1228672

RECEIVED
FEB 12 2015
EDMC

WASTE SITE RECLASSIFICATION FORM

Operable Unit: 100-DR-2 **Control No.:** 2014-104

Waste Site Code(s)/Subsite Code(s). 100-D-106

Reclassification Category: Interim ☒ Final ☐

Reclassification Status: Closed Out ☒ No Action ☐ Rejected ☐
RCRA Postclosure ☐ Consolidated ☐ None ☐

Approvals Needed: DOE ☒ Ecology ☒ EPA ☐

Description of current waste site condition:

The 100-D-106, 1607-D1 Influent Pipelines waste site was a candidate site 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-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units,* U.S. Environmental Protection Agency, Region 10, Seattle, Washington (Remaining Sites ROD) (EPA 1999), by the Tri-Party Agreement Administrative Record *Fact Sheet 100 Area "Plug-In" and Candidate Waste Sites for Calendar Year 2011,* U.S. Department of Energy, Richland, Washington (DOE-RL 2012), per the *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington,* U.S. Environmental Protection Agency, Region 10, Seattle, Washington (EPA 2009). The 100-D-106 waste site consisted of the sanitary sewer pipelines that connected the service buildings at the 100-D main gate to the 1607-D1 septic tank. It also included a french drain approximately 21 m (70 ft) north of the 1709-D Building. The site provided sanitary service for patrol and fire personnel located at the entrance to the 100-D/DR Reactor Area. This waste site was subsequently recommended for remove, treat, and dispose without confirmatory sampling because it was part of the 1607-D1 septic system that was previously found to be contaminated and was remediated.

Remedial action at the 100-D-106 waste site was performed from March 31, 2014, until April 2, 2014. Approximately 1,600 bank cubic meters (2,093 bank cubic yards) of excavated materials were removed and staged within the staging pile area waiting for disposal at the Environmental Restoration Disposal Facility (ERDF). The maximum depth of the waste site excavation was approximately 1.2 m (4 ft) below ground surface (bgs), the depth of the excavation where the french drain was removed was approximately 4.4 m (10 ft) bgs. Excavated materials consisted of concrete-encased 15.2-cm (6-in.)-diameter vitrified clay pipe, concrete from foundations, asphalt debris from roadways, a french drain, soil, gravel, and approximately 285 linear meters (935 linear feet) of pipe debris. No stained soil or anomalous materials were encountered during remediation.

Verification sampling was performed on April 2, July 16, and July 22, 2014. The sampling was performed to determine if the waste site met the remedial action objectives (RAOs) and remedial action goals (RAGs) established by the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (100 Area RDR/RAWP), DOE/RL-97-17, Rev. 6, U.S. Department of Energy, Richland Operations Office, Richland, Washington (DOE-RL 2009b), and the Remaining Sites ROD (EPA 1999). The selected remedy involved (1) excavating the site to the extent required to meet specified soil cleanup levels, (2) disposing of contaminated excavation materials at ERDF, (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:

The verification sampling and modeling results for the 100-D-106 waste site demonstrate that the site meets the RAOs and corresponding RAGs established in the 100 Area RDR/RAWP (DOE-RL 2009b) and the Remaining Sites ROD (EPA 1999) to support a reclassification to Interim Closed Out. These sampling and modeling results established that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Contamination above direct exposure levels was not observed in shallow zone soils and is concluded to not exist in deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone soil are not required. The basis for reclassification is described in detail in the *Remaining Sites Verification Package for the 100-D-106, 1607-D1 Influent Pipelines Waste Site* (attached).

Cross ref - 122 86 71

WASTE SITE RECLASSIFICATION FORM

Operable Unit: 100-DR-2 **Control No.:** 2014-104

Waste Site Code(s)/Subsite Code(s). 100-D-106

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	JP Neath	1/20/15
DOE Federal Project Director (printed)	Signature	Date
N. Menard	Nina M. Menard	1/30/15
Ecology Project Manager (printed)	Signature	Date
N/A		
EPA Project Manager (printed)	Signature	Date

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-D-106; 1607-D1 INFLUENT PIPELINES WASTE SITE

Attachment to Waste Site Reclassification Form 2014-104

February 2015

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-D-106; 1607-D1 INFLUENT PIPELINES WASTE SITE

EXECUTIVE SUMMARY

The 100-D-106, 1607-D1 Influent Pipelines waste site, located within the 100-DR-2 operable unit, was included as a candidate site in the Tri-Party Agreement Administrative Record *Fact Sheet: 100 Area "Plug-In" and Candidate Waste Sites for Calendar Year 2011: Annual Listing of Waste Sites Plugged into the Remove, Treat and Dispose Remedy in the 1999 Interim Action Record of Decision for the 100 Area Remaining Sites* (DOE-RL 2012) and was added to the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units* (Remaining Sites ROD) (EPA 1999) in accordance with the *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington* (EPA 2009). This waste site was subsequently recommended for remove, treat, and dispose (RTD) without confirmatory sampling because it was part of the 1607-D1 septic system that was previously found to be contaminated and was remediated (WCH 2013).

Remedial action at the 100-D-106 waste site was performed from March 31, 2014, until April 2, 2014. Approximately 1,600 bank cubic meters (2,093 bank cubic yards) of excavated materials were removed and staged within the staging pile area (SPA) waiting for disposal at the Environmental Restoration Disposal Facility. The maximum depth of the waste site excavation was approximately 1.2 m (4 ft) below ground surface, the depth of the excavation where the french drain was removed was approximately 4.4 m (10 ft) below ground surface. Excavated materials consisted of concrete-encased 15.2-cm (6-in.)-diameter vitrified clay pipe, concrete from foundations, asphalt debris from roadways, a french drain, soil, gravel, and approximately 285 linear meters (935 linear feet) of pipe debris. No stained soil or anomalous materials were encountered during remediation.

Verification sampling was performed on April 2, July 16, and July 22, 2014. A summary of the cleanup evaluation for the soil sampling results against the applicable remedial action goals is presented in Table ES-1.

The results of the verification sampling were used to make reclassification decisions for the 100-D-106 waste site 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-106 Waste Site. (2 Pages)

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Direct Exposure – Radionuclides	Attain dose rate of <15 mrem/yr above background over 1,000 years.	Radionuclides were not COPCs for the 100-D-106 waste site.	NA
Direct Exposure – Nonradionuclides	Attain individual COPC direct exposure RAGs.	All individual COPC concentrations for soil 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 for soil are <1.	Yes
	Attain a cumulative hazard quotient of <1 for noncarcinogens.	The cumulative hazard quotient for soil 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 for soil 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 for soil is 2.2×10^{-7}.	
Groundwater/River Protection – Radionuclides	Attain single COPC groundwater and river RAGs.	Radionuclides were not COPCs for the 100-D-106 waste site.	NA
	Attain National Primary Drinking Water Regulations: 4 mrem/yr (beta/gamma) dose standard to target receptor/organ [a].		
	Meet drinking water standards for alpha emitters: the more stringent of 15 pCi/L MCL or 1/25th of the derived concentration guide for DOE Order 5400.5 [b].		
	Meet the total uranium drinking water standard of 21.2 pCi/L [c].		

Table ES-1. Summary of Remedial Action Goals for the 100-D-106 Waste Site. (2 Pages)

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Groundwater/River Protection – Nonradionuclides	Attain individual nonradionuclide groundwater and Columbia River cleanup requirements.	Residual concentrations of selenium and zinc exceed soil RAGs for groundwater and/or river protection. However, based on RESRAD modeling discussed in Appendix C of the 100 Area RDR/RAWP (DOE-RL 2009b) and evaluation of the contaminant matrix, 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* [CFR] 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), the residual concentrations of zinc are not predicted to migrate more than 1.8 m (5.9 ft) vertically within 1,000 years based on the distribution coefficient of zinc of 30 mL/g. The distance to groundwater from the bottom of the excavation area is approximately 12.6 m (41.3 ft). Therefore, residual concentrations of zinc are predicted to be protective of groundwater and the Columbia River. Cleanup verification sampling at the 100-D-106 waste site detected selenium at a concentration of 1.2 mg/kg at focused sample location FS-3 at 4.4 m (10 ft) bgs where a french drain had been removed. The selenium concentration of 1.2 mg/kg is above the river protection lookup value of 1.0 mg/kg. However, selenium is not a product of any known processes related to reactor operations and examination of the 100-D-106 data has concluded that the selenium concentration reported is due to the natural mineralogy found in the sample matrix and not to any type of waste disposal or man-made contamination. Therefore, it is concluded the selenium concentrations at the 100-D-106 waste site meet the remedial action objectives established in the 100 Area RDR/RAWP (DOE-RL 2009b).

bgs = below ground surface
COPC = contaminant of potential concern
DOE = U.S. Department of Energy
MCL = maximum contaminant level
NA = not applicable
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)

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

Soil cleanup levels were established in the Remaining Sites ROD (EPA 1999) based in part on a limited ecological risk assessment. Although not required by the Remaining Sites ROD, a comparison against ecological risk screening levels has been made for the 100-D-106 waste site contaminants of potential concern and other constituents (Appendix A). Ecological screening levels from the *Washington Administrative Code* (WAC) 173-340, "Model Toxics Control Act – Cleanup," were exceeded for boron, selenium, vanadium, and zinc. The U.S. Environmental Protection Agency ecological soil-screening levels were exceeded for antimony, manganese, selenium, vanadium, and zinc. Exceedance of screening values is intended to trigger additional evaluation and does not necessarily indicate the existence of risk to ecological receptors. Because the concentrations of antimony, manganese, and vanadium are below the Hanford Site or Washington State background values, it is believed that the presence of these constituents does not pose a risk to ecological receptors. All exceedances will be evaluated in the context of additional lines of evidence for risk to ecological receptors as part of the final closeout decision for this site.

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-D-106; 1607-D1 INFLUENT PIPELINES WASTE SITE

STATEMENT OF PROTECTIVENESS

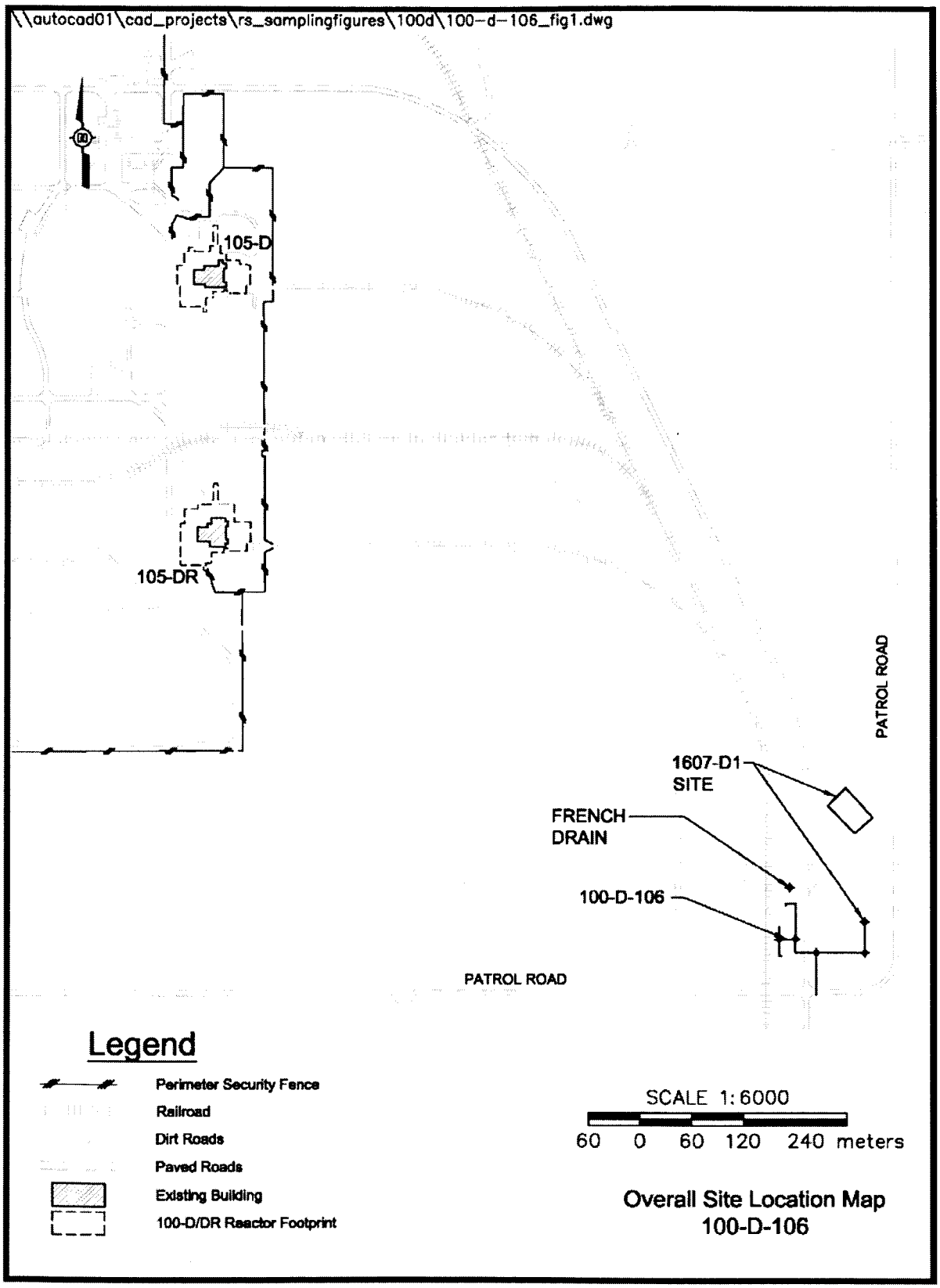
The 100-D-106, 1607-D1 Influent Pipelines waste site verification data, site evaluations, and supporting documentation demonstrate that this site meets the remedial action goals (RAGs) and remedial action objectives (RAOs) established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (100 Area RDR/RAWP) (DOE-RL 2009b) and the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD) (EPA 1999). These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]), and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. The 100-D-106 waste site contamination did not extend into the deep zone. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required.

Soil cleanup levels were established in the Remaining Sites ROD (EPA 1999) based in part on a limited ecological risk assessment. Although not required by the Remaining Sites ROD, a comparison against ecological risk screening levels has been made for the 100-D-106 waste site contaminants of potential concern (COPC) and other constituents (Appendix A). Ecological screening levels from the *Washington Administrative Code* (WAC) 173-340, "Model Toxics Control Act – Cleanup," were exceeded for boron, selenium, vanadium, and zinc. The U.S. Environmental Protection Agency (EPA) ecological soil-screening levels were exceeded for antimony, manganese, selenium, vanadium, and zinc. Exceedance of screening values is intended to trigger additional evaluation and does not necessarily indicate the existence of risk to ecological receptors. Because the concentrations of antimony, manganese, and vanadium are below the Hanford Site or Washington State background values, it is believed that the presence of these constituents does not pose a risk to ecological receptors. All exceedances will be evaluated in the context of additional lines of evidence for risk to ecological receptors as part of the final closeout decision for this site.

GENERAL SITE INFORMATION AND BACKGROUND

The 100-D-106 waste site consisted of the sanitary sewer pipelines that connected the service buildings at the 100-D main gate to the 1607-D1 septic tank. It also included a french drain approximately 21 m (70 ft) north of the 1709-D Building, shown in Figure 1. The site provided sanitary service for patrol and fire personnel located at the entrance to the 100-D/DR Reactor Area.

Figure 1. General Location of the 100-D-106 Waste Site.



REMEDIAL ACTION SUMMARY

Remedial action at the 100-D-106 waste site was performed from March 31, 2014, until April 2, 2014. Approximately 1,600 bank cubic meters (2,093 bank cubic yards) of excavated materials were removed and staged within the staging pile area (SPA) waiting for disposal at the Environmental Restoration Disposal Facility. The maximum depth of the waste site excavation was approximately 1.2 m (4 ft) below ground surface (bgs), the depth of the remediation where the french drain was taken out was approximately 4.4 m (10 ft) bgs. Excavated materials consisted of concrete-encased 15.2-cm (6–in.)-diameter vitrified clay pipe, concrete from foundations, asphalt debris from roadways, a french drain, soil, gravel, and approximately 285 linear meters (935 linear feet) of pipe debris. There were no anomalies present and there was no stained soil observed.

Post-remediation boundaries of the 100-D-106 waste site excavation and waste SPAs were obtained following remedial action activities (Figure 2).

VERIFICATION SAMPLING ACTIVITIES

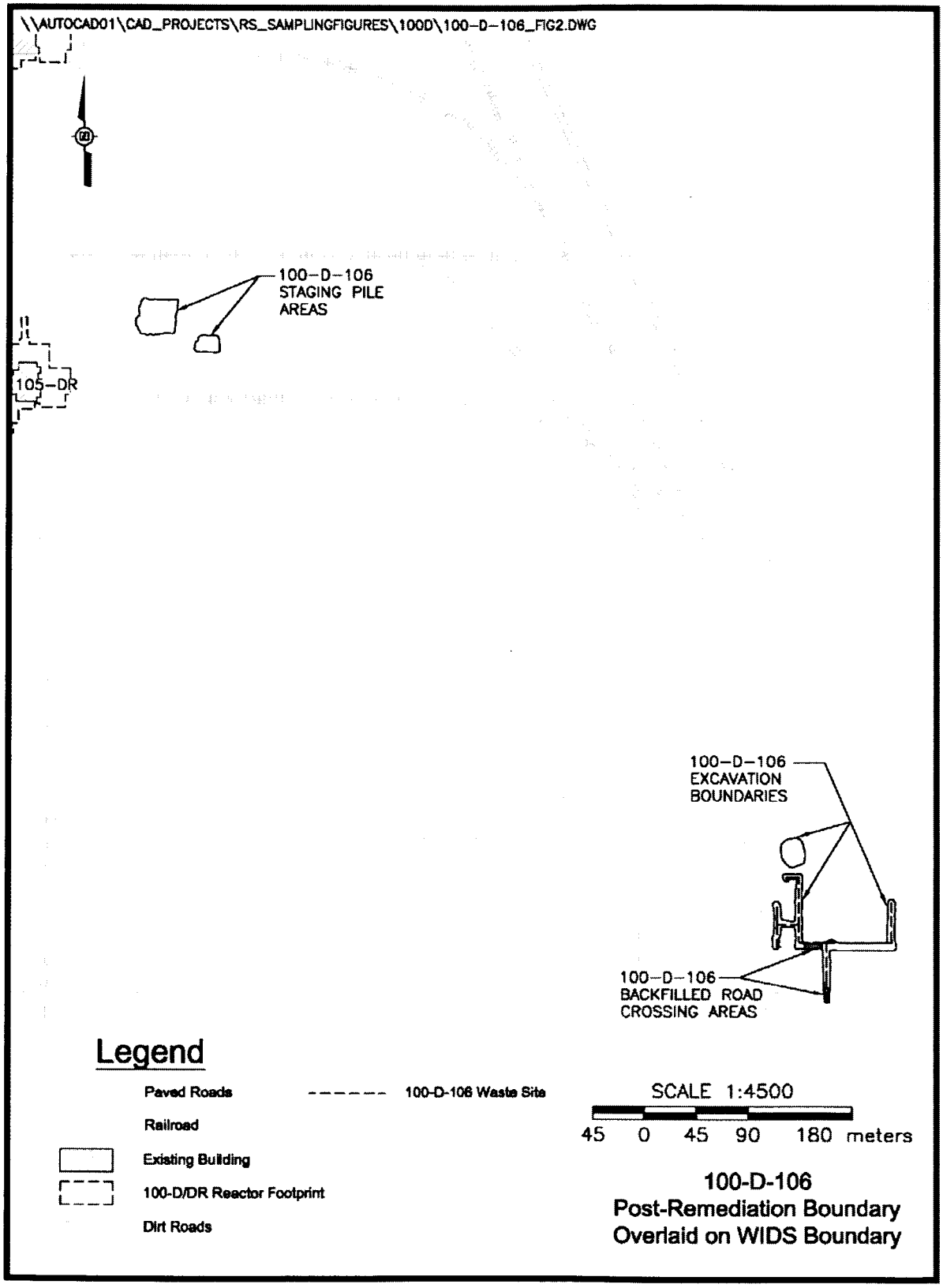
Verification sampling was performed on April 2, July 16, and July 22, 2014, per the *Work Instruction for Verification Sampling of the 100-D-106; 1607-D1 Influent Pipelines* (WCH 2014b). Sampling was conducted to support a determination that residual contaminant concentrations in the soil meet cleanup criteria specified in the 100 Area RDR/RAWP (DOE-RL 2009b) and the Remaining Sites ROD (EPA 1999).

The verification sample results are provided in Appendix B and indicate that the waste removal action achieved compliance with the RAOs and RAGs for the 100-D-106 waste site. The following subsections provide additional discussion of the information used to develop the verification sampling design. The statistical and focused sampling results of verification sampling are also summarized to support interim closure of the site.

Contaminants of Potential Concern

The 100-D-106 waste site pipelines discharged into the 1607-D1 septic system and drain field that were remediated in November and December 2011 (WCH 2012). Contamination was discovered in the septic tank and drain field, which was the basis for remediation of the pipelines. The COPCs for the 100-D-106 waste site were based on confirmatory sampling activities and historical information from the 1607-D1 waste site. The COPCs identified for 100-D-106 were the expanded list of inductively coupled plasma metals, mercury, hexavalent chromium, pesticides, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAH), semivolatile organic compounds, nitrate, and inorganic anions. Focused Samples 1 and 2 (FS-1 and FS-2) included "TPH-diesel range" and "TPH-diesel range extended" as a conservative measure to backfill for a road crossing, referenced in CCN 175712. FS-3 was given a list of COPCs to be consistent with the excavation and staging pile areas.

Figure 2. 100-D-106 Waste Site Post-Remediation Boundaries.



The analytical methods that were performed to evaluate the site COPCs are provided in Table 1.

Table 1. Laboratory Analytical Methods for the 100-D-106 Waste Site.

Analytical Method	Contaminants of Potential Concern
ICP metals [a] – EPA Method 6010	Metals [a]
Mercury – EPA Method 7471	Mercury
Hexavalent chromium – EPA Method 7196	Hexavalent chromium
PAH – EPA Method 8310 [b]	Polycyclic aromatic hydrocarbons
IC anions [c] – EPA Method 300.0	Anions [c]
Nitrate/nitrite – EPA Method 353.2 [d]	Nitrate
SVOA – EPA Method 8270	Semivolatile organic compounds
PCB – EPA Method 8082	Polychlorinated biphenyls
TPH – NWTPH-Dx	Total petroleum hydrocarbons [e]
Pesticides – EPA Method 8081	Pesticides

[a] The expanded list of ICP metals included antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc in the analytical results package.
[b] Because Method 8310 is specifically meant to analyze for PAH, data from this method was used preferentially over the Method 8270 data for evaluation of PAH analyses.
[c] IC anions analyses included bromide, chloride, fluoride, nitrate, nitrite, phosphate, and sulfate.
[d] To preclude holding time issues associated with EPA Method 300.0 for nitrites and nitrates, EPA Method 353.2 was performed.
[e] FS-1 and FS-2 were the only samples that analyzed for TPH as a conservative approach to backfilling a road crossing per CCN 175712.

