

Lognormal distribution? r-squared is: 0.835
Normal distribution? r-squared is: 0.929
Recommendations:
Use normal distribution.

UCL (based on t-statistic) is 0.57

Arsenic 95% UCL Calculation

DATA	ID
4.5	J1TRM9/J1TRP1
4.5	J1TRN0
3.4	J1TRN1
5.6	J1TRN2
3.7	J1TRN3
2.9	J1TRN4
3.4	J1TRN5
3.2	J1TRN6
15.8	J1TRN7
16.1	J1TRN8
1.7	J1TRN9
3.9	J1TRP0

Number of samples		Uncensored values	
Uncensored	12	Mean	5.7
Censored		Lognormal mean	5.6
Detection limit or PQL		Std. devn.	4.9
Method detection limit		Median	3.8
TOTAL	12	Min.	1.7
		Max.	16.1

Lognormal distribution? r-squared is: 0.837
Normal distribution? r-squared is: 0.644
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 8.0

Barium 95% UCL Calculation

DATA	ID
60.5	J1TRM9/J1TRP1
68.7	J1TRN0
68.4	J1TRN1
68.5	J1TRN2
74.0	J1TRN3
58.4	J1TRN4
61.1	J1TRN5
66.9	J1TRN6
69.9	J1TRN7
82.6	J1TRN8
54.6	J1TRN9
60.4	J1TRP0

Number of samples		Uncensored values	
Uncensored	12	Mean	66.2
Censored		Lognormal mean	66.2
Detection limit or PQL		Std. devn.	7.7
Method detection limit		Median	67.7
TOTAL	12	Min.	54.6
		Max.	82.6

Lognormal distribution? r-squared is: 0.955
Normal distribution? r-squared is: 0.940
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 70.4

Beryllium 95% UCL Calculation

DATA	ID
0.23	J1TRM9/J1TRP1
0.15	J1TRN0
0.16	J1TRN1
0.19	J1TRN2
0.17	J1TRN3
0.17	J1TRN4
0.17	J1TRN5
0.22	J1TRN6
0.27	J1TRN7
0.26	J1TRN8
0.13	J1TRN9
0.16	J1TRP0

Number of samples		Uncensored values	
Uncensored	12	Mean	0.19
Censored		Lognormal mean	0.19
Detection limit or PQL		Std. devn.	0.044
Method detection limit		Median	0.17
TOTAL	12	Min.	0.13
		Max.	0.27

Lognormal distribution? r-squared is: 0.943
Normal distribution? r-squared is: 0.912
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 0.22

Boron 95% UCL Calculation

DATA	ID
2.2	J1TRM9/J1TRP1
4.4	J1TRN0
2.3	J1TRN1
2.9	J1TRN2
2.1	J1TRN3
1.7	J1TRN4
1.4	J1TRN5
1.2	J1TRN6
1.9	J1TRN7
4.7	J1TRN8
0.43	J1TRN9
1.1	J1TRP0

Number of samples		Uncensored values	
Uncensored	12	Mean	2.2
Censored		Lognormal mean	2.3
Detection limit or PQL		Std. devn.	1.3
Method detection limit		Median	2.0
TOTAL	12	Min.	0.43
		Max.	4.7

Lognormal distribution? r-squared is: 0.934
Normal distribution? r-squared is: 0.906
Recommendations:
Use normal distribution.

UCL (based on t-statistic) is 3.6

Chromium 95% UCL Calculation

DATA	ID
11.65	J1TRM9/J1TRP1
13.7	J1TRN0
9.1	J1TRN1
11.2	J1TRN2
10.2	J1TRN3
9.9	J1TRN4
9.4	J1TRN5
8.4	J1TRN6
10.5	J1TRN7
11.1	J1TRN8
4.8	J1TRN9
6.9	J1TRP0

Number of samples		Uncensored values	
Uncensored	12	Mean	9.7
Censored		Lognormal mean	9.8
Detection limit or PQL		Std. devn.	2.3
Method detection limit		Median	10.1
TOTAL	12	Min.	4.8
		Max.	13.7

Lognormal distribution? r-squared is: 0.871
Normal distribution? r-squared is: 0.950
Recommendations:
Use normal distribution.

UCL (based on t-statistic) is 10.9

Cobalt 95% UCL Calculation

DATA	ID
6.2	J1TRM9/J1TRP1
8.3	J1TRN0
8.5	J1TRN1
7.7	J1TRN2
8.4	J1TRN3
8.0	J1TRN4
8.7	J1TRN5
8.8	J1TRN6
7.2	J1TRN7
6.9	J1TRN8
8.3	J1TRN9
8.4	J1TRP0

Number of samples		Uncensored values	
Uncensored	12	Mean	7.9
Censored		Lognormal mean	8.0
Detection limit or PQL		Std. devn.	0.81
Method detection limit		Median	8.3
TOTAL	12	Min.	6.2
		Max.	8.8

Lognormal distribution? r-squared is: 0.844
Normal distribution? r-squared is: 0.870
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 8.3

Copper 95% UCL Calculation

DATA	ID
11.3	J1TRM9/J1TRP1
29.4	J1TRN0
15.3	J1TRN1
19.7	J1TRN2
15.7	J1TRN3
12.1	J1TRN4
13.4	J1TRN5
14.0	J1TRN6
14.0	J1TRN7
12.5	J1TRN8
10.3	J1TRN9
12.1	J1TRP0

Number of samples		Uncensored values	
Uncensored	12	Mean	15.0
Censored		Lognormal mean	15.0
Detection limit or PQL		Std. devn.	5.2
Method detection limit		Median	13.7
TOTAL	12	Min.	10.3
		Max.	29.4

Lognormal distribution? r-squared is: 0.845
Normal distribution? r-squared is: 0.720
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 17.4

Hexavalent Chromium 95% UCL Calculation

DATA	ID
0.211	J1TRM9/J1TRP1
0.651	J1TRN0
0.594	J1TRN1
0.450	J1TRN2
0.550	J1TRN3
0.487	J1TRN4
0.370	J1TRN5
0.389	J1TRN6
0.155	J1TRN7
0.155	J1TRN8
0.249	J1TRN9
0.267	J1TRP0

Number of samples		Uncensored values	
Uncensored	12	Mean	0.377
Censored		Lognormal mean	0.385
Detection limit or PQL		Std. devn.	0.172
Method detection limit		Median	0.380
TOTAL	12	Min.	0.155
		Max.	0.651

Lognormal distribution? r-squared is: 0.947
Normal distribution? r-squared is: 0.962
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 0.534

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator I. B. Berezovskiy

Project 100-D Field Remediation

Subject 100-D-83:3 Subsite Cleanup Verification 95% UCL Calculations

Date 08/19/14

Job No. 14655

Calc. No. 0100D-CA-V0542

Checked J. D. Skoglie

Rev. No. 0

Date 08/19/14

Sheet No. 22 of 26

Ecology Software (MTCAStat) Results, 100-D-83:3 Subsite Staging Pile Area

Lead 95% UCL Calculation

DATA	ID
3.8	J1TRM9/J1TRP1
98.6	J1TRN0
15.2	J1TRN1
16.8	J1TRN2
15.4	J1TRN3
6.9	J1TRN4
9.2	J1TRN5
7.0	J1TRN6
67.3	J1TRN7
66.7	J1TRN8
3.6	J1TRN9
13.1	J1TRP0

Number of samples		Uncensored values	
Uncensored	12	Mean	27.0
Censored		Lognormal mean	27.7
Detection limit or PQL		Std. devn.	31.8
Method detection limit		Median	14.2
TOTAL	12	Min.	3.6
		Max.	98.6

Lognormal distribution? r-squared is: 0.924

Normal distribution? r-squared is: 0.719

Recommendations:
Use lognormal distribution.

UCL (Land's method) is 78.1

Manganese 95% UCL Calculation

DATA	ID
234	J1TRM9/J1TRP1
334	J1TRN0
281	J1TRN1
281	J1TRN2
284	J1TRN3
263	J1TRN4
288	J1TRN5
294	J1TRN6
268	J1TRN7
262	J1TRN8
257	J1TRN9
278	J1TRP0

Number of samples		Uncensored values	
Uncensored	12	Mean	277
Censored		Lognormal mean	277
Detection limit or PQL		Std. devn.	24.3
Method detection limit		Median	280
TOTAL	12	Min.	234
		Max.	334

Lognormal distribution? r-squared is: 0.922

Normal distribution? r-squared is: 0.906

Recommendations:
Use lognormal distribution.

UCL (Land's method) is 290

Mercury 95% UCL Calculation

DATA	ID
0.0069	J1TRM9/J1TRP1
0.036	J1TRN0
0.053	J1TRN1
0.031	J1TRN2
0.074	J1TRN3
0.072	J1TRN4
0.066	J1TRN5
0.015	J1TRN6
0.020	J1TRN7
0.017	J1TRN8
0.0085	J1TRN9
0.013	J1TRP0

Number of samples		Uncensored values	
Uncensored	12	Mean	0.034
Censored		Lognormal mean	0.036
Detection limit or PQL		Std. devn.	0.025
Method detection limit		Median	0.026
TOTAL	12	Min.	0.0069
		Max.	0.074

Lognormal distribution? r-squared is: 0.953

Normal distribution? r-squared is: 0.889

Recommendations:
Use lognormal distribution.

UCL (Land's method) is 0.071

Molybdenum 95% UCL Calculation

DATA	ID
1.1	J1TRM9/J1TRP1
2.1	J1TRN0
0.43	J1TRN1
0.43	J1TRN2
0.39	J1TRN3
0.27	J1TRN4
0.26	J1TRN5
0.12	J1TRN6
0.12	J1TRN7
0.13	J1TRN8
0.12	J1TRN9
0.13	J1TRP0

Number of samples		Uncensored values	
Uncensored	12	Mean	0.47
Censored		Lognormal mean	0.45
Detection limit or PQL		Std. devn.	0.59
Method detection limit		Median	0.27
TOTAL	12	Min.	0.12
		Max.	2.1

Lognormal distribution? r-squared is: 0.874

Normal distribution? r-squared is: 0.631

Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.75

Nickel 95% UCL Calculation

DATA	ID
11.5	J1TRM9/J1TRP1
14.6	J1TRN0
10.2	J1TRN1
12.2	J1TRN2
11.5	J1TRN3
12.8	J1TRN4
9.7	J1TRN5
10.2	J1TRN6
11.0	J1TRN7
11.0	J1TRN8
9.0	J1TRN9
9.1	J1TRP0

Number of samples		Uncensored values	
Uncensored	12	Mean	11.1
Censored		Lognormal mean	11.1
Detection limit or PQL		Std. devn.	1.6
Method detection limit		Median	11.0
TOTAL	12	Min.	9.0
		Max.	14.6

Lognormal distribution? r-squared is: 0.969

Normal distribution? r-squared is: 0.945

Recommendations:
Use lognormal distribution.

UCL (Land's method) is 12.0

Vanadium 95% UCL Calculation

DATA	ID
31.4	J1TRM9/J1TRP1
48.4	J1TRN0
56.3	J1TRN1
46.5	J1TRN2
54.9	J1TRN3
49.3	J1TRN4
55.0	J1TRN5
50.9	J1TRN6
39.2	J1TRN7
36.0	J1TRN8
59.8	J1TRN9
54.5	J1TRP0

Number of samples		Uncensored values	
Uncensored	12	Mean	48.5
Censored		Lognormal mean	48.6
Detection limit or PQL		Std. devn.	8.8
Method detection limit		Median	50.1
TOTAL	12	Min.	31.4
		Max.	59.8

Lognormal distribution? r-squared is: 0.884

Normal distribution? r-squared is: 0.922

Recommendations:
Use normal distribution.

UCL (based on t-statistic) is 53.1

Zinc 95% UCL Calculation

DATA	ID
29.2	J1TRM9/J1TRP1
45.4	J1TRN0
46.2	J1TRN1
48.9	J1TRN2
57.5	J1TRN3
46.1	J1TRN4
42.6	J1TRN5
40.8	J1TRN6
41.6	J1TRN7
37.8	J1TRN8
37.8	J1TRN9
42.7	J1TRP0

Number of samples		Uncensored values	
Uncensored	12	Mean	43.0
Censored		Lognormal mean	43.1
Detection limit or PQL		Std. devn.	6.9
Method detection limit		Median	42.7
TOTAL	12	Min.	29.2
		Max.	57.5

Lognormal distribution? r-squared is: 0.916

Normal distribution? r-squared is: 0.932

Recommendations:
Use lognormal distribution.

UCL (Land's method) is 47.2

Chloride 95% UCL Calculation

DATA	ID
13.0	J1TRM9/J1TRP1
14.9	J1TRN0
39.9	J1TRN1
18.0	J1TRN2
14.9	J1TRN3
8.7	J1TRN4
17.2	J1TRN5
16.6	J1TRN6
16.6	J1TRN7
11.3	J1TRN8
10.4	J1TRN9
11.1	J1TRP0

Number of samples		Uncensored values	
Uncensored	12	Mean	16.0
Censored		Lognormal mean	16.0
Detection limit or PQL		Std. devn.	8.1
Method detection limit		Median	14.9
TOTAL	12	Min.	8.7
		Max.	39.9

Lognormal distribution? r-squared is: 0.854

Normal distribution? r-squared is: 0.656

Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 19.9

Fluoride 95% UCL Calculation

DATA	ID
0.41	J1TRM9/J1TRP1
0.94	J1TRN0
0.89	J1TRN1
1.0	J1TRN2
1.1	J1TRN3
1.2	J1TRN4
1.3	J1TRN5
1.3	J1TRN6
1.5	J1TRN7
1.6	J1TRN8
1.3	J1TRN9
1.4	J1TRP0

Number of samples		Uncensored values	
Uncensored	12	Mean	1.2
Censored		Lognormal mean	1.2
Detection limit or PQL		Std. devn.	0.32
Method detection limit		Median	1.3
TOTAL	12	Min.	0.4
		Max.	1.6

Lognormal distribution? r-squared is: 0.780

Normal distribution? r-squared is: 0.923

Recommendations:
Use normal distribution.

UCL (based on t-statistic) is 1.3

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator I. B. Berezovskiy
Project 100-D Field Remediation
Subject 100-D-83:3 Subsite Cleanup Verification 95% UCL Calculations

Date 08/19/14
Job No. 14655

Calc. No. 0100D-CA-V0542
Checked J. D. Skoglie

Rev. No. 0
Date 08/19/14
Sheet No. 23 of 26

Ecology Software (MTCAStat) Results, 100-D-83:3 Subsite Staging Pile Area

Nitrogen in Nitrate 95% UCL Calculation

DATA	ID
1.5	J1TRM9/J1TRP1
2.4	J1TRN0
4.4	J1TRN1
4.5	J1TRN2
2.6	J1TRN3
1.4	J1TRN4
11.7	J1TRN5
2.7	J1TRN6
3.2	J1TRN7
7.8	J1TRN8
1.9	J1TRN9
3.7	J1TRP0

Number of samples		Uncensored values	
Uncensored	12	Mean	4.0
Censored		Lognormal mean	4.0
Detection limit or PQL		Std. devn.	3.0
Method detection limit		Median	3.0
TOTAL	12	Min.	1.4
		Max.	11.7

Lognormal distribution? r-squared is: 0.957
Normal distribution? r-squared is: 0.771
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 6.2

Nirogen in Nitrite and Nitrate 95% UCL Calculation

DATA	ID
1.6	J1TRM9/J1TRP1
2.2	J1TRN0
5.2	J1TRN1
5.4	J1TRN2
1.5	J1TRN3
1.6	J1TRN4
8.2	J1TRN5
2.9	J1TRN6
2.4	J1TRN7
6.7	J1TRN8
1.9	J1TRN9
2.9	J1TRP0

Number of samples		Uncensored values	
Uncensored	12	Mean	3.5
Censored		Lognormal mean	3.6
Detection limit or PQL		Std. devn.	2.3
Method detection limit		Median	2.7
TOTAL	12	Min.	1.5
		Max.	8.2

Lognormal distribution? r-squared is: 0.922
Normal distribution? r-squared is: 0.847
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 5.4

Sulfate 95% UCL Calculation

DATA	ID
45.2	J1TRM9/J1TRP1
105	J1TRN0
55.8	J1TRN1
388	J1TRN2
57.5	J1TRN3
90.0	J1TRN4
191	J1TRN5
102	J1TRN6
47.4	J1TRN7
36.0	J1TRN8
25.7	J1TRN9
61.1	J1TRP0

Number of samples		Uncensored values	
Uncensored	12	Mean	100
Censored		Lognormal mean	98.2
Detection limit or PQL		Std. devn.	101
Method detection limit		Median	59.3
TOTAL	12	Min.	25.7
		Max.	388

Lognormal distribution? r-squared is: 0.931
Normal distribution? r-squared is: 0.657
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 172

CALCULATION SHEET

Washington Closure Hanford

Originator I. B. Berezovskiy
Project 100-D Field Remediation
Subject 100-D-83:3 Subsite Cleanup Verification 95% UCL Calculations

Date 08/19/14
Job No. 14655

Calc. No. 0100D-CA-V0542
Checked J. D. Skoglie

Rev. No. 0
Date 08/19/14
Sheet No. 24 of 26

Duplicate Analysis - 100-D-83:3 Subsite - Excavation

Sampling Area	Sample Number	Sample Date	Aluminum			Arsenic			Barium			Cadmium			Calcium			Chromium			Cobalt			Copper		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-1	J1TRK3	6/3/14	5460		1.4	2.0		0.59	75.5	X	0.068	0.18		0.037	5990	X	12.6	6.5	X	0.052	7.3	X	0.090	15.4	X	0.19
Duplicate of J1TRK3	J1TRL5	6/3/14	5480		1.4	2.3		0.58	70.7	X	0.067	0.15	B	0.036	5920	X	12.4	6.7	X	0.051	7.4	X	0.088	13.6	X	0.19

Analysis:

TDL		5	10	2	0.5	100	1	2	1
Duplicate Analysis	Both > PQL?	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**
	Both >5xTDL?	**Yes (calc RPD)**	No-Stop (acceptable)	**Yes (calc RPD)**	No-Stop (acceptable)	**Yes (calc RPD)**	**Yes (calc RPD)**	No-Stop (acceptable)	**Yes (calc RPD)**
	RPD	0.4%		6.6%		1.2%	3.0%		12.4%
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable

Duplicate Analysis - 100-D-83:3 Subsite - Excavation

Sampling Area	Sample Number	Sample Date	Hexavalent Chromium			Iron			Lead			Magnesium			Manganese			Mercury			Nickel			Potassium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-1	J1TRK3	6/3/14	0.461		0.155	22300		3.4	12.6	X	0.24	4120	X	3.3	287	X	0.090	1.1	N	0.011	7.7	X	0.11	886		36.7
Duplicate of J1TRK3	J1TRL5	6/3/14	0.376		0.155	22100		3.3	12.7	X	0.24	4310	X	3.2	286	X	0.088	0.78		0.0057	8.4	X	0.11	914		36.0

Analysis:

TDL		0.5	5	5	75	5	0.2	4	400
Duplicate Analysis	Both > PQL?	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**
	Both >5xTDL?	No-Stop (acceptable)	**Yes (calc RPD)**	No-Stop (acceptable)	**Yes (calc RPD)**	**Yes (calc RPD)**	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)
	RPD		0.9%		4.5%	0.3%			
	Difference > 2 TDL?	No - acceptable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable

Duplicate Analysis - 100-D-83:3 Subsite - Excavation

Sampling Area	Sample Number	Sample Date	Silicon			Sodium			Vanadium			Zinc			Chloride			Nitrogen in Nitrate			Nitrogen in Nitrite and Nitrate			Sulfate		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-1	J1TRK3	6/3/14	290	NXJ	5.1	286		52.8	50.3	X	0.084	38.9	XJ	0.36	3.0	B	2.0	1.4	BJ	0.31	0.37	B	0.36	7.5		1.7
Duplicate of J1TRK3	J1TRL5	6/3/14	296	XJ	5.0	244		51.7	48.3	X	0.082	39.1	XJ	0.35	2.9	B	2.0	1.2	BJ	0.31	0.58	B	0.36	7.3		1.7

Analysis:

TDL		2	50	2.5	1	2	0.75	0.75	5
Duplicate Analysis	Both > PQL?	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**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)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)
	RPD	2.0%		4.1%	0.5%				
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable	No - acceptable

Duplicate Analysis - 100-D-83:3 Subsite - Excavation

Sampling Area	Sample Number	Sample Date	Pyrene		
			ug/kg	Q	PQL
EXC-1	J1TRK3	6/3/14	83	J	12
Duplicate of J1TRK3	J1TRL5	6/3/14	13	J	12

Analysis:

TDL		330
Duplicate Analysis	Both > PQL?	**Yes (continue)**
	Both >5xTDL?	No-Stop (acceptable)
	RPD	
	Difference > 2 TDL?	No - acceptable

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator I. B. Berezovskiy **Date** 08/19/14 **Calc. No.** 0100D-CA-V0542 **Rev. No.** 0
Project 100-D Field Remediation **Job No.** 14655 **Checked** J. D. Skoglie **Date** 08/19/14
Subject 100-D-83:3 Subsite Cleanup Verification 95% UCL Calculations **Sheet No.** 25 of 26