EPA = U.S. Environmental Protection Agency
IC = ion chromatography
ICP = inductively coupled plasma
NWTPH = Northwest total petroleum hydrocarbons-diesel range organics
PAH = polycyclic aromatic hydrocarbons
PCB = polychlorinated biphenyl
SVOA = semivolatile organic analysis
TPH = total petroleum hydrocarbons

Verification Sample Design

Two decision units were identified for the 100-D-106 waste site; specifically, the excavation and the waste SPA. Twelve statistical soil samples were collected from each decision unit along with a total of three focused samples. Two of the focused samples were collected at road crossings on April 2, 2014, and immediately backfilled to allow road access as agreed to by the U.S. Department of Energy and Washington State Department of Ecology (CCN 175712). The third focused sample was taken at the location of the removed french drain. Additionally, one duplicate sample was collected from each of the excavation and SPA decision units, and one equipment blank was collected for the 100-D-106 waste site.

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). All samples were grab samples collected at the predetermined coordinates.

Additional information related to verification sampling can be found in the field sampling logbook (WCH 2014a). The verification sample summary is provided in Table 2 and the sample locations are shown in Figures 3 and 4.

Table 2. 100-D-106 Waste Site Verification Sample Summary Table. (2 Pages)

Sample Location	HEIS Sample Number	Washington State Plane Coordinates (m)		Sample Analysis
		Northing	Easting	
Excavation Area				
EXC-1	J1TWC8	150764.0	574475.9	ICP metals [a], mercury, hexavalent chromium, IC anions, nitrate/nitrite [b], SVOA, PCB, PAH [c], and pesticides
EXC-2	J1TWC9	150788.9	574432.9	
EXC-3	J1TWD0	150788.9	574475.9	
EXC-4	J1TWD1	150788.9	574490.3	
EXC-5	J1TWD2	150788.9	574504.6	
EXC-6	J1TWD3	150788.9	574518.9	
EXC-7	J1TWD4	150788.9	574533.3	
EXC-8	J1TWD5	150801.3	574454.4	
EXC-9	J1TWD6	150813.7	574432.9	
EXC-10	J1TWD7	150813.7	574533.3	
EXC-11	J1TWD8	150826.1	574454.4	
EXC-12	J1TWD9	150850.9	574440.1	
EXC-13	J1TWF0	150850.9	574454.4	
Duplicate of J1TWC8	J1TWF1	150764.0	574475.9	
SPA Area				
SPA-1	J1TW94	151317.7	573921.2	ICP metals [a], mercury, hexavalent chromium, IC anions, nitrate/nitrite [b], SVOA, PCB, PAH [c], and pesticides
SPA-2	J1TW97	151317.7	573932.4	
SPA-3	J1TW96	151327.4	573926.8	
SPA-4	J1TW95	151327.4	573938.0	
SPA-5	J1TW98	151337.1	573876.5	
SPA-6	J1TW99	151337.1	573887.7	
SPA-7	J1TWC0	151337.1	573898.9	
SPA-8	J1TWC1	151346.8	573882.1	
SPA-9	J1TWC2	151346.8	573893.3	
SPA-10	J1TWC3	151356.5	573876.5	
SPA-11	J1TWC4	151356.5	573887.7	
SPA-12	J1TWC5	151356.5	573898.9	

Table 2. 100-D-106 Waste Site Verification Sample Summary Table. (2 Pages)

Sample Location	HEIS Sample Number	Washington State Plane Coordinates (m)		Sample Analysis
		Northing	Easting	
Duplicate of J1TWC0	J1TWC6	151337.1	573898.9	ICP metals [a], mercury, hexavalent chromium, IC anions, nitrate/nitrite [b], SVOA, PCB, PAH [c], and pesticides
Focused Samples				
FS-1	J1THH1	150789.1	574463.1	ICP metals [a], mercury, hexavalent chromium, nitrate/nitrite [b], SVOA, PCB, PAH [c], TPH, and pesticides
FS-2	J1THK6	150742.8	574477.3	
FS-3	J1TWF2	150871.9	574448.4	ICP metals [a], mercury, hexavalent chromium, IC anions, nitrate/nitrite [b], SVOA, PCB, PAH [c], and pesticides
Equipment blank	J1TWC7	NA	NA	ICP metals [a], mercury and SVOA

[a] The expanded list of ICP metals included antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, magnesium, molybdenum, nickel, silver, selenium, vanadium, and zinc in the analytical results package.

[b] To preclude holding time issues associated with EPA Method 300.0 for nitrates and nitrites, EPA Method 353.2 was performed.

[c] Because Method 8310 is specifically meant to analyze for PAH, data from this method was used preferentially over the Method 8270 data for evaluation of PAH analyses.

EPA = U.S. Environmental Protection Agency
HEIS = Hanford Environmental Information System
IC = ion chromatography
ICP = inductively coupled plasma
NA = not applicable
PAH = polycyclic aromatic hydrocarbons
PCB = polychlorinated biphenyl
SVOA = semivolatile organic analysis
TPH = total petroleum hydrocarbons

Figure 3. 100-D-106 Excavation and Focused Verification Sample Locations.

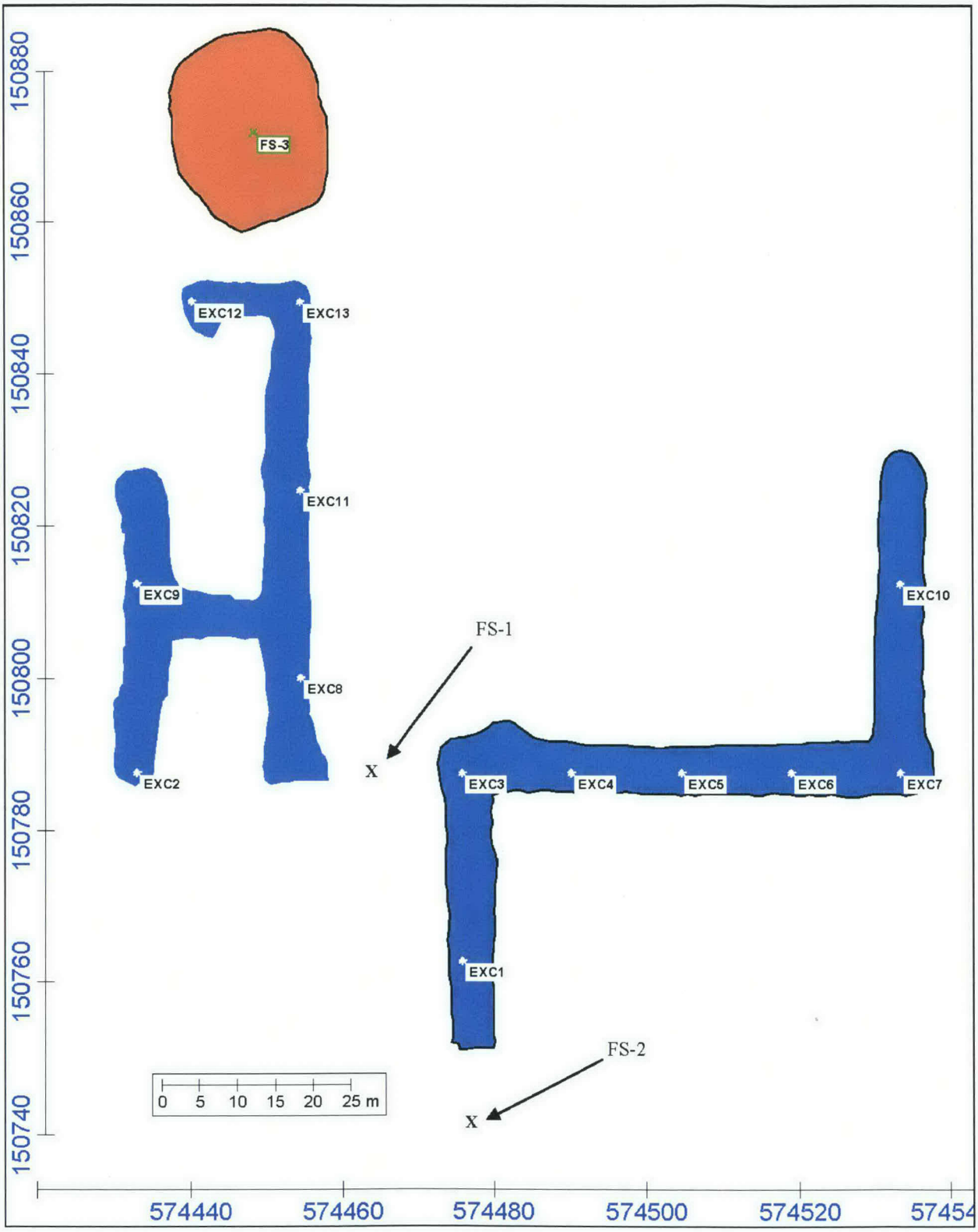
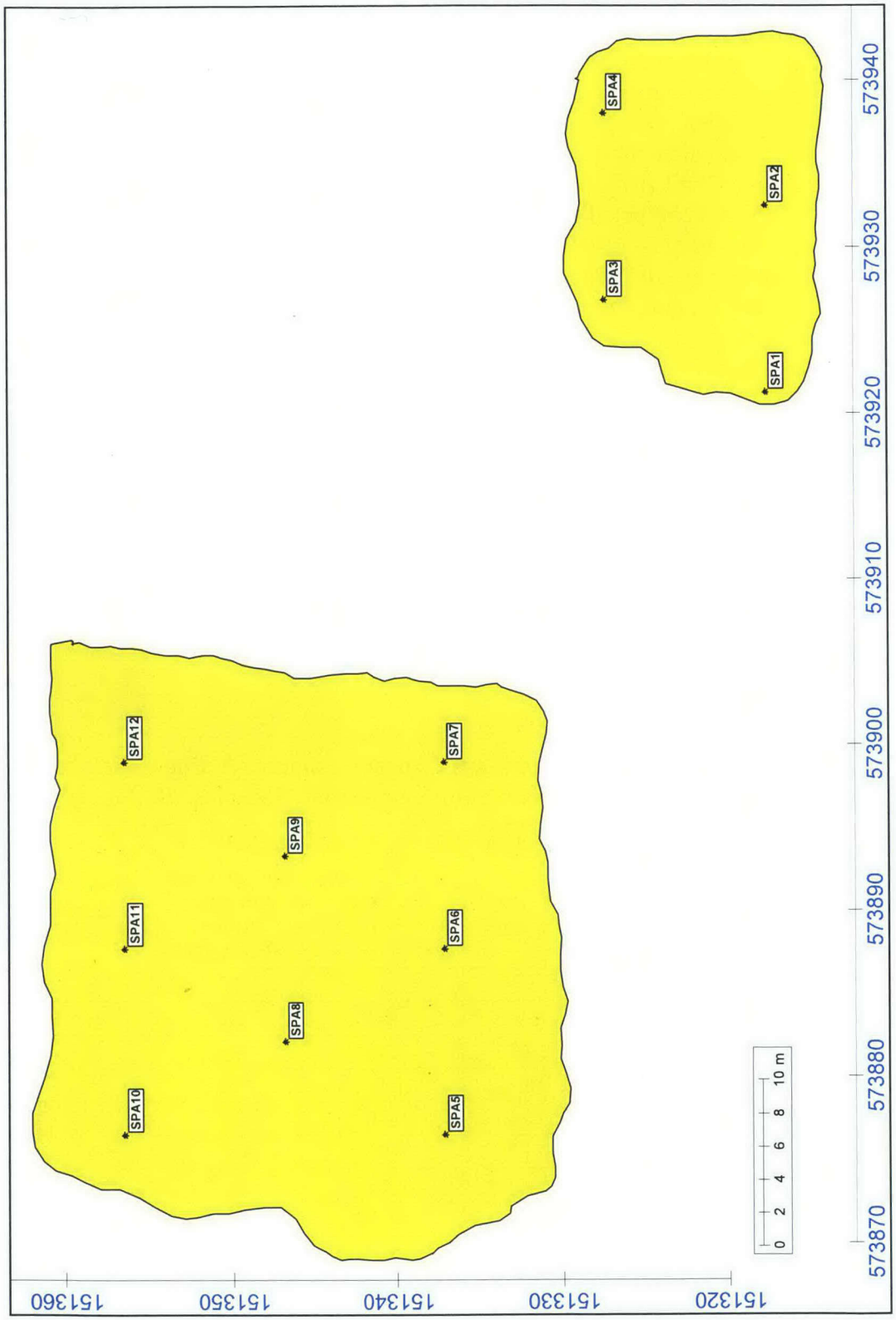


Figure 4. 100-D-106 Waste Site Staging Pile Area Verification Sample Locations.



Verification Sample Results

All verification samples were collected for full protocol laboratory analysis and analyzed using EPA-approved analytical methods. Evaluation of the verification data from the 100-D-106 waste site 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 the 100-D-106 waste site 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 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 each COPC from the 100-D-106 waste site against the RAGs are summarized in Tables 3, 4, and 5. Contaminants that were not detected by laboratory analysis are excluded from these tables. Calculated cleanup levels are not presented in the Cleanup Levels and Risk Calculations Database (Ecology 2014) under WAC 173-340-740(3) for calcium, magnesium, potassium, silicon, and sodium. The EPA's *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual* (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.

Table 3. Comparison of Contaminant Concentrations to Action Levels for the 100-D-106 Waste Site Excavation Verification Samples. (2 Pages)

COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals (mg/kg) [a]			Does the Result Exceed RAGs?	Does the Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Antimony	0.44 (<BG)	32	5 [c]	5 [c]	No	--
Arsenic	3.8 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	74.9 (<BG)	5,600	200	400	No	--
Beryllium	0.20 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Boron [e]	2.0	7,200	320	-- [f]	No	--
Cadmium [g]	0.16 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium	11.8 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	5.8 (<BG)	24	15.7 [d]	-- [f]	No	--
Copper	12.5 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [e]	0.290	2.1 [d]	4.8	2	No	--
Lead	5.6 (<BG)	353	10.2 [c]	10.2 [c]	No	--

Table 3. Comparison of Contaminant Concentrations to Action Levels for the 100-D-106 Waste Site Excavation Verification Samples. (2 Pages)

COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals (mg/kg) [a]			Does the Result Exceed RAGs?	Does the Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Manganese	253 (<BG)	3,760	512 [c]	512	No	--
Molybdenum [e]	0.58	400	8	-- [f]	No	--
Nickel	11.1 (<BG)	1,600	19.1 [c]	27.4	No	--
Selenium [g]	0.81	400	5	1	No	--
Vanadium	32.8 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	46.4 (<BG)	24,000	480	67.8 [c]	No	--
Chloride	16.4 (<BG)	-- [f]	25,000	-- [f]	No	--
Fluoride	0.94 (<BG)	4,800	96	400	No	--
Nitrogen in nitrate	3.2 (<BG)	128,000	1,000	2,000	No	--
Nitrogen in nitrate and nitrite	4.0 (<BG)	128,000	1,000	2,000	No	--
Sulfate	37.5 (<BG)	-- [f]	25,000	-- [f]	No	--
Benzo(a)anthracene	0.012	1.37	0.015 [h]	0.015 [h]	No	--
Benzo(a)pyrene	0.0076	0.137	0.015 [h]	0.015 [h]	No	--
Chrysene	0.010	13.7	0.12	0.1 [h]	No	--
Fluoranthene	0.019	3,200	64	18.0	No	--
Pyrene	0.015	2,400	48	192	No	--
4-4'-DDE	0.00051	2.94	0.0257	0.0033 [h]	No	--
4-4'-DDT	0.0014	2.94	0.0257	0.0033 [h]	No	--

[a] RAGs obtained from the 100 Area RDR/RAWP (DOE-RL 2009b).
[b] Maximum or 95% upper confidence limit, depending on data censorship, as described in the *100-D-106 Waste Site Cleanup Verification 95% UCL Calculations* (Appendix B).
[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 (WAC 173-340-750[3], Ecology 1996).
[e] No Hanford Site-specific or Washington State background value available.
[f] No parameters (bioconcentration factors or ambient water quality criteria values) are available from the Washington State Department of Ecology Cleanup Levels and Risk Calculations database or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], 1996 [Method B for surface waters]).
[g] Hanford Site-specific background value is not available. 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).

-- = not applicable
BG = background
COPC = contaminant of potential concern
DDE = dichlorodiphenyldichloroethylene
DDT = dichlorodiphenyltrichloroethane
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 Action Levels for the 100-D-106 Waste Site Staging Pile Area Verification Samples.

COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals (mg/kg) [a]			Does the Result Exceed RAGs?	Does the Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Antimony	0.74 (<BG)	32	5 [c]	5 [c]	No	--
Arsenic	3.0 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	56.9 (<BG)	5,600	200	400	No	--
Beryllium	0.15 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Boron [e]	0.87	7,200	320	-- [f]	No	--
Chromium	5.7 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	10.6 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	15.1 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [e]	0.321	2.1	4.8 [d]	2	No	--
Lead	4.9 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	326 (<BG)	3,760	512 [c]	512	No	--
Mercury	0.0076 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Molybdenum [e]	0.78	400	8	-- [f]	No	--
Nickel	8.7 (<BG)	1,600	19.1 [c]	27.4	No	--
Vanadium	66.3 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	46.2 (<BG)	24,000	480	67.8 [c]	No	--
Chloride	91.1 (<BG)	-- [f]	25,000	-- [f]	No	--
Fluoride	4.2	4,800	96	400	No	--
Nitrogen in nitrate	13.4	128,000	1,000	2,000	No	--
Nitrogen in nitrate and nitrite	14.1	128,000	1,000	2,000	No	--
Sulfate	78.4 (<BG)	-- [f]	25,000	-- [f]	No	--

[a] RAGs obtained from the 100 Area RDR/RAWP (DOE-RL 2009b).
[b] Maximum or 95% upper confidence limit, depending on data censorship, as described in the *100-D-106 Waste Site Cleanup Verification 95% UCL Calculations* (Appendix B).
[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 (WAC 173-340-750[3], Ecology 1996).
[e] No Hanford Site-specific or Washington State background value available.
[f] No parameters (bioconcentration factors or ambient water quality criteria values) are available from the Washington State Department of Ecology Cleanup Levels and Risk Calculations database or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], 1996 [Method B for surface waters]).

-- = not applicable
BG = background
COPC = contaminant of potential concern
RAG = remedial action goal
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 Action Levels for the 100-D-106 Waste Site Focused Verification Samples. (2 Pages)

COPC	Maximum Result [b] (mg/kg)	Remedial Action Goals (mg/kg) [a]			Does the Result Exceed RAGs?	Does the Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Antimony	0.35 (<BG)	32	5 [c]	5 [c]	No	--
Arsenic	3.6 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	61.1 (<BG)	5,600	200	400	No	--
Beryllium	0.32 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Boron [e]	1.8	7,200	320	-- [f]	No	--
Cadmium [g]	0.12 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium	11.5 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	5.9 (<BG)	24	15.7 [d]	-- [f]	No	--
Copper	13.4 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [e]	0.188	2.1 [d]	4.8	2	No	--
Lead	5.9 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	273 (<BG)	3,760	512 [c]	512	No	--
Mercury	0.0079 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Molybdenum [e]	0.55	400	8	-- [f]	No	--
Nickel	11.7 (<BG)	1,600	19.1 [c]	27.4	No	--
Selenium [g]	1.2	400	5	1	Yes	Yes [h]
Vanadium	35.5 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	147	24,000	480	67.8 [c]	Yes	Yes [h]
Chloride	7.4 (<BG)	-- [f]	25,000	-- [f]	No	--
Nitrogen in nitrate	1.3 (<BG)	128,000	1,000	2,000	No	--
Nitrogen in nitrate and nitrite	0.92 (<BG)	128,000	1,000	2,000	No	--
Sulfate	8.6 (<BG)	-- [f]	25,000	-- [f]	No	--
TPH – diesel range	12	200	200	200	No	--
TPH – diesel range extended	29	200	200	200	No	--
Fluorene	0.050	3,200	64	260	No	--
4-4'-DDT	0.0010	2.94	0.0257	0.0033 [i]	No	--

Table 5. Comparison of Contaminant Concentrations to Action Levels for the 100-D-106 Waste Site Focused Verification Samples. (2 Pages)

COPC	Maximum Result [b] (mg/kg)	Remedial Action Goals (mg/kg) [a]			Does the Result Exceed RAGs?	Does the Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Chlordane (alpha,gamma)	0.0077	2.86	0.025	0.0165 [i]	No	--

[a] RAGs obtained from the 100 Area RDR/RAWP (DOE-RL 2009b).
[b] Maximum, as described in the *100-D-106 Waste Site Cleanup Verification 95% UCL Calculations* (Appendix B).
[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 (WAC 173-340-750[3], Ecology 1996).
[e] No Hanford Site-specific or Washington State background value available.
[f] No parameters (bioconcentration factors or ambient water quality criteria values) are available from the Washington State Department of Ecology Cleanup Levels and Risk Calculations database or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], 1996 [Method B for surface waters]).
[g] Hanford Site-specific background value is not available. 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 zinc are not predicted to migrate more than 1.8 m (5.9 ft) vertically within 1,000 years based on the distribution coefficient of zinc of 30 mL/g. The distance to groundwater from the bottom of the excavation area is approximately 12.6 m (41.3 ft). Therefore, residual concentrations of zinc are predicted to be protective of groundwater and the Columbia River. Cleanup verification sampling at the 100-D-106 waste site detected selenium at a concentration of 1.2 mg/kg at focused sample location FS-3 at 4.4 m (10 ft) bgs where a french drain had been removed. The selenium concentration of 1.2 mg/kg is above the river protection lookup value of 1.0 mg/kg. However, selenium is not a product of any known processes related to reactor operations and examination of the 100-D-106 data has concluded that the selenium concentration reported is due to the natural mineralogy found in the sample matrix and not to any type of waste disposal or man-made contamination. Also, the depth of the excavation at this location is believed to have reached native soil and there is no known use or disposal of selenium in the 100 Area. Furthermore, a detailed calculation for the single selenium hit (1.2 mg/kg) slightly in excess of the soil cleanup level to be protective of the Columbia River (1.0 mg/kg) is not believed to be necessary. Therefore, it is concluded the selenium concentrations at the 100-D-106 waste site meet the remedial action objectives established in the 100 Area RDR/RAWP (DOE-RL 2009b).
[i] Where cleanup levels are less than RDLs, cleanup levels default to RDLs per WAC 173-340-707(2) (Ecology 1996).

-- = not applicable
BG = background
COPC = contaminant of potential concern
DDT = dichlorodiphenyltrichloroethane
RAG = remedial action goal
RDL = required detection limit
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
TPH = total petroleum hydrocarbons
WAC = *Washington Administrative Code*

The complete laboratory results for all constituents are stored in a Washington Closure Hanford project-specific database prior to archival in the Hanford Environmental Information System and are presented in *Waste Site Cleanup Verification 95% UCL Calculations* in Appendix B of this remaining sites verification package.

DATA EVALUATION

This section demonstrates that contaminant concentrations at the 100-D-106 waste site achieve the applicable RAGs developed to support unrestricted land use at the 100 Area as established in the Remaining Sites ROD (EPA 1999) and documented in the 100 Area RDR/RAWP (DOE-RL 2009b).

Attainment of Nonradionuclide RAGs

Tables 3, 4, and 5 compare the cleanup verification sample values for the 100-D-106 waste site excavation, SPA, and focused samples to the applicable soil RAGs for direct exposure, protection of groundwater, and protection of the Columbia River. All COPCs were quantified below direct exposure RAGs.

Selenium and zinc are present at maximum concentrations above soil RAGs for groundwater and/or Columbia River protection in Table 5. However, based on RESidual RADioactivity (RESRAD) modeling discussed in Appendix C of the 100 Area RDR/RAWP (DOE-RL 2009b), it is predicted that zinc will not migrate more than 1.8 m (5.9 ft) vertically in 1,000 years based on the distribution coefficient of zinc of 30 mL/g. The distance to groundwater from the bottom of the excavation area is approximately 12.6 m (41.3 ft); therefore, the residual concentrations of zinc at the 100-D-106 waste site are predicted to be protective of groundwater and the Columbia River.

Selenium was detected at a concentration of 1.2 mg/kg at focused sample location FS-3 at 4.4 m (10 ft) bgs where a french drain had been removed. The selenium concentration of 1.2 mg/kg is above the river protection lookup value of 1.0 mg/kg. Selenium is not a product of any known processes related to reactor operations. Examination of the 100-D-106 data has concluded that the selenium concentration reported is due to the natural mineralogy found in the sample matrix and not to any type of waste disposal or man-made contamination. Also, the depth of the excavation at this location is believed to have reached native soil and there is no known use or disposal of selenium in the 100 Area. Furthermore, a detailed calculation for the single selenium hit (1.2 mg/kg) slightly in excess of the soil cleanup level to be protective of the Columbia River (1.0 mg/kg) is not believed to be necessary. Therefore, it is concluded the selenium concentrations at the 100-D-106 waste site meet the RAOs established in the 100 Area RDR/RAWP (DOE-RL 2009b).

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-106 waste site is included in the *100-D-106 Waste Site Cleanup Verification 95% UCL Calculation* in Appendix B of this remaining sites verification package, where half or more 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.

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 all applicable RAGs; therefore, the residual concentrations of all COPCs in Tables 3 and 4 at the 100-D-106 waste site are predicted to be protective of groundwater and the Columbia River.

Nonradionuclide Direct Contact Hazard Quotient and Carcinogenic Risk RAGs Attained

Nonradionuclide risk requirements include an individual hazard quotient of less than 1.0, a cumulative hazard quotient of less than 1.0, an individual contaminant carcinogenic risk of less than 1×10^{-6}, and a cumulative carcinogenic risk of less than 1×10^{-5}. For the 100-D-106 waste site, these risk values were not calculated for constituents that were either not detected or were detected at concentrations below Hanford Site or Washington State background. 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}, which is less than 1.0. The individual carcinogenic risk values for the carcinogenic constituents detected above background are less than 1×10^{-6} and the cumulative carcinogenic risk value is 2.2×10^{-7}, which is less than 1×10^{-5}. The 100-D-106 waste site 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-106 waste site included a 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}. 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 soil-partitioning coefficients for these contaminants must be 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 12.6 m (41.3 ft) in thickness, a distribution coefficient of 5.8 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-106 waste site is 3.2×10^{-1}, which is less than 1.0. No carcinogenic constituents met the criteria for groundwater protection evaluation at the 100-D-106 waste site; therefore, no calculations of excess carcinogenic risk were performed and 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-106 waste site established that the data are of the right type, quality, and quantity to support site closeout decisions within specified error tolerances. The evaluation verified that the sample design was sufficient for the purpose of clean site verification. The cleanup verification sample analytical data are stored in a Washington Closure Hanford project-specific database for data evaluation prior to archival in the Hanford Environmental Information System and are summarized in Appendix B. The detailed DQA is presented in Appendix C.

SUMMARY FOR INTERIM CLOSURE

The 100-D-106 waste site 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 evaluation of the analytical results indicates that the residual concentrations of COPCs at the site meet the RAOs for direct exposure, groundwater protection, and river protection.

In accordance with this evaluation, the verification sampling results support a reclassification of the 100-D-106 waste site to Interim Closed Out. Contamination above direct exposure levels was not observed in the shallow zone soils and is concluded to not exist in deep zone soils. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the sites 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, "Maintenance of the Waste Information Data System (WIDS)," Rev. 2, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2012, *Fact Sheet: 100 Area "Plug-In" and Candidate Waste Sites for Calendar Year 2011: Annual Listing of Waste Sites Plugged into the Remove, Treat and Dispose Remedy in the 1999 Interim Action Record of Decision for the 100 Area Remaining Sites,* AR/PIR Accession Number 1202240339, 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, 2012, Attachment to Waste Site Reclassification Form 2011-120, *Remaining Sites Verification Package for the 1607-D1, Septic Tank and Associated Drain Field,* Content ID 2000525, Washington Closure Hanford, Richland, Washington.

WCH, 2013, "100-D-106; 1607-D1 Influent Pipelines for Remedial Action," CCN 169748 to T. M. Blakely from T. Q. Howell, Washington Closure Hanford, Richland, Washington, February 6.

WCH, 2014a, *100D Field Remediation Miscellaneous Sampling Activities*, Logbook EL-1662-02, pp. 19-22 and 63-70, Washington Closure Hanford, Richland, Washington.

WCH, 2014b, *Work Instruction for Verification Sampling of the 100-D-106; 1607-D1 Influent Pipelines,* 0100D-WI-G0140, Rev. 0, Washington Closure Hanford, Richland, Washington.

APPENDIX A

ECOLOGICAL RISK COMPARISON TABLE

Table A-1. Maximum Contaminant Concentrations in Soil that Exceed Ecological Screening Levels for the 100-D-106 Waste Site [a].

Hazardous Substance		2007 WAC 173-340 Table 749-3			EPA Ecological Soil-Screening Levels [b]				Maximum Result
		Plants	Soil Biota	Wildlife	Plants	Soil Biota	Avian [c]	Mammalian [c]	
	Background	Metals (mg/kg)							
Antimony	5	5	NA	NA	NA	78	NA	0.27	0.74 (<BG)
Boron	--	0.5	NA	NA	NA	NA	NA	NA	2.0
Manganese	512	1,100 [d]	NA	1,500	220	450	4,300	4,000	326 (<BG)
Selenium	0.78	1	70	0.3	0.52	4.1	1.2	0.63	1.2
Vanadium	85.1	2	NA	NA	NA	NA	7.8	280	66.3 (<BG)
Zinc	67.8	86 [d]	200	360	160	120	46	79	147

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 applicable
BG = background
EPA = U.S. Environmental Protection Agency
NA = not available
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-106 Waste Site Cleanup Verification 95% UCL Calculations, 0100D-CA-V0552, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-D-106 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculations, 0100D-CA-V0553, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-D-106 Waste Site Hazard Quotient and Carcinogenic Risk Calculation for Protection of Groundwater, 0100D-CA-V0554, 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 Area Closure Operations **Job No. 14655**

Area: 100-D

Discipline: Environmental *Calculation No: 0100D-CA-V0552

Subject: 100-D-106 Waste Site Cleanup Verification 95% UCL 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 Sheets = 20 Attm. 1 = 21 Total = 42	I. B. Berezovskiy	R. J. Nielson	J. D. Shoglie	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** 09/22/14 **Calc. No.** 0100D-CA-V0552 **Rev. No.** 0
Project 100-D Area Closure Operations **Job No.** 14655 **Checked** R. J. Nielson **Date** 09/22/14
Subject 100-D-106 Waste Site Cleanup Verification 95% UCL Calculations **Sheet No.** 1 of 20

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 13 - Calculation Sheet Verification Data - Excavation and Staging Pile Area
Sheets 14 to 18 - Ecology Software (MTCAStat) Results
Sheets 19 to 20 - Calculation Sheet - Duplicate Analysis
Attachment 1 - 100-D-106 Waste Site, Verification Sampling Results (21 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-106 waste site. 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-106 waste site underwent statistical sampling. The 100-D-106 waste site has two decision units for verification sampling, consisting of excavation and staging pile area. In addition, three focused samples were collected for verifiication sampling purposes.

Washington Closure Hanford **CALCULATION SHEET**

Originator I. B. Berezovskiy	**Date** 09/22/14	**Calc. No.** 0100D-CA-V0552	**Rev. No.** 0
Project 100-D Area Closure Operations	**Job No.** 14655	**Checked** R. J. Nielson	**Date** 09/22/14
Subject 100-D-106 Waste Site Cleanup Verification 95% UCL Calculations			**Sheet No.** 2 of 20

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** 09/22/14	**Calc. No.** 0100D-CA-V0552	**Rev. No.** 0
Project 100-D Area Closure Operations	**Job No.** 14655	**Checked** R. J. Nielson	**Date** 09/22/14
Subject 100-D-106 Waste Site Cleanup Verification 95% UCL Calculations			**Sheet No.** 3 of 20

Summary (continued)

QUALIFIER LIST

B = Estimated result. Result is less than the RL, but greater than MDL.
C = Sample was </= 5X the blank concentration
J = estimate
M = sample duplicate precision not met.
N = recovery is outside control limits
R = rejected
U = undetected
X = > 40% difference between primary and confirmation detector results.

ACRONYM LIST

-- = not applicable
DE = direct exposure
EXC = excavation
FS = fosused sample
GW = groundwater
MDL = method detection limit
MTCA = *Model Toxics Control Act*
NA = not applicable
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
SVOA = semivolatile organic analysis
TDL = target detection limit
UCL = upper confidence limit
WAC = Washington Administrative Code

Washington Closure Hanford **CALCULATION SHEET**

Originator I. B. Berezovskiy **Date** 09/22/14 **Calc. No.** 0100D-CA-V0552 **Rev. No.** 0
Project 100-D Area Closure Operations **Job No.** 14655 **Checked** R. J. Nielson **Date** 09/22/14
Subject 100-D-106 Waste Site Cleanup Verification 95% UCL Calculations **Sheet No.** 4 of 20

Results:
The results presented in the tables that follow include the summary of the results of the 95% UCL calculations for the excavation, 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 - Excavation [a]

Analyte	EXC		SPA		FS	Units
	95% UCL Result	Maximum Result	95% UCL Result	Maximum Result	Maximum Result	
Antimony	--	0.44	0.74	--	0.35	mg/kg
Arsenic	3.8	--	3.0	--	3.6	mg/kg
Barium	74.9	--	56.9	--	61.1	mg/kg
Beryllium	0.20	--	0.15	--	0.32	mg/kg
Boron	2.0	--	--	0.87	1.8	mg/kg
Cadmium	--	0.16	--	--	0.12	mg/kg
Chromium	11.8	--	5.7	--	11.5	mg/kg
Cobalt	5.8	--	10.6	--	5.9	mg/kg
Copper	12.5	--	15.1	--	13.4	mg/kg
Hexavalent chromium	0.290	--	0.321	--	0.188	mg/kg
Lead	5.6	--	4.9	--	5.9	mg/kg
Manganese	253	--	326	--	273	mg/kg
Mercury	--	--	0.0076	--	0.0079	mg/kg
Molybdenum	--	0.58	--	0.78	0.55	mg/kg
Nickel	11.1	--	8.7	--	11.7	mg/kg
Selenium	--	0.81	--	--	1.2	mg/kg
Vanadium	32.8	--	66.3	--	35.5	mg/kg
Zinc	46.4	--	46.2	--	147	mg/kg
Chloride	16.4	--	91.1	--	7.4	mg/kg
Fluoride	--	0.94	4.2	--	--	mg/kg
Nitrogen in Nitrate	3.2	--	13.4	--	1.3	mg/kg
Nitrogen in Nitrite and Nitrate	4.0	--	14.1	--	0.92	mg/kg
Sulfate	37.5	--	78.4	--	8.6	mg/kg
TPH - diesel range	--	--	--	--	12	mg/kg
TPH - diesel range extended	--	--	--	--	29	mg/kg
Benzo(a)anthracene	--	0.012	--	--	--	mg/kg
Benzo(a)pyrene	--	0.0076	--	--	--	mg/kg
Chrysene	--	0.010	--	--	--	mg/kg
Fluorene	--	--	--	--	0.050	mg/kg
Fluoranthene	--	0.019	--	--	--	mg/kg
Pyrene	--	0.015	--	--	--	mg/kg
Dichlorodiphenyldichloroethylene	--	0.00051	--	--	--	mg/kg
Dichlorodiphenyltrichloroethane	--	0.0014	--	--	0.0010	mg/kg
alpha-Chlordane	--	--	--	--	0.0038	mg/kg
gamma-Chlordane	--	--	--	--	0.0039	mg/kg

3-Part Test Evaluation

	EXC		SPA	
95% UCL or Maximum > Cleanup Limit?	NO	NO	NO	NO
> 10% above Cleanup Limit?	NO	NO	NO	NO
Any sample > 2x Cleanup Limit?	NO	NO	NO	NO

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

Originator	I. B. Berezovskiy	**Date**	09/22/14	**Calc. No.**	0100D-CA-V0552
Project	100-D Area Closure Operations	**Job No.**	14655	**Checked**	R. J. Nielson
Subject	100-D-106 Waste Site Cleanup Verification 95% UCL Calculations				

Rev. No. 0
Date 09/22/14
Sheet No. 5 of 20

Results:
The results presented in the tables that follow include the summary of the results of the 95% UCL calculations for the excavation, 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	Staging Pile Area
Aluminum	3.6%	10.5%
Barium	8.4%	19.6%
Calcium	5.1%	1.9%
Chromium	0.9%	--
Copper	8.1%	2.9%
Iron	0.0%	2.7%
Magnesium	2.8%	6.8%
Manganese	2.1%	7.1%
Silicon	18.9%	***33.6%***
Sodium	--	7.9%
Vanadium	1.0%	4.5%
Zinc	5.5%	21.5%
Chloride	2.1%	8.7%
Nitrogen in nitrate	--	1.1%
Nitrogen in nitrite and nitrate	--	6.9%

[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 Area Closure Operations
Subject 100-D-106 Waste Site Cleanup Verification 95% UCL Calculations

Date 09/22/14
Job No. 14655

Calc. No. 0100D-CA-V0552
Checked R. J. Nielson

Rev. No. 0
Date 09/22/14
Sheet No. 6 of 20

1 **100-D-106 Waste Site Statistical Calculations**

2 **Verification Data - Excavation**

3	Sample	Sample	Sample	Arsenic			Barium			Beryllium			Boron			Chromium			Cobalt			Copper			Hexavalent Chromium			Lead		
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	EXC-1	J1TWC8	7/22/14	3.2		0.59	50.1		0.068	0.18		0.029	1.4	B	0.87	10.8	X	0.052	5.6	X	0.089	11.6		0.19	0.274		0.155	8.1	M	0.24
6	Duplicate of J1TWC8	J1TWF1	7/22/14	2.8		0.61	54.5		0.070	0.19		0.031	1.1	B	0.91	10.9	X	0.054	5.5	X	0.093	10.7		0.20	0.421		0.155	13.4		0.25
7	EXC-2	J1TWC9	7/22/14	4.2		0.57	60.7		0.066	0.19		0.029	1.6	B	0.85	12.1	X	0.050	5.5	X	0.087	12.2		0.19	0.295		0.155	3.8		0.23
8	EXC-3	J1TWD0	7/22/14	3.9		0.63	60.1		0.073	0.20		0.031	1.5	B	0.94	11.8	X	0.055	5.6	X	0.095	12.1		0.21	0.292		0.155	4.8		0.26
9	EXC-4	J1TWD1	7/22/14	3.4		0.56	100		0.064	0.19		0.028	1.2	B	0.83	13.8	X	0.049	5.8	X	0.084	16.6		0.18	0.316		0.155	5.1		0.23
10	EXC-5	J1TWD2	7/22/14	3.6		0.57	56.5		0.065	0.18		0.028	1.2	B	0.84	10.4	X	0.050	5.4	X	0.086	10.1		0.19	0.311		0.155	4.8		0.23
11	EXC-6	J1TWD3	7/22/14	3.9		0.62	55.3		0.071	0.18	B	0.031	1.1	B	0.92	11.6	X	0.055	5.5	X	0.094	10.4		0.20	0.209		0.155	3.8		0.25
12	EXC-7	J1TWD4	7/22/14	3.5		0.64	60.4		0.074	0.21		0.032	1.3	B	0.95	11.1	X	0.056	5.7	X	0.097	11.1		0.21	0.294		0.155	4.6		0.26
13	EXC-8	J1TWD5	7/22/14	3.7		0.61	60.1		0.070	0.19		0.031	1.1	B	0.91	11.3	X	0.054	5.7	X	0.093	11.9		0.20	0.231		0.155	3.8		0.25
14	EXC-9	J1TWD6	7/22/14	4.0		0.60	62.3		0.069	0.19		0.030	1.2	B	0.89	12.1	X	0.053	5.5	X	0.091	11.1		0.20	0.155	U	0.155	5.0		0.25
15	EXC-10	J1TWD7	7/22/14	4.0		0.58	61.7		0.067	0.18		0.029	1.1	B	0.86	11.2	X	0.051	5.5	X	0.088	12.7		0.19	0.231		0.155	3.6		0.24
16	EXC-11	J1TWD8	7/22/14	3.7		0.64	59.7		0.074	0.20		0.032	1.1	B	0.96	10.7	X	0.057	6.4	X	0.097	11.6		0.21	0.231		0.155	3.7		0.26
17	EXC-12	J1TWD9	7/22/14	3.3		0.64	113		0.074	0.25		0.032	4.8		0.96	10.8	X	0.057	5.6	X	0.097	11.6		0.21	0.155	U	0.155	4.0		0.26
18	EXC-13	J1TWF0	7/22/14	3.1		0.63	63.2		0.072	0.20		0.031	1.1	B	0.93	9.8	X	0.055	5.5	X	0.095	9.5		0.21	0.334		0.155	3.4		0.26

19

20 **Statistical Computation Input Data**

21	Sample	Sample	Sample	Arsenic	Barium	Beryllium	Boron	Chromium	Cobalt	Copper	Hexavalent Chromium	Lead
22	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
23	EXC-1	J1TWC8/ J1TWF1	7/22/14	3.0	52.3	0.19	1.3	10.9	5.6	11.2	0.348	10.8
24	EXC-2	J1TWC9	7/22/14	4.2	60.7	0.19	1.6	12.1	5.5	12.2	0.295	3.8
25	EXC-3	J1TWD0	7/22/14	3.9	60.1	0.20	1.5	11.8	5.6	12.1	0.292	4.8
26	EXC-4	J1TWD1	7/22/14	3.4	100	0.19	1.2	13.8	5.8	16.6	0.316	5.1
27	EXC-5	J1TWD2	7/22/14	3.6	56.5	0.18	1.2	10.4	5.4	10.1	0.311	4.8
28	EXC-6	J1TWD3	7/22/14	3.9	55.3	0.18	1.1	11.6	5.5	10.4	0.209	3.8
29	EXC-7	J1TWD4	7/22/14	3.5	60.4	0.21	1.3	11.1	5.7	11.1	0.294	4.6
30	EXC-8	J1TWD5	7/22/14	3.7	60.1	0.19	1.1	11.3	5.7	11.9	0.231	3.8
31	EXC-9	J1TWD6	7/22/14	4.0	62.3	0.19	1.2	12.1	5.5	11.1	0.0775	5.0
32	EXC-10	J1TWD7	7/22/14	4.0	61.7	0.18	1.1	11.2	5.5	12.7	0.231	3.6
33	EXC-11	J1TWD8	7/22/14	3.7	59.7	0.20	1.1	10.7	6.4	11.6	0.231	3.7
34	EXC-12	J1TWD9	7/22/14	3.3	113	0.25	4.8	10.8	5.6	11.6	0.078	4.0
35	EXC-13	J1TWF0	7/22/14	3.1	63.2	0.20	1.1	9.8	5.5	9.5	0.334	3.4

36 **Statistical Computations**

37		Arsenic	Barium	Beryllium	Boron	Chromium	Cobalt	Copper	Hexavalent Chromium	Lead
38	95% UCL based on	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), lognormal and normal distribution rejected, use z-statistic.	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), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.
39	N	13	13	13	13	13	13	13	13	13
40	% < Detection limit	0%	0%	0%	0%	0%	0%	0%	15%	0%
41	Mean	3.6	66.6	0.20	1.5	11.4	5.6	11.7	0.250	4.7
42	Standard deviation	0.37	18.2	0.019	1.0	0.99	0.25	1.7	0.0879	1.9
43	95% UCL on mean	3.8	74.9	0.20	2.0	11.8	5.8	12.5	0.290	5.6
44	Maximum value	4.2	113	0.25	4.8	13.8	6.4	16.6	0.421	13.4
45	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)**	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	10.2 GW & River Protection
46	**WAC 173-340 3-PART TEST**									
47	95% UCL > Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	NO	NO
48	> 10% above Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	NO	NO
49	Any sample > 2X Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	NO	NO
50	**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 (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.	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.