Duplicate Analysis - 100-D-83:3 Subsite - Overburden

Sampling Area	Sample Number	Sample Date	Aluminum			Arsenic			Barium			Cadmium			Calcium			Chromium			Cobalt			Copper		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
OB-12	J1TRM7	6/3/14	5240	X	1.4	2.0		0.58	59.0	X	0.067	0.14	B	0.036	5640	X	12.4	5.7	X	0.051	7.8	X	0.088	14.4	X	0.19
Duplicate of J1TRM7	J1TRM8	6/3/14	5570	X	1.4	2.4		0.60	59.3	X	0.069	0.17	B	0.037	5960	X	12.7	6.3	X	0.052	7.9	X	0.090	13.9	X	0.20

Analysis:

TDL			5			10			2			0.5			100			1			2			1		
Duplicate Analysis	Both > PQL?		**Yes (continue)**			**Yes (continue)**			**Yes (continue)**			**Yes (continue)**			**Yes (continue)**			**Yes (continue)**			**Yes (continue)**			**Yes (continue)**		
	Both >5xTDL?		**Yes (calc RPD)**			No-Stop (acceptable)			**Yes (calc RPD)**			No-Stop (acceptable)			**Yes (calc RPD)**			**Yes (calc RPD)**			No-Stop (acceptable)			**Yes (calc RPD)**		
	RPD		6.1%						0.5%						5.5%			10.0%						3.5%		
	Difference > 2 TDL?		Not applicable			No - acceptable			Not applicable			No - acceptable			Not applicable			Not applicable			No - acceptable			Not applicable		

Duplicate Analysis - 100-D-83:3 Subsite - Overburden

Sampling Area	Sample Number	Sample Date	Hexavalent Chromium			Iron			Lead			Magnesium			Manganese			Mercury			Molybdenum			Nickel		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
OB-12	J1TRM7	6/3/14	0.337		0.155	22800	X	3.3	3.9	X	0.24	4300	X	3.3	288	X	0.088	0.0089	B	0.0049	0.23	B	0.23	7.4	X	0.11
Duplicate of J1TRM7	J1TRM8	6/3/14	0.315		0.155	22900	X	3.4	4.4	X	0.24	4390	X	3.3	304	X	0.090	0.0091	B	0.0051	0.30	B	0.23	9.1	X	0.11

Analysis:

TDL			0.5			5			5			75			5			0.2			2			4		
Duplicate Analysis	Both > PQL?		**Yes (continue)**			**Yes (continue)**			**Yes (continue)**			**Yes (continue)**			**Yes (continue)**			**Yes (continue)**			No-Stop (acceptable)			**Yes (continue)**		
	Both >5xTDL?		No-Stop (acceptable)			**Yes (calc RPD)**			No-Stop (acceptable)			**Yes (calc RPD)**			**Yes (calc RPD)**			No-Stop (acceptable)						No-Stop (acceptable)		
	RPD					0.4%						2.1%			5.4%											
	Difference > 2 TDL?		No - acceptable			Not applicable			No - acceptable			Not applicable			Not applicable			No - acceptable			No - acceptable			No - acceptable		

Duplicate Analysis - 100-D-83:3 Subsite - Overburden

Sampling Area	Sample Number	Sample Date	Potassium			Silicon			Sodium			Vanadium			Zinc			Chloride			Nitrogen in Nitrate			Nitrogen in Nitrite and Nitrate		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
OB-12	J1TRM7	6/3/14	777		36.1	230	N	5.0	260		51.9	54.5	X	0.083	38.0	X	0.35	13		1.9	1.1	B	0.31	1.5		0.36
Duplicate of J1TRM7	J1TRM8	6/3/14	829		37.0	296	N	5.1	229		53.3	53.4	X	0.085	37.5	X	0.36	14		2.0	1.2	B	0.31	1.0		0.36

Analysis:

TDL			400			2			50			2.5			1			2			0.75			0.75		
Duplicate Analysis	Both > PQL?		**Yes (continue)**			**Yes (continue)**			**Yes (continue)**			**Yes (continue)**			**Yes (continue)**			**Yes (continue)**			**Yes (continue)**			**Yes (continue)**		
	Both >5xTDL?		No-Stop (acceptable)			**Yes (calc RPD)**			No-Stop (acceptable)			**Yes (calc RPD)**			**Yes (calc RPD)**			**Yes (calc RPD)**			No-Stop (acceptable)			No-Stop (acceptable)		
	RPD					25.1%						2.0%			1.3%			7.4%								
	Difference > 2 TDL?		No - acceptable			Not applicable			No - acceptable			Not applicable			Not applicable			Not applicable			No - acceptable			No - acceptable		

Duplicate Analysis - 100-D-83:3 Subsite - Overburden

Sampling Area	Sample Number	Sample Date	Sulfate		
			mg/kg	Q	PQL
OB-12	J1TRM7	6/3/14	11.1		1.7
Duplicate of J1TRM7	J1TRM8	6/3/14	12.4		1.7

Analysis:

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

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator I. B. Berezovskiy
Project 100-D Field Remediation
Subject 100-D-83:3 Subsite Cleanup Verification 95% UCL Calculations

Date 08/19/14
Job No. 14655

Calc. No. 0100D-CA-V0542
Checked J. D. Skoglie

Rev. No. 0
Date 08/19/14
Sheet No. 26 of 26

Duplicate Analysis - 100-D-83:3 Subsite - SPA

Sampling Area	Sample Number	Sample Date	Aluminum			Arsenic			Barium			Beryllium			Boron			Calcium			Chromium			Cobalt		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
SPA-1	J1TRM9	7/23/14	6680		1.5	5.3	M	0.66	62.6		0.076	0.26	M	0.033	3.2	M	0.98	8920		14.1	11.7		0.058	6.6	X	0.10
Duplicate of J1TRM9	J1TRP1	7/23/14	6400		1.6	3.6		0.66	58.3		0.076	0.19	B	0.033	1.2	B	0.98	8670		14.1	11.6		0.058	5.7	X	0.10

Analysis:

TDL		5	10	2	0.5	2	100	1	2
Duplicate Analysis	Both > PQL?	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**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)	**Yes (calc RPD)**	**Yes (calc RPD)**	No-Stop (acceptable)
	RPD	4.3%		7.1%			2.8%	0.9%	
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	Not applicable	Not applicable	No - acceptable

Duplicate Analysis - 100-D-83:3 Subsite - SPA

Sampling Area	Sample Number	Sample Date	Copper			Hexavalent Chromium			Iron			Lead			Magnesium			Manganese			Mercury			Nickel		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
SPA-1	J1TRM9	7/23/14	11.6		0.22	0.192		0.155	14100		3.8	4.2		0.27	4350		3.7	236		0.10	0.0072	B	0.0055	11.6	X	0.12
Duplicate of J1TRM9	J1TRP1	7/23/14	11.0		0.22	0.229		0.155	13600		3.8	3.4		0.27	4310		3.7	232		0.10	0.0066	B	0.0051	11.3	X	0.12

Analysis:

TDL		1	0.5	5	5	75	5	0.2	4
Duplicate Analysis	Both > PQL?	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**
	Both >5xTDL?	**Yes (calc RPD)**	No-Stop (acceptable)	**Yes (calc RPD)**	No-Stop (acceptable)	**Yes (calc RPD)**	**Yes (calc RPD)**	No-Stop (acceptable)	No-Stop (acceptable)
	RPD	5.3%		3.6%		0.9%	1.7%		
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable

Duplicate Analysis - 100-D-83:3 Subsite - SPA

Sampling Area	Sample Number	Sample Date	Potassium			Silicon			Sodium			Vanadium			Zinc			Chloride			Nitrogen in Nitrate			Nitrogen in Nitrite and Nitrate		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
SPA-1	J1TRM9	7/23/14	1390		41.0	311	N	5.7	349		59.0	32.7		0.094	29.6	X	0.40	14.6	M	2.0	1.6	B	0.32	1.3		0.37
Duplicate of J1TRM9	J1TRP1	7/23/14	1260		41.0	271		5.7	255		59.0	30.0		0.094	28.7	X	0.40	11.3	N	2.0	1.4	B	0.31	1.9		0.37

Analysis:

TDL		400	2	50	2.5	1	2	0.75	0.75
Duplicate Analysis	Both > PQL?	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**
	Both >5xTDL?	No-Stop (acceptable)	**Yes (calc RPD)**	**Yes (calc RPD)**	**Yes (calc RPD)**	**Yes (calc RPD)**	**Yes (calc RPD)**	No-Stop (acceptable)	No-Stop (acceptable)
	RPD		13.7%	*31.1%*	8.6%	3.1%	25.5%		
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	No - acceptable	No - acceptable

Duplicate Analysis - 100-D-83:3 Subsite - SPA

Sampling Area	Sample Number	Sample Date	Sulfate		
			mg/kg	Q	PQL
SPA-1	J1TRM9	7/23/14	60.2	N	1.7
Duplicate of J1TRM9	J1TRP1	7/23/14	30.2	N	1.7

Analysis:

TDL		5
Duplicate Analysis	Both > PQL?	**Yes (continue)**
	Both >5xTDL?	**Yes (calc RPD)**
	RPD	*66.4%*
	Difference > 2 TDL?	Not applicable

Acronyms and qualifiers are defined on sheet 3.

Attachment 1. 100-D-83:3 Subsite Verification Sample Results (Metals).

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
EXC-1	J1TRK3	6/3/14	5460		1.4	0.35	BJ	0.34	2.0		0.59	75.5	X	0.068
Duplicate of J1TRK3	J1TRL5	6/3/14	5480		1.4	0.33	UJ	0.33	2.3		0.58	70.7	X	0.067
EXC-2	J1TRK4	6/3/14	5510		1.4	0.35	UJ	0.35	2.1		0.61	64.7	X	0.070
EXC-3	J1TRK5	6/3/14	6640		1.5	0.36	UJ	0.36	2.4		0.63	77.1	X	0.073
EXC-4	J1TRK6	6/3/14	5840		1.4	0.35	UJ	0.35	2.4		0.61	65.7	X	0.070
EXC-5	J1TRK7	6/3/14	5700		1.4	0.33	UJ	0.33	2.3		0.58	55.0	X	0.067
EXC-6	J1TRK8	6/3/14	5580		1.3	0.33	UJ	0.33	1.9		0.56	66.2	X	0.065
EXC-7	J1TRK9	6/3/14	4650		1.5	0.50	BJ	0.38	1.5		0.66	56.0	X	0.076
EXC-8	J1TRL0	6/3/14	5360		1.4	0.34	UJ	0.34	1.9		0.59	63.1	X	0.068
EXC-9	J1TRL1	6/3/14	4910		1.5	0.36	UJ	0.36	1.8		0.62	59.3	X	0.072
EXC-10	J1TRL2	6/3/14	5960		1.5	0.37	UJ	0.37	2.0		0.64	59.0	X	0.074
EXC-11	J1TRL3	6/3/14	5170		1.6	0.38	UJ	0.38	2.4		0.66	56.2	X	0.076
EXC-12	J1TRL4	6/3/14	5530		1.4	0.41	BJ	0.33	2.8		0.58	58.5	X	0.067
OB-12	J1TRM7	6/3/14	5240	X	1.4	0.33	U	0.33	2.0		0.58	59.0	X	0.067
Duplicate of J1TRM7	J1TRM8	6/3/14	5570	X	1.4	0.46	B	0.34	2.4		0.60	59.3	X	0.069
OB-1	J1TRL6	6/3/14	5720	X	1.4	0.68		0.35	2.4		0.61	132	XM	0.070
OB-2	J1TRL7	6/3/14	5250	X	1.5	0.37	U	0.37	2.2		0.65	56.7	X	0.075
OB-3	J1TRL8	6/3/14	5640	X	1.3	0.33	U	0.33	2.1		0.57	58.7	X	0.066
OB-4	J1TRL9	6/3/14	6960	X	1.4	0.34	U	0.34	2.6		0.59	70.5	X	0.068
OB-5	J1TRM0	6/3/14	6310	X	1.6	0.38	U	0.38	3.4		0.67	77.1	X	0.077
OB-6	J1TRM1	6/3/14	5420	X	1.5	0.44	B	0.37	1.8		0.64	63.1	X	0.074
OB-7	J1TRM2	6/3/14	6320	X	1.4	0.34	U	0.34	2.2		0.58	62.0	X	0.067
OB-8	J1TRM3	6/3/14	5550	X	1.4	0.34	U	0.34	2.0		0.59	56.4	X	0.068
OB-9	J1TRM4	6/3/14	7110	X	1.5	0.37	U	0.37	3.1		0.65	70.9	X	0.074
OB-10	J1TRM5	6/3/14	5230	X	1.5	0.36	U	0.36	6.5		0.63	58.5	X	0.073
OB-11	J1TRM6	6/3/14	4570	X	1.6	0.38	U	0.38	1.4		0.67	65.5	X	0.077
SPA-1	J1TRM9	7/23/14	6680		1.5	0.78	M	0.38	5.3	M	0.66	62.6		0.076
Duplicate of J1TRM9	J1TRP1	7/23/14	6400		1.6	0.38	U	0.38	3.6		0.66	58.3		0.076
SPA-2	J1TRN0	7/23/14	5180		1.4	0.42	B	0.34	4.5		0.60	68.7		0.069
SPA-3	J1TRN1	7/23/14	5530		1.4	0.80		0.35	3.4		0.61	68.4		0.070
SPA-4	J1TRN2	7/23/14	6130		1.5	0.45	B	0.36	5.6		0.62	68.5		0.071
SPA-5	J1TRN3	7/23/14	5730		1.4	0.47	B	0.34	3.7		0.59	74.0		0.068
SPA-6	J1TRN4	7/23/14	5340		1.4	0.54		0.34	2.9		0.59	58.4		0.068
SPA-7	J1TRN5	7/23/14	5670		1.4	0.56		0.34	3.4		0.60	61.1		0.069
SPA-8	J1TRN6	7/23/14	6620		1.4	0.35	B	0.35	3.2		0.61	66.9		0.071
SPA-9	J1TRN7	7/23/14	7700		1.4	0.52	B	0.34	15.8		0.59	69.9		0.068
SPA-10	J1TRN8	7/23/14	7790		1.5	0.37	U	0.37	16.1		0.63	82.6		0.073
SPA-11	J1TRN9	7/23/14	4500		1.4	0.62		0.33	1.7		0.58	54.6		0.066
SPA-12	J1TRP0	7/23/14	5490		1.5	0.55	B	0.37	3.9		0.64	60.4		0.074
Equipment Blank	J1TRP2	7/23/14	187		1.4	0.36	U	0.36	0.62	U	0.62	1.5		0.071

Grey cells indicate not applicable or data will not be used.
Acronyms and notes apply to all of the tables in this attachment.
Note: Data qualified with B, J, M, N, and/or X.
B = blank contamination (inorganic constituents)
EXC = Excavation
HEIS = Hanford Environmental Information System
J = estimate
M = sample duplicate precision not met
N = recovery is outside control limits
OB = overburden
PQL = practical quantitative limit
Q = qualifier
R = rejected
SPA = staging pile area
U = undetected
X (metals) = serial dilution in the analytical batch indicates that physical and chemical interferences are present.
X (organics) = >40% difference between primary and confirmation detector results.

Attachment	1	Sheet No.	1 of 23
Originator	I. B. Berezovskiy	Date	8/19/14
Checked	J. D. Skoglie	Date	8/19/14
Calc. No.	0100D-CA-V0542	Rev. No.	0

Attachment 1. 100-D-83:3 Subsite Verification Sample Results (Metals).

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
EXC-1	J1TRK3	6/3/14	0.030	U	0.030	0.88	UN	0.88	0.18		0.037	5990	X	12.6
Duplicate of J1TRK3	J1TRL5	6/3/14	0.029	U	0.029	0.86	U	0.86	0.15	B	0.036	5920	X	12.4
EXC-2	J1TRK4	6/3/14	0.030	U	0.030	0.96	B	0.90	0.17	B	0.038	5760	X	12.9
EXC-3	J1TRK5	6/3/14	0.046	B	0.032	1.3	B	0.94	0.19		0.039	4620	X	13.5
EXC-4	J1TRK6	6/3/14	0.030	U	0.030	1.3	B	0.90	0.16	B	0.038	5770	X	12.9
EXC-5	J1TRK7	6/3/14	0.029	U	0.029	0.86	U	0.86	0.13	B	0.036	5700	X	12.4
EXC-6	J1TRK8	6/3/14	0.028	U	0.028	0.89	B	0.84	0.15	B	0.035	8200	X	12.1
EXC-7	J1TRK9	6/3/14	0.033	U	0.033	0.98	U	0.98	0.13	B	0.041	5550	X	14.1
EXC-8	J1TRL0	6/3/14	0.029	U	0.029	0.88	U	0.88	0.15	B	0.037	6340	X	12.6
EXC-9	J1TRL1	6/3/14	0.031	U	0.031	0.92	U	0.92	0.14	B	0.039	5340	X	13.3
EXC-10	J1TRL2	6/3/14	0.032	U	0.032	0.96	U	0.96	0.16	B	0.040	6090	X	13.7
EXC-11	J1TRL3	6/3/14	0.033	U	0.033	0.98	U	0.98	0.14	B	0.041	5880	X	14.1
EXC-12	J1TRL4	6/3/14	0.029	U	0.029	0.86	U	0.86	0.20		0.036	6140	X	12.4
OB-12	J1TRM7	6/3/14	0.029	U	0.029	0.86	U	0.86	0.14	B	0.036	5640	X	12.4
Duplicate of J1TRM7	J1TRM8	6/3/14	0.030	U	0.030	0.89	U	0.89	0.17	B	0.037	5960	X	12.7
OB-1	J1TRL6	6/3/14	0.030	U	0.030	1.2	B	0.90	0.17	B	0.038	6320	X	12.9
OB-2	J1TRL7	6/3/14	0.032	U	0.032	1.1	B	0.96	0.16	B	0.040	5490	X	13.9
OB-3	J1TRL8	6/3/14	0.029	U	0.029	0.85	U	0.85	0.15	B	0.036	6170	X	12.2
OB-4	J1TRL9	6/3/14	0.030	U	0.030	1.5	B	0.88	0.21		0.037	6890	X	12.7
OB-5	J1TRM0	6/3/14	0.033	U	0.033	2.1		0.99	0.20		0.041	7460	X	14.3
OB-6	J1TRM1	6/3/14	0.032	U	0.032	0.95	B	0.95	0.18	B	0.040	6270	X	13.7
OB-7	J1TRM2	6/3/14	0.029	U	0.029	1.1	B	0.87	0.25		0.036	6390	X	12.5
OB-8	J1TRM3	6/3/14	0.030	U	0.030	0.88	U	0.88	0.15	B	0.037	6000	X	12.6
OB-9	J1TRM4	6/3/14	0.059	B	0.032	1.1	B	0.96	0.18	B	0.040	10500	X	13.8
OB-10	J1TRM5	6/3/14	0.032	U	0.032	0.97	B	0.94	0.19		0.039	7410	X	13.5
OB-11	J1TRM6	6/3/14	0.033	U	0.033	0.99	U	0.99	0.14	B	0.041	5460	X	14.2
SPA-1	J1TRM9	7/23/14	0.26	M	0.033	3.2	M	0.98	0.19	B	0.041	8920		14.1
Duplicate of J1TRM9	J1TRP1	7/23/14	0.19	B	0.033	1.2	B	0.98	0.041	U	0.041	8670		14.1
SPA-2	J1TRN0	7/23/14	0.15	B	0.030	4.4		0.88	0.037	U	0.037	7140		12.7
SPA-3	J1TRN1	7/23/14	0.16	B	0.030	2.3		0.90	0.038	U	0.038	9260		13.0
SPA-4	J1TRN2	7/23/14	0.19		0.031	2.9		0.92	0.039	U	0.039	13100		13.2
SPA-5	J1TRN3	7/23/14	0.17	B	0.029	2.1		0.88	0.037	U	0.037	8180		12.6
SPA-6	J1TRN4	7/23/14	0.17	B	0.029	1.7	B	0.87	0.037	U	0.037	7040		12.6
SPA-7	J1TRN5	7/23/14	0.17	B	0.030	1.4	B	0.89	0.037	U	0.037	7940		12.7
SPA-8	J1TRN6	7/23/14	0.22		0.031	1.2	B	0.91	0.038	U	0.038	7340		13.1
SPA-9	J1TRN7	7/23/14	0.27		0.029	1.9		0.88	0.037	U	0.037	7060		12.6
SPA-10	J1TRN8	7/23/14	0.26		0.032	4.7		0.94	0.039	U	0.039	5920		13.6
SPA-11	J1TRN9	7/23/14	0.13	B	0.029	0.85	U	0.85	0.036	U	0.036	5520		12.3
SPA-12	J1TRP0	7/23/14	0.16	B	0.032	1.1	B	0.95	0.040	U	0.040	6730		13.7
Equipment Blank	J1TRP2	7/23/14	0.099	B	0.031	0.92	U	0.92	0.038	U	0.038	370		13.2

Attachment	1	Sheet No.	2 of 23
Originator	I. B. Berezovskiy	Date	8/19/14
Checked	J. D. Skoglie	Date	8/19/14
Calc. No.	0100D-CA-V0542	Rev. No.	0

Attachment 1. 100-D-83:3 Subsite Verification Sample Results (Metals).