51

CALCULATION SHEET

Washington Closure Hanford

Originator I. B. Berezovskiy
Project 100-D Area Closure Operations
Subject 100-D-106 Waste Site Cleanup Verification 95% UCL Calculations

Date 09/22/14
Job No. 14655

Calc. No. 0100D-CA-V0552
Checked R. J. Nielson

Rev. No. 0
Date 09/22/14
Sheet No. 7 of 20

1 **100-D-106 Waste Site Statistical Calculations**

2 **Verification Data - Excavation**

3	Sample	Sample	Sample	Manganese			Nickel			Vanadium			Zinc			Chloride			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	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
5	EXC-1	J1TWC8	7/22/14	241		0.089	11.0	X	0.11	31.3		0.084	29.8	X	0.35	29.0	M	2.0	1.9	B	0.31	0.94		0.36	40.4	MN	1.7
6	Duplicate of J1TWC8	J1TWF1	7/22/14	236		0.093	10.7	X	0.11	31.6		0.087	31.5	X	0.37	28.4	N	2.0	1.9	B	0.31	0.36	U	0.36	14.8	MN	1.7
7	EXC-2	J1TWC9	7/22/14	253		0.087	11.8	X	0.11	30.9		0.081	86.1	X	0.34	10.5		1.9	6.6		0.31	5.1		0.36	23.7		1.7
8	EXC-3	J1TWD0	7/22/14	255		0.095	10.2	X	0.12	32.7		0.090	35.7	X	0.38	19.5		1.9	2.3		0.29	2.2		0.36	51.5		1.6
9	EXC-4	J1TWD1	7/22/14	269		0.084	11.8	X	0.10	32.3		0.079	67.0	X	0.34	12.2		2.0	1.8	B	0.31	1.5		0.36	27.3		1.7
10	EXC-5	J1TWD2	7/22/14	249		0.086	9.6	X	0.11	32.4		0.081	30.6	X	0.34	12.2		1.9	4.0		0.30	4.7		0.36	35.0		1.6
11	EXC-6	J1TWD3	7/22/14	245		0.094	11.1	X	0.12	31.6		0.088	29.7	X	0.37	9.6		1.9	2.6		0.29	3.0		0.36	30.3		1.6
12	EXC-7	J1TWD4	7/22/14	249		0.097	10.7	X	0.12	31.8		0.091	31.1	X	0.39	8.6		2.0	2.5		0.31	3.1		0.36	16.5		1.7
13	EXC-8	J1TWD5	7/22/14	254		0.093	10.6	X	0.11	33.9		0.087	31.1	X	0.37	13.8		2.0	1.3	B	0.32	1.1		0.36	35.5		1.7
14	EXC-9	J1TWD6	7/22/14	239		0.091	11.3	X	0.11	29.3		0.086	32.2	X	0.36	9.2		1.9	1.6	B	0.30	1.8		0.36	16.5		1.6
15	EXC-10	J1TWD7	7/22/14	236		0.088	10.7	X	0.11	30.9		0.083	30.1	X	0.35	11.1		1.9	2.7		0.29	3.0		0.36	24.2		1.6
16	EXC-11	J1TWD8	7/22/14	251		0.097	10.5	X	0.12	35.9		0.092	31.7	X	0.39	17.4		1.9	2.1	B	0.30	2.4		0.36	42.1		1.6
17	EXC-12	J1TWD9	7/22/14	257		0.097	10.3	X	0.12	32.3		0.092	32.8	X	0.39	7.9		1.9	2.2	B	0.30	2.6		0.36	10.9		1.6
18	EXC-13	J1TWF0	7/22/14	238		0.095	9.5	X	0.12	30.6		0.089	30.5	X	0.38	12.7		2.0	2.1	B	0.31	3.3		0.36	33.9		1.7

19

20 **Statistical Computation Input Data**

21	Sample	Sample	Sample	Manganese	Nickel	Vanadium	Zinc	Chloride	Nitrogen in nitrate	Nitrogen in nitrite and nitrate	Sulfate
22	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
23	EXC-1	J1TWC8/ J1TWF1	7/22/14	239	10.9	31.5	30.7	28.7	1.9	0.56	27.6
24	EXC-2	J1TWC9	7/22/14	253	11.8	30.9	86.1	10.5	6.6	5.1	23.7
25	EXC-3	J1TWD0	7/22/14	255	10.2	32.7	35.7	19.5	2.3	2.2	51.5
26	EXC-4	J1TWD1	7/22/14	269	11.8	32.3	67.0	12.2	1.8	1.5	27.3
27	EXC-5	J1TWD2	7/22/14	249	9.6	32.4	30.6	12.2	4.0	4.7	35.0
28	EXC-6	J1TWD3	7/22/14	245	11.1	31.6	29.7	9.6	2.6	3.0	30.3
29	EXC-7	J1TWD4	7/22/14	249	10.7	31.8	31.1	8.6	2.5	3.1	16.5
30	EXC-8	J1TWD5	7/22/14	254	10.6	33.9	31.1	13.8	1.3	1.1	35.5
31	EXC-9	J1TWD6	7/22/14	239	11.3	29.3	32.2	9.2	1.6	1.8	16.5
32	EXC-10	J1TWD7	7/22/14	236	10.7	30.9	30.1	11.1	2.7	3.0	24.2
33	EXC-11	J1TWD8	7/22/14	251	10.5	35.9	31.7	17.4	2.1	2.4	42.1
34	EXC-12	J1TWD9	7/22/14	257	10.3	32.3	32.8	7.9	2.2	2.6	10.9
35	EXC-13	J1TWF0	7/22/14	238	9.5	30.6	30.5	12.7	2.1	3.3	33.9

36 **Statistical Computations**

37		Manganese	Nickel	Vanadium	Zinc	Chloride	Nitrogen in nitrate	Nitrogen in nitrite and nitrate	Sulfate
38	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), 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.
39	N	13	13	13	13	13	13	13	13
40	% < Detection limit	0%	0%	0%	0%	0%	0%	0%	0%
41	Mean	249	10.7	32.0	38.4	13.3	2.6	2.6	28.8
42	Standard deviation	9.4	0.71	1.6	17.4	5.7	1.4	1.3	11.1
43	95% UCL on mean	253	11.1	32.8	46.4	16.4	3.2	4.0	37.5
44	Maximum value	269	11.8	35.9	86.1	29.0	6.6	5.1	51.5
45	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)**	512 GW 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
46	**WAC 173-340 3-PART TEST**								
47	95% UCL > Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	NA
48	> 10% above Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	NA
49	Any sample > 2X Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	NA
50	**WAC 173-340 Compliance?**	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 (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.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	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.	Because all values are below background (237 mg/kg) the WAC 173-340 3-part test is not required.

51

MAXIMUM VALUE 3-PART TEST CALCULATION SHEET

Washington Closure Hanford

Originator I. B. Berezovskiy

Project 100-D Area Closure Operations

Subject 100-D-106 Waste Site Cleanup Verification 95% UCL Calculations

Date 09/25/14

Job No. 14655

Calc. No. 0100D-CA-V0552

Checked R. J. Nielson

Rev. No. 0

Date 09/25/14

Sheet No. 8 of 20

100-D-106 Waste Site Maximum Calculations

Verification Data - Excavation

Sample Area	Sample Number	Sample Date	Antimony			Cadmium			Molybdenum			Selenium			Fluoride			Benzo(a)anthracene			Benzo(a)pyrene		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
EXC-1	J1TWC8	7/22/14	0.34	U	0.34	0.037	U	0.037	0.58	B	0.23	0.79	BM	0.77	0.81	UN	0.81	3.1	U	3.1	6.2	U	6.2
Duplicate of J1TWC8	J1TWF1	7/22/14	0.35	U	0.35	0.038	U	0.038	0.24	U	0.24	0.80	U	0.80	0.80	UN	0.80	12	J	3.1	7.6	J	6.3
EXC-2	J1TWC9	7/22/14	0.43	B	0.33	0.11	B	0.036	0.27	B	0.23	0.81	B	0.75	0.94	B	0.80	3.2	U	3.2	6.4	U	6.4
EXC-3	J1TWD0	7/22/14	0.44	B	0.36	0.039	U	0.039	0.34	B	0.25	0.82	U	0.82	0.82	B	0.77	3.1	U	3.1	6.2	U	6.2
EXC-4	J1TWD1	7/22/14	0.32	U	0.32	0.16	B	0.035	0.27	B	0.22	0.72	U	0.72	0.80	U	0.80	3.1	U	3.1	6.2	U	6.2
EXC-5	J1TWD2	7/22/14	0.44	B	0.33	0.035	U	0.035	0.22	U	0.22	0.74	U	0.74	0.78	U	0.78	3.0	U	3.0	6.1	U	6.1
EXC-6	J1TWD3	7/22/14	0.36	U	0.36	0.039	U	0.039	0.24	U	0.24	0.81	U	0.81	0.76	U	0.76	3.1	U	3.1	6.2	U	6.2
EXC-7	J1TWD4	7/22/14	0.37	U	0.37	0.040	U	0.040	0.25	U	0.25	0.83	U	0.83	0.82	U	0.82	3.1	U	3.1	6.2	U	6.2
EXC-8	J1TWD5	7/22/14	0.35	U	0.35	0.038	U	0.038	0.24	U	0.24	0.80	U	0.80	0.86	B	0.83	3.2	U	3.2	6.4	U	6.4
EXC-9	J1TWD6	7/22/14	0.41	B	0.35	0.037	U	0.037	0.24	U	0.24	0.79	U	0.79	0.79	U	0.79	3.1	U	3.1	6.2	U	6.2
EXC-10	J1TWD7	7/22/14	0.34	U	0.34	0.036	U	0.036	0.23	U	0.23	0.76	U	0.76	0.77	U	0.77	3.1	U	3.1	6.2	U	6.2
EXC-11	J1TWD8	7/22/14	0.37	U	0.37	0.040	U	0.040	0.25	U	0.25	0.84	U	0.84	0.79	U	0.79	3.2	U	3.2	6.4	U	6.4
EXC-12	J1TWD9	7/22/14	0.37	U	0.37	0.040	U	0.040	0.25	U	0.25	0.84	U	0.84	0.78	U	0.78	3.2	U	3.2	6.4	U	6.4
EXC-13	J1TWF0	7/22/14	0.36	U	0.36	0.039	U	0.039	0.25	U	0.25	0.82	U	0.82	0.81	U	0.81	3.1	U	3.1	6.2	U	6.2

Statistical Computations

	Antimony	Cadmium	Molybdenum	Selenium	Fluoride	Benzo(a)anthracene	Benzo(a)pyrene
% < Detection limit	69%	85%	69%	85%	77%	92%	92%
Maximum value	0.44	0.16	0.58	0.81	0.94	12	7.6
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless otherwise noted	5 GW & River Protection	0.81 GW & River Protection	8 GW Protection	1 River Protection	96 GW Protection	15 ug/kg GW & River Protection	15 ug/kg GW & River Protection
3-PART TEST							
Maximum > Cleanup Limit?	NA	NA	NO	NO	NA	NO	NO
> 10% above Cleanup Limit?	NA	NA	NO	NO	NA	NO	NO
Any sample > 2X Cleanup Limit?	NA	NA	NO	NO	NA	NO	NO
3-Part Test Compliance?	Because all values are below background (5 mg/kg) the 3-part test is not required.	Because all values are below background (0.81 mg/kg) the 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 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.

MAXIMUM VALUE 3-PART TEST CALCULATION SHEET

Washington Closure Hanford

Originator I. B. Berezovskiy

Project 100-D Area Closure Operations

Subject 100-D-106 Waste Site Cleanup Verification 95% UCL Calculations

Date 09/22/14

Job No. 14655

Calc. No. 0100D-CA-V0552

Checked R. J. Nielson

Rev. No. 0

Date 09/22/14

Sheet No. 9 of 20

1 **100-D-106 Waste Site Maximum Calculations**

2 **Verification Data - Excavation**

3	Sample	Sample	Sample	Chrysene			Fluoranthene			Pyrene			4,4'- DDE			4,4'- DDT		
4	Area	Number	Date	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
5	EXC-1	J1TWC8	7/22/14	4.7	U	4.7	13	U	13	12	U	12	0.39	J	0.24	1.1	J	0.59
6	Duplicate of J1TWC8	J1TWF1	7/22/14	10	J	4.8	19	J	13	15	J	12	0.51	J	0.23	1.4	JY	0.58
7	EXC-2	J1TWC9	7/22/14	4.8	U	4.8	13	U	13	12	U	12	0.22	U	0.22	0.55	U	0.55
8	EXC-3	J1TWD0	7/22/14	4.7	U	4.7	13	U	13	12	U	12	0.23	U	0.23	0.57	U	0.57
9	EXC-4	J1TWD1	7/22/14	4.7	U	4.7	13	U	13	12	U	12	0.62	J	0.23	3.8		0.56
10	EXC-5	J1TWD2	7/22/14	4.6	U	4.6	12	U	12	11	U	11	0.24	U	0.24	0.59	U	0.59
11	EXC-6	J1TWD3	7/22/14	4.7	U	4.7	13	U	13	12	U	12	0.24	U	0.24	0.59	U	0.59
12	EXC-7	J1TWD4	7/22/14	4.7	U	4.7	13	U	13	12	U	12	0.22	U	0.22	0.55	U	0.55
13	EXC-8	J1TWD5	7/22/14	4.9	U	4.9	13	U	13	12	U	12	0.24	U	0.24	0.58	U	0.58
14	EXC-9	J1TWD6	7/22/14	4.7	U	4.7	13	U	13	12	U	12	0.22	U	0.22	0.55	U	0.55
15	EXC-10	J1TWD7	7/22/14	4.6	U	4.6	12	U	12	12	U	12	0.23	U	0.23	0.58	U	0.58
16	EXC-11	J1TWD8	7/22/14	4.8	U	4.8	13	U	13	12	U	12	0.23	U	0.23	0.58	U	0.58
17	EXC-12	J1TWD9	7/22/14	4.8	U	4.8	13	U	13	12	U	12	0.23	U	0.23	0.58	U	0.58
18	EXC-13	J1TWF0	7/22/14	4.6	U	4.6	12	U	12	12	U	12	0.22	U	0.22	0.55	U	0.55

19 **Statistical Computations**

20		Chrysene		Fluoranthene		Pyrene		Dichlorodiphenyl-dichloroethylene		Dichlorodiphenyl-trichloroethane	
21	% < Detection limit	85%		85%		85%		77%		77%	
22	Maximum value	10		19		15		0.51		1.4	
23	**Most Stringent Cleanup Limit for nonradionuclide and RAG type ug/kg**	100	River Protection	18000	River Protection	48000	GW Protection	3.3	River Protection	3.3	River Protection
24	**3-PART TEST**										
25	Maximum > Cleanup Limit?	NO		NO		NO		NO		NO	
26	> 10% above Cleanup Limit?	NO		NO		NO		NO		NO	
27	Any sample > 2X Cleanup Limit?	NO		NO		NO		NO		NO	
28	**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.	

29

CALCULATION SHEET

Washington Closure Hanford

Originator I. B. Berezovskiy
Project 100-D Area Closure Operations
Subject 100-D-106 Waste Site Cleanup Verification 95% UCL Calculations

Date 09/22/14
Job No. 14655

Calc. No. 0100D-CA-V0552
Checked R. J. Nielson

Rev. No. 0
Date 09/22/14
Sheet No. 10 of 20

1 **100-D-106 Waste Site Statistical Calculations**
2 **Verification Data - Staging Pile Area**

3	Sample	Sample	Sample	Antimony			Arsenic			Barium			Beryllium			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
5	SPA-7	J1TWC0	7/16/14	0.82	J	0.38	2.6		0.66	50.2	X	0.076	0.11	BJ	0.033	4.5	X	0.058	10.1		0.10	14.2		0.22	0.397		0.155
6	Duplicate of J1TWC0	J1TWC6	7/16/14	0.66	J	0.38	2.4		0.66	61.1	X	0.076	0.15	BJ	0.033	5.4	X	0.058	10.0		0.10	13.8		0.22	0.355		0.155
7	SPA-1	J1TW94	7/16/14	1.7	UJ	1.70	3.2		0.58	53.0	X	0.066	0.14	UNJ	0.140	5.0	X	0.051	11.9		0.44	17.2		0.95	0.155	U	0.155
8	SPA-2	J1TW97	7/16/14	0.76	J	0.37	3.4		0.64	53.5	X	0.074	0.15	BJ	0.032	6.3	X	0.056	9.2		0.10	15.3		0.21	0.315		0.155
9	SPA-3	J1TW96	7/16/14	0.75	J	0.34	2.7		0.58	46.7	X	0.067	0.13	BJ	0.029	5.5	X	0.051	9.2		0.09	13.3		0.19	0.356		0.155
10	SPA-4	J1TW95	7/16/14	0.73	J	0.37	3.3		0.64	77.2	X	0.074	0.14	BJ	0.032	5.4	X	0.056	11.0		0.10	15.0		0.21	0.316		0.155
11	SPA-5	J1TW98	7/16/14	1.7	UJ	1.70	2.8		0.60	48.1	X	0.069	0.15	UJ	0.150	5.9	X	0.053	12.3		0.46	15.9		0.99	0.294		0.155
12	SPA-6	J1TW99	7/16/14	0.54	J	0.33	2.7		0.58	49.0	X	0.067	0.12	BJ	0.029	5.1	X	0.051	9.5		0.09	12.7		0.19	0.316		0.155
13	SPA-8	J1TWC1	7/16/14	0.51	BJ	0.33	2.7		0.57	54.0	X	0.066	0.17	J	0.028	6.0	X	0.050	10.2		0.09	14.6		0.19	0.335		0.155
14	SPA-9	J1TWC2	7/16/14	0.50	BJ	0.33	3.2		0.58	52.8	X	0.067	0.15	BJ	0.029	6.0	X	0.051	9.5		0.09	14.1		0.19	0.336		0.155
15	SPA-10	J1TWC3	7/16/14	0.48	BJ	0.35	2.6		0.61	50.8	X	0.070	0.13	BJ	0.031	5.2	X	0.054	9.2		0.09	13.1		0.20	0.155	U	0.155
16	SPA-11	J1TWC4	7/16/14	0.56	J	0.34	2.8		0.58	48.0	X	0.067	0.14	BJ	0.029	5.2	X	0.051	9.6		0.09	13.2		0.19	0.316		0.155
17	SPA-12	J1TWC5	7/16/14	0.38	BJ	0.35	2.4		0.62	46.7	X	0.071	0.12	BJ	0.031	3.8	X	0.054	9.0		0.09	14.1		0.20	0.155	U	0.155

18 **Statistical Computation Input Data**

19	Sample	Sample	Sample	Antimony	Arsenic	Barium	Beryllium	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
21	SPA-7	J1TWC0/ J1TWC6	7/16/14	0.74	2.5	55.7	0.13	5.0	10.1	14.0	0.376
22	SPA-1	J1TW94	7/16/14	0.85	3.2	53.0	0.070	5.0	11.9	17.2	0.0775
23	SPA-2	J1TW97	7/16/14	0.76	3.4	53.5	0.15	6.3	9.2	15.3	0.315
24	SPA-3	J1TW96	7/16/14	0.75	2.7	46.7	0.13	5.5	9.2	13.3	0.356
25	SPA-4	J1TW95	7/16/14	0.73	3.3	77.2	0.14	5.4	11.0	15.0	0.316
26	SPA-5	J1TW98	7/16/14	0.85	2.8	48.1	0.08	5.9	12.3	15.9	0.294
27	SPA-6	J1TW99	7/16/14	0.54	2.7	49.0	0.12	5.1	9.5	12.7	0.316
28	SPA-8	J1TWC1	7/16/14	0.51	2.7	54.0	0.17	6.0	10.2	14.6	0.335
29	SPA-9	J1TWC2	7/16/14	0.50	3.2	52.8	0.15	6.0	9.5	14.1	0.336
30	SPA-10	J1TWC3	7/16/14	0.48	2.6	50.8	0.13	5.2	9.2	13.1	0.0775
31	SPA-11	J1TWC4	7/16/14	0.56	2.8	48.0	0.14	5.2	9.6	13.2	0.316
32	SPA-12	J1TWC5	7/16/14	0.38	2.4	46.7	0.12	3.8	9.0	14.1	0.0775

33 **Statistical Computations**

34		Antimony	Arsenic	Barium	Beryllium	Chromium	Cobalt	Copper	Hexavalent Chromium
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), 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 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), lognormal and normal distribution rejected, use z-statistic.
36	N	12	12	12	12	12	12	12	12
37	% < Detection limit	17%	0%	0%	17%	0%	0%	0%	25%
38	Mean	0.64	2.9	53.0	0.13	5.4	10.1	14.4	0.266
39	Standard deviation	0.16	0.33	8.2	0.029	0.67	1.1	1.3	0.116
40	95% UCL on mean	0.74	3.0	56.9	0.15	5.7	10.6	15.1	0.321
41	Maximum value	0.82	3.4	77.2	0.17	6.3	12.3	17.2	0.397
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	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	NA	NA	NA	NA	NA	NA	NO
45	> 10% above Cleanup Limit?	NA	NA	NA	NA	NA	NA	NA	NO
46	Any sample > 2X Cleanup Limit?	NA	NA	NA	NA	NA	NA	NA	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.	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 (1.51 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.

CALCULATION SHEET

Washington Closure Hanford

Originator I. B. Berezovskiy
Project 100-D Area Closure Operations
Subject 100-D-106 Waste Site Cleanup Verification 95% UCL Calculations

Date 09/22/14
Job No. 14655

Calc. No. 0100D-CA-V0552
Checked R. J. Nielson

Rev. No. 0
Date 09/22/14
Sheet No. 11 of 20

1 **100-D-106 Waste Site Statistical Calculations**

2 **Verification Data - Staging Pile Area**

3	Sample	Sample	Sample	Lead			Manganese			Mercury			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
5	SPA-7	J1TWC0	7/16/14	3.7		0.27	314	X	0.10	0.0085	B	0.0055	7.5	X	0.12	66.0		0.094	47.5	X	0.40	58.2		2.0	3.8	BJ	0.82
6	Duplicate of	J1TWC6	7/16/14	3.7		0.27	337	X	0.10	0.0079	B	0.0053	8.9	X	0.12	61.0		0.094	45.4	X	0.40	72.2		2.0	4.5	BJ	0.82
7	SPA-1	J1TW94	7/16/14	6.0		1.2	306	X	0.087	0.0080	B	0.0055	8.3	X	0.11	72.3		0.41	48.0	X	0.35	101	M	2.0	3.3	BNJ	0.81
8	SPA-2	J1TW97	7/16/14	3.9		0.26	305	X	0.097	0.0076	B	0.0052	8.4	X	0.12	56.9		0.091	44.1	X	0.39	89.8		2.0	4.1	BJ	0.82
9	SPA-3	J1TW96	7/16/14	3.9		0.24	309	X	0.089	0.0076	B	0.0053	8.0	X	0.11	62.4		0.083	43.3	X	0.35	72.7		2.0	4.2	BJ	0.81
10	SPA-4	J1TW95	7/16/14	5.9		0.26	358	X	0.097	0.0069	B	0.0053	9.4	X	0.12	69.4		0.091	48.4	X	0.39	80.0		2.0	4.3	BJ	0.82
11	SPA-5	J1TW98	7/16/14	6.4		1.2	345	X	0.091	0.0075	B	0.0055	8.6	X	0.11	74.4		0.43	47.6	X	0.36	66.3		2.0	4.3	BJ	0.82
12	SPA-6	J1TW99	7/16/14	3.4		0.24	304	X	0.088	0.0067	B	0.0052	8.2	X	0.11	60.3		0.083	44.0	X	0.35	68.9		2.0	3.9	BJ	0.82
13	SPA-8	J1TWC1	7/16/14	4.4		0.23	336	X	0.086	0.0079	B	0.0055	8.7	X	0.11	63.8		0.081	46.7	X	0.34	66.6		2.0	4.2	BJ	0.81
14	SPA-9	J1TWC2	7/16/14	3.8		0.24	307	X	0.088	0.0072	B	0.0050	9.4	X	0.11	57.7		0.082	43.7	X	0.35	58.0		2.0	4.3	BJ	0.81
15	SPA-10	J1TWC3	7/16/14	3.9		0.25	304	X	0.093	0.0067	B	0.0052	7.3	X	0.11	59.7		0.087	43.7	X	0.37	104		2.0	3.7	BJ	0.83
16	SPA-11	J1TWC4	7/16/14	3.7		0.24	314	X	0.088	0.0064	B	0.0050	7.8	X	0.11	60.0		0.083	43.0	X	0.35	110		2.0	3.9	BJ	0.82
17	SPA-12	J1TWC5	7/16/14	3.3		0.25	258	X	0.093	0.0068	B	0.0050	6.7	X	0.11	54.9		0.088	41.1	X	0.37	87.7		2.0	4.0	BJ	0.82

18 **Statistical Computation Input Data**

19	Sample	Sample	Sample	Lead	Manganese	Mercury	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
21	SPA-7	J1TWC0/ J1TWC6	7/16/14	3.7	326	0.0082	8.2	63.5	46.5	65.2	4.2
22	SPA-1	J1TW94	7/16/14	6.0	306	0.0080	8.3	72.3	48.0	101	3.3
23	SPA-2	J1TW97	7/16/14	3.9	305	0.0076	8.4	56.9	44.1	89.8	4.1
24	SPA-3	J1TW96	7/16/14	3.9	309	0.0076	8.0	62.4	43.3	72.7	4.2
25	SPA-4	J1TW95	7/16/14	5.9	358	0.0069	9.4	69.4	48.4	80.0	4.3
26	SPA-5	J1TW98	7/16/14	6.4	345	0.0075	8.6	74.4	47.6	66.3	4.3
27	SPA-6	J1TW99	7/16/14	3.4	304	0.0067	8.2	60.3	44.0	68.9	3.9
28	SPA-8	J1TWC1	7/16/14	4.4	336	0.0079	8.7	63.8	46.7	66.6	4.2
29	SPA-9	J1TWC2	7/16/14	3.8	307	0.0072	9.4	57.7	43.7	58.0	4.3
30	SPA-10	J1TWC3	7/16/14	3.9	304	0.0067	7.3	59.7	43.7	104	3.7
31	SPA-11	J1TWC4	7/16/14	3.7	314	0.0064	7.8	60.0	43.0	110	3.9
32	SPA-12	J1TWC5	7/16/14	3.3	258	0.0068	6.7	54.9	41.1	87.7	4.0

33 **Statistical Computations**

34		Lead	Manganese	Mercury	Nickel	Vanadium	Zinc	Chloride	Fluoride
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), 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), 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
37	% < Detection limit	0%	0%	0%	0%	0%	0%	0%	0%
38	Mean	4.4	314	0.0073	8.3	62.9	45.0	80.9	4.0
39	Standard deviation	1.1	25.3	0.00059	0.77	6.2	2.3	17.3	0.30
40	95% UCL on mean	4.9	326	0.0076	8.7	66.3	46.2	91.1	4.2
41	Maximum value	6.4	358	0.0085	9.4	74.4	48.4	110	4.5
42	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless otherwise noted**	10.2 GW & River Protection	512 GW Protection	0.33 GW & River 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?	NA	NA	NA	NA	NA	NA	NO	NO
45	> 10% above Cleanup Limit?	NA	NA	NA	NA	NA	NA	NO	NO
46	Any sample > 2X Cleanup Limit?	NA	NA	NA	NA	NA	NA	NO	NO
47	**WAC 173-340 Compliance?**	Because all values are below background (10.2 mg/kg) the WAC 173-340 3-part test is not required.	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.	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.	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.

CALCULATION SHEET

Washington Closure Hanford

Originator I. B. Berezovskiy
Project 100-D Area Closure Operations
Subject 100-D-106 Waste Site Cleanup Verification 95% UCL Calculations

Date 09/22/14
Job No. 14655

Calc. No. 0100D-CA-V0552
Checked R. J. Nielson

Rev. No. 0
Date 09/22/14
Sheet No. 12 of 20

1 **100-D-106 Waste Site Statistical Calculations**

2 **Verification Data - Staging Pile Area**

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-7	J1TWC0	7/16/14	7.7	J	0.32	5.6		0.36	30.4	CU	1.7
6	Duplicate of	J1TWC6	7/16/14	8.4	J	0.31	6.0		0.36	31.4	CU	1.7
7	SPA-1	J1TW94	7/16/14	10.8	J	0.31	15.6		0.36	58.4	M	1.7
8	SPA-2	J1TW97	7/16/14	16.9	J	0.32	13.5		0.36	99.8		1.7
9	SPA-3	J1TW96	7/16/14	12.5	J	0.31	9.7		0.36	69.4		1.7
10	SPA-4	J1TW95	7/16/14	7.7	J	0.31	4.6		0.36	211		1.7
11	SPA-5	J1TW98	7/16/14	4.1	J	0.31	2.2		0.36	16.0	CU	1.7
12	SPA-6	J1TW99	7/16/14	8.0	J	0.31	4.6	N	0.36	42.4		1.7
13	SPA-8	J1TWC1	7/16/14	8.9	J	0.31	7.0		0.36	28.4	CU	1.7
14	SPA-9	J1TWC2	7/16/14	3.9	J	0.31	1.6		0.36	24.6	CU	1.7
15	SPA-10	J1TWC3	7/16/14	14.8	J	0.32	12.5		0.36	40.2		1.7
16	SPA-11	J1TWC4	7/16/14	14.5	J	0.32	11.5		0.36	40.5		1.7
17	SPA-12	J1TWC5	7/16/14	7.6	J	0.31	5.9		0.36	36.5		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-7	J1TWC0/ J1TWC6	7/16/14	8.1	5.8	0.85
22	SPA-1	J1TW94	7/16/14	10.8	15.6	58.4
23	SPA-2	J1TW97	7/16/14	16.9	13.5	99.8
24	SPA-3	J1TW96	7/16/14	12.5	9.7	69.4
25	SPA-4	J1TW95	7/16/14	7.7	4.6	211
26	SPA-5	J1TW98	7/16/14	4.1	2.2	0.85
27	SPA-6	J1TW99	7/16/14	8.0	4.6	42.4
28	SPA-8	J1TWC1	7/16/14	8.9	7.0	0.85
29	SPA-9	J1TWC2	7/16/14	3.9	1.6	0.85
30	SPA-10	J1TWC3	7/16/14	14.8	12.5	40.2
31	SPA-11	J1TWC4	7/16/14	14.5	11.5	40.5
32	SPA-12	J1TWC5	7/16/14	7.6	5.9	36.5

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), lognormal and normal distribution rejected, use z-statistic.
36	N	12	12	12
37	% < Detection limit	0%	0%	33%
38	Mean	9.8	7.9	50.1
39	Standard deviation	4.2	4.6	59.5
40	95% UCL on mean	13.4	14.1	78.4
41	Maximum value	16.9	15.6	211
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?	NO	NO	NA
45	> 10% above Cleanup Limit?	NO	NO	NA
46	Any sample > 2X Cleanup Limit?	NO	NO	NA
47	**WAC 173-340 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.	Because all values are below background (237 mg/kg) the WAC 173-340 3-part test is not required.

MAXIMUM VALUE 3-PART TEST CALCULATION SHEET

Washington Closure Hanford

Originator I. B. Berezovskiy
Project 100-D Area Closure Operations
Subject 100-D-106 Waste Site Cleanup Verification 95% UCL Calculations

Date 09/22/14
Job No. 14655

Calc. No. 0100D-CA-V0552
Checked R. J. Nielson

Rev. No. 0
Date 09/22/14
Sheet No. 13 of 20

100-D-106 Waste Site Maximum Calculations

Verification Data - Staging Pilea Area

Sample Area	Sample Number	Sample Date	Boron mg/kg	Boron Q	Boron PQL	Molybdenum mg/kg	Molybdenum Q	Molybdenum PQL
SPA-7	J1TWC0	7/16/14	0.98	U	0.98	0.26	U	0.26
Duplicate of J1TWC0	J1TWC6	7/16/14	0.98	U	0.98	0.26	U	0.26
SPA-1	J1TW94	7/16/14	0.87	B	0.86	0.68	BM	0.23
SPA-2	J1TW97	7/16/14	0.95	U	0.95	0.25	U	0.25
SPA-3	J1TW96	7/16/14	0.87	U	0.87	0.30	B	0.23
SPA-4	J1TW95	7/16/14	0.95	U	0.95	0.78	B	0.25
SPA-5	J1TW98	7/16/14	0.89	U	0.89	0.24	U	0.24
SPA-6	J1TW99	7/16/14	0.86	U	0.86	0.23	U	0.23
SPA-8	J1TWC1	7/16/14	0.85	U	0.85	0.22	U	0.22
SPA-9	J1TWC2	7/16/14	0.86	U	0.86	0.23	U	0.23
SPA-10	J1TWC3	7/16/14	0.91	U	0.91	0.24	U	0.24
SPA-11	J1TWC4	7/16/14	0.86	U	0.86	0.23	U	0.23
SPA-12	J1TWC5	7/16/14	0.91	U	0.91	0.24	U	0.24

Statistical Computations

	Boron	Molybdenum
% < Detection limit	92%	75%
Maximum value	0.87	0.78
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)	320 River Protection	8 GW Protection
WAC 173-340 3-PART TEST		
Maximum > Cleanup Limit?	NO	NO
> 10% above Cleanup Limit?	NO	NO
Any sample > 2X Cleanup Limit?	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.

CALCULATION SHEET

Washington Closure Hanford

Originator	I. B. Berezovskiy	**Date**	09/22/14	**Calc. No.**	0100D-CA-V0552
Project	100-D Area Closure Operations	**Job No.**	14655	**Checked**	R. J. Nielson
Subject	100-D-106 Waste Site Cleanup Verification 95% UCL Calculations				

Rev. No. 0
Date 09/22/14
Sheet No. 14 of 20

Ecology Software (MTCAStat) Results, 100-D-106 Waste Site Excavation

Arsenic 95% UCL Calculation

DATA	ID
3.0	J1TWC8/ J1TWF1
4.2	J1TWC9
3.9	J1TWD0
3.4	J1TWD1
3.6	J1TWD2
3.9	J1TWD3
3.5	J1TWD4
3.7	J1TWD5
4.0	J1TWD6
4.0	J1TWD7
3.7	J1TWD8
3.3	J1TWD9
3.1	J1TWF0

Number of samples		Uncensored values	
Uncensored	13	Mean	3.6
Censored		Lognormal mean	3.6
Detection limit or PQL		Std. devn.	0.37
Method detection limit		Median	3.7
TOTAL	13	Min.	3.0
		Max.	4.2

Lognormal distribution? r-squared is: 0.964
Normal distribution? r-squared is: 0.974
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 3.8

Barium 95% UCL Calculation

DATA	ID
52.3	J1TWC8/ J1TWF1
60.7	J1TWC9
60.1	J1TWD0
100	J1TWD1
56.5	J1TWD2
55.3	J1TWD3
60.4	J1TWD4
60.1	J1TWD5
62.3	J1TWD6
61.7	J1TWD7
59.7	J1TWD8
113	J1TWD9
63.2	J1TWF0

Number of samples		Uncensored values	
Uncensored	13	Mean	66.6
Censored		Lognormal mean	66.5
Detection limit or PQL		Std. devn.	18.2
Method detection limit		Median	60.4
TOTAL	13	Min.	52.3
		Max.	113

Lognormal distribution? r-squared is: 0.664
Normal distribution? r-squared is: 0.607
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 74.9

Beryllium 95% UCL Calculation

DATA	ID
0.19	J1TWC8/ J1TWF1
0.19	J1TWC9
0.20	J1TWD0
0.19	J1TWD1
0.18	J1TWD2
0.18	J1TWD3
0.21	J1TWD4
0.19	J1TWD5
0.19	J1TWD6
0.18	J1TWD7
0.20	J1TWD8
0.25	J1TWD9
0.20	J1TWF0

Number of samples		Uncensored values	
Uncensored	13	Mean	0.20
Censored		Lognormal mean	0.20
Detection limit or PQL		Std. devn.	0.019
Method detection limit		Median	0.19
TOTAL	13	Min.	0.18
		Max.	0.25

Lognormal distribution? r-squared is: 0.770
Normal distribution? r-squared is: 0.728
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.20

Boron 95% UCL Calculation

DATA	ID
1.3	J1TWC8/ J1TWF1
1.6	J1TWC9
1.5	J1TWD0
1.2	J1TWD1
1.2	J1TWD2
1.1	J1TWD3
1.3	J1TWD4
1.1	J1TWD5
1.2	J1TWD6
1.1	J1TWD7
1.1	J1TWD8
4.8	J1TWD9
1.1	J1TWF0

Number of samples		Uncensored values	
Uncensored	13	Mean	1.5
Censored		Lognormal mean	1.5
Detection limit or PQL		Std. devn.	1.0
Method detection limit		Median	1.2
TOTAL	13	Min.	1.1
		Max.	4.8

Lognormal distribution? r-squared is: 0.531
Normal distribution? r-squared is: 0.406
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 2.0

Chromium 95% UCL Calculation

DATA	ID
10.9	J1TWC8/ J1TWF1
12.1	J1TWC9
11.8	J1TWD0
13.8	J1TWD1
10.4	J1TWD2
11.6	J1TWD3
11.1	J1TWD4
11.3	J1TWD5
12.1	J1TWD6
11.2	J1TWD7
10.7	J1TWD8
10.8	J1TWD9
9.8	J1TWF0

Number of samples		Uncensored values	
Uncensored	13	Mean	11.4
Censored		Lognormal mean	11.4
Detection limit or PQL		Std. devn.	0.99
Method detection limit		Median	11.2
TOTAL	13	Min.	9.8
		Max.	13.8

Lognormal distribution? r-squared is: 0.938
Normal distribution? r-squared is: 0.913
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 11.8

Cobalt 95% UCL Calculation

DATA	ID
5.6	J1TWC8/ J1TWF1
5.5	J1TWC9
5.6	J1TWD0
5.8	J1TWD1
5.4	J1TWD2
5.5	J1TWD3
5.7	J1TWD4
5.7	J1TWD5
5.5	J1TWD6
5.5	J1TWD7
6.4	J1TWD8
5.6	J1TWD9
5.5	J1TWF0

Number of samples		Uncensored values	
Uncensored	13	Mean	5.6
Censored		Lognormal mean	5.6
Detection limit or PQL		Std. devn.	0.25
Method detection limit		Median	5.55
TOTAL	13	Min.	5.4
		Max.	6.4

Lognormal distribution? r-squared is: 0.688
Normal distribution? r-squared is: 0.667
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 5.8

Copper 95% UCL Calculation

DATA	ID
11.2	J1TWC8/ J1TWF1
12.2	J1TWC9
12.1	J1TWD0
16.6	J1TWD1
10.1	J1TWD2
10.4	J1TWD3
11.1	J1TWD4
11.9	J1TWD5
11.1	J1TWD6
12.7	J1TWD7
11.6	J1TWD8
11.6	J1TWD9
9.5	J1TWF0

Number of samples		Uncensored values	
Uncensored	13	Mean	11.7
Censored		Lognormal mean	11.7
Detection limit or PQL		Std. devn.	1.7
Method detection limit		Median	11.6
TOTAL	13	Min.	9.5
		Max.	16.6

Lognormal distribution? r-squared is: 0.855
Normal distribution? r-squared is: 0.787
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 12.5

Hexavalent Chromium 95% UCL Calculation

DATA	ID
0.348	J1TWC8/ J1TWF1
0.295	J1TWC9
0.292	J1TWD0
0.316	J1TWD1
0.311	J1TWD2
0.209	J1TWD3
0.294	J1TWD4
0.231	J1TWD5
0.0775	J1TWD6
0.231	J1TWD7
0.231	J1TWD8
0.0775	J1TWD9
0.334	J1TWF0

Number of samples		Uncensored values	
Uncensored	13	Mean	0.250
Censored		Lognormal mean	0.259
Detection limit or PQL		Std. devn.	0.088
Method detection limit		Median	0.292
TOTAL	13	Min.	0.078
		Max.	0.348

Lognormal distribution? r-squared is: 0.719
Normal distribution? r-squared is: 0.853
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.290

Lead 95% UCL Calculation

DATA	ID
10.8	J1TWC8/ J1TWF1
3.8	J1TWC9
4.8	J1TWD0
5.1	J1TWD1
4.8	J1TWD2
3.8	J1TWD3
4.6	J1TWD4
3.8	J1TWD5
5.0	J1TWD6
3.6	J1TWD7
3.7	J1TWD8
4.0	J1TWD9
3.4	J1TWF0

Number of samples		Uncensored values	
Uncensored	13	Mean	4.7
Censored		Lognormal mean	4.7
Detection limit or PQL		Std. devn.	1.9
Method detection limit		Median	4.0
TOTAL	13	Min.	3.4
		Max.	10.8

Lognormal distribution? r-squared is: 0.709
Normal distribution? r-squared is: 0.560
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 5.6

CALCULATION SHEET

Washington Closure Hanford

Originator	I. B. Berezovskiy	**Date**	09/22/14	**Calc. No.**	0100D-CA-V0552
Project	100-D Area Closure Operations	**Job No.**	14655	**Checked**	R. J. Nielson
Subject	100-D-106 Waste Site Cleanup Verification 95% UCL Calculations				

Rev. No. 0
Date 09/22/14
Sheet No. 15 of 20

Ecology Software (MTCAStat) Results, 100-D-106 Waste Site Excavation

Manganese 95% UCL Calculation

DATA	ID
239	J1TWC8/ J1TWF1
253	J1TWC9
255	J1TWD0
269	J1TWD1
249	J1TWD2
245	J1TWD3
249	J1TWD4
254	J1TWD5
239	J1TWD6
236	J1TWD7
251	J1TWD8
257	J1TWD9
238	J1TWF0

Number of samples		Uncensored values	
Uncensored	13	Mean	249
Censored		Lognormal mean	249
Detection limit or PQL		Std. devn.	9.4
Method detection limit		Median	249
TOTAL	13	Min.	236
		Max.	269

Lognormal distribution? r-squared is: 0.942
Normal distribution? r-squared is: 0.938
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 253

Nickel 95% UCL Calculation

DATA	ID
10.9	J1TWC8/ J1TWF1
11.8	J1TWC9
10.2	J1TWD0
11.8	J1TWD1
9.6	J1TWD2
11.1	J1TWD3
10.7	J1TWD4
10.6	J1TWD5
11.3	J1TWD6
10.7	J1TWD7
10.5	J1TWD8
10.3	J1TWD9
9.5	J1TWF0

Number of samples		Uncensored values	
Uncensored	13	Mean	10.7
Censored		Lognormal mean	10.7
Detection limit or PQL		Std. devn.	0.71
Method detection limit		Median	10.7
TOTAL	13	Min.	9.5
		Max.	11.8

Lognormal distribution? r-squared is: 0.965
Normal distribution? r-squared is: 0.967
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 11.1

Vanadium 95% UCL Calculation

DATA	ID
31.5	J1TWC8/ J1TWF1
30.9	J1TWC9
32.7	J1TWD0
32.3	J1TWD1
32.4	J1TWD2
31.6	J1TWD3
31.8	J1TWD4
33.9	J1TWD5
29.3	J1TWD6
30.9	J1TWD7
35.9	J1TWD8
32.3	J1TWD9
30.6	J1TWF0

Number of samples		Uncensored values	
Uncensored	13	Mean	32.0
Censored		Lognormal mean	32.0
Detection limit or PQL		Std. devn.	1.6
Method detection limit		Median	31.8
TOTAL	13	Min.	29.3
		Max.	35.9

Lognormal distribution? r-squared is: 0.929
Normal distribution? r-squared is: 0.916
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 32.8

Zinc 95% UCL Calculation

DATA	ID
30.7	J1TWC8/ J1TWF1
86.1	J1TWC9
35.7	J1TWD0
67.0	J1TWD1
30.6	J1TWD2
29.7	J1TWD3
31.1	J1TWD4
31.1	J1TWD5
32.2	J1TWD6
30.1	J1TWD7
31.7	J1TWD8
32.8	J1TWD9
30.5	J1TWF0

Number of samples		Uncensored values	
Uncensored	13	Mean	38.4
Censored		Lognormal mean	38.1
Detection limit or PQL		Std. devn.	17.4
Method detection limit		Median	31.1
TOTAL	13	Min.	29.7
		Max.	86.1

Lognormal distribution? r-squared is: 0.568
Normal distribution? r-squared is: 0.522
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 46.4

Chloride 95% UCL Calculation

DATA	ID
28.7	J1TWC8/ J1TWF1
10.5	J1TWC9
19.5	J1TWD0
12.2	J1TWD1
12.2	J1TWD2
9.6	J1TWD3
8.6	J1TWD4
13.8	J1TWD5
9.2	J1TWD6
11.1	J1TWD7
17.4	J1TWD8
7.9	J1TWD9
12.7	J1TWF0

Number of samples		Uncensored values	
Uncensored	13	Mean	13.3
Censored		Lognormal mean	13.3
Detection limit or PQL		Std. devn.	5.7
Method detection limit		Median	12.2
TOTAL	13	Min.	7.9
		Max.	28.7

Lognormal distribution? r-squared is: 0.923
Normal distribution? r-squared is: 0.797
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 16.4

Nitrogen in Nitrate 95% UCL Calculation

DATA	ID
1.9	J1TWC8/ J1TWF1
6.6	J1TWC9
2.3	J1TWD0
1.8	J1TWD1
4.0	J1TWD2
2.6	J1TWD3
2.5	J1TWD4
1.3	J1TWD5
1.6	J1TWD6
2.7	J1TWD7
2.1	J1TWD8
2.2	J1TWD9
2.1	J1TWF0

Number of samples		Uncensored values	
Uncensored	13	Mean	2.6
Censored		Lognormal mean	2.6
Detection limit or PQL		Std. devn.	1.37
Method detection limit		Median	2.2
TOTAL	13	Min.	1.3
		Max.	6.6

Lognormal distribution? r-squared is: 0.882
Normal distribution? r-squared is: 0.695
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 3.2

Nitrogen in Nitrite and Nitrate 95% UCL Calculation

DATA	ID
0.56	J1TWC8/ J1TWF1
5.1	J1TWC9
2.2	J1TWD0
1.5	J1TWD1
4.7	J1TWD2
3.0	J1TWD3
3.1	J1TWD4
1.1	J1TWD5
1.8	J1TWD6
3.0	J1TWD7
2.4	J1TWD8
2.6	J1TWD9
3.3	J1TWF0

Number of samples		Uncensored values	
Uncensored	13	Mean	2.6
Censored		Lognormal mean	2.8
Detection limit or PQL		Std. devn.	1.3
Method detection limit		Median	2.60
TOTAL	13	Min.	0.56
		Max.	5.1