LOCATION	HEIS Number	Sample Date	Chromium			Cobalt			Copper			Hexavalent Chromium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-1	J1TRK3	6/3/14	6.5	X	0.052	7.3	X	0.090	15.4	X	0.19	0.461		0.155
Duplicate of J1TRK3	J1TRL5	6/3/14	6.7	X	0.051	7.4	X	0.088	13.6	X	0.19	0.376		0.155
EXC-2	J1TRK4	6/3/14	6.2	X	0.053	7.8	X	0.092	14.1	X	0.20	0.314		0.155
EXC-3	J1TRK5	6/3/14	7.3	X	0.056	7.4	X	0.096	14.0	X	0.21	0.399		0.155
EXC-4	J1TRK6	6/3/14	7.8	X	0.053	7.5	X	0.092	14.6	X	0.20	0.438		0.155
EXC-5	J1TRK7	6/3/14	6.3	X	0.051	7.2	X	0.088	13.0	X	0.19	0.295		0.155
EXC-6	J1TRK8	6/3/14	6.8	X	0.050	7.1	X	0.086	14.6	X	0.19	0.454		0.155
EXC-7	J1TRK9	6/3/14	4.5	X	0.058	8.0	X	0.10	13.9	X	0.22	0.295		0.155
EXC-8	J1TRL0	6/3/14	6.3	X	0.052	8.1	X	0.089	14.4	X	0.19	0.315		0.155
EXC-9	J1TRL1	6/3/14	4.9	X	0.055	8.5	X	0.094	14.5	X	0.20	0.313		0.155
EXC-10	J1TRL2	6/3/14	6.9	X	0.057	7.7	X	0.097	14.9	X	0.21	0.314		0.155
EXC-11	J1TRL3	6/3/14	6.7	X	0.058	7.8	X	0.10	13.9	X	0.22	0.375		0.155
EXC-12	J1TRL4	6/3/14	8.1	X	0.051	7.5	X	0.088	19.8	X	0.19	0.397		0.155
OB-12	J1TRM7	6/3/14	5.7	X	0.051	7.8	X	0.088	14.4	X	0.19	0.337		0.155
Duplicate of J1TRM7	J1TRM8	6/3/14	6.3	X	0.052	7.9	X	0.090	13.9	X	0.20	0.315		0.155
OB-1	J1TRL6	6/3/14	6.8	X	0.053	7.8	X	0.092	14.9	X	0.20	0.481		0.155
OB-2	J1TRL7	6/3/14	5.4	X	0.057	7.7	X	0.098	14.0	X	0.21	0.415		0.155
OB-3	J1TRL8	6/3/14	7.9	X	0.050	7.7	X	0.087	14.2	X	0.19	0.378		0.155
OB-4	J1TRL9	6/3/14	8.4	X	0.052	6.9	X	0.090	14.4	X	0.20	0.417		0.155
OB-5	J1TRM0	6/3/14	7.8	X	0.059	7.6	X	0.10	16.0	X	0.22	0.155	U	0.155
OB-6	J1TRM1	6/3/14	6.2	X	0.056	7.9	X	0.097	14.0	X	0.21	0.356		0.155
OB-7	J1TRM2	6/3/14	8.8	X	0.051	6.8	X	0.089	13.5	X	0.19	0.155	U	0.155
OB-8	J1TRM3	6/3/14	5.9	X	0.052	7.2	X	0.089	14.3	X	0.19	0.292		0.155
OB-9	J1TRM4	6/3/14	12.8	X	0.057	7.1	X	0.098	15.8	X	0.21	0.497		0.155
OB-10	J1TRM5	6/3/14	7.5	X	0.056	6.8	X	0.096	13.3	X	0.21	0.418		0.155
OB-11	J1TRM6	6/3/14	4.3	X	0.059	8.1	X	0.10	13.1	X	0.22	0.274		0.155
SPA-1	J1TRM9	7/23/14	11.7		0.058	6.6	X	0.10	11.6		0.22	0.192		0.155
Duplicate of J1TRM9	J1TRP1	7/23/14	11.6		0.058	5.7	X	0.10	11.0		0.22	0.229		0.155
SPA-2	J1TRN0	7/23/14	13.7		0.052	8.3	X	0.090	29.4		0.20	0.651		0.155
SPA-3	J1TRN1	7/23/14	9.1		0.053	8.5	X	0.092	15.3		0.20	0.594		0.155
SPA-4	J1TRN2	7/23/14	11.2		0.054	7.7	X	0.094	19.7		0.20	0.450		0.155
SPA-5	J1TRN3	7/23/14	10.2		0.052	8.4	X	0.089	15.7		0.19	0.550		0.155
SPA-6	J1TRN4	7/23/14	9.9		0.052	8.0	X	0.089	12.1		0.19	0.487		0.155
SPA-7	J1TRN5	7/23/14	9.4		0.052	8.7	X	0.090	13.4		0.20	0.370		0.155
SPA-8	J1TRN6	7/23/14	8.4		0.054	8.8	X	0.093	14.0		0.20	0.389		0.155
SPA-9	J1TRN7	7/23/14	10.5		0.052	7.2	X	0.089	14.0		0.19	0.155	U	0.155
SPA-10	J1TRN8	7/23/14	11.1		0.056	6.9	X	0.096	12.5		0.21	0.155	U	0.155
SPA-11	J1TRN9	7/23/14	4.8		0.051	8.3	X	0.087	10.3		0.19	0.249		0.155
SPA-12	J1TRP0	7/23/14	6.9		0.056	8.4	X	0.097	12.1		0.21	0.267		0.155
Equipment Blank	J1TRP2	7/23/14	0.17	B	0.054	0.16	BX	0.093	0.54	B	0.20			

Attachment	1	Sheet No.	3 of 23
Originator	I. B. Berezovskiy	Date	8/19/14
Checked	J. D. Skoglie	Date	8/19/14
Calc. No.	0100D-CA-V0542	Rev. No.	0

Attachment 1. 100-D-83:3 Subsite Verification Sample Results (Metals).

LOCATION	HEIS Number	Sample Date	Iron			Lead			Magnesium			Manganese		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-1	J1TRK3	6/3/14	22300		3.4	12.6	X	0.24	4120	X	3.3	287	X	0.090
Duplicate of J1TRK3	J1TRL5	6/3/14	22100		3.3	12.7	X	0.24	4310	X	3.2	286	X	0.088
EXC-2	J1TRK4	6/3/14	22400		3.5	9.6	X	0.25	4420	X	3.4	292	X	0.092
EXC-3	J1TRK5	6/3/14	21100		3.6	7.7	X	0.26	4190	X	3.5	323	X	0.096
EXC-4	J1TRK6	6/3/14	22600		3.5	6.8	X	0.25	4310	X	3.4	288	X	0.092
EXC-5	J1TRK7	6/3/14	21500		3.3	3.6	X	0.24	4320	X	3.2	279	X	0.088
EXC-6	J1TRK8	6/3/14	21200		3.3	7.5	X	0.23	4050	X	3.2	273	X	0.086
EXC-7	J1TRK9	6/3/14	24200		3.8	2.7	X	0.27	4160	X	3.7	294	X	0.10
EXC-8	J1TRL0	6/3/14	23800		3.4	4.1	X	0.24	4520	X	3.3	307	X	0.089
EXC-9	J1TRL1	6/3/14	23700		3.6	3.6	X	0.25	4280	X	3.5	295	X	0.094
EXC-10	J1TRL2	6/3/14	22400		3.7	3.7	X	0.26	4490	X	3.6	295	X	0.097
EXC-11	J1TRL3	6/3/14	23300		3.8	4.0	X	0.27	4330	X	3.7	288	X	0.10
EXC-12	J1TRL4	6/3/14	24100		3.3	7.4	X	0.24	4110	X	3.3	283	X	0.088
OB-12	J1TRM7	6/3/14	22800	X	3.3	3.9	X	0.24	4300	X	3.3	288	X	0.088
Duplicate of J1TRM7	J1TRM8	6/3/14	22900	X	3.4	4.4	X	0.24	4390	X	3.3	304	X	0.090
OB-1	J1TRL6	6/3/14	22500	X	3.5	15.3	XM	0.25	4520	X	3.4	302	X	0.092
OB-2	J1TRL7	6/3/14	21600	X	3.7	7.5	X	0.27	4080	X	3.6	282	X	0.098
OB-3	J1TRL8	6/3/14	22600	X	3.3	6.5	X	0.23	4490	X	3.2	298	X	0.087
OB-4	J1TRL9	6/3/14	20800	X	3.4	6.9	X	0.24	4250	X	3.3	296	X	0.090
OB-5	J1TRM0	6/3/14	21300	X	3.8	15.6	X	0.27	4390	X	3.7	306	X	0.10
OB-6	J1TRM1	6/3/14	22500	X	3.7	5.8	X	0.26	4740	X	3.6	301	X	0.097
OB-7	J1TRM2	6/3/14	20400	X	3.4	4.3	X	0.24	4370	X	3.3	290	X	0.089
OB-8	J1TRM3	6/3/14	21200	X	3.4	3.6	X	0.24	4110	X	3.3	282	X	0.089
OB-9	J1TRM4	6/3/14	20400	X	3.7	4.3	X	0.26	4770	X	3.6	305	X	0.098
OB-10	J1TRM5	6/3/14	20700	X	3.6	6.5	X	0.26	3970	X	3.5	282	X	0.096
OB-11	J1TRM6	6/3/14	24000	X	3.8	2.5	X	0.27	4370	X	3.7	316	X	0.10
SPA-1	J1TRM9	7/23/14	14100		3.8	4.2		0.27	4350		3.7	236		0.10
Duplicate of J1TRM9	J1TRP1	7/23/14	13600		3.8	3.4		0.27	4310		3.7	232		0.10
SPA-2	J1TRN0	7/23/14	34000		3.4	98.6		0.24	3990		3.3	334		0.09
SPA-3	J1TRN1	7/23/14	23400		3.5	15.2		0.25	4200		3.4	281		0.092
SPA-4	J1TRN2	7/23/14	22300		3.6	16.8		0.25	4360		3.5	281		0.094
SPA-5	J1TRN3	7/23/14	22500		3.4	15.4		0.24	4300		3.3	284		0.089
SPA-6	J1TRN4	7/23/14	19800		3.4	6.9		0.24	4460		3.3	263		0.089
SPA-7	J1TRN5	7/23/14	21900		3.4	9.2		0.24	4290		3.3	288		0.090
SPA-8	J1TRN6	7/23/14	21000		3.5	7.0		0.25	4620		3.4	294		0.093
SPA-9	J1TRN7	7/23/14	17200		3.4	67.3		0.24	4350		3.3	268		0.089
SPA-10	J1TRN8	7/23/14	16300		3.7	66.7		0.26	4080		3.6	262		0.096
SPA-11	J1TRN9	7/23/14	21200		3.3	3.6		0.24	3970		3.2	257		0.087
SPA-12	J1TRP0	7/23/14	20600		3.7	13.1		0.26	4240		3.6	278		0.097
Equipment Blank	J1TRP2	7/23/14	1110		3.6	0.43	B	0.25	24.8		3.5	5.5		0.093

Attachment	1	Sheet No.	4 of 23
Originator	I. B. Berezovskiy	Date	8/19/14
Checked	J. D. Skoglie	Date	8/19/14
Calc. No.	0100D-CA-V0542	Rev. No.	0

Attachment 1. 100-D-83:3 Subsite Verification Sample Results (Metals).

LOCATION	HEIS Number	Sample Date	Mercury			Molybdenum			Nickel			Potassium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-1	J1TRK3	6/3/14	1.1	N	0.011	0.32	B	0.23	7.7	X	0.11	886		36.7
Duplicate of J1TRK3	J1TRL5	6/3/14	0.78		0.0057	0.23	U	0.23	8.4	X	0.11	914		36.0
EXC-2	J1TRK4	6/3/14	0.040		0.0059	0.27	B	0.24	7.8	X	0.11	905		37.6
EXC-3	J1TRK5	6/3/14	0.010	B	0.0055	0.25	U	0.25	8.5	X	0.12	1100		39.2
EXC-4	J1TRK6	6/3/14	0.014	B	0.0055	0.24	B	0.24	8.5	X	0.11	909		37.6
EXC-5	J1TRK7	6/3/14	0.0077	B	0.0056	0.23	U	0.23	8.5	X	0.11	931		36.0
EXC-6	J1TRK8	6/3/14	0.027		0.0060	0.22	U	0.22	7.6	X	0.11	924		35.1
EXC-7	J1TRK9	6/3/14	0.0057	B	0.0057	0.26	U	0.26	6.5	X	0.12	650		40.9
EXC-8	J1TRL0	6/3/14	0.036		0.0061	0.23	U	0.23	9.0	X	0.11	781		36.6
EXC-9	J1TRL1	6/3/14	0.0093	B	0.0055	0.25	U	0.25	7.7	X	0.12	726		38.6
EXC-10	J1TRL2	6/3/14	0.0073	B	0.0049	0.25	U	0.25	8.4	X	0.12	907		40.0
EXC-11	J1TRL3	6/3/14	0.0093	B	0.0058	0.26	U	0.26	8.4	X	0.12	801		41.1
EXC-12	J1TRL4	6/3/14	0.013	B	0.0060	0.29	B	0.23	9.2	X	0.11	837		36.1
OB-12	J1TRM7	6/3/14	0.0089	B	0.0049	0.23	B	0.23	7.4	X	0.11	777		36.1
Duplicate of J1TRM7	J1TRM8	6/3/14	0.0091	B	0.0051	0.30	B	0.23	9.1	X	0.11	829		37.0
OB-1	J1TRL6	6/3/14	0.10		0.0053	0.32	B	0.24	8.6	X	0.11	911		37.6
OB-2	J1TRL7	6/3/14	0.057		0.0054	0.29	B	0.26	7.5	X	0.12	810		40.3
OB-3	J1TRL8	6/3/14	0.0094	B	0.0059	0.23	B	0.23	9.3	X	0.11	874		35.6
OB-4	J1TRL9	6/3/14	0.011	B	0.0055	0.23	U	0.23	8.7	X	0.11	1180		36.9
OB-5	J1TRM0	6/3/14	0.017		0.0053	0.26	U	0.26	8.5	X	0.12	1040		41.5
OB-6	J1TRM1	6/3/14	0.011	B	0.0048	0.25	U	0.25	8.4	X	0.12	867		39.7
OB-7	J1TRM2	6/3/14	0.0073	B	0.0053	0.23	U	0.23	9.3	X	0.11	1000		36.3
OB-8	J1TRM3	6/3/14	0.0073	B	0.0050	0.23	U	0.23	7.6	X	0.11	871		36.7
OB-9	J1TRM4	6/3/14	0.011	B	0.0049	0.25	U	0.25	9.2	X	0.12	1000		40.1
OB-10	J1TRM5	6/3/14	0.045		0.0051	0.25	U	0.25	7.4	X	0.12	884		39.3
OB-11	J1TRM6	6/3/14	0.0067	B	0.0052	0.26	U	0.26	7.8	X	0.12	649		41.4
SPA-1	J1TRM9	7/23/14	0.0072	B	0.0055	2.1	M	0.26	11.6	X	0.12	1390		41.0
Duplicate of J1TRM9	J1TRP1	7/23/14	0.0066	B	0.0051	0.26	U	0.26	11.3	X	0.12	1260		41.0
SPA-2	J1TRN0	7/23/14	0.036		0.0056	2.1		0.23	14.6	X	0.11	842		37.0
SPA-3	J1TRN1	7/23/14	0.053		0.0058	0.43	B	0.24	10.2	X	0.11	918		37.7
SPA-4	J1TRN2	7/23/14	0.031		0.0047	0.43	B	0.24	12.2	X	0.12	1100		38.5
SPA-5	J1TRN3	7/23/14	0.074		0.0052	0.39	B	0.23	11.5	X	0.11	969		36.6
SPA-6	J1TRN4	7/23/14	0.072		0.0051	0.27	B	0.23	12.8	X	0.11	925		36.6
SPA-7	J1TRN5	7/23/14	0.066		0.006	0.26	B	0.24	9.7	X	0.11	981		37.1
SPA-8	J1TRN6	7/23/14	0.015		0.0048	0.24	U	0.24	10.2	X	0.11	1140		38.1
SPA-9	J1TRN7	7/23/14	0.020		0.0055	0.23	U	0.23	11.0	X	0.11	1390		36.6
SPA-10	J1TRN8	7/23/14	0.017		0.0052	0.25	U	0.25	11.0	X	0.12	1400		39.4
SPA-11	J1TRN9	7/23/14	0.0085	B	0.0061	0.23	U	0.23	9.0	X	0.11	668		35.7
SPA-12	J1TRP0	7/23/14	0.013	B	0.0054	0.25	U	0.25	9.1	X	0.12	903		39.8
Equipment Blank	J1TRP2	7/23/14	0.0058	U	0.0058	0.24	U	0.24	0.45	BX	0.11	47.0	B	38.3

Attachment	1	Sheet No.	5 of 23
Originator	I. B. Berezovskiy	Date	8/19/14
Checked	J. D. Skoglie	Date	8/19/14
Calc. No.	0100D-CA-V0542	Rev. No.	0

Attachment 1. 100-D-83:3 Subsite Verification Sample Results (Metals).

LOCATION	HEIS Number	Sample Date	Selenium			Silicon			Silver			Sodium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-1	J1TRK3	6/3/14	0.77	U	0.77	290	NXJ	5.1	0.14	U	0.14	286		52.8
Duplicate of J1TRK3	J1TRL5	6/3/14	0.75	U	0.75	296	XJ	5.0	0.14	U	0.14	244		51.7
EXC-2	J1TRK4	6/3/14	0.79	U	0.79	338	XJ	5.2	0.15	U	0.15	207		54.1
EXC-3	J1TRK5	6/3/14	0.82	U	0.82	304	XJ	5.4	0.15	U	0.15	196		56.5
EXC-4	J1TRK6	6/3/14	0.79	U	0.79	363	XJ	5.2	0.15	U	0.15	246		54.2
EXC-5	J1TRK7	6/3/14	0.76	U	0.76	301	XJ	5.0	0.14	U	0.14	236		51.8
EXC-6	J1TRK8	6/3/14	0.74	U	0.74	251	XJ	4.8	0.14	U	0.14	306		50.5
EXC-7	J1TRK9	6/3/14	0.86	U	0.86	241	XJ	5.7	0.16	U	0.16	246		58.9
EXC-8	J1TRL0	6/3/14	0.77	U	0.77	304	XJ	5.1	0.14	U	0.14	275		52.7
EXC-9	J1TRL1	6/3/14	0.81	U	0.81	289	XJ	5.3	0.15	U	0.15	276		55.6
EXC-10	J1TRL2	6/3/14	0.84	U	0.84	323	XJ	5.5	0.16	U	0.16	257		57.5
EXC-11	J1TRL3	6/3/14	0.86	U	0.86	261	XJ	5.7	0.16	U	0.16	226		59.2
EXC-12	J1TRL4	6/3/14	0.76	U	0.76	323	XJ	5.0	0.14	U	0.14	247		52.0
OB-12	J1TRM7	6/3/14	0.76	U	0.76	230	N	5.0	0.14	U	0.14	260		51.9
Duplicate of J1TRM7	J1TRM8	6/3/14	0.78	U	0.78	296	N	5.1	0.14	U	0.14	229		53.3
OB-1	J1TRL6	6/3/14	0.79	U	0.79	253	N	5.2	0.15	U	0.15	206		54.1
OB-2	J1TRL7	6/3/14	0.85	U	0.85	264	N	5.6	0.16	U	0.16	240		58.0
OB-3	J1TRL8	6/3/14	0.75	U	0.75	245	N	4.9	0.14	U	0.14	222		51.2
OB-4	J1TRL9	6/3/14	0.77	U	0.77	338	N	5.1	0.14	U	0.14	209		53.1
OB-5	J1TRM0	6/3/14	0.87	U	0.87	314	N	5.7	0.16	U	0.16	237		59.7
OB-6	J1TRM1	6/3/14	0.83	U	0.83	316	N	5.5	0.16	U	0.16	230		57.2
OB-7	J1TRM2	6/3/14	0.76	U	0.76	365	N	5.0	0.14	U	0.14	211		52.2
OB-8	J1TRM3	6/3/14	0.77	U	0.77	254	N	5.1	0.14	U	0.14	230		52.8
OB-9	J1TRM4	6/3/14	0.84	U	0.84	290	N	5.5	0.16	U	0.16	241		57.7
OB-10	J1TRM5	6/3/14	0.83	U	0.83	301	N	5.4	0.15	U	0.15	253		56.6
OB-11	J1TRM6	6/3/14	0.87	U	0.87	227	N	5.7	0.16	U	0.16	274		59.5
SPA-1	J1TRM9	7/23/14	3.9		0.86	311	N	5.7	0.16	U	0.16	349		59.0
Duplicate of J1TRM9	J1TRP1	7/23/14	0.86	U	0.86	271		5.7	0.16	U	0.16	255		59.0
SPA-2	J1TRN0	7/23/14	0.78	U	0.78	133		5.1	0.14	U	0.14	501		53.3
SPA-3	J1TRN1	7/23/14	0.79	U	0.79	169		5.2	0.15	U	0.15	330		54.3
SPA-4	J1TRN2	7/23/14	0.81	U	0.81	217		5.3	0.15	U	0.15	432		55.4
SPA-5	J1TRN3	7/23/14	0.77	U	0.77	197		5.1	0.14	U	0.14	267		52.7
SPA-6	J1TRN4	7/23/14	0.77	U	0.77	199		5.0	0.14	U	0.14	349		52.6
SPA-7	J1TRN5	7/23/14	0.78	U	0.78	177		5.1	0.14	U	0.14	309		53.3
SPA-8	J1TRN6	7/23/14	0.80	U	0.80	205		5.3	0.15	U	0.15	292		54.8
SPA-9	J1TRN7	7/23/14	0.77	U	0.77	219		5.1	0.14	U	0.14	209		52.7
SPA-10	J1TRN8	7/23/14	0.83	U	0.83	218		5.4	0.15	U	0.15	199		56.8
SPA-11	J1TRN9	7/23/14	0.75	U	0.75	174		4.9	0.14	U	0.14	242		51.4
SPA-12	J1TRP0	7/23/14	0.83	U	0.83	200		5.5	0.16	U	0.16	256		57.3
Equipment Blank	J1TRP2	7/23/14	0.80	U	0.80	93.1		5.3	0.15	U	0.15	55.1	U	55.1

Attachment	1	Sheet No.	6 of 23
Originator	I. B. Berezovskiy	Date	8/19/14
Checked	J. D. Skoglie	Date	8/19/14
Calc. No.	0100D-CA-V0542	Rev. No.	0

Attachment 1. 100-D-83:3 Subsite Verification Sample Results (Metals and Anions).