Lognormal distribution? r-squared is: 0.917
Normal distribution? r-squared is: 0.964
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 4.0

Sulfate 95% UCL Calculation

DATA	ID
27.6	J1TWC8/ J1TWF1
23.7	J1TWC9
51.5	J1TWD0
27.3	J1TWD1
35.0	J1TWD2
30.3	J1TWD3
16.5	J1TWD4
35.5	J1TWD5
16.5	J1TWD6
24.2	J1TWD7
42.1	J1TWD8
10.9	J1TWD9
33.9	J1TWF0

Number of samples		Uncensored values	
Uncensored	13	Mean	28.8
Censored		Lognormal mean	29.2
Detection limit or PQL		Std. devn.	11.1
Method detection limit		Median	27.6
TOTAL	13	Min.	10.9
		Max.	51.5

Lognormal distribution? r-squared is: 0.953
Normal distribution? r-squared is: 0.975
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 37.5

CALCULATION SHEET

Washington Closure Hanford

Originator	I. B. Berezovskiy	**Date**	09/22/14	**Calc. No.**	0100D-CA-V0552
Project	100-D Area Closure Operations	**Job No.**	14655	**Checked**	R. J. Nielson
Subject	100-D-106 Waste Site Cleanup Verification 95% UCL Calculations				

Rev. No. 0
Date 09/22/14
Sheet No. 16 of 20

Ecology Software (MTCAStat) Results, 100-D-106 Waste Site Staging Pile Area

Antimony 95% UCL Calculation

DATA	ID
0.74	J1TWC0/ J1TWC6
0.85	J1TW94
0.76	J1TW97
0.75	J1TW96
0.73	J1TW95
0.85	J1TW98
0.54	J1TW99
0.51	J1TWC1
0.50	J1TWC2
0.48	J1TWC3
0.56	J1TWC4
0.38	J1TWC5

Number of samples		Uncensored values	
Uncensored	12	Mean	0.64
Censored		Lognormal mean	0.64
Detection limit or PQL		Std. devn.	0.16
Method detection limit		Median	0.65
TOTAL	12	Min.	0.38
		Max.	0.85

Lognormal distribution? r-squared is: 0.920
Normal distribution? r-squared is: 0.924
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 0.74

Arsenic 95% UCL Calculation

DATA	ID
2.5	J1TWC0/ J1TWC6
3.2	J1TW94
3.4	J1TW97
2.7	J1TW96
3.3	J1TW95
2.8	J1TW98
2.7	J1TW99
2.7	J1TWC1
3.2	J1TWC2
2.6	J1TWC3
2.8	J1TWC4
2.4	J1TWC5

Number of samples		Uncensored values	
Uncensored	12	Mean	2.9
Censored		Lognormal mean	2.9
Detection limit or PQL		Std. devn.	0.33
Method detection limit		Median	2.75
TOTAL	12	Min.	2.4
		Max.	3.4

Lognormal distribution? r-squared is: 0.930
Normal distribution? r-squared is: 0.918
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 3.0

Barium 95% UCL Calculation

DATA	ID
55.7	J1TWC0/ J1TWC6
53.0	J1TW94
53.5	J1TW97
46.7	J1TW96
77.2	J1TW95
48.1	J1TW98
49.0	J1TW99
54.0	J1TWC1
52.8	J1TWC2
50.8	J1TWC3
48.0	J1TWC4
46.7	J1TWC5

Number of samples		Uncensored values	
Uncensored	12	Mean	53.0
Censored		Lognormal mean	53.0
Detection limit or PQL		Std. devn.	8.2
Method detection limit		Median	51.8
TOTAL	12	Min.	46.7
		Max.	77.2

Lognormal distribution? r-squared is: 0.716
Normal distribution? r-squared is: 0.648
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 56.9

Beryllium 95% UCL Calculation

DATA	ID
0.13	J1TWC0/ J1TWC6
0.070	J1TW94
0.15	J1TW97
0.13	J1TW96
0.14	J1TW95
0.075	J1TW98
0.12	J1TW99
0.17	J1TWC1
0.15	J1TWC2
0.13	J1TWC3
0.14	J1TWC4
0.12	J1TWC5

Number of samples		Uncensored values	
Uncensored	12	Mean	0.13
Censored		Lognormal mean	0.13
Detection limit or PQL		Std. devn.	0.029
Method detection limit		Median	0.13
TOTAL	12	Min.	0.07
		Max.	0.17

Lognormal distribution? r-squared is: 0.805
Normal distribution? r-squared is: 0.880
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.15

Chromium 95% UCL Calculation

DATA	ID
5.0	J1TWC0/ J1TWC6
5.0	J1TW94
6.3	J1TW97
5.5	J1TW96
5.4	J1TW95
5.9	J1TW98
5.1	J1TW99
6.0	J1TWC1
6.0	J1TWC2
5.2	J1TWC3
5.2	J1TWC4
3.8	J1TWC5

Number of samples		Uncensored values	
Uncensored	12	Mean	5.4
Censored		Lognormal mean	5.4
Detection limit or PQL		Std. devn.	0.67
Method detection limit		Median	5.3
TOTAL	12	Min.	3.8
		Max.	6.3

Lognormal distribution? r-squared is: 0.859
Normal distribution? r-squared is: 0.905
Recommendations:
Use normal distribution.

UCL (based on t-statistic) is 5.7

Cobalt 95% UCL Calculation

DATA	ID
10.1	J1TWC0/ J1TWC6
11.9	J1TW94
9.2	J1TW97
9.2	J1TW96
11.0	J1TW95
12.3	J1TW98
9.5	J1TW99
10.2	J1TWC1
9.5	J1TWC2
9.2	J1TWC3
9.6	J1TWC4
9.0	J1TWC5

Number of samples		Uncensored values	
Uncensored	12	Mean	10.1
Censored		Lognormal mean	10.1
Detection limit or PQL		Std. devn.	1.1
Method detection limit		Median	9.6
TOTAL	12	Min.	9.0
		Max.	12.3

Lognormal distribution? r-squared is: 0.855
Normal distribution? r-squared is: 0.835
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 10.6

Copper 95% UCL Calculation

DATA	ID
14.0	J1TWC0/ J1TWC6
17.2	J1TW94
15.3	J1TW97
13.3	J1TW96
15.0	J1TW95
15.9	J1TW98
12.7	J1TW99
14.6	J1TWC1
14.1	J1TWC2
13.1	J1TWC3
13.2	J1TWC4
14.1	J1TWC5

Number of samples		Uncensored values	
Uncensored	12	Mean	14.4
Censored		Lognormal mean	14.4
Detection limit or PQL		Std. devn.	1.31
Method detection limit		Median	14.1
TOTAL	12	Min.	12.7
		Max.	17.2

Lognormal distribution? r-squared is: 0.957
Normal distribution? r-squared is: 0.941
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 15.1

Hexavalent Chromium 95% UCL Calculation

DATA	ID
0.376	J1TWC0/ J1TWC6
0.0775	J1TW94
0.315	J1TW97
0.356	J1TW96
0.316	J1TW95
0.294	J1TW98
0.316	J1TW99
0.335	J1TWC1
0.336	J1TWC2
0.0775	J1TWC3
0.316	J1TWC4
0.0775	J1TWC5

Number of samples		Uncensored values	
Uncensored	12	Mean	0.266
Censored		Lognormal mean	0.284
Detection limit or PQL		Std. devn.	0.116
Method detection limit		Median	0.316
TOTAL	12	Min.	0.0775
		Max.	0.376

Lognormal distribution? r-squared is: 0.651
Normal distribution? r-squared is: 0.724
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.321

Lead 95% UCL Calculation

DATA	ID
3.7	J1TWC0/ J1TWC6
6.0	J1TW94
3.9	J1TW97
3.9	J1TW96
5.9	J1TW95
6.4	J1TW98
3.4	J1TW99
4.4	J1TWC1
3.8	J1TWC2
3.9	J1TWC3
3.7	J1TWC4
3.3	J1TWC5

Number of samples		Uncensored values	
Uncensored	12	Mean	4.4
Censored		Lognormal mean	4.4
Detection limit or PQL		Std. devn.	1.1
Method detection limit		Median	3.9
TOTAL	12	Min.	3.3
		Max.	6.4

Lognormal distribution? r-squared is: 0.831
Normal distribution? r-squared is: 0.791
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 4.9

CALCULATION SHEET

Washington Closure Hanford

Originator	I. B. Berezovskiy	Date	09/22/14	Calc. No.	0100D-CA-V0552
Project	100-D Area Closure Operations	Job No.	14655	Checked	R. J. Nielson
Subject	100-D-106 Waste Site Cleanup Verification 95% UCL Calculations				

Rev. No. 0
Date 09/22/14
Sheet No. 17 of 20

Ecology Software (MTCAStat) Results, 100-D-106 Waste Site Staging Pile Area

Manganese 95% UCL Calculation

DATA	ID
326	J1TWC0/ J1TWC6
306	J1TW94
305	J1TW97
309	J1TW96
358	J1TW95
345	J1TW98
304	J1TW99
336	J1TWC1
307	J1TWC2
304	J1TWC3
314	J1TWC4
258	J1TWC5

Number of samples		Uncensored values	
Uncensored	12	Mean	314
Censored		Lognormal mean	314
Detection limit or PQL		Std. devn.	25.3
Method detection limit		Median	308
TOTAL	12	Min.	258
		Max.	358

Lognormal distribution? r-squared is: 0.865
Normal distribution? r-squared is: 0.883
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 326

Mercury 95% UCL Calculation

DATA	ID
0.0082	J1TWC0/ J1TWC6
0.0080	J1TW94
0.0076	J1TW97
0.0076	J1TW96
0.0069	J1TW95
0.0075	J1TW98
0.0067	J1TW99
0.0079	J1TWC1
0.0072	J1TWC2
0.0067	J1TWC3
0.0064	J1TWC4
0.0068	J1TWC5

Number of samples		Uncensored values	
Uncensored	12	Mean	0.0073
Censored		Lognormal mean	0.0073
Detection limit or PQL		Std. devn.	0.00059
Method detection limit		Median	0.0074
TOTAL	12	Min.	0.0064
		Max.	0.0082

Lognormal distribution? r-squared is: 0.958
Normal distribution? r-squared is: 0.958
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 0.0076

Nickel 95% UCL Calculation

DATA	ID
8.2	J1TWC0/ J1TWC6
8.3	J1TW94
8.4	J1TW97
8.0	J1TW96
9.4	J1TW95
8.6	J1TW98
8.2	J1TW99
8.7	J1TWC1
9.4	J1TWC2
7.3	J1TWC3
7.8	J1TWC4
6.7	J1TWC5

Number of samples		Uncensored values	
Uncensored	12	Mean	8.3
Censored		Lognormal mean	8.3
Detection limit or PQL		Std. devn.	0.77
Method detection limit		Median	8.3
TOTAL	12	Min.	6.7
		Max.	9.4

Lognormal distribution? r-squared is: 0.940
Normal distribution? r-squared is: 0.953
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 8.7

Vanadium 95% UCL Calculation

DATA	ID
63.5	J1TWC0/ J1TWC6
72.3	J1TW94
56.9	J1TW97
62.4	J1TW96
69.4	J1TW95
74.4	J1TW98
60.3	J1TW99
63.8	J1TWC1
57.7	J1TWC2
59.7	J1TWC3
60.0	J1TWC4
54.9	J1TWC5

Number of samples		Uncensored values	
Uncensored	12	Mean	62.9
Censored		Lognormal mean	63.0
Detection limit or PQL		Std. devn.	6.2
Method detection limit		Median	61.4
TOTAL	12	Min.	54.9
		Max.	74.4

Lognormal distribution? r-squared is: 0.945
Normal distribution? r-squared is: 0.929
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 66.3

Zinc 95% UCL Calculation

DATA	ID
46.5	J1TWC0/ J1TWC6
48.0	J1TW94
44.1	J1TW97
43.3	J1TW96
48.4	J1TW95
47.6	J1TW98
44.0	J1TW99
46.7	J1TWC1
43.7	J1TWC2
43.7	J1TWC3
43.0	J1TWC4
41.1	J1TWC5

Number of samples		Uncensored values	
Uncensored	12	Mean	45.0
Censored		Lognormal mean	45.0
Detection limit or PQL		Std. devn.	2.3
Method detection limit		Median	44.1
TOTAL	12	Min.	41.1
		Max.	48.4

Lognormal distribution? r-squared is: 0.931
Normal distribution? r-squared is: 0.929
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 46.2

Chloride 95% UCL Calculation

DATA	ID
65.2	J1TWC0/ J1TWC6
101	J1TW94
89.8	J1TW97
72.7	J1TW96
80.0	J1TW95
66.3	J1TW98
68.9	J1TW99
66.6	J1TWC1
58.0	J1TWC2
104	J1TWC3
110	J1TWC4
87.7	J1TWC5

Number of samples		Uncensored values	
Uncensored	12	Mean	80.9
Censored		Lognormal mean	81.0
Detection limit or PQL		Std. devn.	17.3
Method detection limit		Median	76.4
TOTAL	12	Min.	58.0
		Max.	110

Lognormal distribution? r-squared is: 0.950
Normal distribution? r-squared is: 0.935
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 91.1

Fluoride 95% UCL Calculation

DATA	ID
4.2	J1TWC0/ J1TWC6
3.3	J1TW94
4.1	J1TW97
4.2	J1TW96
4.3	J1TW95
4.3	J1TW98
3.9	J1TW99
4.2	J1TWC1
4.3	J1TWC2
3.7	J1TWC3
3.9	J1TWC4
4.0	J1TWC5

Number of samples		Uncensored values	
Uncensored	12	Mean	4.0
Censored		Lognormal mean	4.0
Detection limit or PQL		Std. devn.	0.30
Method detection limit		Median	4.1
TOTAL	12	Min.	3.3
		Max.	4.3

Lognormal distribution? r-squared is: 0.820
Normal distribution? r-squared is: 0.845
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 4.2

Nitrogen in Nitrate 95% UCL Calculation

DATA	ID
8.1	J1TWC0/ J1TWC6
10.8	J1TW94
16.9	J1TW97
12.5	J1TW96
7.7	J1TW95
4.1	J1TW98
8.0	J1TW99
8.9	J1TWC1
3.9	J1TWC2
14.8	J1TWC3
14.5	J1TWC4
7.6	J1TWC5

Number of samples		Uncensored values	
Uncensored	12	Mean	9.8
Censored		Lognormal mean	10.0
Detection limit or PQL		Std. devn.	4.2
Method detection limit		Median	8.5
TOTAL	12	Min.	3.9
		Max.	16.9

Lognormal distribution? r-squared is: 0.930
Normal distribution? r-squared is: 0.951
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 13.4

Nitrogen in Nitrite and Nitrate 95% UCL Calculation

DATA	ID
5.8	J1TWC0/ J1TWC6
15.6	J1TW94
13.5	J1TW97
9.7	J1TW96
4.6	J1TW95
2.2	J1TW98
4.6	J1TW99
7.0	J1TWC1
1.6	J1TWC2
12.5	J1TWC3
11.5	J1TWC4
5.9	J1TWC5

Number of samples		Uncensored values	
Uncensored	12	Mean	7.9
Censored		Lognormal mean	8.3
Detection limit or PQL		Std. devn.	4.6
Method detection limit		Median	6.5
TOTAL	12	Min.	1.6
		Max.	15.6

Lognormal distribution? r-squared is: 0.936
Normal distribution? r-squared is: 0.958
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 14.1

CALCULATION SHEET

Washington Closure Hanford

Originator I. B. Berezovskiy
Project 100-D Area Closure Operations
Subject 100-D-106 Waste Site Cleanup Verification 95% UCL Calculations

Date 09/22/14
Job No. 14655

Calc. No. 0100D-CA-V0552
Checked R. J. Nielson

Rev. No. 0
Date 09/22/14
Sheet No. 18 of 20

Ecology Software (MTCAStat) Results, 100-D-106 Waste Site Staging Pile Area

DATA	ID	Sulfate 95% UCL Calculation			
0.85	J1TWC0/ J1TWC6				
58.4	J1TW94				
99.8	J1TW97	Number of samples		Uncensored values	
69.4	J1TW96	Uncensored	12	Mean	50.1
211	J1TW95	Censored		Lognormal mean	154
0.85	J1TW98	Detection limit or PQL		Std. devn.	59.5
42.4	J1TW99	Method detection limit		Median	40.4
0.85	J1TWC1	TOTAL	12	Min.	0.85
0.85	J1TWC2			Max.	211
40.2	J1TWC3				
40.5	J1TWC4				
36.5	J1TWC5				

Lognormal distribution? r-squared is: 0.796

Normal distribution? r-squared is: 0.761

Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 78.4

CALCULATION SHEET

Washington Closure Hanford

Originator I. B. Berezovskiy
Project 100-D Area Closure Operations
Subject 100-D-106 Waste Site Cleanup Verification 95% UCL Calculations

Date 09/22/14
Job No. 14655

Calc. No. 0100D-CA-V0552
Checked R. J. Nielson

Rev. No. 0
Date 09/22/14
Sheet No. 19 of 20

Duplicate Analysis - 100-D-106 Waste Site Excavation

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
EXC-1	J1TWC8	7/22/14	6840		1.4	3.2		0.59	50.1		0.068	0.18		0.029	1.4	B	0.87	5760		12.6	10.8	X	0.052	5.6	X	0.089
Duplicate of J1TWC8	J1TWF1	7/22/14	6600		1.4	2.8		0.61	54.5		0.070	0.19		0.031	1.1	B	0.91	6060		13.1	10.9	X	0.054	5.5	X	0.093

Analysis:

TDL		5	10	2	0.2	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	3.6%		8.4%			5.1%	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-106 Waste Site Excavation

Sampling Area	HEIS 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
EXC-1	J1TWC8	7/22/14	11.6		0.19	0.274		0.155	14600		3.4	8.1	M	0.24	4230		3.3	241		0.089	0.0068	BM	0.0051	11.0	X	0.11
Duplicate of J1TWC8	J1TWF1	7/22/14	10.7		0.20	0.421		0.155	14600		3.5	13.4		0.25	4350		3.4	236		0.093	0.0084	B	0.0051	10.7	X	0.11

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	8.1%		0.0%		2.8%	2.1%		
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable

Duplicate Analysis - 100-D-106 Waste Site Excavation

Sampling Area	HEIS Number	Sample Date	Potassium			Silicon			Sodium			Vanadium			Zinc			Chloride			Nitrogen in 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	J1TWC8	7/22/14	974		36.5	278	N	5.0	252		52.6	31.3		0.084	29.8	X	0.35	29	M	2.0	1.9	B	0.31	40.4	MN	1.7
Duplicate of J1TWC8	J1TWF1	7/22/14	1030		38.0	230		5.2	166		54.7	31.6		0.087	31.5	X	0.37	28.4	N	2.0	1.9	B	0.31	14.8	MN	1.7

Analysis:

TDL		400	2	50	2.5	1	2	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?	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		18.9%		1.0%	5.5%	2.1%		
	Difference > 2 TDL?	No - acceptable	Not applicable	No - acceptable	Not applicable	Not applicable	Not applicable	No - acceptable	Yes - assess further

Duplicate Analysis - 100-D-106 Waste Site Excavation

Sampling Area	HEIS Number	Sample Date	Dichlorophenyl-dichloroethylene			Dichlorofiphenyl-trichloroethane		
			ug/kg	Q	PQL	ug/kg	Q	PQL
EXC-1	J1TWC8	7/22/14	0.39	J	0.24	1.1	J	0.59
Duplicate of J1TWC8	J1TWF1	7/22/14	0.51	J	0.23	1.4	JY	0.58

Analysis:

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

CALCULATION SHEET

Washington Closure Hanford

Originator I. B. Berezovskiy
Project 100-D Area Closure Operations
Subject 100-D-106 Waste Site Cleanup Verification 95% UCL Calculations

Date 09/22/14
Job No. 14655

Calc. No. 0100D-CA-V0552
Checked R. J. Nielson

Rev. No. 0
Date 09/22/14
Sheet No. 20 of 20

Duplicate Analysis - 100-D-106 Waste Site Staging Pile Area

Sampling Area	Sample Number	Sample Date	Aluminum			Antimony			Arsenic			Barium			Beryllium			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-7	J1TWC0	7/16/14	4880	X	1.5	0.82	J	0.38	2.6		0.66	50.2	X	0.076	0.11	BJ	0.033	7320	X	14.1	4.5	X	0.058	10.1		0.10
Duplicate of J1TWC0	J1TWC6	7/16/14	5420	X	1.6	0.66	J	0.38	2.4		0.66	61.1	X	0.076	0.15	BJ	0.033	7460	X	14.1	5.4	X	0.058	10.0		0.10

Analysis:

TDL			5			0.6			10			2			0.2			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)			No-Stop (acceptable)			Yes (calc RPD)			No-Stop (acceptable)			Yes (calc RPD)			No-Stop (acceptable)			No-Stop (acceptable)		
	RPD		10.5%									19.6%						1.9%								
	Difference > 2 TDL?		Not applicable			No - acceptable			No - acceptable			Not applicable			No - acceptable			Not applicable			No - acceptable			No - acceptable		

Duplicate Analysis - 100-D-106 Waste Site Staging Pile Area

Sampling Area	HEIS 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-7	J1TWC0	7/16/14	14.2		0.22	0.40		0.155	26200	X	3.8	3.7		0.27	4560	X	3.7	314	X	0.10	0.0085	B	0.0055	7.5	X	0.12
Duplicate of J1TWC0	J1TWC6	7/16/14	13.8		0.22	0.36		0.155	25500	X	3.8	3.7		0.27	4880	X	3.7	337	X	0.10	0.0079	B	0.0053	8.9	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		2.9%						2.7%						6.8%			7.1%								
	Difference > 2 TDL?		Not applicable			No - acceptable			Not applicable			No - acceptable			Not applicable			Not applicable			No - acceptable			No - acceptable		

Duplicate Analysis - 100-D-106 Waste Site Staging Pile Area

Sampling Area	HEIS Number	Sample Date	Potassium			Silicon			Sodium			Vanadium			Zinc			Chloride			Fluoride			Nitrogen in 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-7	J1TWC0	7/16/14	745		41.0	114	J	5.7	376		59.0	66.0		0.094	47.5	X	0.40	58.2		2.0	3.8	BJ	0.82	7.7	J	0.32
Duplicate of J1TWC0	J1TWC6	7/16/14	822		41.0	160	J	5.7	380		59.0	61.0		0.094	45.4	X	0.40	72.2		2.0	4.5	BJ	0.82	8.4	J	0.31

Analysis:

TDL			400			2			50			2.5			1			2			5			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)			Yes (calc RPD)		
	RPD					33.6%			1.1%			7.9%			4.5%			21.5%						8.7%		
	Difference > 2 TDL?		No - acceptable			Not applicable			Not applicable			Not applicable			Not applicable			Not applicable			No - acceptable			Not applicable		

Duplicate Analysis - 100-D-106 Waste Site Staging Pile Area

Sampling Area	HEIS Number	Sample Date	Nitrogen in Nitrite and Nitrate			Phosphorus in Phosphate		
			mg/kg	Q	PQL	mg/kg	Q	PQL
SPA-7	J1TWC0	7/16/14	5.6		0.36	2.7	BJ	1.2
Duplicate of J1TWC0	J1TWC6	7/16/14	6.0		0.36	2.7	BJ	1.2

Analysis:

TDL			0.75	10
Duplicate Analysis	Both > PQL?		Yes (continue)	Yes (continue)
	Both >5xTDL?		Yes (calc RPD)	No-Stop (acceptable)
	RPD		6.9%	
	Difference > 2 TDL?		Not applicable	No - acceptable

Attachment 1. 100-D-106 Waste Site Verification Sampling Results - Metals.