LOCATION	HEIS Number	Sample Date	Vanadium			Zinc			Bromide			Chloride		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-1	J1TRK3	6/3/14	50.3	X	0.084	38.9	XJ	0.36	0.38	U	0.38	3.0	B	2.0
Duplicate of J1TRK3	J1TRL5	6/3/14	48.3	X	0.082	39.1	XJ	0.35	0.39	U	0.39	2.9	B	2.0
EXC-2	J1TRK4	6/3/14	51.5	X	0.086	38.9	XJ	0.37	0.39	U	0.39	3.1	B	2.0
EXC-3	J1TRK5	6/3/14	44.9	X	0.090	36.1	XJ	0.38	0.40	U	0.40	3.5	B	2.1
EXC-4	J1TRK6	6/3/14	51.7	X	0.086	42.5	XJ	0.37	0.38	U	0.38	5.3		1.9
EXC-5	J1TRK7	6/3/14	53.4	X	0.083	36.1	XJ	0.35	0.38	U	0.38	15.0		1.9
EXC-6	J1TRK8	6/3/14	49.8	X	0.080	39.5	XJ	0.34	0.38	U	0.38	7.1		2.0
EXC-7	J1TRK9	6/3/14	60.1	X	0.094	38.3	XJ	0.40	0.38	U	0.38	8.4		2.0
EXC-8	J1TRL0	6/3/14	58.9	X	0.084	39.2	XJ	0.36	0.39	U	0.39	5.2		2.0
EXC-9	J1TRL1	6/3/14	59.0	X	0.089	50.5	XJ	0.38	0.38	U	0.38	3.9	B	1.9
EXC-10	J1TRL2	6/3/14	56.1	X	0.092	38.6	XJ	0.39	0.39	U	0.39	10.4		2.0
EXC-11	J1TRL3	6/3/14	56.9	X	0.094	39.6	XJ	0.40	0.38	U	0.38	9.6		1.9
EXC-12	J1TRL4	6/3/14	52.6	X	0.083	41.1	XJ	0.35	0.37	U	0.37	7.9		1.9
OB-12	J1TRM7	6/3/14	54.5	X	0.083	38.0	X	0.35	0.38	U	0.38	13.0		1.9
Duplicate of J1TRM7	J1TRM8	6/3/14	53.4	X	0.085	37.5	X	0.36	0.38	U	0.38	14.0		2.0
OB-1	J1TRL6	6/3/14	51.5	X	0.086	41.4	X	0.36	0.39	U	0.39	2.8	B	2.0
OB-2	J1TRL7	6/3/14	51.4	X	0.092	37.6	X	0.39	0.40	U	0.40	2.8	B	2.0
OB-3	J1TRL8	6/3/14	54.0	X	0.082	39.0	X	0.35	0.38	U	0.38	2.7	B	2.0
OB-4	J1TRL9	6/3/14	46.9	X	0.085	38.8	X	0.36	0.38	U	0.38	2.9	B	2.0
OB-5	J1TRM0	6/3/14	49.3	X	0.095	42.5	X	0.40	0.37	U	0.37	2.8	B	1.9
OB-6	J1TRM1	6/3/14	51.5	X	0.091	38.2	X	0.39	0.38	U	0.38	3.3	B	1.9
OB-7	J1TRM2	6/3/14	46.0	X	0.083	36.1	X	0.35	0.39	U	0.39	4.2	B	2.0
OB-8	J1TRM3	6/3/14	47.8	X	0.084	34.8	X	0.36	0.38	U	0.38	5.9		2.0
OB-9	J1TRM4	6/3/14	45.4	X	0.092	35.9	X	0.39	0.38	U	0.38	3.7	B	2.0
OB-10	J1TRM5	6/3/14	50.5	X	0.090	39.8	X	0.38	0.39	U	0.39	4.5	B	2.0
OB-11	J1TRM6	6/3/14	58.6	X	0.095	38.3	X	0.40	0.37	U	0.37	5.1		1.9
SPA-1	J1TRM9	7/23/14	32.7		0.094	29.6	X	0.40	0.39	U	0.39	14.6	M	2.0
Duplicate of J1TRM9	J1TRP1	7/23/14	30.0		0.094	28.7	X	0.40	0.39	U	0.39	11.3	N	2.0
SPA-2	J1TRN0	7/23/14	48.4		0.085	45.4	X	0.36	0.39	U	0.39	14.9		2.0
SPA-3	J1TRN1	7/23/14	56.3		0.086	46.2	X	0.37	0.39	U	0.39	39.9		2.0
SPA-4	J1TRN2	7/23/14	46.5		0.088	48.9	X	0.37	0.39	U	0.39	18.0		2.0
SPA-5	J1TRN3	7/23/14	54.9		0.084	57.5	X	0.36	0.38	U	0.38	14.9		1.9
SPA-6	J1TRN4	7/23/14	49.3		0.084	46.1	X	0.35	0.37	U	0.37	8.7		1.9
SPA-7	J1TRN5	7/23/14	55.0		0.085	42.6	X	0.36	0.38	U	0.38	17.2		1.9
SPA-8	J1TRN6	7/23/14	50.9		0.087	40.8	X	0.37	0.38	U	0.38	16.6		1.9
SPA-9	J1TRN7	7/23/14	39.2		0.084	41.6	X	0.36	0.39	U	0.39	16.6		2.0
SPA-10	J1TRN8	7/23/14	36.0		0.090	37.8	X	0.38	0.39	U	0.39	11.3		2.0
SPA-11	J1TRN9	7/23/14	59.8		0.082	37.8	X	0.35	0.37	U	0.37	10.4		1.9
SPA-12	J1TRP0	7/23/14	54.5		0.091	42.7	X	0.39	0.39	U	0.39	11.1		2.0
Equipment Blank	J1TRP2	7/23/14	0.71	B	0.088	1.1	X	0.37						

Attachment	1	Sheet No.	7 of 23
Originator	I. B. Berezovskiy	Date	8/19/14
Checked	J. D. Skoglie	Date	8/19/14
Calc. No.	0100D-CA-V0542	Rev. No.	0

Attachment 1. 100-D-83:3 Subsite Verification Sample Results (Anions).

LOCATION	HEIS Number	Sample Date	Fluoride			Nitrogen in Nitrate			Nitrogen in Nitrite and Nitrate			Nitrogen in Nitrite		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-1	J1TRK3	6/3/14	0.81	UJ	0.81	1.4	BJ	0.31	0.37	B	0.36	0.33	UR	0.33
Duplicate of J1TRK3	J1TRL5	6/3/14	0.81	UJ	0.81	1.2	BJ	0.31	0.58	B	0.36	0.33	UR	0.33
EXC-2	J1TRK4	6/3/14	0.82	UNJ	0.82	1.5	BJ	0.31	0.70	B	0.36	0.33	UR	0.33
EXC-3	J1TRK5	6/3/14	0.85	UJ	0.85	2.8	J	0.33	1.9		0.38	0.35	UR	0.35
EXC-4	J1TRK6	6/3/14	0.80	UJ	0.80	2.0	BJ	0.31	1.5		0.36	0.33	UR	0.33
EXC-5	J1TRK7	6/3/14	0.95	BJ	0.79	2.0	BJ	0.30	1.7		0.36	0.32	UR	0.32
EXC-6	J1TRK8	6/3/14	0.81	UJ	0.81	1.7	BJ	0.31	1.0		0.36	0.33	UR	0.33
EXC-7	J1TRK9	6/3/14	0.81	UJ	0.81	2.5	J	0.31	1.7		0.36	0.33	UR	0.33
EXC-8	J1TRL0	6/3/14	0.98	BJ	0.81	1.1	BJ	0.31	0.36	U	0.36	0.33	UR	0.33
EXC-9	J1TRL1	6/3/14	0.94	BJ	0.80	1.3	BJ	0.31	0.39	B	0.36	0.33	UR	0.33
EXC-10	J1TRL2	6/3/14	0.83	BJ	0.82	1.1	BJ	0.31	0.37	B	0.36	0.33	UR	0.33
EXC-11	J1TRL3	6/3/14	0.80	UJ	0.80	1.0	BJ	0.30	0.48	B	0.36	0.33	UR	0.33
EXC-12	J1TRL4	6/3/14	0.78	UNJ	0.78	1.3	BJ	0.30	0.84		0.36	0.32	UR	0.32
OB-12	J1TRM7	6/3/14	0.80	U	0.80	1.1	B	0.31	1.5		0.36	0.33	UR	0.33
Duplicate of J1TRM7	J1TRM8	6/3/14	0.81	UN	0.81	1.2	B	0.31	1.0		0.36	0.33	UR	0.33
OB-1	J1TRL6	6/3/14	0.81	UN	0.81	1.3	BN	0.31	0.68	B	0.36	0.33	UR	0.33
OB-2	J1TRL7	6/3/14	0.85	B	0.84	1.2	B	0.32	0.44	B	0.37	0.34	UR	0.34
OB-3	J1TRL8	6/3/14	0.81	U	0.81	1.1	B	0.31	0.47	B	0.36	0.33	UR	0.33
OB-4	J1TRL9	6/3/14	0.81	B	0.81	1.4	B	0.31	1.1		0.36	0.33	UR	0.33
OB-5	J1TRM0	6/3/14	1.0	B	0.78	1.4	B	0.30	1.4		0.36	0.32	UR	0.32
OB-6	J1TRM1	6/3/14	0.80	U	0.80	1.2	B	0.31	0.96		0.36	0.33	UR	0.33
OB-7	J1TRM2	6/3/14	1.0	B	0.82	1.5	B	0.31	1.3		0.36	0.34	UR	0.34
OB-8	J1TRM3	6/3/14	0.90	B	0.81	1.4	B	0.31	1.4		0.36	0.33	UR	0.33
OB-9	J1TRM4	6/3/14	1.5	B	0.81	1.1	B	0.31	0.48	B	0.36	0.33	UR	0.33
OB-10	J1TRM5	6/3/14	0.81	U	0.81	1.1	B	0.31	0.62	B	0.36	0.33	UR	0.33
OB-11	J1TRM6	6/3/14	0.79	U	0.79	1.2	B	0.30	0.86		0.36	0.32	UR	0.32
SPA-1	J1TRM9	7/23/14	0.83	UN	0.83	1.6	B	0.32	1.3		0.37	0.34	UR	0.34
Duplicate of J1TRM9	J1TRP1	7/23/14	0.82	UN	0.82	1.4	B	0.31	1.9		0.37	0.34	UR	0.34
SPA-2	J1TRN0	7/23/14	0.94	B	0.82	2.4	B	0.31	2.2		0.36	0.33	UR	0.33
SPA-3	J1TRN1	7/23/14	0.89	B	0.83	4.4		0.32	5.2		0.37	0.34	UR	0.34
SPA-4	J1TRN2	7/23/14	1.0	B	0.81	4.5		0.31	5.4		0.36	0.33	UR	0.33
SPA-5	J1TRN3	7/23/14	1.1	B	0.80	2.6		0.31	1.5		0.36	0.33	UR	0.33
SPA-6	J1TRN4	7/23/14	1.2	B	0.78	1.4	B	0.30	1.6		0.36	0.32	UR	0.32
SPA-7	J1TRN5	7/23/14	1.3	B	0.80	11.7		0.30	8.2		0.36	0.33	UR	0.33
SPA-8	J1TRN6	7/23/14	1.3	B	0.79	2.7		0.30	2.9		0.36	0.33	UR	0.33
SPA-9	J1TRN7	7/23/14	1.5	B	0.81	3.2		0.31	2.4		0.36	0.33	UR	0.33
SPA-10	J1TRN8	7/23/14	1.6	B	0.81	7.8		0.31	6.7		0.36	0.33	UR	0.33
SPA-11	J1TRN9	7/23/14	1.3	B	0.79	1.9	B	0.30	1.9		0.36	0.32	UR	0.32
SPA-12	J1TRP0	7/23/14	1.4	B	0.81	3.7		0.31	2.9		0.36	0.33	UR	0.33
Equipment Blank	J1TRP2	7/23/14												

Attachment	1	Sheet No.	8 of 23
Originator	I. B. Berezovskiy	Date	8/27/14
Checked	J. D. Skoglie	Date	8/27/14
Calc. No.	0100D-CA-V0542	Rev. No.	0

Attachment 1. 100-D-83:3 Subsite Verification Sample Results (Anions).

LOCATION	HEIS Number	Sample Date	Phosphorous in phosphate			Sulfate			Percent moisture (wet sample)			pH Measurement		
			mg/kg	Q	PQL	mg/kg	Q	PQL	%	Q	PQL	pH	Q	PQL
EXC-1	J1TRK3	6/3/14	1.2	UR	1.2	7.5		1.7	1.1		0.10	9.29	J	0.100
Duplicate of J1TRK3	J1TRL5	6/3/14	1.2	UR	1.2	7.3		1.7	0.86		0.10	9.31	J	0.100
EXC-2	J1TRK4	6/3/14	1.2	UNR	1.2	7.6		1.7	0.93		0.10	9.12	J	0.100
EXC-3	J1TRK5	6/3/14	1.3	UR	1.3	10.0		1.8	5.9		0.10	9.00	J	0.100
EXC-4	J1TRK6	6/3/14	1.2	UR	1.2	8.9		1.7	1.0		0.10	9.11	J	0.100
EXC-5	J1TRK7	6/3/14	1.2	UR	1.2	12.3		1.6	1.0		0.10	9.15	J	0.100
EXC-6	J1TRK8	6/3/14	1.2	UR	1.2	17.3		1.7	0.92		0.10	9.22	J	0.100
EXC-7	J1TRK9	6/3/14	1.2	UR	1.2	25.7		1.7	0.86		0.10	9.23	J	0.100
EXC-8	J1TRL0	6/3/14	1.2	UR	1.2	9.4		1.7	0.99		0.10	9.24	J	0.100
EXC-9	J1TRL1	6/3/14	1.2	UR	1.2	242		1.7	0.85		0.10	8.59	J	0.100
EXC-10	J1TRL2	6/3/14	1.2	UR	1.2	9.9		1.7	1.4		0.10	9.16	J	0.100
EXC-11	J1TRL3	6/3/14	1.2	UR	1.2	236		1.6	1.2		0.10	8.66	J	0.100
EXC-12	J1TRL4	6/3/14	1.2	UNR	1.2	35.4		1.6	1.3		0.10	9.12	J	0.100
OB-12	J1TRM7	6/3/14	1.2	UR	1.2	11.1		1.7	1.2		0.10	9.12		0.100
Duplicate of J1TRM7	J1TRM8	6/3/14	1.2	UNR	1.2	12.4		1.7	1.2		0.10	9.13		0.100
OB-1	J1TRL6	6/3/14	1.2	UNR	1.2	5.9	N	1.7	0.86		0.10	9.04		0.100
OB-2	J1TRL7	6/3/14	1.3	UR	1.3	6.7		1.7	3.2		0.10	9.19		0.100
OB-3	J1TRL8	6/3/14	1.2	UR	1.2	7.9		1.7	0.73		0.10	9.17		0.100
OB-4	J1TRL9	6/3/14	1.2	UR	1.2	7.6		1.7	0.85		0.10	8.98		0.100
OB-5	J1TRM0	6/3/14	1.2	UR	1.2	8.0		1.6	1.2		0.10	9.04		0.100
OB-6	J1TRM1	6/3/14	1.2	UR	1.2	7.1		1.7	0.79		0.10	9.06		0.100
OB-7	J1TRM2	6/3/14	1.2	UR	1.2	8.4		1.7	0.92		0.10	8.89		0.100
OB-8	J1TRM3	6/3/14	1.2	UR	1.2	10.2		1.7	1.0		0.10	9.16		0.100
OB-9	J1TRM4	6/3/14	1.2	UR	1.2	16.9		1.7	0.79		0.10	9.00		0.100
OB-10	J1TRM5	6/3/14	1.2	UR	1.2	14.2		1.7	0.73		0.10	9.19		0.100
OB-11	J1TRM6	6/3/14	1.2	UR	1.2	16.3		1.6	0.92		0.10	9.22		0.100
SPA-1	J1TRM9	7/23/14	1.3	UR	1.3	60.2	N	1.7	2.0		0.10	9.15		0.100
Duplicate of J1TRM9	J1TRP1	7/23/14	1.2	UNR	1.2	30.2	N	1.7	2.0		0.10	9.29		0.100
SPA-2	J1TRN0	7/23/14	1.2	UR	1.2	105		1.7	1.1		0.10	8.75		0.100
SPA-3	J1TRN1	7/23/14	1.3	UR	1.3	55.8		1.7	2.1		0.10	8.65		0.100
SPA-4	J1TRN2	7/23/14	1.2	UR	1.2	388		1.7	1.4		0.10	8.51		0.100
SPA-5	J1TRN3	7/23/14	1.2	UR	1.2	57.5		1.7	0.89		0.10	8.60		0.100
SPA-6	J1TRN4	7/23/14	1.2	UR	1.2	90.0		1.6	0.74		0.10	8.63		0.100
SPA-7	J1TRN5	7/23/14	2.0	B	1.2	191		1.7	1.2		0.10	8.47		0.100
SPA-8	J1TRN6	7/23/14	1.2	UR	1.2	102		1.6	1.2		0.10	8.37		0.100
SPA-9	J1TRN7	7/23/14	1.2	UR	1.2	47.4		1.7	0.90		0.10	8.33		0.100
SPA-10	J1TRN8	7/23/14	1.2	UR	1.2	36.0		1.7	1.0		0.10	8.16		0.100
SPA-11	J1TRN9	7/23/14	1.2	UR	1.2	25.7		1.6	1.1		0.10	8.65		0.100
SPA-12	J1TRP0	7/23/14	1.2	UR	1.2	61.1		1.7	0.93		0.10	8.45		0.100
Equipment Blank	J1TRP2	7/23/14							0.10	U	0.10			

Attachment	1	Sheet No.	9 of 23
Originator	I. B. Berezovskiy	Date	8/27/14
Checked	J. D. Skoglie	Date	8/27/14
Calc. No.	0100D-CA-V0542	Rev. No.	0

Attachment 1. 100-D-83:3 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1TRK3, EXC-1			J1TRL5, Duplicate of J1TRK3			J1TRK4, EXC-2			J1TRK5, EXC-3			J1TRK6, EXC-4			J1TRK7, EXC-5		
		6/3/14			6/3/14			6/3/14			6/3/14			6/3/14			6/3/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	28	U	28	27	U	27	28	U	28	29	U	29	27	U	27	27	U	27
1,2-Dichlorobenzene	SVOA	22	U	22	21	U	21	22	U	22	22	U	22	21	U	21	21	U	21
1,3-Dichlorobenzene	SVOA	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12
1,4-Dichlorobenzene	SVOA	14	U	14	13	U	13	14	U	14	14	U	14	13	U	13	13	U	13
2,4,5-Trichlorophenol	SVOA	10	U	10	9.6	U	9.6	10	U	10	10	U	10	9.7	U	9.7	9.7	U	9.7
2,4,6-Trichlorophenol	SVOA	10	U	10	9.6	U	9.6	10	U	10	10	U	10	9.7	U	9.7	9.7	U	9.7
2,4-Dichlorophenol	SVOA	10	U	10	9.6	U	9.6	10	U	10	10	U	10	9.7	U	9.7	9.7	U	9.7
2,4-Dimethylphenol	SVOA	66	U	66	64	U	64	67	U	67	67	U	67	64	U	64	64	U	64
2,4-Dinitrophenol	SVOA	330	UJ	330	320	UJ	320	340	UJ	340	340	UJ	340	320	UXJ	320	320	UJ	320
2,4-Dinitrotoluene	SVOA	66	U	66	64	U	64	67	U	67	67	U	67	64	U	64	64	U	64
2,6-Dinitrotoluene	SVOA	28	U	28	27	U	27	28	U	28	29	U	29	27	U	27	27	U	27
2-Chloronaphthalene	SVOA	10	U	10	9.6	U	9.6	10	U	10	10	U	10	9.7	U	9.7	9.7	U	9.7
2-Chlorophenol	SVOA	21	U	21	20	U	20	21	U	21	21	U	21	20	U	20	20	U	20
2-Methylnaphthalene	SVOA	19	U	19	18	U	18	19	U	19	19	U	19	18	U	18	18	U	18
2-Methylphenol (cresol, o-)	SVOA	13	U	13	13	U	13	13	U	13	13	U	13	13	U	13	13	U	13
2-Nitroaniline	SVOA	50	U	50	48	U	48	50	U	50	51	U	51	48	U	48	49	U	49
2-Nitrophenol	SVOA	10	U	10	9.6	U	9.6	10	U	10	10	U	10	9.7	U	9.7	9.7	U	9.7
3,3'-Dichlorobenzidine	SVOA	90	UJ	90	87	UJ	87	91	UJ	91	92	UJ	92	87	UJ	87	87	UJ	87
3+4 Methylphenol (cresol, m+p)	SVOA	33	U	33	32	U	32	33	U	33	34	U	34	32	U	32	32	U	32
3-Nitroaniline	SVOA	73	U	73	70	U	70	74	U	74	74	U	74	71	U	71	71	U	71
4,6-Dinitro-2-methylphenol	SVOA	330	U	330	320	U	320	330	U	330	340	U	340	320	U	320	320	U	320
4-Bromophenylphenyl ether	SVOA	19	U	19	18	U	18	19	U	19	19	U	19	18	U	18	18	U	18
4-Chloro-3-methylphenol	SVOA	66	U	66	64	U	64	67	U	67	67	U	67	64	U	64	64	U	64
4-Chloroaniline	SVOA	82	UJ	82	79	UJ	79	83	UJ	83	83	UJ	83	79	UJ	79	80	UJ	80
4-Chlorophenylphenyl ether	SVOA	21	U	21	20	U	20	21	U	21	21	U	21	20	U	20	20	U	20
4-Nitroaniline	SVOA	73	U	73	70	U	70	73	U	73	74	U	74	70	U	70	70	U	70
4-Nitrophenol	SVOA	97	U	97	93	U	93	98	U	98	99	U	99	94	U	94	94	U	94
Acenaphthene	SVOA	10	U	10	9.9	U	9.9	10	U	10	10	U	10	10	U	10	10	U	10
Acenaphthylene	SVOA	17	U	17	16	U	16	17	U	17	17	U	17	16	U	16	17	U	17
Anthracene	SVOA	17	U	17	16	U	16	17	U	17	17	U	17	16	U	16	17	U	17
Benzo(a)anthracene	SVOA	40	J	20	19	U	19	20	U	20	20	U	20	19	U	19	19	U	19
Benzo(a)pyrene	SVOA	31	J	20	19	U	19	20	U	20	20	U	20	19	U	19	19	U	19