Location	HEIS Number	Date	Aluminum			Antimony			Arsenic			Barium			Beryllium			Boron		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-1	J1TWC8	7/22/14	6840		1.4	0.34	U	0.34	3.2		0.59	50.1		0.068	0.18		0.029	1.4	B	0.87
Duplicate of J1TWC8	J1TWF1	7/22/14	6600		1.4	0.35	U	0.35	2.8		0.61	54.5		0.070	0.19		0.031	1.1	B	0.91
EXC-2	J1TWC9	7/22/14	7090		1.3	0.43	B	0.33	4.2		0.57	60.7		0.066	0.19		0.029	1.6	B	0.85
EXC-3	J1TWD0	7/22/14	6990		1.5	0.44	B	0.36	3.9		0.63	60.1		0.073	0.20		0.031	1.5	B	0.94
EXC-4	J1TWD1	7/22/14	7260		1.3	0.32	U	0.32	3.4		0.56	100		0.064	0.19		0.028	1.2	B	0.83
EXC-5	J1TWD2	7/22/14	6810		1.3	0.44	B	0.33	3.6		0.57	56.5		0.065	0.18		0.028	1.2	B	0.84
EXC-6	J1TWD3	7/22/14	6690		1.5	0.36	U	0.36	3.9		0.62	55.3		0.071	0.18	B	0.031	1.1	B	0.92
EXC-7	J1TWD4	7/22/14	7110		1.5	0.37	U	0.37	3.5		0.64	60.4		0.074	0.21		0.032	1.3	B	0.95
EXC-8	J1TWD5	7/22/14	6970		1.4	0.35	U	0.35	3.7		0.61	60.1		0.070	0.19		0.031	1.1	B	0.91
EXC-9	J1TWD6	7/22/14	6700		1.4	0.41	B	0.35	4.0		0.60	62.3		0.069	0.19		0.030	1.2	B	0.89
EXC-10	J1TWD7	7/22/14	6680		1.4	0.34	U	0.34	4.0		0.58	61.7		0.067	0.18		0.029	1.1	B	0.86
EXC-11	J1TWD8	7/22/14	6810		1.5	0.37	U	0.37	3.7		0.64	59.7		0.074	0.20		0.032	1.1	B	0.96
EXC-12	J1TWD9	7/22/14	7600		1.5	0.37	U	0.37	3.3		0.64	113		0.074	0.25		0.032	4.8		0.96
EXC-13	J1TWF0	7/22/14	7010		1.5	0.36	U	0.36	3.1		0.63	63.2		0.072	0.20		0.031	1.1	B	0.93
SPA-7	J1TWC0	7/16/14	4880	X	1.5	0.82	J	0.38	2.6		0.66	50.2	X	0.076	0.11	BJ	0.033	0.98	U	0.98
Duplicate of J1TWC0	J1TWC6	7/16/14	5420	X	1.6	0.66	J	0.38	2.4		0.66	61.1	X	0.076	0.15	BJ	0.033	0.98	U	0.98
SPA-1	J1TW94	7/16/14	6000	X	1.4	1.7	UJ	1.7	3.2		0.58	53.0	X	0.066	0.14	UNJ	0.14	0.87	B	0.86
SPA-2	J1TW97	7/16/14	5670	X	1.5	0.76	J	0.37	3.4		0.64	53.5	X	0.074	0.15	BJ	0.032	0.95	U	0.95
SPA-3	J1TW96	7/16/14	5380	X	1.4	0.75	J	0.34	2.7		0.58	46.7	X	0.067	0.13	BJ	0.029	0.87	U	0.87
SPA-4	J1TW95	7/16/14	6080	X	1.5	0.73	J	0.37	3.3		0.64	77.2	X	0.074	0.14	BJ	0.032	0.95	U	0.95
SPA-5	J1TW98	7/16/14	5530	X	1.4	1.7	UJ	1.7	2.8		0.60	48.1	X	0.069	0.15	UJ	0.15	0.89	U	0.89
SPA-6	J1TW99	7/16/14	4670	X	1.4	0.54	J	0.33	2.7		0.58	49.0	X	0.067	0.12	BJ	0.029	0.86	U	0.86
SPA-8	J1TWC1	7/16/14	6080	X	1.3	0.51	BJ	0.33	2.7		0.57	54.0	X	0.066	0.17	J	0.028	0.85	U	0.85
SPA-9	J1TWC2	7/16/14	5780	X	1.4	0.50	BJ	0.33	3.2		0.58	52.8	X	0.067	0.15	BJ	0.029	0.86	U	0.86
SPA-10	J1TWC3	7/16/14	5070	X	1.4	0.48	BJ	0.35	2.6		0.61	50.8	X	0.070	0.13	BJ	0.031	0.91	U	0.91
SPA-11	J1TWC4	7/16/14	5340	X	1.4	0.56	J	0.34	2.8		0.58	48.0	X	0.067	0.14	BJ	0.029	0.86	U	0.86
SPA-12	J1TWC5	7/16/14	4960	X	1.4	0.38	BJ	0.35	2.4		0.62	46.7	X	0.071	0.12	BJ	0.031	0.91	U	0.91
FS-1	J1THH1	4/2/14	6450		1.7	0.42	U	0.42	3.6		0.72	60.0		0.083	0.31		0.036	1.1	U	1.1
FS-2	J1THK6	4/2/14	6940		1.5	0.37	U	0.37	3.5		0.65	58.8		0.075	0.32		0.032	0.97	B	0.96
FS-3	J1TWF2	7/22/14	6410		1.4	0.35	B	0.35	3.6		0.60	61.1		0.069	0.19		0.030	1.8	M	0.90
Equipment blank	J1TWC7	7/16/14	121	X	1.3	0.32	U	0.32	0.56	U	0.56	1.3	X	0.065	0.031	B	0.028	0.84	U	0.84

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, C, J and/or X are considered acceptable values.

B = Estimated result. Result is less than the RL, but greater than MDL.

C = detected in both the sample and the associated QC blank, and the sample concentration was <=5X the blank concentration.

EXC = excavation

FS = focused sample

HEIS = Hanford Environmental Information System

J = estimate

M = sample duplicate precision not met.

MDL = method detection limit

N = recovery exceeds upper or lower control limits.

PCBs = polychlorinated biphenyls

PEST = pesticide

PQL = practical quantitation limit

Q = qualifier

R = rejected

RAG = remedial action goal

SPA = staging pile area

SVOA = semivolatile organic analysis

TPH = total petroleum hydrocarbon

U = undetected

X (metals) = Serial dilution in the analytical batch indicates that physical and chemical interferences are present

X (SVOAs) = MS, MSD: recovery exceeds upper or lower control limits.

Attachment	1	Sheet No.	1 of 21
Originator	I. B. Berezovskiy	Date	09/22/14
Checked	R. J. Nielson	Date	09/22/14
Calc. No.	0100D-CA-V0552	Rev. No.	0

Attachment 1. 100-D-106 Waste Site Verification Sampling Results - Metals.

Location	HEIS Number	Date	Cadmium			Calcium			Chromium			Cobalt			Copper			Hexavalent Chromium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-1	J1TWC8	7/22/14	0.037	U	0.037	5760		12.6	10.8	X	0.052	5.6	X	0.089	11.6		0.19	0.274		0.155
Duplicate of J1TWC8	J1TWF1	7/22/14	0.038	U	0.038	6060		13.1	10.9	X	0.054	5.5	X	0.093	10.7		0.20	0.421		0.155
EXC-2	J1TWC9	7/22/14	0.11	B	0.036	10700		12.2	12.1	X	0.050	5.5	X	0.087	12.2		0.19	0.295		0.155
EXC-3	J1TWD0	7/22/14	0.039	U	0.039	8800		13.5	11.8	X	0.055	5.6	X	0.095	12.1		0.21	0.292		0.155
EXC-4	J1TWD1	7/22/14	0.16	B	0.035	6530		11.9	13.8	X	0.049	5.8	X	0.084	16.6		0.18	0.316		0.155
EXC-5	J1TWD2	7/22/14	0.035	U	0.035	5890		12.1	10.4	X	0.050	5.4	X	0.086	10.1		0.19	0.311		0.155
EXC-6	J1TWD3	7/22/14	0.039	U	0.039	8140		13.3	11.6	X	0.055	5.5	X	0.094	10.4		0.20	0.209		0.155
EXC-7	J1TWD4	7/22/14	0.040	U	0.040	6770		13.6	11.1	X	0.056	5.7	X	0.097	11.1		0.21	0.294		0.155
EXC-8	J1TWD5	7/22/14	0.038	U	0.038	8880		13.1	11.3	X	0.054	5.7	X	0.093	11.9		0.20	0.231		0.155
EXC-9	J1TWD6	7/22/14	0.037	U	0.037	11200		12.9	12.1	X	0.053	5.5	X	0.091	11.1		0.20	0.155	U	0.155
EXC-10	J1TWD7	7/22/14	0.036	U	0.036	13900		12.4	11.2	X	0.051	5.5	X	0.088	12.7		0.19	0.231		0.155
EXC-11	J1TWD8	7/22/14	0.040	U	0.040	8620		13.7	10.7	X	0.057	6.4	X	0.097	11.6		0.21	0.231		0.155
EXC-12	J1TWD9	7/22/14	0.040	U	0.040	5000		13.7	10.8	X	0.057	5.6	X	0.097	11.6		0.21	0.155	U	0.155
EXC-13	J1TWF0	7/22/14	0.039	U	0.039	3490		13.4	9.8	X	0.055	5.5	X	0.095	9.5		0.21	0.334		0.155
SPA-7	J1TWC0	7/16/14	0.041	U	0.041	7320	X	14.1	4.5	X	0.058	10.1		0.10	14.2		0.22	0.397		0.155
Duplicate of J1TWC0	J1TWC6	7/16/14	0.041	U	0.041	7460	X	14.1	5.4	X	0.058	10.0		0.10	13.8		0.22	0.355		0.155
SPA-1	J1TW94	7/16/14	0.036	U	0.036	8130	X	12.3	5.0	X	0.051	11.9		0.44	17.2		0.95	0.155	U	0.155
SPA-2	J1TW97	7/16/14	0.040	U	0.040	7820	X	13.7	6.3	X	0.056	9.2		0.097	15.3		0.21	0.315		0.155
SPA-3	J1TW96	7/16/14	0.036	U	0.036	7550	X	12.5	5.5	X	0.051	9.2		0.089	13.3		0.19	0.356		0.155
SPA-4	J1TW95	7/16/14	0.040	U	0.040	7680	X	13.7	5.4	X	0.056	11.0		0.097	15.0		0.21	0.316		0.155
SPA-5	J1TW98	7/16/14	0.037	U	0.037	7260	X	12.9	5.9	X	0.053	12.3		0.46	15.9		0.99	0.294		0.155
SPA-6	J1TW99	7/16/14	0.036	U	0.036	6890	X	12.4	5.1	X	0.051	9.5		0.088	12.7		0.19	0.316		0.155
SPA-8	J1TWC1	7/16/14	0.035	U	0.035	7870	X	12.2	6.0	X	0.050	10.2		0.086	14.6		0.19	0.335		0.155
SPA-9	J1TWC2	7/16/14	0.036	U	0.036	7210	X	12.4	6.0	X	0.051	9.5		0.088	14.1		0.19	0.336		0.155
SPA-10	J1TWC3	7/16/14	0.038	U	0.038	6440	X	13.1	5.2	X	0.054	9.2		0.093	13.1		0.20	0.155	U	0.155
SPA-11	J1TWC4	7/16/14	0.036	U	0.036	6940	X	12.4	5.2	X	0.051	9.6		0.088	13.2		0.19	0.316		0.155
SPA-12	J1TWC5	7/16/14	0.038	U	0.038	7140	X	13.1	3.8	X	0.054	9.0		0.093	14.1		0.20	0.155	U	0.155
FS-1	J1THH1	4/2/14	0.045	U	0.045	8110		15.4	10.4		0.063	5.1	X	0.11	11.1		0.24	0.155	U	0.155
FS-2	J1THK6	4/2/14	0.12	BM	0.040	7570		13.9	11.5		0.057	5.9	X	0.098	13.4		0.21	0.155	U	0.155
FS-3	J1TWF2	7/22/14	0.069	B	0.037	7800		12.9	10.7		0.053	5.2	X	0.091	11.1		0.20	0.188		0.155
Equipment blank	J1TWC7	7/16/14	0.035	U	0.035	27.7	BX	12.1	0.18	CXUJ	0.050	0.24	B	0.085	0.29	BCUJ	0.19			

Attachment	1	Sheet No.	2 of 21
Originator	I. B. Berezovskiy	Date	09/22/14
Checked	R. J. Nielson	Date	09/22/14
Calc. No.	0100D-CA-V0552	Rev. No.	0

Attachment 1. 100-D-106 Waste Site Verification Sampling Results - Metals

Sample Location	HEIS Number	Sample Date	Iron			Lead			Magnesium			Manganese			Mercury			Molybdenum		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-1	J1TWC8	7/22/14	14600		3.4	8.1	M	0.24	4230		3.3	241		0.089	0.0068	BM	0.0051	0.58	B	0.23
Duplicate of J1TWC8	J1TWF1	7/22/14	14600		3.5	13.4		0.25	4350		3.4	236		0.093	0.0084	B	0.0051	0.24	U	0.24
EXC-2	J1TWC9	7/22/14	14300		3.3	3.8		0.23	4790		3.2	253		0.087	0.0060	B	0.0056	0.27	B	0.23
EXC-3	J1TWD0	7/22/14	14800		3.6	4.8		0.26	4720		3.5	255		0.095	0.019		0.0058	0.34	B	0.25
EXC-4	J1TWD1	7/22/14	15200		3.2	5.1		0.23	4890		3.1	269		0.084	0.19		0.0052	0.27	B	0.22
EXC-5	J1TWD2	7/22/14	14700		3.3	4.8		0.23	4300		3.2	249		0.086	0.0048	U	0.0048	0.22	U	0.22
EXC-6	J1TWD3	7/22/14	14400		3.6	3.8		0.25	4680		3.5	245		0.094	0.0048	U	0.0048	0.24	U	0.24
EXC-7	J1TWD4	7/22/14	14900		3.7	4.6		0.26	4280		3.6	249		0.097	0.0060	B	0.0051	0.25	U	0.25
EXC-8	J1TWD5	7/22/14	15000		3.5	3.8		0.25	4510		3.4	254		0.093	0.010	B	0.0057	0.24	U	0.24
EXC-9	J1TWD6	7/22/14	13900		3.5	5.0		0.25	4400		3.4	239		0.091	0.0069	B	0.0050	0.24	U	0.24
EXC-10	J1TWD7	7/22/14	14100		3.4	3.6		0.24	4990		3.3	236		0.088	0.0067	B	0.0056	0.23	U	0.23
EXC-11	J1TWD8	7/22/14	16400		3.7	3.7		0.26	4490		3.6	251		0.097	0.0066	B	0.0062	0.25	U	0.25
EXC-12	J1TWD9	7/22/14	15500		3.7	4.0		0.26	4080		3.6	257		0.097	0.014	B	0.0048	0.25	U	0.25
EXC-13	J1TWF0	7/22/14	14300		3.6	3.4		0.26	3740		3.5	238		0.095	0.0086	B	0.0063	0.25	U	0.25
SPA-7	J1TWC0	7/16/14	26200	X	3.8	3.7		0.27	4560	X	3.7	314	X	0.10	0.0085	B	0.0055	0.26	U	0.26
Duplicate of J1TWC0	J1TWC6	7/16/14	25500	X	3.8	3.7		0.27	4880	X	3.7	337	X	0.10	0.0079	B	0.0053	0.26	U	0.26
SPA-1	J1TW94	7/16/14	25600	X	3.3	6.0		1.2	4590	X	3.2	306	X	0.087	0.0080	B	0.0055	0.68	BM	0.23
SPA-2	J1TW97	7/16/14	23800	X	3.7	3.9		0.26	4850	X	3.6	305	X	0.097	0.0076	B	0.0052	0.25	U	0.25
SPA-3	J1TW96	7/16/14	24400	X	3.4	3.9		0.24	4540	X	3.3	309	X	0.089	0.0076	B	0.0053	0.30	B	0.23
SPA-4	J1TW95	7/16/14	28300	X	3.7	5.9		0.26	5370	X	3.6	358	X	0.097	0.0069	B	0.0053	0.78	B	0.25
SPA-5	J1TW98	7/16/14	26800	X	3.5	6.4		1.2	5020	X	3.4	345	X	0.091	0.0075	B	0.0055	0.24	U	0.24
SPA-6	J1TW99	7/16/14	25200	X	3.3	3.4		0.24	4660	X	3.2	304	X	0.088	0.0067	B	0.0052	0.23	U	0.23
SPA-8	J1TWC1	7/16/14	26000	X	3.3	4.4		0.23	4980	X	3.2	336	X	0.086	0.0079	B	0.0055	0.22	U	0.22
SPA-9	J1TWC2	7/16/14	24200	X	3.3	3.8		0.24	4820	X	3.2	307	X	0.088	0.0072	B	0.0050	0.23	U	0.23
SPA-10	J1TWC3	7/16/14	24000	X	3.5	3.9		0.25	4370	X	3.4	304	X	0.093	0.0067	B	0.0052	0.24	U	0.24
SPA-11	J1TWC4	7/16/14	24900	X	3.4	3.7		0.24	4580	X	3.3	314	X	0.088	0.0064	B	0.0050	0.23	U	0.23
SPA-12	J1TWC5	7/16/14	22200	X	3.5	3.3		0.25	3750	X	3.5	258	X	0.093	0.0068	B	0.0050	0.24	U	0.24
FS-1	J1THH1	4/2/14	13800	X	4.2	3.5		0.30	4850	X	4.0	257		0.11	0.0066	UN	0.0066	0.29	B	0.28
FS-2	J1THK6	4/2/14	15400	X	3.7	4.4		0.27	4890	X	3.6	273		0.098	0.0079	BN	0.0062	0.26	U	0.26
FS-3	J1TWF2	7/22/14	13300		3.5	5.9		0.25	4310		3.4	227		0.091	0.0066	B	0.0049	0.55	B	0.24
Equipment blank	J1TWC7	7/16/14	1010	X	3.2	0.38	B	0.23	14.9	BX	3.2	15.3	X	0.085	0.0052	U	0.0052	0.22	U	0.22

Attachment	1	Sheet No.	3 of 21
Originator	I. B. Berezovskiy	Date	09/22/14
Checked	R. J. Nielson	Date	09/22/14
Calc. No.	0100D-CA-V0552	Rev. No.	0

Attachment 1. 100-D-106 Waste Site Verification Sampling Results - Metals.

Sample Location	HEIS Number	Sample Date	Nickel			Potassium			Selenium			Silicon			Silver			Sodium		
			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	J1TWC8	7/22/14	11.0	X	0.11	974		36.5	0.79	BM	0.77	278	N	5.0	0.14	U	0.14	252		52.6
Duplicate of J1TWC8	J1TWF1	7/22/14	10.7	X	0.11	1030		38.0	0.80	U	0.80	230		5.2	0.15	U	0.15	166		54.7
EXC-2	J1TWC9	7/22/14	11.8	X	0.11	1120		35.5	0.81	B	0.75	199		4.9	0.14	U	0.14	154		51.1
EXC-3	J1TWD0	7/22/14	10.2	X	0.12	1050		39.1	0.82	U	0.82	189		5.4	0.15	U	0.15	187		56.3
EXC-4	J1TWD1	7/22/14	11.8	X	0.1	1100		34.5	0.72	U	0.72	173		4.8	0.13	U	0.13	186		49.7
EXC-5	J1TWD2	7/22/14	9.6	X	0.11	1120		35.1	0.74	U	0.74	163		4.8	0.14	U	0.14	181		50.5
EXC-6	J1TWD3	7/22/14	11.1	X	0.12	1050		38.5	0.81	U	0.81	203		5.3	0.15	U	0.15	166		55.5
EXC-7	J1TWD4	7/22/14	10.7	X	0.12	1280		39.7	0.83	U	0.83	240		5.5	0.15	U	0.15	169		57.1
EXC-8	J1TWD5	7/22/14	10.6	X	0.11	1130		38.0	0.80	U	0.80	244		5.2	0.15	U	0.15	243		54.6
EXC-9	J1TWD6	7/22/14	11.3	X	0.11	1070		37.4	0.79	U	0.79	235		5.2	0.15	U	0.15	161		53.9
EXC-10	J1TWD7	7/22/14	10.7	X	0.11	973		36.2	0.76	U	0.76	240		5.0	0.14	U	0.14	211		52.0
EXC-11	J1TWD8	7/22/14	10.5	X	0.12	1100		40.0	0.84	U	0.84	224		5.5	0.16	U	0.16	167		57.5
EXC-12	J1TWD9	7/22/14	10.3	X	0.12	1240		40.0	0.84	U	0.84	259		5.5	0.16	U	0.16	206		57.5
EXC-13	J1TWF0	7/22/14	9.5	X	0.12	1230		39.0	0.82	U	0.82	205		5.4	0.15	U	0.15	151		56.1
SPA-7	J1TWC0	7/16/14	7.5	X	0.12	745		41.0	0.86	U	0.86	114	J	5.7	0.16	U	0.16	376		59.0
Duplicate of J1TWC0	J1TWC6	7/16/14	8.9	X	0.12	822		41.0	0.86	U	0.86	160	J	5.7	0.16	U	0.16	380		59.0
SPA-1	J1TW94	7/16/14	8.3	X	0.11	880		35.8	0.75	U	0.75	196	N	4.9	0.14	U	0.14	528		51.5
SPA-2	J1TW97	7/16/14	8.4	X	0.12	923		39.9	0.84	U	0.84	159	J	5.5	0.16	U	0.16	356		57.4
SPA-3	J1TW96	7/16/14	8.0	X	0.11	839		36.3	0.76	U	0.76	114	J	5.0	0.14	U	0.14	373		52.3
SPA-4	J1TW95	7/16/14	9.4	X	0.12	933		39.9	0.84	U	0.84	138	J	5.5	0.16	U	0.16	544		57.4
SPA-5	J1TW98	7/16/14	8.6	X	0.11	871		37.4	0.78	U	0.78	119	J	5.2	0.15	U	0.15	345		53.8
SPA-6	J1TW99	7/16/14	8.2	X	0.11	738		36.0	0.76	U	0.76	114	J	5.0	0.14	U	0.14	372		51.8
SPA-8	J1TWC1	7/16/14	8.7	X	0.11	990		35.4	0.74	U	0.74	126	J	4.9	0.14	U	0.14	343		50.9
SPA-9	J1TWC2	7/16/14	9.4	X	0.11	925		36.0	0.75	U	0.75	172	J	5.0	0.14	U	0.14	358		51.8
SPA-10	J1TWC3	7/16/14	7.3	X	0.11	854		38.0	0.80	U	0.80	122	J	5.2	0.15	U	0.15	370		54.7
SPA-11	J1TWC4	7/16/14	7.8	X	0.11	876		36.2	0.76	U	0.76	134	J	5.0	0.14	U	0.14	389		52.1
SPA-12	J1TWC5	7/16/14	6.7	X	0.11	731		38.2	0.80	U	0.80	83.8	J	5.3	0.15	U	0.15	448		55.0
FS-1	J1THH1	4/2/14	10.9	X	0.13	1120		44.8	0.94	U	0.94	151		6.2	0.17	U	0.17	178		64.5
FS-2	J1THK6	4/2/14	11.7	X	0.12	1070		40.3	0.85	U	0.85	149		5.6	0.16	U	0.16	248		58.0
FS-3	J1TWF2	7/22/14	10.5	X	0.11	1010		37.5	1.2	M	0.79	295	N	5.2	0.15	U	0.15	157		53.9
Equipment blank	J1TWC7	7/16/14	0.26	BX	0.11	35.0	U	35.0	0.74	U	0.74	56.6		4.8	0.14	U	0.14	50.4	U	50.4

Attachment	1	Sheet No.	4 of 21
Originator	I. B. Berezovskiy	Date	09/22/14
Checked	R. J. Nielson	Date	09/22/14
Calc. No.	0100D-CA-V0552	Rev. No.	0

Attachment 1. 100-D-106 Waste Site Verification Sampling Results - Metals.