Attachment	1	Sheet No.	10 of 23
Originator	I. B. Berezovskiy	Date	8/19/14
Checked	J. D. Skoglie	Date	8/19/14
Calc. No.	0100D-CA-V0542	Rev. No.	0

Attachment 1. 100-D-83:3 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1TRK3, EXC-1			J1TRL5, Duplicate of J1TRK3			J1TRK4, EXC-2			J1TRK5, EXC-3			J1TRK6, EXC-4			J1TRK7, EXC-5		
		6/3/14			6/3/14			6/3/14			6/3/14			6/3/14			6/3/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Benzo(b)fluoranthene	SVOA	42	J	26	25	U	25	26	U	26	27	U	27	25	U	25	25	U	25
Benzo(ghi)perylene	SVOA	17	J	16	15	U	15	16	U	16	16	U	16	15	U	15	16	U	16
Benzo(k)fluoranthene	SVOA	40	U	40	39	U	39	40	U	40	41	U	41	39	U	39	39	U	39
Bis(2-chloro-1-methylethyl)ether	SVOA	23	U	23	22	U	22	23	U	23	23	U	23	22	U	22	22	U	22
Bis(2-Chloroethoxy)methane	SVOA	23	U	23	22	U	22	23	U	23	23	U	23	22	U	22	22	U	22
Bis(2-chloroethyl) ether	SVOA	17	U	17	16	U	16	17	U	17	17	U	17	16	U	16	16	U	16
Bis(2-ethylhexyl) phthalate	SVOA	46	U	46	44	U	44	46	U	46	47	U	47	45	U	45	45	U	45
Butylbenzylphthalate	SVOA	43	U	43	41	U	41	43	U	43	44	U	44	42	U	42	42	U	42
Carbazole	SVOA	36	U	36	35	U	35	36	U	36	37	U	37	35	U	35	35	U	35
Chrysene	SVOA	47	J	27	26	U	26	27	U	27	27	U	27	26	U	26	26	U	26
Dibenz[a,h]anthracene	SVOA	19	U	19	18	U	18	19	U	19	19	U	19	18	U	18	18	U	18
Dibenzofuran	SVOA	20	U	20	19	U	19	20	U	20	20	U	20	19	U	19	19	U	19
Diethyl phthalate	SVOA	26	U	26	25	U	25	26	U	26	26	U	26	25	U	25	25	U	25
Dimethyl phthalate	SVOA	23	U	23	31	J	22	23	U	23	38	J	23	22	U	22	22	U	22
Di-n-butylphthalate	SVOA	29	U	29	28	U	28	29	U	29	30	U	30	28	U	28	28	U	28
Di-n-octylphthalate	SVOA	14	U	14	14	U	14	15	U	15	15	U	15	14	U	14	14	U	14
Fluoranthene	SVOA	79	J	36	35	U	35	36	U	36	37	U	37	35	U	35	35	U	35
Fluorene	SVOA	18	U	18	17	U	17	18	U	18	18	U	18	17	U	17	17	U	17
Hexachlorobenzene	SVOA	29	U	29	28	U	28	29	U	29	30	U	30	28	U	28	28	U	28
Hexachlorobutadiene	SVOA	10	U	10	9.6	U	9.6	10	U	10	10	U	10	9.7	U	9.7	9.7	U	9.7
Hexachlorocyclopentadiene	SVOA	50	U	50	48	U	48	50	U	50	51	U	51	48	U	48	49	U	49
Hexachloroethane	SVOA	21	U	21	21	U	21	22	U	22	22	U	22	21	U	21	21	U	21
Indeno(1,2,3-cd)pyrene	SVOA	75	J	22	21	U	21	22	U	22	22	U	22	21	U	21	21	U	21
Isophorone	SVOA	17	U	17	16	U	16	17	U	17	17	U	17	16	U	16	17	U	17
Naphthalene	SVOA	31	U	31	30	U	30	31	U	31	32	U	32	30	U	30	30	U	30
Nitrobenzene	SVOA	22	U	22	21	U	21	22	U	22	22	U	22	21	U	21	21	U	21
N-Nitroso-di-n-dipropylamine	SVOA	31	U	31	30	U	30	31	U	31	32	U	32	30	U	30	30	U	30
N-Nitrosodiphenylamine	SVOA	21	U	21	20	U	20	21	U	21	21	U	21	20	U	20	20	U	20
Pentachlorophenol	SVOA	330	U	330	320	U	320	330	U	330	340	U	340	320	U	320	320	U	320
Phenanthrene	SVOA	36	J	17	16	U	16	17	U	17	17	U	17	16	U	16	17	U	17
Phenol	SVOA	18	U	18	17	U	17	18	U	18	18	U	18	17	U	17	17	U	17
Pyrene	SVOA	83	J	12	13	J	12	17	J	12	12	U	12	18	J	12	14	J	12

Attachment	1	Sheet No.	11 of 23
Originator	I. B. Berezovskiy	Date	8/19/14
Checked	J. D. Skoglie	Date	8/19/14
Calc. No.	0100D-CA-V0542	Rev. No.	0

Attachment 1. 100-D-83:3 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1TRK8, EXC-6			J1TRK9, EXC-7			J1TRL0, EXC-8			J1TRL1, EXC-9			J1TRL2, EXC-10			J1TRL3, EXC-11		
		6/3/14			6/3/14			6/3/14			6/3/14			6/3/14			6/3/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	28	U	28	27	U	27	28	U	28	26	U	26	28	U	28	28	U	28
1,2-Dichlorobenzene	SVOA	22	U	22	21	U	21	22	U	22	20	U	20	22	U	22	22	U	22
1,3-Dichlorobenzene	SVOA	12	U	12	12	U	12	12	U	12	11	U	11	12	U	12	12	U	12
1,4-Dichlorobenzene	SVOA	13	U	13	13	U	13	13	U	13	13	U	13	13	U	13	13	U	13
2,4,5-Trichlorophenol	SVOA	9.8	U	9.8	9.7	U	9.7	9.8	U	9.8	9.3	U	9.3	9.9	U	9.9	9.8	U	9.8
2,4,6-Trichlorophenol	SVOA	9.8	U	9.8	9.7	U	9.7	9.8	U	9.8	9.3	U	9.3	9.9	U	9.9	9.8	U	9.8
2,4-Dichlorophenol	SVOA	9.8	U	9.8	9.7	U	9.7	9.8	U	9.8	9.3	U	9.3	9.9	U	9.9	9.8	U	9.8
2,4-Dimethylphenol	SVOA	65	U	65	64	U	64	65	U	65	61	U	61	65	U	65	65	U	65
2,4-Dinitrophenol	SVOA	330	UJ	330	320	UJ	320	330	UJ	330	310	UJ	310	330	UJ	330	330	UJ	330
2,4-Dinitrotoluene	SVOA	65	U	65	64	U	64	65	U	65	61	U	61	65	U	65	65	U	65
2,6-Dinitrotoluene	SVOA	28	U	28	27	U	27	28	U	28	26	U	26	28	U	28	28	U	28
2-Chloronaphthalene	SVOA	9.8	U	9.8	9.7	U	9.7	9.8	U	9.8	9.3	U	9.3	9.9	U	9.9	9.8	U	9.8
2-Chlorophenol	SVOA	21	U	21	20	U	20	21	U	21	19	U	19	21	U	21	21	U	21
2-Methylnaphthalene	SVOA	19	U	19	18	U	18	19	U	19	18	U	18	19	U	19	19	U	19
2-Methylphenol (cresol, o-)	SVOA	13	U	13	13	U	13	13	U	13	12	U	12	13	U	13	13	U	13
2-Nitroaniline	SVOA	49	U	49	48	U	48	49	U	49	46	U	46	49	U	49	49	U	49
2-Nitrophenol	SVOA	9.8	U	9.8	9.7	U	9.7	9.8	U	9.8	9.3	U	9.3	9.9	U	9.9	9.8	U	9.8
3,3'-Dichlorobenzidine	SVOA	88	UJ	88	87	UJ	87	89	UJ	89	84	UJ	84	89	UJ	89	88	UJ	88
3+4 Methylphenol (cresol, m+p)	SVOA	32	U	32	32	U	32	32	U	32	31	U	31	33	U	33	32	U	32
3-Nitroaniline	SVOA	72	U	72	71	U	71	72	U	72	68	U	68	72	U	72	72	U	72
4,6-Dinitro-2-methylphenol	SVOA	320	U	320	320	U	320	320	U	320	310	U	310	330	U	330	320	U	320
4-Bromophenylphenyl ether	SVOA	19	U	19	18	U	18	19	U	19	18	U	18	19	U	19	19	U	19
4-Chloro-3-methylphenol	SVOA	65	U	65	64	U	64	65	U	65	61	U	61	65	U	65	65	U	65
4-Chloroaniline	SVOA	81	UJ	81	79	UJ	79	81	UJ	81	76	UJ	76	81	UJ	81	81	UJ	81
4-Chlorophenylphenyl ether	SVOA	21	U	21	20	U	20	21	U	21	19	U	19	21	U	21	21	U	21
4-Nitroaniline	SVOA	71	U	71	70	U	70	71	U	71	67	U	67	72	U	72	71	U	71
4-Nitrophenol	SVOA	95	U	95	94	U	94	95	U	95	90	U	90	96	U	96	95	U	95
Acenaphthene	SVOA	10	U	10	10	U	10	10	U	10	9.6	U	9.6	10	U	10	10	U	10
Acenaphthylene	SVOA	17	U	17	16	U	16	17	U	17	16	U	16	17	U	17	17	U	17
Anthracene	SVOA	17	U	17	16	U	16	17	U	17	16	U	16	17	U	17	17	U	17
Benzo(a)anthracene	SVOA	78	J	20	19	U	19	20	U	20	19	U	19	20	U	20	20	U	20
Benzo(a)pyrene	SVOA	71	J	20	19	U	19	20	U	20	19	U	19	20	U	20	20	U	20

Attachment	1	Sheet No.	12 of 23
Originator	I. B. Berezovskiy	Date	8/19/14
Checked	J. D. Skoglie	Date	8/19/14
Calc. No.	0100D-CA-V0542	Rev. No.	0

Attachment 1. 100-D-83:3 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1TRK8, EXC-6			J1TRK9, EXC-7			J1TRL0, EXC-8			J1TRL1, EXC-9			J1TRL2, EXC-10			J1TRL3, EXC-11		
		6/3/14			6/3/14			6/3/14			6/3/14			6/3/14			6/3/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Benzo(b)fluoranthene	SVOA	94	J	26	25	U	25	26	U	26	24	U	24	26	U	26	26	U	26
Benzo(ghi)perylene	SVOA	42	J	16	16	U	16	16	U	16	15	U	15	16	U	16	16	U	16
Benzo(k)fluoranthene	SVOA	39	U	39	39	U	39	39	U	39	37	U	37	40	U	40	39	U	39
Bis(2-chloro-1-methylethyl)ether	SVOA	23	U	23	22	U	22	23	U	23	21	U	21	23	U	23	23	U	23
Bis(2-Chloroethoxy)methane	SVOA	23	U	23	22	U	22	23	U	23	21	U	21	23	U	23	23	U	23
Bis(2-chloroethyl) ether	SVOA	16	U	16	16	U	16	16	U	16	15	U	15	16	U	16	16	U	16
Bis(2-ethylhexyl) phthalate	SVOA	45	U	45	45	U	45	45	U	45	43	U	43	45	U	45	45	U	45
Butylbenzylphthalate	SVOA	42	U	42	42	U	42	42	U	42	40	U	40	42	U	42	42	U	42
Carbazole	SVOA	35	U	35	35	U	35	35	U	35	33	U	33	36	U	36	35	U	35
Chrysene	SVOA	90	J	27	26	U	26	27	U	27	25	U	25	27	U	27	27	U	27
Dibenz[a,h]anthracene	SVOA	19	U	19	18	U	18	19	U	19	18	U	18	19	U	19	19	U	19
Dibenzofuran	SVOA	20	U	20	19	U	19	20	U	20	19	U	19	20	U	20	20	U	20
Diethyl phthalate	SVOA	26	U	26	25	U	25	26	U	26	24	U	24	26	U	26	26	U	26
Dimethyl phthalate	SVOA	23	U	23	22	U	22	23	U	23	21	U	21	23	U	23	23	U	23
Di-n-butylphthalate	SVOA	29	U	29	28	U	28	29	U	29	27	U	27	29	U	29	29	U	29
Di-n-octylphthalate	SVOA	14	U	14	14	U	14	14	U	14	13	U	13	14	U	14	14	U	14
Fluoranthene	SVOA	140	J	35	35	U	35	35	U	35	33	U	33	36	U	36	35	U	35
Fluorene	SVOA	18	U	18	17	U	17	18	U	18	17	U	17	18	U	18	18	U	18
Hexachlorobenzene	SVOA	29	U	29	28	U	28	29	U	29	27	U	27	29	U	29	29	U	29
Hexachlorobutadiene	SVOA	9.8	U	9.8	9.7	U	9.7	9.8	U	9.8	9.3	U	9.3	9.9	U	9.9	9.8	U	9.8
Hexachlorocyclopentadiene	SVOA	49	U	49	48	U	48	49	U	49	46	U	46	49	U	49	49	U	49
Hexachloroethane	SVOA	21	U	21	21	U	21	21	U	21	20	U	20	21	U	21	21	U	21
Indeno(1,2,3-cd)pyrene	SVOA	97	J	22	21	U	21	22	U	22	20	U	20	22	U	22	22	U	22
Isophorone	SVOA	17	U	17	16	U	16	17	U	17	16	U	16	17	U	17	17	U	17
Naphthalene	SVOA	30	U	30	30	U	30	30	U	30	29	U	29	31	U	31	30	U	30
Nitrobenzene	SVOA	22	U	22	21	U	21	22	U	22	20	U	20	22	U	22	22	U	22
N-Nitroso-di-n-dipropylamine	SVOA	30	U	30	30	U	30	30	U	30	29	U	29	31	U	31	30	U	30
N-Nitrosodiphenylamine	SVOA	21	U	21	20	U	20	21	U	21	19	U	19	21	U	21	21	U	21
Pentachlorophenol	SVOA	320	U	320	320	U	320	320	U	320	310	U	310	330	U	330	320	U	320
Phenanthrene	SVOA	70	J	17	16	U	16	17	U	17	16	U	16	17	U	17	17	U	17
Phenol	SVOA	18	U	18	17	U	17	18	U	18	17	U	17	18	U	18	18	U	18
Pyrene	SVOA	160	J	12	14	J	12	12	U	12	11	U	11	12	U	12	12	U	12

Attachment	1	Sheet No.	13 of 23
Originator	I. B. Berezovskiy	Date	8/19/14
Checked	J. D. Skoglie	Date	8/19/14
Calc. No.	0100D-CA-V0542	Rev. No.	0

Attachment 1. 100-D-83:3 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1TRL4, EXC-12			J1TRM7, OB-12			J1TRM8, Duplicate of J1TRM7			J1TRL6, OB-1			J1TRL7, OB-2			J1TRL8, OB-3		
		6/3/14			6/3/14			6/3/14			6/3/14			6/3/14			6/3/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	27	U	27	28	U	28	28	U	28	27	U	27	28	U	28	27	U	27
1,2-Dichlorobenzene	SVOA	22	U	22	22	U	22	22	U	22	21	U	21	22	U	22	21	U	21
1,3-Dichlorobenzene	SVOA	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12	11	U	11
1,4-Dichlorobenzene	SVOA	13	U	13	14	U	14	14	U	14	13	U	13	14	U	14	13	U	13
2,4,5-Trichlorophenol	SVOA	9.8	U	9.8	10	U	10	10	U	10	9.6	U	9.6	10	U	10	9.5	U	9.5
2,4,6-Trichlorophenol	SVOA	9.8	U	9.8	10	U	10	10	U	10	9.6	U	9.6	10	U	10	9.5	U	9.5
2,4-Dichlorophenol	SVOA	9.8	U	9.8	10	U	10	10	U	10	9.6	U	9.6	10	U	10	9.5	U	9.5
2,4-Dimethylphenol	SVOA	65	U	65	67	U	67	66	U	66	63	U	63	67	U	67	63	U	63
2,4-Dinitrophenol	SVOA	330	UJ	330	340	U	340	330	U	330	320	U	320	340	U	340	320	UX	320
2,4-Dinitrotoluene	SVOA	65	U	65	67	U	67	66	U	66	63	U	63	67	U	67	63	U	63
2,6-Dinitrotoluene	SVOA	27	U	27	28	U	28	28	U	28	27	U	27	28	U	28	27	U	27
2-Chloronaphthalene	SVOA	9.8	U	9.8	10	U	10	10	U	10	9.6	U	9.6	10	U	10	9.5	U	9.5
2-Chlorophenol	SVOA	21	U	21	21	U	21	21	U	21	20	U	20	21	U	21	20	U	20
2-Methylnaphthalene	SVOA	19	U	19	19	U	19	19	U	19	18	U	18	19	U	19	18	U	18
2-Methylphenol (cresol, o-)	SVOA	13	U	13	13	U	13	13	U	13	12	U	12	13	U	13	12	U	12
2-Nitroaniline	SVOA	49	U	49	50	U	50	50	U	50	48	U	48	51	U	51	47	U	47
2-Nitrophenol	SVOA	9.8	U	9.8	10	U	10	10	U	10	9.6	U	9.6	10	U	10	9.5	U	9.5
3,3'-Dichlorobenzidine	SVOA	88	UJ	88	91	U	91	90	U	90	86	U	86	91	U	91	85	U	85
3+4 Methylphenol (cresol, m+p)	SVOA	32	U	32	33	U	33	33	U	33	32	U	32	33	U	33	31	U	31
3-Nitroaniline	SVOA	71	U	71	74	U	74	73	U	73	70	U	70	74	U	74	69	U	69
4,6-Dinitro-2-methylphenol	SVOA	320	U	320	330	U	330	330	U	330	320	U	320	330	U	330	310	UX	310
4-Bromophenylphenyl ether	SVOA	19	U	19	19	U	19	19	U	19	18	U	18	19	U	19	18	U	18
4-Chloro-3-methylphenol	SVOA	65	U	65	67	U	67	66	U	66	63	U	63	67	U	67	63	U	63
4-Chloroaniline	SVOA	80	UJ	80	83	U	83	82	U	82	79	U	79	83	U	83	78	U	78
4-Chlorophenylphenyl ether	SVOA	21	U	21	21	U	21	21	U	21	20	U	20	21	U	21	20	U	20
4-Nitroaniline	SVOA	71	U	71	73	U	73	72	U	72	70	U	70	73	U	73	69	U	69
4-Nitrophenol	SVOA	95	U	95	98	U	98	97	U	97	93	U	93	98	U	98	92	U	92
Acenaphthene	SVOA	10	U	10	10	U	10	10	U	10	9.9	U	9.9	10	U	10	9.8	U	9.8
Acenaphthylene	SVOA	17	U	17	17	U	17	17	U	17	16	U	16	17	U	17	16	U	16
Anthracene	SVOA	17	U	17	17	U	17	17	U	17	16	U	16	17	U	17	16	U	16
Benzo(a)anthracene	SVOA	20	U	20	20	U	20	20	U	20	19	J	19	20	U	20	19	U	19
Benzo(a)pyrene	SVOA	20	U	20	20	U	20	20	U	20	22	J	19	20	U	20	19	U	19

Attachment	1	Sheet No.	14 of 23
Originator	I. B. Berezovskiy	Date	8/19/14
Checked	J. D. Skoglie	Date	8/19/14
Calc. No.	0100D-CA-V0542	Rev. No.	0

Attachment 1. 100-D-83:3 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1TRL4, EXC-12			J1TRM7, OB-12			J1TRM8, Duplicate of J1TRM7			J1TRL6, OB-1			J1TRL7, OB-2			J1TRL8, OB-3		
		6/3/14			6/3/14			6/3/14			6/3/14			6/3/14			6/3/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Benzo(b)fluoranthene	SVOA	26	U	26	26	U	26	26	U	26	27	JX	25	27	U	27	25	U	25
Benzo(ghi)perylene	SVOA	16	U	16	16	U	16	16	U	16	15	U	15	16	U	16	15	U	15
Benzo(k)fluoranthene	SVOA	39	U	39	40	U	40	40	U	40	38	UX	38	41	U	41	38	U	38
Bis(2-chloro-1-methylethyl)ether	SVOA	22	U	22	23	U	23	23	U	23	22	U	22	23	U	23	22	U	22
Bis(2-Chloroethoxy)methane	SVOA	22	U	22	23	U	23	23	U	23	22	U	22	23	U	23	22	U	22
Bis(2-chloroethyl) ether	SVOA	16	U	16	17	U	17	17	U	17	16	U	16	17	U	17	16	U	16
Bis(2-ethylhexyl) phthalate	SVOA	45	U	45	46	U	46	46	U	46	44	U	44	47	U	47	44	U	44
Butylbenzylphthalate	SVOA	42	U	42	43	U	43	43	U	43	41	U	41	44	U	44	41	U	41
Carbazole	SVOA	35	U	35	36	U	36	36	U	36	35	U	35	36	U	36	34	U	34
Chrysene	SVOA	26	U	26	27	U	27	27	U	27	26	U	26	27	U	27	26	U	26
Dibenz[a,h]anthracene	SVOA	19	U	19	19	U	19	19	U	19	18	U	18	19	U	19	18	U	18
Dibenzofuran	SVOA	20	U	20	20	U	20	20	U	20	19	U	19	20	U	20	19	U	19
Diethyl phthalate	SVOA	25	U	25	26	U	26	26	U	26	25	U	25	26	U	26	25	U	25
Dimethyl phthalate	SVOA	22	U	22	23	U	23	23	U	23	22	U	22	37	J	23	22	U	22
Di-n-butylphthalate	SVOA	28	U	28	29	U	29	29	U	29	28	U	28	29	U	29	27	U	27
Di-n-octylphthalate	SVOA	14	U	14	15	U	15	14	U	14	14	U	14	15	U	15	14	U	14
Fluoranthene	SVOA	35	U	35	36	U	36	36	U	36	35	U	35	36	U	36	34	U	34
Fluorene	SVOA	18	U	18	18	U	18	18	U	18	17	U	17	18	U	18	17	U	17
Hexachlorobenzene	SVOA	28	U	28	29	U	29	29	U	29	28	U	28	29	U	29	27	U	27
Hexachlorobutadiene	SVOA	9.8	U	9.8	10	U	10	10	U	10	9.6	U	9.6	10	U	10	9.5	U	9.5
Hexachlorocyclopentadiene	SVOA	49	U	49	50	U	50	50	U	50	48	U	48	51	U	51	47	U	47
Hexachloroethane	SVOA	21	U	21	21	U	21	21	U	21	20	U	20	22	U	22	20	U	20
Indeno(1,2,3-cd)pyrene	SVOA	22	U	22	22	U	22	22	U	22	21	U	21	22	U	22	21	U	21
Isophorone	SVOA	17	U	17	17	U	17	17	U	17	16	U	16	17	U	17	16	U	16
Naphthalene	SVOA	30	U	30	31	U	31	31	U	31	30	U	30	31	U	31	29	U	29
Nitrobenzene	SVOA	22	U	22	22	U	22	22	U	22	21	U	21	22	U	22	21	U	21
N-Nitroso-di-n-dipropylamine	SVOA	30	U	30	31	U	31	31	U	31	30	U	30	31	U	31	29	U	29
N-Nitrosodiphenylamine	SVOA	21	U	21	21	U	21	21	U	21	20	U	20	21	U	21	20	U	20
Pentachlorophenol	SVOA	320	U	320	330	U	330	330	U	330	320	U	320	330	U	330	310	U	310
Phenanthrene	SVOA	17	U	17	17	U	17	17	U	17	16	U	16	17	U	17	16	U	16
Phenol	SVOA	18	U	18	18	U	18	18	U	18	17	U	17	18	U	18	17	U	17
Pyrene	SVOA	12	U	12	12	U	12	12	U	12	25	J	12	12	U	12	11	U	11

Attachment	1	Sheet No.	15 of 23
Originator	I. B. Berezovskiy	Date	8/19/14
Checked	J. D. Skoglie	Date	8/19/14
Calc. No.	0100D-CA-V0542	Rev. No.	0

Attachment 1. 100-D-83:3 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1TRL9, OB-4			J1TRM0, OB-5			J1TRM1, OB-6			J1TRM2, OB-7			J1TRM3, OB-8			J1TRM4, OB-9		
		6/3/14			6/3/14			6/3/14			6/3/14			6/3/14			6/3/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	26	U	26	26	U	26	28	U	28	28	U	28	28	U	28	26	U	26
1,2-Dichlorobenzene	SVOA	21	U	21	20	U	20	22	U	22	22	U	22	22	U	22	21	U	21
1,3-Dichlorobenzene	SVOA	11	U	11	11	U	11	12	U	12	12	U	12	12	U	12	11	U	11
1,4-Dichlorobenzene	SVOA	13	U	13	13	U	13	14	U	14	13	U	13	14	U	14	13	U	13
2,4,5-Trichlorophenol	SVOA	9.4	U	9.4	9.3	U	9.3	9.9	U	9.9	9.9	U	9.9	9.9	U	9.9	9.5	U	9.5
2,4,6-Trichlorophenol	SVOA	9.4	U	9.4	9.3	U	9.3	9.9	U	9.9	9.9	U	9.9	9.9	U	9.9	9.5	U	9.5
2,4-Dichlorophenol	SVOA	9.4	U	9.4	9.3	U	9.3	9.9	U	9.9	9.9	U	9.9	9.9	U	9.9	9.5	U	9.5
2,4-Dimethylphenol	SVOA	62	U	62	61	U	61	66	U	66	65	U	65	66	U	66	62	U	62
2,4-Dinitrophenol	SVOA	310	U	310	310	U	310	330	U	330	330	U	330	330	U	330	310	U	310
2,4-Dinitrotoluene	SVOA	62	U	62	61	U	61	66	U	66	65	U	65	66	U	66	62	U	62
2,6-Dinitrotoluene	SVOA	26	U	26	26	U	26	28	U	28	28	U	28	28	U	28	26	U	26
2-Chloronaphthalene	SVOA	9.4	U	9.4	9.3	U	9.3	9.9	U	9.9	9.9	U	9.9	9.9	U	9.9	9.5	U	9.5
2-Chlorophenol	SVOA	20	U	20	20	U	20	21	U	21	21	U	21	21	U	21	20	U	20
2-Methylnaphthalene	SVOA	18	U	18	18	U	18	19	U	19	19	U	19	19	U	19	18	U	18
2-Methylphenol (cresol, o-)	SVOA	12	U	12	12	U	12	13	U	13	13	U	13	13	U	13	12	U	12
2-Nitroaniline	SVOA	47	U	47	47	U	47	50	U	50	49	U	49	50	U	50	47	U	47
2-Nitrophenol	SVOA	9.4	U	9.4	9.3	U	9.3	9.9	U	9.9	9.9	U	9.9	9.9	U	9.9	9.5	U	9.5
3,3'-Dichlorobenzidine	SVOA	84	U	84	84	U	84	90	U	90	89	U	89	89	U	89	85	U	85
3+4 Methylphenol (cresol, m+p)	SVOA	31	U	31	31	U	31	33	U	33	33	U	33	33	U	33	31	U	31
3-Nitroaniline	SVOA	68	U	68	68	U	68	73	U	73	72	U	72	73	U	73	69	U	69
4,6-Dinitro-2-methylphenol	SVOA	310	U	310	310	U	310	330	U	330	330	U	330	330	U	330	310	U	310
4-Bromophenylphenyl ether	SVOA	18	U	18	18	U	18	19	U	19	19	U	19	19	U	19	18	U	18
4-Chloro-3-methylphenol	SVOA	62	U	62	61	U	61	66	U	66	65	U	65	66	U	66	62	U	62
4-Chloroaniline	SVOA	77	U	77	76	U	76	81	U	81	81	U	81	81	U	81	77	U	77
4-Chlorophenylphenyl ether	SVOA	20	U	20	20	U	20	21	U	21	21	U	21	21	U	21	20	U	20
4-Nitroaniline	SVOA	68	U	68	68	U	68	72	U	72	72	U	72	72	U	72	69	U	69
4-Nitrophenol	SVOA	91	U	91	90	U	90	96	U	96	96	U	96	96	U	96	92	U	92
Acenaphthene	SVOA	9.6	U	9.6	9.6	U	9.6	10	U	10	10	U	10	10	U	10	9.7	U	9.7
Acenaphthylene	SVOA	16	U	16	16	U	16	17	U	17	17	U	17	17	U	17	16	U	16
Anthracene	SVOA	16	U	16	16	U	16	17	U	17	17	U	17	17	U	17	16	U	16
Benzo(a)anthracene	SVOA	19	U	19	23	J	19	20	U	20	20	U	20	20	U	20	19	U	19
Benzo(a)pyrene	SVOA	19	U	19	21	J	19	20	U	20	20	U	20	20	U	20	19	U	19

Attachment	1	Sheet No.	16 of 23
Originator	I. B. Berezovskiy	Date	8/19/14
Checked	J. D. Skoglie	Date	8/19/14
Calc. No.	0100D-CA-V0542	Rev. No.	0

Attachment 1. 100-D-83:3 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1TRL9, OB-4			J1TRM0, OB-5			J1TRM1, OB-6			J1TRM2, OB-7			J1TRM3, OB-8			J1TRM4, OB-9		
		6/3/14			6/3/14			6/3/14			6/3/14			6/3/14			6/3/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Benzo(b)fluoranthene	SVOA	25	U	25	38	JX	24	26	U	26	26	U	26	26	U	26	25	U	25
Benzo(ghi)perylene	SVOA	15	U	15	15	U	15	16	U	16	16	U	16	16	U	16	15	U	15
Benzo(k)fluoranthene	SVOA	37	U	37	37	UX	37	40	U	40	39	U	39	40	U	40	38	U	38
Bis(2-chloro-1-methylethyl)ether	SVOA	22	U	22	21	U	21	23	U	23	23	U	23	23	U	23	22	U	22
Bis(2-Chloroethoxy)methane	SVOA	22	U	22	21	U	21	23	U	23	23	U	23	23	U	23	22	U	22
Bis(2-chloroethyl) ether	SVOA	16	U	16	15	U	15	17	U	17	16	U	16	16	U	16	16	U	16
Bis(2-ethylhexyl) phthalate	SVOA	43	U	43	43	U	43	46	U	46	45	U	45	46	U	46	43	U	43
Butylbenzylphthalate	SVOA	40	U	40	40	U	40	43	U	43	42	U	42	43	U	43	41	U	41
Carbazole	SVOA	34	U	34	34	U	34	36	U	36	36	U	36	36	U	36	34	U	34
Chrysene	SVOA	25	U	25	26	J	25	27	U	27	27	U	27	27	U	27	26	U	26
Dibenz[a,h]anthracene	SVOA	18	U	18	18	U	18	19	U	19	19	U	19	19	U	19	18	U	18
Dibenzofuran	SVOA	19	U	19	19	U	19	20	U	20	20	U	20	20	U	20	19	U	19
Diethyl phthalate	SVOA	24	U	24	24	U	24	26	U	26	26	U	26	26	U	26	25	U	25
Dimethyl phthalate	SVOA	72	J	22	37	J	21	36	J	23	49	J	23	61	J	23	22	U	22
Di-n-butylphthalate	SVOA	27	U	27	27	U	27	29	U	29	29	U	29	29	U	29	27	U	27
Di-n-octylphthalate	SVOA	13	U	13	13	U	13	14	U	14	14	U	14	14	U	14	14	U	14
Fluoranthene	SVOA	34	U	34	34	U	34	36	U	36	36	U	36	36	U	36	34	U	34
Fluorene	SVOA	17	U	17	17	U	17	18	U	18	18	U	18	18	U	18	17	U	17
Hexachlorobenzene	SVOA	27	U	27	27	U	27	29	U	29	29	U	29	29	U	29	27	U	27
Hexachlorobutadiene	SVOA	9.4	U	9.4	9.3	U	9.3	9.9	U	9.9	9.9	U	9.9	9.9	U	9.9	9.5	U	9.5
Hexachlorocyclopentadiene	SVOA	47	U	47	47	U	47	50	U	50	49	U	49	50	U	50	47	U	47
Hexachloroethane	SVOA	20	U	20	20	U	20	21	U	21	21	U	21	21	U	21	20	U	20
Indeno(1,2,3-cd)pyrene	SVOA	21	U	21	20	U	20	22	U	22	22	U	22	22	U	22	21	U	21
Isophorone	SVOA	16	U	16	16	U	16	17	U	17	17	U	17	17	U	17	16	U	16
Naphthalene	SVOA	29	U	29	29	U	29	31	U	31	31	U	31	31	U	31	29	U	29
Nitrobenzene	SVOA	21	U	21	20	U	20	22	U	22	22	U	22	22	U	22	21	U	21
N-Nitroso-di-n-dipropylamine	SVOA	29	U	29	29	U	29	31	U	31	31	U	31	31	U	31	29	U	29
N-Nitrosodiphenylamine	SVOA	20	U	20	20	U	20	21	U	21	21	U	21	21	U	21	20	U	20
Pentachlorophenol	SVOA	310	U	310	310	U	310	330	U	330	330	U	330	330	U	330	310	U	310
Phenanthrene	SVOA	16	U	16	16	U	16	17	U	17	17	U	17	17	U	17	16	U	16
Phenol	SVOA	17	U	17	17	U	17	18	U	18	18	U	18	18	U	18	17	U	17
Pyrene	SVOA	11	U	11	31	J	11	15	J	12	12	U	12	12	U	12	11	U	11

Attachment	1	Sheet No.	17 of 23
Originator	I. B. Berezovskiy	Date	8/19/14
Checked	J. D. Skoglie	Date	8/19/14
Calc. No.	0100D-CA-V0542	Rev. No.	0

Attachment 1. 100-D-83:3 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1TRM5, OB-10			J1TRM6, OB-11			J1TRM9, SPA-1			J1TRP1, Duplicate of J1TRM9			J1TRN0, SPA-2			J1TRN1, SPA-3		
		6/3/14			6/3/14			7/23/14			7/23/14			7/23/14			7/23/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	27	U	27	28	U	28	28	U	28	28	U	28	26	U	26	27	U	27
1,2-Dichlorobenzene	SVOA	21	U	21	22	U	22	22	U	22	22	U	22	21	U	21	21	U	21
1,3-Dichlorobenzene	SVOA	12	U	12	12	U	12	12	U	12	12	U	12	11	U	11	12	U	12
1,4-Dichlorobenzene	SVOA	13	U	13	14	U	14	14	U	14	14	U	14	13	U	13	13	U	13
2,4,5-Trichlorophenol	SVOA	9.6	U	9.6	10	U	10	10	U	10	10	U	10	9.3	U	9.3	9.7	U	9.7
2,4,6-Trichlorophenol	SVOA	9.6	U	9.6	10	U	10	10	U	10	10	U	10	9.3	U	9.3	9.7	U	9.7
2,4-Dichlorophenol	SVOA	9.6	U	9.6	10	U	10	10	U	10	10	U	10	9.3	U	9.3	9.7	U	9.7
2,4-Dimethylphenol	SVOA	63	U	63	66	U	66	66	U	66	66	U	66	62	U	62	64	U	64
2,4-Dinitrophenol	SVOA	320	U	320	330	U	330	330	U	330	330	U	330	310	U	310	320	U	320
2,4-Dinitrotoluene	SVOA	63	U	63	66	U	66	66	U	66	66	U	66	62	U	62	64	U	64
2,6-Dinitrotoluene	SVOA	27	U	27	28	U	28	28	U	28	28	U	28	26	U	26	27	U	27
2-Chloronaphthalene	SVOA	9.6	U	9.6	10	U	10	10	U	10	10	U	10	9.3	U	9.3	9.7	U	9.7
2-Chlorophenol	SVOA	20	U	20	21	U	21	21	U	21	21	U	21	20	U	20	20	U	20
2-Methylnaphthalene	SVOA	18	U	18	19	U	19	19	U	19	19	U	19	18	U	18	18	U	18
2-Methylphenol (cresol, o-)	SVOA	12	U	12	13	U	13	13	U	13	13	U	13	12	U	12	13	U	13
2-Nitroaniline	SVOA	48	U	48	50	U	50	50	U	50	50	U	50	47	U	47	49	U	49
2-Nitrophenol	SVOA	9.6	U	9.6	10	U	10	10	U	10	10	U	10	9.3	U	9.3	9.7	U	9.7
3,3'-Dichlorobenzidine	SVOA	86	U	86	90	U	90	90	U	90	90	U	90	84	U	84	88	U	88
3+4 Methylphenol (cresol, m+p)	SVOA	32	U	32	33	U	33	33	U	33	33	U	33	31	U	31	32	U	32
3-Nitroaniline	SVOA	70	U	70	73	U	73	73	U	73	73	U	73	68	U	68	71	U	71
4,6-Dinitro-2-methylphenol	SVOA	320	U	320	330	U	330	330	U	330	330	U	330	310	U	310	320	U	320
4-Bromophenylphenyl ether	SVOA	18	U	18	19	U	19	19	U	19	19	U	19	18	U	18	18	U	18
4-Chloro-3-methylphenol	SVOA	63	U	63	66	U	66	66	U	66	66	U	66	62	U	62	64	U	64
4-Chloroaniline	SVOA	79	U	79	82	U	82	82	U	82	82	U	82	76	U	76	80	U	80
4-Chlorophenylphenyl ether	SVOA	20	U	20	21	U	21	21	U	21	21	U	21	20	U	20	20	U	20
4-Nitroaniline	SVOA	70	U	70	72	U	72	72	U	72	73	U	73	68	U	68	71	U	71
4-Nitrophenol	SVOA	93	U	93	97	U	97	97	U	97	97	U	97	91	U	91	94	U	94
Acenaphthene	SVOA	9.9	U	9.9	10	U	10	10	U	10	10	U	10	9.6	U	9.6	10	U	10
Acenaphthylene	SVOA	16	U	16	17	U	17	17	U	17	17	U	17	16	U	16	17	U	17
Anthracene	SVOA	16	U	16	17	U	17	17	U	17	17	U	17	16	U	16	17	U	17
Benzo(a)anthracene	SVOA	61	J	19	20	U	20	20	U	20	20	U	20	19	U	19	19	U	19
Benzo(a)pyrene	SVOA	47	J	19	20	U	20	20	U	20	20	U	20	19	U	19	19	U	19

Attachment	1	Sheet No.	18 of 23
Originator	I. B. Berezovskiy	Date	8/19/14
Checked	J. D. Skoglie	Date	8/19/14
Calc. No.	0100D-CA-V0542	Rev. No.	0

Attachment 1. 100-D-83:3 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1TRM5, OB-10			J1TRM6, OB-11			J1TRM9, SPA-1			J1TRP1, Duplicate of J1TRM9			J1TRN0, SPA-2			J1TRN1, SPA-3		
		6/3/14			6/3/14			7/23/14			7/23/14			7/23/14			7/23/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Benzo(b)fluoranthene	SVOA	90	JX	25	26	U	26	26	U	26	26	U	26	24	U	24	25	U	25
Benzo(ghi)perylene	SVOA	28	J	15	16	U	16	16	U	16	16	U	16	15	U	15	16	U	16
Benzo(k)fluoranthene	SVOA	38	UX	38	40	U	40	40	U	40	40	U	40	37	U	37	39	U	39
Bis(2-chloro-1-methylethyl)ether	SVOA	22	U	22	23	U	23	23	U	23	23	U	23	21	U	21	22	U	22
Bis(2-Chloroethoxy)methane	SVOA	22	U	22	23	U	23	23	U	23	23	U	23	21	U	21	22	U	22
Bis(2-chloroethyl) ether	SVOA	16	U	16	17	U	17	17	U	17	17	U	17	15	U	15	16	U	16
Bis(2-ethylhexyl) phthalate	SVOA	44	U	44	46	U	46	46	U	46	46	U	46	43	U	43	45	U	45
Butylbenzylphthalate	SVOA	41	U	41	43	U	43	43	U	43	43	U	43	40	U	40	42	U	42
Carbazole	SVOA	35	U	35	36	U	36	36	U	36	36	U	36	34	U	34	35	U	35
Chrysene	SVOA	69	J	26	27	U	27	27	U	27	27	U	27	25	U	25	26	U	26
Dibenz[a,h]anthracene	SVOA	18	U	18	19	U	19	19	U	19	19	U	19	18	U	18	18	U	18
Dibenzofuran	SVOA	19	U	19	20	U	20	20	U	20	20	U	20	19	U	19	19	U	19
Diethyl phthalate	SVOA	25	U	25	26	U	26	26	U	26	26	U	26	24	U	24	25	U	25
Dimethyl phthalate	SVOA	22	U	22	23	U	23	23	U	23	23	U	23	21	U	21	22	U	22
Di-n-butylphthalate	SVOA	28	U	28	29	U	29	29	U	29	29	U	29	27	U	27	28	U	28
Di-n-octylphthalate	SVOA	14	U	14	14	U	14	14	U	14	14	U	14	13	U	13	14	U	14
Fluoranthene	SVOA	110	J	35	36	U	36	36	U	36	36	U	36	34	U	34	35	U	35
Fluorene	SVOA	17	U	17	18	U	18	18	U	18	18	U	18	17	U	17	18	U	18
Hexachlorobenzene	SVOA	28	U	28	29	U	29	29	U	29	29	U	29	27	U	27	28	U	28
Hexachlorobutadiene	SVOA	9.6	U	9.6	10	U	10	10	U	10	10	U	10	9.3	U	9.3	9.7	U	9.7
Hexachlorocyclopentadiene	SVOA	48	U	48	50	U	50	50	U	50	50	U	50	47	U	47	49	U	49
Hexachloroethane	SVOA	20	U	20	21	U	21	21	U	21	21	U	21	20	U	20	21	U	21
Indeno(1,2,3-cd)pyrene	SVOA	30	J	21	22	U	22	22	U	22	22	U	22	21	U	21	21	U	21
Isophorone	SVOA	16	U	16	17	U	17	17	U	17	17	U	17	16	U	16	17	U	17
Naphthalene	SVOA	30	U	30	31	U	31	31	U	31	31	U	31	29	U	29	30	U	30
Nitrobenzene	SVOA	21	U	21	22	U	22	22	U	22	22	U	22	21	U	21	21	U	21
N-Nitroso-di-n-dipropylamine	SVOA	30	U	30	31	U	31	31	U	31	31	U	31	29	U	29	30	U	30
N-Nitrosodiphenylamine	SVOA	20	U	20	21	U	21	21	U	21	21	U	21	20	U	20	20	U	20
Pentachlorophenol	SVOA	320	U	320	330	U	330	330	U	330	330	U	330	310	U	310	320	U	320
Phenanthrene	SVOA	63	J	16	17	U	17	17	U	17	17	U	17	16	U	16	17	U	17
Phenol	SVOA	17	U	17	18	U	18	18	U	18	18	U	18	17	U	17	18	U	18
Pyrene	SVOA	120	J	12	12	U	12	12	U	12	12	U	12	11	U	11	12	U	12

Attachment	1	Sheet No.	19 of 23
Originator	I. B. Berezovskiy	Date	8/19/14
Checked	J. D. Skoglie	Date	8/19/14
Calc. No.	0100D-CA-V0542	Rev. No.	0

Attachment 1. 100-D-83:3 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1TRN2, SPA-4			J1TRN3, SPA-5			J1TRN4, SPA-6			J1TRN5, SPA-7			J1TRN6, SPA-8			J1TRN7, SPA-9		
		7/23/14			7/23/14			7/23/14			7/23/14			7/23/14			7/23/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	26	U	26	28	U	28	27	U	27	27	U	27	28	U	28	27	U	27
1,2-Dichlorobenzene	SVOA	21	U	21	22	U	22	22	U	22	21	U	21	22	U	22	21	U	21
1,3-Dichlorobenzene	SVOA	11	U	11	12	U	12	12	U	12	11	U	11	12	U	12	11	U	11
1,4-Dichlorobenzene	SVOA	13	U	13	14	U	14	13	U	13	13	U	13	13	U	13	13	U	13
2,4,5-Trichlorophenol	SVOA	9.4	U	9.4	10	U	10	9.8	U	9.8	9.6	U	9.6	9.9	U	9.9	9.5	U	9.5
2,4,6-Trichlorophenol	SVOA	9.4	U	9.4	10	U	10	9.8	U	9.8	9.6	U	9.6	9.9	U	9.9	9.5	U	9.5
2,4-Dichlorophenol	SVOA	9.4	U	9.4	10	U	10	9.8	U	9.8	9.6	U	9.6	9.9	U	9.9	9.5	U	9.5
2,4-Dimethylphenol	SVOA	62	U	62	66	U	66	65	U	65	63	U	63	65	U	65	63	U	63
2,4-Dinitrophenol	SVOA	310	U	310	330	U	330	330	U	330	320	U	320	330	U	330	320	U	320
2,4-Dinitrotoluene	SVOA	62	U	62	66	U	66	65	U	65	63	U	63	65	U	65	63	U	63
2,6-Dinitrotoluene	SVOA	26	U	26	28	U	28	27	U	27	27	U	27	28	U	28	27	U	27
2-Chloronaphthalene	SVOA	9.4	U	9.4	10	U	10	9.8	U	9.8	9.6	U	9.6	9.9	U	9.9	9.5	U	9.5
2-Chlorophenol	SVOA	20	U	20	21	U	21	21	U	21	20	U	20	21	U	21	20	U	20
2-Methylnaphthalene	SVOA	18	U	18	19	U	19	19	U	19	18	U	18	19	U	19	18	U	18
2-Methylphenol (cresol, o-)	SVOA	12	U	12	13	U	13	13	U	13	12	U	12	13	U	13	12	U	12
2-Nitroaniline	SVOA	47	U	47	50	U	50	49	U	49	48	U	48	50	U	50	47	U	47
2-Nitrophenol	SVOA	9.4	U	9.4	10	U	10	9.8	U	9.8	9.6	U	9.6	9.9	U	9.9	9.5	U	9.5
3,3'-Dichlorobenzidine	SVOA	85	U	85	90	U	90	88	U	88	86	U	86	89	U	89	85	U	85
3+4 Methylphenol (cresol, m+p)	SVOA	31	U	31	33	U	33	32	U	32	32	U	32	33	U	33	31	U	31
3-Nitroaniline	SVOA	69	U	69	73	U	73	71	U	71	70	U	70	72	U	72	69	U	69
4,6-Dinitro-2-methylphenol	SVOA	310	U	310	330	U	330	320	U	320	320	U	320	330	U	330	310	U	310
4-Bromophenylphenyl ether	SVOA	18	U	18	19	U	19	19	U	19	18	U	18	19	U	19	18	U	18
4-Chloro-3-methylphenol	SVOA	62	U	62	66	U	66	65	U	65	63	U	63	65	U	65	63	U	63
4-Chloroaniline	SVOA	77	U	77	82	U	82	80	U	80	78	U	78	81	U	81	78	U	78
4-Chlorophenylphenyl ether	SVOA	20	U	20	21	U	21	21	U	21	20	U	20	21	U	21	20	U	20
4-Nitroaniline	SVOA	68	U	68	72	U	72	71	U	71	69	U	69	72	U	72	69	U	69
4-Nitrophenol	SVOA	91	U	91	97	U	97	95	U	95	93	U	93	96	U	96	92	U	92
Acenaphthene	SVOA	9.7	U	9.7	10	U	10	10	U	10	9.8	U	9.8	10	U	10	9.8	U	9.8
Acenaphthylene	SVOA	16	U	16	17	U	17	17	U	17	16	U	16	17	U	17	16	U	16
Anthracene	SVOA	16	U	16	17	U	17	17	U	17	16	U	16	17	U	17	16	U	16
Benzo(a)anthracene	SVOA	19	U	19	20	U	20	20	U	20	19	U	19	25	J	20	19	U	19
Benzo(a)pyrene	SVOA	19	U	19	20	U	20	20	U	20	19	U	19	23	J	20	19	U	19

Attachment	1	Sheet No.	20 of 23
Originator	I. B. Berezovskiy	Date	8/19/14
Checked	J. D. Skoglie	Date	8/19/14
Calc. No.	0100D-CA-V0542	Rev. No.	0

Attachment 1. 100-D-83:3 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1TRN2, SPA-4			J1TRN3, SPA-5			J1TRN4, SPA-6			J1TRN5, SPA-7			J1TRN6, SPA-8			J1TRN7, SPA-9		
		7/23/14			7/23/14			7/23/14			7/23/14			7/23/14			7/23/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Benzo(b)fluoranthene	SVOA	25	U	25	26	U	26	26	U	26	25	U	25	36	J	26	25	U	25
Benzo(ghi)perylene	SVOA	15	U	15	16	U	16	16	U	16	15	U	15	16	U	16	15	U	15
Benzo(k)fluoranthene	SVOA	38	U	38	40	U	40	39	U	39	38	U	38	40	U	40	38	U	38
Bis(2-chloro-1-methylethyl)ether	SVOA	22	U	22	23	U	23	22	U	22	22	U	22	23	U	23	22	U	22
Bis(2-Chloroethoxy)methane	SVOA	22	U	22	23	U	23	22	U	22	22	U	22	23	U	23	22	U	22
Bis(2-chloroethyl) ether	SVOA	16	U	16	17	U	17	16	U	16	16	U	16	16	U	16	16	U	16
Bis(2-ethylhexyl) phthalate	SVOA	43	U	43	46	U	46	45	U	45	44	U	44	46	U	46	44	U	44
Butylbenzylphthalate	SVOA	41	U	41	43	U	43	42	U	42	41	U	41	43	U	43	41	U	41
Carbazole	SVOA	34	U	34	36	U	36	35	U	35	34	U	34	36	U	36	34	U	34
Chrysene	SVOA	25	U	25	27	U	27	26	U	26	26	U	26	36	J	27	26	U	26
Dibenz[a,h]anthracene	SVOA	18	U	18	19	U	19	19	U	19	18	U	18	19	U	19	18	U	18
Dibenzofuran	SVOA	19	U	19	20	U	20	20	U	20	19	U	19	20	U	20	19	U	19
Diethyl phthalate	SVOA	25	U	25	26	U	26	25	U	25	25	U	25	26	U	26	25	U	25
Dimethyl phthalate	SVOA	22	U	22	23	U	23	22	U	22	22	U	22	23	U	23	22	U	22
Di-n-butylphthalate	SVOA	27	U	27	29	U	29	28	U	28	28	U	28	29	U	29	28	U	28
Di-n-octylphthalate	SVOA	14	U	14	14	U	14	14	U	14	14	U	14	14	U	14	14	U	14
Fluoranthene	SVOA	34	U	34	36	U	36	35	U	35	34	U	34	60	J	36	34	U	34
Fluorene	SVOA	17	U	17	18	U	18	18	U	18	17	U	17	18	U	18	17	U	17
Hexachlorobenzene	SVOA	27	U	27	29	U	29	28	U	28	28	U	28	29	U	29	28	U	28
Hexachlorobutadiene	SVOA	9.4	U	9.4	10	U	10	9.8	U	9.8	9.6	U	9.6	9.9	U	9.9	9.5	U	9.5
Hexachlorocyclopentadiene	SVOA	47	U	47	50	U	50	49	U	49	48	U	48	50	U	50	47	U	47
Hexachloroethane	SVOA	20	U	20	21	U	21	21	U	21	20	U	20	21	U	21	20	U	20
Indeno(1,2,3-cd)pyrene	SVOA	21	U	21	22	U	22	68	J	22	21	U	21	69	J	22	21	U	21
Isophorone	SVOA	16	U	16	17	U	17	17	U	17	16	U	16	17	U	17	16	U	16
Naphthalene	SVOA	29	U	29	31	U	31	30	U	30	30	U	30	31	U	31	29	U	29
Nitrobenzene	SVOA	21	U	21	22	U	22	22	U	22	21	U	21	22	U	22	21	U	21
N-Nitroso-di-n-dipropylamine	SVOA	29	U	29	31	U	31	30	U	30	30	U	30	31	U	31	29	U	29
N-Nitrosodiphenylamine	SVOA	20	U	20	21	U	21	21	U	21	20	U	20	21	U	21	20	U	20
Pentachlorophenol	SVOA	310	U	310	330	U	330	320	U	320	320	U	320	330	U	330	310	U	310
Phenanthrene	SVOA	16	U	16	17	U	17	17	U	17	16	U	16	53	J	17	16	U	16
Phenol	SVOA	17	U	17	18	U	18	18	U	18	17	U	17	18	U	18	17	U	17
Pyrene	SVOA	11	U	11	12	U	12	15	J	12	12	U	12	51	J	12	16	J	11

Attachment	1	Sheet No.	21 of 23
Originator	I. B. Berezovskiy	Date	8/19/14
Checked	J. D. Skoglie	Date	8/19/14
Calc. No.	0100D-CA-V0542	Rev. No.	0

Attachment 1. 100-D-83:3 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1TRN8, SPA-10			J1TRN9, SPA-11			J1TRP0, SPA-12			J1TRP2, Equipment Blank		
		7/23/14			7/23/14			7/23/14			7/23/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	27	U	27	28	U	28	27	U	27	27	U	27
1,2-Dichlorobenzene	SVOA	21	U	21	22	U	22	21	U	21	22	U	22
1,3-Dichlorobenzene	SVOA	11	U	11	12	U	12	12	U	12	12	U	12
1,4-Dichlorobenzene	SVOA	13	U	13	13	U	13	13	U	13	13	U	13
2,4,5-Trichlorophenol	SVOA	9.5	U	9.5	9.9	U	9.9	9.8	U	9.8	9.8	U	9.8
2,4,6-Trichlorophenol	SVOA	9.5	U	9.5	9.9	U	9.9	9.8	U	9.8	9.8	U	9.8
2,4-Dichlorophenol	SVOA	9.5	U	9.5	9.9	U	9.9	9.8	U	9.8	9.8	U	9.8
2,4-Dimethylphenol	SVOA	63	U	63	65	U	65	64	U	64	65	U	65
2,4-Dinitrophenol	SVOA	320	U	320	330	U	330	330	U	330	330	U	330
2,4-Dinitrotoluene	SVOA	63	U	63	65	U	65	64	U	64	65	U	65
2,6-Dinitrotoluene	SVOA	27	U	27	28	U	28	27	U	27	27	U	27
2-Chloronaphthalene	SVOA	9.5	U	9.5	9.9	U	9.9	9.8	U	9.8	9.8	U	9.8
2-Chlorophenol	SVOA	20	U	20	21	U	21	21	U	21	21	U	21
2-Methylnaphthalene	SVOA	18	U	18	19	U	19	19	U	19	19	U	19
2-Methylphenol (cresol, o-)	SVOA	12	U	12	13	U	13	13	U	13	13	U	13
2-Nitroaniline	SVOA	48	U	48	50	U	50	49	U	49	49	U	49
2-Nitrophenol	SVOA	9.5	U	9.5	9.9	U	9.9	9.8	U	9.8	9.8	U	9.8
3,3'-Dichlorobenzidine	SVOA	86	U	86	89	U	89	88	U	88	88	U	88
3+4 Methylphenol (cresol, m+p)	SVOA	31	U	31	33	U	33	32	U	32	32	U	32
3-Nitroaniline	SVOA	70	U	70	72	U	72	71	U	71	72	U	72
4,6-Dinitro-2-methylphenol	SVOA	310	U	310	330	U	330	320	U	320	320	U	320
4-Bromophenylphenyl ether	SVOA	18	U	18	19	U	19	19	U	19	19	U	19
4-Chloro-3-methylphenol	SVOA	63	U	63	65	U	65	64	U	64	65	U	65
4-Chloroaniline	SVOA	78	U	78	81	U	81	80	U	80	80	U	80
4-Chlorophenylphenyl ether	SVOA	20	U	20	21	U	21	21	U	21	21	U	21
4-Nitroaniline	SVOA	69	U	69	72	U	72	71	U	71	71	U	71
4-Nitrophenol	SVOA	92	U	92	96	U	96	95	U	95	95	U	95
Acenaphthene	SVOA	9.8	U	9.8	10	U	10	10	U	10	10	U	10
Acenaphthylene	SVOA	16	U	16	17	U	17	17	U	17	17	U	17
Anthracene	SVOA	16	U	16	17	U	17	17	U	17	17	U	17
Benzo(a)anthracene	SVOA	22	J	19	20	U	20	20	U	20	20	U	20
Benzo(a)pyrene	SVOA	19	U	19	20	U	20	20	U	20	20	U	20

Attachment	1	Sheet No.	22 of 23
Originator	I. B. Berezovskiy	Date	8/19/14
Checked	J. D. Skoglie	Date	8/19/14
Calc. No.	0100D-CA-V0542	Rev. No.	0

Attachment 1. 100-D-83:3 Subsite Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1TRN8, SPA-10			J1TRN9, SPA-11			J1TRP0, SPA-12			J1TRP2, Equipment Blank		
		7/23/14			7/23/14			7/23/14			7/23/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Benzo(b)fluoranthene	SVOA	25	U	25	26	U	26	26	U	26	26	U	26
Benzo(ghi)perylene	SVOA	15	U	15	16	U	16	16	U	16	16	U	16
Benzo(k)fluoranthene	SVOA	38	U	38	40	U	40	39	U	39	39	U	39
Bis(2-chloro-1-methylethyl)ether	SVOA	22	U	22	23	U	23	22	U	22	23	U	23
Bis(2-Chloroethoxy)methane	SVOA	22	U	22	23	U	23	22	U	22	23	U	23
Bis(2-chloroethyl) ether	SVOA	16	U	16	16	U	16	16	U	16	16	U	16
Bis(2-ethylhexyl) phthalate	SVOA	44	U	44	46	U	46	45	U	45	45	U	45
Butylbenzylphthalate	SVOA	41	U	41	43	U	43	42	U	42	42	U	42
Carbazole	SVOA	34	U	34	36	U	36	35	U	35	35	U	35
Chrysene	SVOA	26	U	26	27	U	27	26	U	26	26	U	26
Dibenz[a,h]anthracene	SVOA	18	U	18	19	U	19	19	U	19	19	U	19
Dibenzofuran	SVOA	19	U	19	20	U	20	20	U	20	20	U	20
Diethyl phthalate	SVOA	25	U	25	26	U	26	25	U	25	25	U	25
Dimethyl phthalate	SVOA	22	U	22	23	U	23	22	U	22	23	U	23
Di-n-butylphthalate	SVOA	28	U	28	29	U	29	28	U	28	28	U	28
Di-n-octylphthalate	SVOA	14	U	14	14	U	14	14	U	14	14	U	14
Fluoranthene	SVOA	41	J	34	36	U	36	35	U	35	35	U	35
Fluorene	SVOA	17	U	17	18	U	18	18	U	18	18	U	18
Hexachlorobenzene	SVOA	28	U	28	29	U	29	28	U	28	28	U	28
Hexachlorobutadiene	SVOA	9.5	U	9.5	9.9	U	9.9	9.8	U	9.8	9.8	U	9.8
Hexachlorocyclopentadiene	SVOA	48	U	48	50	U	50	49	U	49	49	U	49
Hexachloroethane	SVOA	20	U	20	21	U	21	21	U	21	21	U	21
Indeno(1,2,3-cd)pyrene	SVOA	21	U	21	22	U	22	21	U	21	22	U	22
Isophorone	SVOA	16	U	16	17	U	17	17	U	17	17	U	17
Naphthalene	SVOA	30	U	30	31	U	31	30	U	30	30	U	30
Nitrobenzene	SVOA	21	U	21	22	U	22	21	U	21	22	U	22
N-Nitroso-di-n-dipropylamine	SVOA	30	U	30	31	U	31	30	U	30	30	U	30
N-Nitrosodiphenylamine	SVOA	20	U	20	21	U	21	21	U	21	21	U	21
Pentachlorophenol	SVOA	310	U	310	330	U	330	320	U	320	320	U	320
Phenanthrene	SVOA	46	J	16	17	U	17	17	U	17	17	U	17
Phenol	SVOA	17	U	17	18	U	18	18	U	18	18	U	18
Pyrene	SVOA	45	J	12	14	J	12	12	U	12	12	U	12

Attachment	1	Sheet No.	23 of 23
Originator	I. B. Berezovskiy	Date	8/19/14
Checked	J. D. Skoglie	Date	8/19/14
Calc. No.	0100D-CA-V0542	Rev. No.	0

Acrobat 8.0

CALCULATION COVER SHEET

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

Area: 100-D

Discipline: Environmental *Calculation No: 0100D-CA-V0541

Subject: 100-D-83:3 Subsite 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 = 4 Total = 5	L. B. Berezovskiy	J. D. Skoglie	J. M. Capron	S. G. Wilkinson	10/27/14

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:	I. B. Berezovskiy	Date:	08/19/14	Calc. No.:	0100D-CA-V0541	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	J. D. Skoglie	Date:	08/19/14
Subject:	100-D-83:3 Subsite Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No.	1 of 4

PURPOSE:

Provide documentation to support the calculation of the direct contact hazard quotient (HQ) and excess carcinogenic risk for the 100-D-83:3 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 $<1 \times 10^{-6}$ for individual carcinogens
4) A cumulative excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.

GIVEN/REFERENCES:

1) DOE-RL, 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 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, *100-D-83:3 Subsite Cleanup Verification 95% UCL Calculation*, 0100D-CA-V0542, Rev. 0, 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 of <1.0 (DOE-RL 2009b).

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 2009b).

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

Washington Closure Hanford CALCULATION SHEET

Originator:	I. B. Berezovskiy	Date:	08/19/14	Calc. No.:	0100D-CA-V0541	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	J. D. Skoglie	Date:	08/19/14
Subject:	100-D-83:3 Subsite Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No.	2 of 4

METHODOLOGY:

The 100-D-83:3 subsite is comprised of three decision units for verification sampling, consisting of excavation, overburden stockpile and staging pile area. The direct contact hazard quotient and carcinogenic risk calculations for the 100-D-83:3 subsite were conservatively calculated for the entire subsite using the greater of the statistical or maximum value for each analyte in all decision units from WCH (2014). Of the contaminants of potential concern (COPCs) for this site, boron, hexavalent chromium, molybdenum, and detected semivolatile organic compounds require HQ and risk calculations because these analytes were detected and a Washington State or Hanford Site background value is not available. Selenium is included because it was quantitated at a concentration above Hanford Site background. Arsenic was detected above background; however, arsenic cleanup level is not toxicity based, and therefore HQ and risk calculations for arsenic are not performed. 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 boron is 3.6 mg/kg, divided by the noncarcinogenic RAG value of 7,200 mg/kg (calculated in accordance with the noncarcinogenic toxics effects formula in WAC 173-340-740[3]), is 5.0×10^{-4}. Comparing this value, and all other individual values, to the requirement of <1.0, this criterion is met.

2) After the HQ calculation is completed for the appropriate analytes, the cumulative HQ can be obtained by summing the individual values. To avoid errors due to intermediate rounding, the individual HQ values prior to rounding are used for this calculation. The sum of the HQ values is 1.4×10^{-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 1.0×10^{-6}. For example, the statistical value for hexavalent chromium is 0.534 mg/kg; divided by 2.1 mg/kg, and multiplied as indicated, is 2.5×10^{-7}. Comparing this value 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 is obtained by summing the individual values. The excess cancer risk for the carcinogenic constituents detected is 9.8×10^{-7}. Comparing this value to the requirement of $<1 \times 10^{-5}$, this criterion is met.

RESULTS:

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

Table 1 shows the results of the calculations.

Washington Closure Hanford CALCULATION SHEET

Originator:	I. B. Berezovskiy	Date:	08/19/14	Calc. No.:	0100D-CA-V0541	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	J. D. Skoglie	Date:	08/19/14
Subject:	100-D-83:3 Subsite Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No.	3 of 4

Table 1. Direct Contact Hazard Quotient and Excess Cancer Risk Results for the 100-D-83:3 Subsite.

Contaminants of Potential Concern	Statistical or Maximum Value[a] (mg/kg)	Noncarcinogen RAG[b] (mg/kg)	Hazard Quotient	Carcinogen RAG[b] (mg/kg)	Carcinogen Risk
Metals					
Arsenic[c]	8.0	20	--	--	--
Boron	3.6	7,200	5.0E-04	--	--
Chromium, hexavalent[d]	0.534	240	2.2E-03	2.1	2.5E-07
Lead[e]	78.1	353	--	--	--
Molybdenum	0.75	400	1.9E-03	--	--
Selenium	3.9	400	9.8E-03	--	--
Semivolatiles					
Benzo(a)anthracene	0.078	--	--	1.37	5.7E-08
Benzo(a)pyrene	0.071	--	--	0.137	5.2E-07
Benzo(b)fluoranthene	0.094	--	--	1.37	6.9E-08
Benzo(ghi)perylene[f]	0.042	2,400	1.8E-05	--	--
Chrysene	0.090	--	--	13.7	6.6E-09
Dimethylphthalate	0.040	80,000	5.0E-07	--	--
Fluoranthene	0.14	3,200	4.4E-05	--	--
Indeno(1,2,3-cd) pyrene	0.097	--	--	1.37	7.1E-08
Phenanthrene[f]	0.070	24,000	2.9E-06	--	--
Pyrene	0.12	2,400	5.0E-05	--	--
Totals					
Cumulative Hazard Quotient:			**1.4E-02**		
Cumulative Excess Cancer Risk:					**9.8E-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] = 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 2009a).

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

[e] = 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.

[f] = Toxicity data for these chemicals are not available. The cleanup levels are based on use of surrogate chemicals.
benzo(g,h,i)perylene surrogate: pyrene
phenanthrene surrogate: anthracene

-- = not applicable

RAG = remedial action goal

Washington Closure Hanford CALCULATION SHEET

Originator:	I. B. Berezovskiy	Date:	08/19/14	Calc. No.:	0100D-CA-V0541	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	J. D. Skoglie	Date:	08/19/14
Subject:	100-D-83:3 Subsite Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No.	4 of 4

CONCLUSION:

The calculations in Table 1 demonstrate that the 100-D-83:3 subsite meets the requirements for the direct contact hazard quotient and carcinogenic (excess cancer) risk, respectively, as identified in the RDR/RAWP (DOE-RL 2009b) and SAP (DOE-RL 2009a). The direct contact hazard quotient and carcinogenic (excess cancer) risk calculations are for use in the RSVP for this subsite.

Acrobat 8.0

CALCULATION COVER SHEET

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

Area: 100-D

Discipline: Environmental *Calculation No: 0100D-CA-V0540

Subject: 100-D-83:3 Subsite Hazard Quotient and Carcinogenic Risk Calculation 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 ☐

Rev.	Sheet Numbers	Originator	Checker	Reviewer	Approval	Date
0	Cover = 1 Sheets = 3 Total = 4	I. B. Berezovskiy	J. D. Skoglie	J. M. Capron	S. G. Wilkinson	10/27/14

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:	I. B. Berezovskiy	Date:	8/19/2014	Calc. No.:	0100D-CA-V0542	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	J. D. Skoglie	Date:	8/19/2014
Subject:	100-D-83:3 Subsite Hazard Quotient and Carcinogenic Risk Calculation 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-83:3 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 $<1 \times 10^{-6}$ for individual carcinogens
4) A cumulative excess cancer risk of $<1 \times 10^{-5}$ 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, *100-D-83:3 Subsite Cleanup Verification 95% UCL Calculations*, 0100D-CA-V0542, Rev. 0, 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 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 of $<1 \times 10^{-5}$.

Washington Closure Hanford CALCULATION SHEET

Originator:	I. B. Berezovskiy	Date:	8/19/2014	Calc. No.:	0100D-CA-V0540	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	J. D. Skoglie	Date:	8/19/2014
Subject:	100-D-83:3 Subsite Hazard Quotient and Carcinogenic Risk Calculation for Protection of Groundwater					Sheet No. 2 of 3	

METHODOLOGY:

The 100-D-83:3 subsite was divided into three decision units for the purpose of verification sampling; excavation area, overburden stockpile and staging pile area. Hazard quotient and carcinogenic risk calculations for potential impact to groundwater at the 100-D-83:3 subsite were conservatively calculated for the entire subsite using the greater of the statistical or maximum value for each analyte in all decision units from the 95% UCL calculation (WCH 2014). Of the contaminants of potential concern (COPCs) for this site, boron, hexavalent chromium, and dimethylphthalate are included because no Washington State or Hanford background value has been established and the distribution coefficients are 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 22 m (72 ft) thickness, a K_d of 3.4 or greater is required to show no predicted migration to groundwater in 1,000 years. Arsenic was detected above background; however, the standard for arsenic is not toxicity based, therefore a groundwater HQ is not calculated. All other site nonradionuclide COPCs were not detected, quantified below background levels, or have a K_d greater than or equal to 3.4. 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 statistical value for boron of 3.6 mg/kg, divided by the noncarcinogenic RAG value of 320 mg/kg is 1.1×10^{-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-83:3 subsite is 1.2×10^{-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, and then multiplied by 1×10^{-6}. The 100-D-83:3 subsite does not have any constituents with carcinogenic RAGs; therefore, the criterion for excess risk is met. Consequently, the criterion for cumulative excess cancer risk for carcinogens is also met.

4) 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 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.

Washington Closure Hanford CALCULATION SHEET

Originator:	I. B. Berezovskiy	Date:	8/19/2014	Calc. No.:	0100D-CA-V0549	Rev.:	0
Project:	100-D Area Field Remediation	Job No:	14655	Checked:	J. D. Skoglie	Date:	8/19/2014
Subject:	100-D-83:3 Subsite Hazard Quotient and Carcinogenic Risk Calculation for Protection of Groundwater					Sheet No. 3 of 3	

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-83:3 Subsite.

Contaminants of Potential Concern[a]	Maximum or Statistical Value[a] (mg/kg)	Noncarcinogen RAG[b] (mg/kg)	Hazard Quotient	Carcinogen RAG[b] (mg/kg)	Carcinogen Risk
Metals					
Arsenic	8.0	20[c]	--	--	--
Boron	3.6	320	1.1E-02	--	--
Chromium, hexavalent	0.534	4.8	1.1E-01	--	--
Semivolatiles					
Dimethylphthalate	0.040	1,600	2.5E-05	--	--
Totals					
Cumulative Hazard Quotient:			**1.2E-01**		
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.

[c] = The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement Project Managers as discussed in Section 2.1.2.1 of the RDR/RAWP (DOE-RL 2009). The arsenic standard is not toxicity based, therefore, will not have a hazard quotient calculated.

-- = not applicable

RAG = remedial action goal

CONCLUSION:

This calculation demonstrates that the 100-D-83:3 subsite meets the requirements for the hazard quotient and excess carcinogenic risk for protection of groundwater as identified in the RDR/RAWP (DOE-RL 2009).

APPENDIX C

DATA QUALITY ASSESSMENT

APPENDIX C

DATA QUALITY ASSESSMENT

VERIFICATION SAMPLING

A data quality assessment (DQA) was performed to compare the verification sampling approach and resulting analytical data with the sampling and data requirements specified in the site-specific sample design (WCH 2014b). This DQA was performed in accordance with site-specific data quality objectives found in the *100 Area Remedial Action Sampling and Analysis Plan* (100 Area SAP) (DOE-RL 2009).

A review of the sample design (WCH 2014b), the field logbook (WCH 2014a), and applicable analytical data packages has been performed as part of this DQA. All samples were collected and analyzed per the sample design, with minimal alterations, as warranted by field conditions.

To ensure quality data, the 100 Area SAP (DOE-RL 2009) data assurance requirements and the data validation procedures for chemical analysis (BHI 2000) is 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 lifecycle (i.e., planning, implementation, and assessment) that was initiated by the data quality objectives process (EPA 2006).

Verification data from samples collected at the 100-D-83:3 subsite were provided by the laboratories in three sample delivery groups (SDG): SDG JP0816, SDG JP0817, and SDG JP0836. SDG JP0817 was submitted for third-party validation. Major and minor deficiencies are discussed for the 100-D-83:3 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.

MAJOR DEFICIENCIES

Due to holding time exceedances in the method 9056M ion chromatography (IC) anions analysis of greater than twice the limit of 48 hours, third-party validation qualified the associated undetected nitrite and orthophosphate results in SDG JP0817 as rejected with "R" flags. Additionally, all of the detected method 9056M nitrate and orthophosphate results are qualified as estimated with "J" flags. This result was anticipated and U.S. Environmental Protection Agency analytical method 353.2 was requested to provide acceptable nitrate/nitrite data for decision-making purposes. Therefore, the estimated and rejected data for nitrate and nitrite do not hinder the evaluation of the 100-D-83:3 subsite. Phosphate is not a regulated chemical under *Washington Administrative Code* (WAC) 173-340, "Model Toxics Control Act – Cleanup."

In the IC anions for SDG JP0816 and SDG JP0836, the holding times for nitrate, nitrite, and orthophosphate were exceeded by more than twice the acceptable range on all samples.

Project qualified all undetected nitrate, nitrite, and orthophosphate results for SDG JP0816 and SDG JP0836 as rejected with "R" flags.

MINOR DEFICIENCIES

SDG JP0816

This SDG comprises 12 statistical soil samples plus one duplicate sample (J1TRL6 through J1TRL9, J1TRM0 through J1TRM8) from the overburden area. This SDG includes one field duplicate pair (J1TRM7/J1TRM8). All samples were analyzed for inductively coupled plasma (ICP) metals, mercury, hexavalent chromium, anions, nitrate/nitrite, pH, and semivolatile organic compounds (SVOCs). Minor deficiencies are as follows.

In the SVOC analysis, the laboratory control sample (LCS) recovery for 4-chloroaniline (48%) is below the recovery limit of 50-150%.. Although not qualified for recovery below LCS limit, all 4-chloroaniline results in SDG JP0816 may be considered estimated. Estimated data are usable for decision-making purposes.

In the SVOC analysis, the matrix spike (MS) recoveries for 4,6-dinitro-2-methylphenol (45%) and 2,4-dinitrophenol (20%) are below the project quality control (QC) limits of 50-150%. The matrix spike duplicate (MSD) recovery for 2,4-dinitrophenol was also below the QC limit at 22%. Although not qualified for MS and MSD recoveries below QC limits, all 4,6-dinitro-2-methylphenol and 2,4-dinitrophenol results may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP analysis, the LCS recovery for silicon (6%) is below the project QC limit of 70-130%%. Although not qualified for LCS recovery below the QC limit, all silicon results in SDG JP0816 may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the MS recoveries were outside the project acceptance criteria of 70-130% for six analytes (aluminum [1,709%], antimony [36%], barium [53%], iron [1,724%], manganese [198%], silicon [9%]). For aluminum, iron, and manganese, the spiking concentration was insignificant compared to the native concentration in the sample from which the MS was prepared. The deficiency in the MS is a reflection of the variability of the native concentration rather than a measure of the recovery from the sample. Antimony, barium, and silicon did not have mismatched spike and native concentrations in the MS. Although not qualified for MS outside the QC limits, all antimony, barium, and silicon results for SDG JP0816 may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the laboratory duplicate relative percent differences (RPDs) for barium (69%) and lead (44%) were above the project QC limit of 30%. Elevated RPDs in environmental samples are generally attributed to natural heterogeneities in the sample matrix. Although not qualified for RPD recoveries above QC limits, all barium and lead data in

SDG JP0816 may be considered estimated. Estimated data are usable for decision-making purposes.

In the IC anions analysis, the MS recoveries were below the project acceptance criteria of 70-130% for phosphate (48%) and fluoride (56%). Although not qualified for MS below the QC limits, all phosphate and fluoride results for SDG JP0816 may be considered estimated. Estimated data are usable for decision-making purposes.

In the IC anions analysis, holding times were exceeded by more than twice the specified holding time for nitrate, nitrite, and orthophosphate. The nondetected results for these analytes are discussed above in the Major Deficiencies section. All detected nitrate, nitrite, and orthophosphate results may be considered estimated. Estimated data are usable for decision-making purposes.

SDG JP0817

This SDG comprises 12 statistical soil samples plus one duplicate sample (J1TRK3 through J1TRK9, J1TRL0 through J1TRL5) from the excavation area. This SDG includes one field duplicate pair (J1TRK3/J1TRL5). All samples were analyzed for ICP metals, mercury, hexavalent chromium, anions, nitrate/nitrite, pH, and SVOCs. SDG JP0817 was submitted for third-party validation. Minor deficiencies are as follows.

In the ICP metals analysis, the MS recoveries were outside the project acceptance criteria of 70-130% for six analytes (aluminum [1,238%], antimony [42%], iron [3,815%], manganese [195%], silicon [5%], and zinc [134%]). For aluminum, iron, and manganese, the spiking concentration was insignificant compared to the native concentration in the sample from which the MS was prepared. The deficiency in the MS is a reflection of the variability of the native concentration rather than a measure of the recovery from the sample. Antimony, silicon, and zinc did not have a mismatched spike and native concentrations in the MS. All antimony, silicon, and zinc results for SDG JP0817 were qualified by third-party validation as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the ICP analysis, the LCS recovery for silicon (10%) is below the project acceptance criteria of 70-130%. All silicon results in SDG JP0817 were qualified by third-party validation as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the laboratory duplicate RPD for silicon (34%) is above the project QC limit of 30%. Elevated RPDs in environmental samples are generally attributed to natural heterogeneities in the sample matrix. All silicon results in SDG JP0817 were qualified by third-party validation as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the SVOC analysis, the LCS recovery for 4-chloroaniline (48%) and 3,3- dichlorobenzidine (40%) are below the project QC limits of 50-150%. All 4-chloroaniline and 3,3-dichlorobenzidine results in SDG JP0817 were qualified by third-party validation as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the SVOC analysis, the MS recovery for 2,4-dinitrophenol is below the project QC limit of 50-150%. All 2,4-dinitrophenol results in SDG JP0817 were qualified by third-party validation as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the IC anions analysis, holding times were exceeded by more than twice the specified holding time for nitrate, nitrite, orthophosphate, and pH. The nondetected results for these analytes are discussed above in the Major Deficiencies section and were qualified as rejected by third-party validation. Nitrite and orthophosphate results were undetected in all field samples. All detected nitrate and pH results were qualified by third-party validation as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the IC anions analysis, the MS recoveries for fluoride (63% and 67%) and orthophosphate (53% and 50%) were outside the project acceptance criteria of 70-130%. All fluoride and orthophosphate results were qualified by third-party validation as estimated with "J" flags. Estimated data are usable for decision-making purposes.

SDG JP0836

This SDG comprises 12 statistical soil samples plus 1 duplicate sample and 1 equipment blank (J1TRM9, J1TRN0 through J1TRN9, J1TRP0 through J1TRP2) from the staging pile area. This SDG includes a field duplicate pair (J1TRM9/J1TRP2). All samples were analyzed for ICP metals, mercury, hexavalent chromium, anions, nitrate/nitrite, pH, and SVOCs. In addition, one field equipment blank sample (J1TRP2) was collected and analyzed for ICP metals, mercury, and SVOCs. Minor deficiencies are as follows.

In the SVOC analysis, the LCS recoveries for 4-chloroaniline (46%) and 3,3- dichlorobenzidine (40%) are below the QC limits of 50-150%. Although not qualified for LCS recoveries outside the QC limits, all 4-chloroaniline and 3,3- dichlorobenzidine results in SDG JP0836 may be considered estimated. Estimated data are usable for decision-making purposes.

In the SVOC analysis, the MS and MSD recoveries for 2,4-dinitrophenol are below the QC limits of 50-150%, at 47% and 46%, respectively. Although not qualified for MS and MSD recoveries below the project acceptance criteria, all 2,4-dinitrophenol results in SDG JP0836 may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP analysis, the LCS recovery for silicon (19%) is below the project QC limit of 70-130%. Although not qualified for LCS recovery outside the QC limit, all silicon results in SDG JP0836 may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the MS recoveries were outside the project acceptance criteria of 70-130% for five analytes (aluminum [998%], antimony [51%], iron [705%], manganese [133%], and silicon [5%]). For aluminum, iron, and manganese, the spiking concentration was insignificant compared to the native concentration in the sample from which the MS was prepared. The deficiency in the MS is a reflection of the variability of the native concentration

rather than a measure of the recovery from the sample. Antimony and silicon did not have mismatched spike and native concentrations in the MS. Although not qualified for MS recoveries outside the QC limits, all antimony and silicon results for SDG JP0836 may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the laboratory duplicate RPDs for antimony (66%), arsenic (37%), beryllium (35%), boron (70%), and molybdenum (117%) are above the project QC limit of 30%. Elevated RPDs in environmental samples are generally attributed to natural heterogeneities in the sample matrix. Although not qualified for RPD recoveries above QC limits, all antimony, arsenic, beryllium, boron, and molybdenum data in SDG JP0836 may be considered estimated. Estimated data are usable for decision-making purposes.

In the IC anions analysis, the MS recoveries for fluoride (60% and 67%) are outside the QC limit of 70-130%. Although not qualified for MS recoveries outside the QC limit, all fluoride results may be considered estimated. Estimated data are usable for decision-making purposes.

In the IC anions analysis, holding times were exceeded by more than twice the specified holding time for nitrate, nitrite, and orthophosphate. The nondetected results for these analytes are discussed above in the Major Deficiencies section. All detected nitrate, nitrite, and orthophosphate results may be considered estimated. Estimated 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 logbook (WCH 2014a) 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 Samples.

Sample Area	Main Sample	Duplicate Sample
Excavation Area	J1TRK3	J1TRL5
Overburden Stockpile	J1TRM7	J1TRM8
Staging Pile Area	J1TRM9	J1TRP1

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. 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. 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.

The calculated RPD duplicate analysis for sodium (31.1%) and sulfate (66.4%) for the staging pile area decision unit are above the acceptance criteria of 30%. Elevated RPDs in environmental samples are generally attributed to natural heterogeneities in the sample matrix. There is no indication that the analytical system was operating out of control. The data are usable for decision-making purposes.

A secondary check of the data variability is used when one or both of the samples being evaluated (main and duplicate) is less than five times the target detection limit, including undetected analytes. In these cases, a control limit of ±2 times the target detection limit is used (Appendix B) to indicate that a visual check of the data is required by the reviewer. No sample 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-83:3 subsite verification sampling data found that the analytical results are accurate within the standard errors associated with the analytical methods, sampling, and sample handling. The DQA review for 100-D-83:3 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 verification 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 verification 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, EPA/240/B-06/001, U.S. Environmental Protection Agency, Office of Environmental Information, Washington, D.C.

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

WCH, 2014a, *100D Field Remediation Miscellaneous Sampling Activities*, Logbook EL-1662-02, pp. 42-45, 71-73, Washington Closure Hanford, Richland, Washington.

WCH, 2014b, *Work Instruction for Verification Sampling of the 100-D-83:3, 108-D Acid Addition Facility Pipelines Waste Site,* 0100D-WI-G0135, Rev. 0, Washington Closure Hanford, Richland, Washington.