Sample Location	HEIS Number	Sample Date	Vanadium			Zinc		
			mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-1	J1TWC8	7/22/14	31.3		0.084	29.8	X	0.35
Duplicate of J1TWC8	J1TWF1	7/22/14	31.6		0.087	31.5	X	0.37
EXC-2	J1TWC9	7/22/14	30.9		0.081	86.1	X	0.34
EXC-3	J1TWD0	7/22/14	32.7		0.090	35.7	X	0.38
EXC-4	J1TWD1	7/22/14	32.3		0.079	67.0	X	0.34
EXC-5	J1TWD2	7/22/14	32.4		0.081	30.6	X	0.34
EXC-6	J1TWD3	7/22/14	31.6		0.088	29.7	X	0.37
EXC-7	J1TWD4	7/22/14	31.8		0.091	31.1	X	0.39
EXC-8	J1TWD5	7/22/14	33.9		0.087	31.1	X	0.37
EXC-9	J1TWD6	7/22/14	29.3		0.086	32.2	X	0.36
EXC-10	J1TWD7	7/22/14	30.9		0.083	30.1	X	0.35
EXC-11	J1TWD8	7/22/14	35.9		0.092	31.7	X	0.39
EXC-12	J1TWD9	7/22/14	32.3		0.092	32.8	X	0.39
EXC-13	J1TWF0	7/22/14	30.6		0.089	30.5	X	0.38
SPA-7	J1TWC0	7/16/14	66.0		0.094	47.5	X	0.40
Duplicate of J1TWC0	J1TWC6	7/16/14	61.0		0.094	45.4	X	0.40
SPA-1	J1TW94	7/16/14	72.3		0.41	48.0	X	0.35
SPA-2	J1TW97	7/16/14	56.9		0.091	44.1	X	0.39
SPA-3	J1TW96	7/16/14	62.4		0.083	43.3	X	0.35
SPA-4	J1TW95	7/16/14	69.4		0.091	48.4	X	0.39
SPA-5	J1TW98	7/16/14	74.4		0.43	47.6	X	0.36
SPA-6	J1TW99	7/16/14	60.3		0.083	44.0	X	0.35
SPA-8	J1TWC1	7/16/14	63.8		0.081	46.7	X	0.34
SPA-9	J1TWC2	7/16/14	57.7		0.082	43.7	X	0.35
SPA-10	J1TWC3	7/16/14	59.7		0.087	43.7	X	0.37
SPA-11	J1TWC4	7/16/14	60.0		0.083	43.0	X	0.35
SPA-12	J1TWC5	7/16/14	54.9		0.088	41.1	X	0.37
FS-1	J1THH1	4/2/14	31.4		0.10	32.5	X	0.44
FS-2	J1THK6	4/2/14	35.5		0.092	147	X	0.39
FS-3	J1TWF2	7/22/14	28.7		0.086	36.1	X	0.36
Equipment blank	J1TWC7	7/16/14	0.26	B	0.080	1.2	CXUJ	0.34

Attachment	1	Sheet No.	5 of 21
Originator	I. B. Berezovskiy	Date	09/22/14
Checked	R. J. Nielson	Date	09/22/14
Calc. No.	0100D-CA-V0552	Rev. No.	0

Attachment 1. 100-D-106 Waste Site Verification Sampling Results - Anions

Sample Location	HEIS Number	Sample Date	Bromide			Chloride			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	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-1	J1TWC8	7/22/14	0.39	U	0.39	29.0	M	2.0	0.81	UN	0.81	1.9	B	0.31	0.94		0.36	0.33	U	0.33
Duplicate of J1TWC8	J1TWF1	7/22/14	0.38	U	0.38	28.4	N	2.0	0.80	UN	0.80	1.9	B	0.31	0.36	U	0.36	0.33	U	0.33
EXC-2	J1TWC9	7/22/14	0.38	U	0.38	10.5		1.9	0.94	B	0.80	6.6		0.31	5.1		0.36	0.33	U	0.33
EXC-3	J1TWD0	7/22/14	0.37	U	0.37	19.5		1.9	0.82	B	0.77	2.3		0.29	2.2		0.36	0.31	U	0.31
EXC-4	J1TWD1	7/22/14	0.38	U	0.38	12.2		2.0	0.80	U	0.80	1.8	B	0.31	1.5		0.36	0.33	U	0.33
EXC-5	J1TWD2	7/22/14	0.37	U	0.37	12.2		1.9	0.78	U	0.78	4.0		0.30	4.7		0.36	0.32	U	0.32
EXC-6	J1TWD3	7/22/14	0.36	U	0.36	9.6		1.9	0.76	U	0.76	2.6		0.29	3.0		0.36	0.31	U	0.31
EXC-7	J1TWD4	7/22/14	0.39	U	0.39	8.6		2.0	0.82	U	0.82	2.5		0.31	3.1		0.36	0.34	U	0.34
EXC-8	J1TWD5	7/22/14	0.39	U	0.39	13.8		2.0	0.86	B	0.83	1.3	B	0.32	1.1		0.36	0.34	U	0.34
EXC-9	J1TWD6	7/22/14	0.38	U	0.38	9.2		1.9	0.79	U	0.79	1.6	B	0.30	1.8		0.36	0.33	U	0.33
EXC-10	J1TWD7	7/22/14	0.37	U	0.37	11.1		1.9	0.77	U	0.77	2.7		0.29	3.0		0.36	0.32	U	0.32
EXC-11	J1TWD8	7/22/14	0.38	U	0.38	17.4		1.9	0.79	U	0.79	2.1	B	0.30	2.4		0.36	0.32	U	0.32
EXC-12	J1TWD9	7/22/14	0.37	U	0.37	7.9		1.9	0.78	U	0.78	2.2	B	0.30	2.6		0.36	0.32	U	0.32
EXC-13	J1TWF0	7/22/14	0.39	U	0.39	12.7		2.0	0.81	U	0.81	2.1	B	0.31	3.3		0.36	0.33	U	0.33
SPA-7	J1TWC0	7/16/14	0.39	U	0.39	58.2		2.0	3.8	BJ	0.82	7.7	J	0.32	5.6		0.36	0.34	UR	0.34
Duplicate of J1TWC0	J1TWC6	7/16/14	0.39	U	0.39	72.2		2.0	4.5	BJ	0.82	8.4	J	0.31	6.0		0.36	0.34	UR	0.34
SPA-1	J1TW94	7/16/14	0.38	U	0.38	101	M	2.0	3.3	BNJ	0.81	10.8	J	0.31	15.6		0.36	0.33	UR	0.33
SPA-2	J1TW97	7/16/14	0.39	U	0.39	89.8		2.0	4.1	BJ	0.82	16.9	J	0.32	13.5		0.36	0.34	UR	0.34
SPA-3	J1TW96	7/16/14	0.39	U	0.39	72.7		2.0	4.2	BJ	0.81	12.5	J	0.31	9.7		0.36	0.33	UR	0.33
SPA-4	J1TW95	7/16/14	0.39	U	0.39	80.0		2.0	4.3	BJ	0.82	7.7	J	0.31	4.6		0.36	0.34	UR	0.34
SPA-5	J1TW98	7/16/14	0.39	U	0.39	66.3		2.0	4.3	BJ	0.82	4.1	J	0.31	2.2		0.36	0.34	UR	0.34
SPA-6	J1TW99	7/16/14	0.39	U	0.39	68.9		2.0	3.9	BJ	0.82	8.0	J	0.31	4.6	N	0.36	0.34	UR	0.34
SPA-8	J1TWC1	7/16/14	0.39	U	0.39	66.6		2.0	4.2	BJ	0.81	8.9	J	0.31	7.0		0.36	0.33	UR	0.33
SPA-9	J1TWC2	7/16/14	0.39	U	0.39	58.0		2.0	4.3	BJ	0.81	3.9	J	0.31	1.6		0.36	0.33	UR	0.33
SPA-10	J1TWC3	7/16/14	0.39	U	0.39	104		2.0	3.7	BJ	0.83	14.8	J	0.32	12.5		0.36	0.34	UR	0.34
SPA-11	J1TWC4	7/16/14	0.39	U	0.39	110		2.0	3.9	BJ	0.82	14.5	J	0.32	11.5		0.36	0.34	UR	0.34
SPA-12	J1TWC5	7/16/14	0.39	U	0.39	87.7		2.0	4.0	BJ	0.82	7.6	J	0.31	5.9		0.36	0.34	UR	0.34
FS-1	J1THH1	4/2/14													0.92		0.39			
FS-2	J1THK6	4/2/14													0.38	U	0.38			
FS-3	J1TWF2	7/22/14	0.38	U	0.38	7.4	C	1.9	0.79	UN	0.79	1.3	B	0.30	0.36	U	0.36	0.32	U	0.32

Attachment	1	Sheet No.	6 of 21
Originator	I. B. Berezovskiy	Date	09/22/14
Checked	R. J. Nielson	Date	09/22/14
Calc. No.	0100D-CA-V0552	Rev. No.	0

Attachment 1. 100-D-106 Waste Site Verification Sampling Results - Anions, TPH, and Physical

Sample Location	HEIS Number	Sample Date	Phosphorous in phosphate			Sulfate			TPH - Diesel Ext.			TPH - Diesel			Percent moisture (wet sample)		
			mg/kg	Q	PQL	mg/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	%	Q	PQL
EXC-1	J1TWC8	7/22/14	1.2	U	1.2	40.4	MN	1.7							0.70		0.10
Duplicate of J1TWC8	J1TWF1	7/22/14	1.2	UN	1.2	14.8	MN	1.7							0.98		0.10
EXC-2	J1TWC9	7/22/14	1.2	U	1.2	23.7		1.7							0.49		0.10
EXC-3	J1TWD0	7/22/14	1.2	U	1.2	51.5		1.6							0.21		0.10
EXC-4	J1TWD1	7/22/14	2.4	B	1.2	27.3		1.7							0.21		0.10
EXC-5	J1TWD2	7/22/14	1.2	U	1.2	35.0		1.6							0.20		0.10
EXC-6	J1TWD3	7/22/14	1.2	U	1.2	30.3		1.6							0.56		0.10
EXC-7	J1TWD4	7/22/14	1.2	U	1.2	16.5		1.7							0.67		0.10
EXC-8	J1TWD5	7/22/14	1.2	U	1.2	35.5		1.7							0.90		0.10
EXC-9	J1TWD6	7/22/14	1.2	U	1.2	16.5		1.6							0.41		0.10
EXC-10	J1TWD7	7/22/14	1.2	U	1.2	24.2		1.6							0.54		0.10
EXC-11	J1TWD8	7/22/14	1.2	U	1.2	42.1		1.6							0.38		0.10
EXC-12	J1TWD9	7/22/14	1.2	U	1.2	10.9		1.6							0.42		0.10
EXC-13	J1TWF0	7/22/14	1.2	U	1.2	33.9		1.7							0.82		0.10
SPA-7	J1TWC0	7/16/14	2.7	BJ	1.2	30.4	CU	1.7							0.93		0.10
Duplicate of J1TWC0	J1TWC6	7/16/14	2.7	BJ	1.2	31.4	CU	1.7							0.99		0.10
SPA-1	J1TW94	7/16/14	2.1	BJ	1.2	58.4	M	1.7							1.2		0.10
SPA-2	J1TW97	7/16/14	2.8	BJ	1.2	99.8		1.7							1.1		0.10
SPA-3	J1TW96	7/16/14	2.9	BJ	1.2	69.4		1.7							1.0		0.10
SPA-4	J1TW95	7/16/14	2.6	BJ	1.2	211		1.7							1.1		0.10
SPA-5	J1TW98	7/16/14	2.9	BJ	1.2	16.0	CU	1.7							1.2		0.10
SPA-6	J1TW99	7/16/14	2.7	BJ	1.2	42.4		1.7							0.96		0.10
SPA-8	J1TWC1	7/16/14	2.5	BJ	1.2	28.4	CU	1.7							0.95		0.10
SPA-9	J1TWC2	7/16/14	2.6	BJ	1.2	24.6	CU	1.7							0.90		0.10
SPA-10	J1TWC3	7/16/14	2.9	BJ	1.3	40.2		1.7							1.9		0.10
SPA-11	J1TWC4	7/16/14	2.7	BJ	1.2	40.5		1.7							1.5		0.10
SPA-12	J1TWC5	7/16/14	4.3	BJ	1.2	36.5		1.7							0.71		0.10
FS-1	J1THH1	4/2/14							5200	B	1100	3600	JB	720	8.6		0.10
FS-2	J1THK6	4/2/14							29000	B	1000	12000	B	700	7.5		0.10
FS-3	J1TWF2	7/22/14	1.2	U	1.2	8.6	N	1.6							0.49		0.10
Equipment blank	J1TWC7	7/16/14													0.10	U	0.10

Attachment	1	Sheet No.	7 of 21
Originator	I. B. Berezovskiy	Date	09/22/14
Checked	R. J. Nielson	Date	09/22/14
Calc. No.	0100D-CA-V0552	Rev. No.	0

Attachment 1. 100-D-106 Waste Site Verification Sample Results (SVOA).

CONSTITUENT	CLASS	J1TWC8, EXC-1			J1TWF1, Duplicate of J1TWC8			J1TWC9, EXC-2			J1TWD0, EXC-3		
		07/22/14			07/22/14			07/22/14			07/22/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	28	U	28	28	U	28	26	U	26	28	U	28
1,2-Dichlorobenzene	SVOA	22	U	22	22	U	22	20	U	20	22	U	22
1,3-Dichlorobenzene	SVOA	12	U	12	12	U	12	11	U	11	12	U	12
1,4-Dichlorobenzene	SVOA	13	U	13	14	U	14	13	U	13	14	U	14
2,4,5-Trichlorophenol	SVOA	9.9	U	9.9	10	U	10	9.2	U	9.2	10	U	10
2,4,6-Trichlorophenol	SVOA	9.9	U	9.9	10	U	10	9.2	U	9.2	10	U	10
2,4-Dichlorophenol	SVOA	9.9	U	9.9	10	U	10	9.2	U	9.2	10	U	10
2,4-Dimethylphenol	SVOA	65	U	65	66	U	66	61	U	61	66	U	66
2,4-Dinitrophenol	SVOA	330	U	330	330	U	330	310	U	310	330	U	330
2,4-Dinitrotoluene	SVOA	65	U	65	66	U	66	61	U	61	66	U	66
2,6-Dinitrotoluene	SVOA	28	U	28	28	U	28	26	U	26	28	U	28
2-Chloronaphthalene	SVOA	9.9	U	9.9	10	U	10	9.2	U	9.2	10	U	10
2-Chlorophenol	SVOA	21	U	21	21	U	21	19	U	19	21	U	21
2-Methylnaphthalene	SVOA	19	U	19	19	U	19	18	U	18	19	U	19
2-Methylphenol (cresol, o-)	SVOA	13	U	13	13	U	13	12	U	12	13	U	13
2-Nitroaniline	SVOA	50	U	50	50	U	50	46	U	46	50	U	50
2-Nitrophenol	SVOA	9.9	U	9.9	10	U	10	9.2	U	9.2	10	U	10
3,3'-Dichlorobenzidine	SVOA	89	U	89	90	U	90	83	U	83	90	U	90
3+4 Methylphenol (cresol, m+p)	SVOA	33	U	33	33	U	33	31	U	31	33	U	33
3-Nitroaniline	SVOA	72	U	72	73	U	73	68	U	68	73	U	73
4,6-Dinitro-2-methylphenol	SVOA	330	U	330	330	U	330	310	U	310	330	U	330
4-Bromophenylphenyl ether	SVOA	19	U	19	19	U	19	18	U	18	19	U	19
4-Chloro-3-methylphenol	SVOA	65	U	65	66	U	66	61	U	61	66	U	66
4-Chloroaniline	SVOA	81	U	81	82	U	82	76	U	76	82	U	82
4-Chlorophenylphenyl ether	SVOA	21	U	21	21	U	21	19	U	19	21	U	21
4-Nitroaniline	SVOA	72	U	72	73	U	73	67	U	67	73	U	73
4-Nitrophenol	SVOA	96	U	96	97	U	97	90	U	90	97	U	97
Acenaphthene	SVOA	10	U	10	10	U	10	9.5	U	9.5	10	U	10
Acenaphthylene	SVOA	17	U	17	17	U	17	16	U	16	17	U	17
Anthracene	SVOA	17	U	17	17	U	17	16	U	16	17	U	17
Benzo(a)anthracene	SVOA	20	U	20	20	U	20	18	U	18	20	U	20
Benzo(a)pyrene	SVOA	20	U	20	20	U	20	18	U	18	20	U	20
Benzo(b)fluoranthene	SVOA	26	U	26	26	U	26	24	U	24	26	U	26
Benzo(ghi)perylene	SVOA	16	U	16	16	U	16	15	U	15	16	U	16
Benzo(k)fluoranthene	SVOA	40	U	40	40	U	40	37	U	37	40	U	40
Bis(2-chloro-1-methylethyl)ether	SVOA	23	U	23	23	U	23	21	U	21	23	U	23
Bis(2-Chloroethoxy)methane	SVOA	23	U	23	23	U	23	21	U	21	23	U	23
Bis(2-chloroethyl) ether	SVOA	16	U	16	17	U	17	15	U	15	17	U	17
Bis(2-ethylhexyl) phthalate	SVOA	46	U	46	46	U	46	43	U	43	46	U	46
Butylbenzylphthalate	SVOA	43	U	43	43	U	43	40	U	40	43	U	43
Carbazole	SVOA	36	U	36	36	U	36	33	U	33	36	U	36
Chrysene	SVOA	27	U	27	27	U	27	25	U	25	27	U	27
Dibenz[a,h]anthracene	SVOA	19	U	19	19	U	19	18	U	18	19	U	19
Dibenzofuran	SVOA	20	U	20	20	U	20	18	U	18	20	U	20
Diethyl phthalate	SVOA	26	U	26	26	U	26	24	U	24	26	U	26
Dimethyl phthalate	SVOA	23	U	23	23	U	23	21	U	21	23	U	23
Di-n-butylphthalate	SVOA	29	U	29	29	U	29	27	U	27	29	U	29
Di-n-octylphthalate	SVOA	14	U	14	14	U	14	13	U	13	14	U	14
Fluoranthene	SVOA	36	U	36	36	U	36	33	U	33	36	U	36
Fluorene	SVOA	18	U	18	18	U	18	17	U	17	18	U	18
Hexachlorobenzene	SVOA	29	U	29	29	U	29	27	U	27	29	U	29
Hexachlorobutadiene	SVOA	9.9	U	9.9	10	U	10	9.2	U	9.2	10	U	10
Hexachlorocyclopentadiene	SVOA	50	U	50	50	U	50	46	U	46	50	U	50
Hexachloroethane	SVOA	21	U	21	21	U	21	20	U	20	21	U	21
Indeno(1,2,3-cd)pyrene	SVOA	22	U	22	22	U	22	20	U	20	22	U	22
Isophorone	SVOA	17	U	17	17	U	17	16	U	16	17	U	17
Naphthalene	SVOA	31	U	31	31	U	31	29	U	29	31	U	31
Nitrobenzene	SVOA	22	U	22	22	U	22	20	U	20	22	U	22
N-Nitroso-di-n-dipropylamine	SVOA	31	U	31	31	U	31	29	U	29	31	U	31
N-Nitrosodiphenylamine	SVOA	21	U	21	21	U	21	19	U	19	21	U	21
Pentachlorophenol	SVOA	330	U	330	330	U	330	310	U	310	330	U	330
Phenanthrene	SVOA	17	U	17	17	U	17	16	U	16	17	U	17
Phenol	SVOA	18	U	18	18	U	18	17	U	17	18	U	18
Pyrene	SVOA	12	U	12	12	U	12	11	U	11	12	U	12

Attachment	1	Sheet No.	8 of 21
Originator	I. B. Berezovskiy	Date	9/22/14
Checked	R. J. Nielson	Date	9/22/14
Calc. No	0100D-CA-V0552	Rev. No.	0

Attachment 1. 100-D-106 Waste Site Verification Sample Results (SVOAs).

CONSTITUENT	CLASS	J1TWD1, EXC-4			J1TWD2, EXC-5			J1TWD3, EXC-6			J1TWD4, EXC-7		
		07/22/14			07/22/14			07/22/14			07/22/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	27	U	27	26	U	26	26	U	26	28	U	28
1,2-Dichlorobenzene	SVOA	21	U	21	20	U	20	21	U	21	22	U	22
1,3-Dichlorobenzene	SVOA	12	U	12	11	U	11	11	U	11	12	U	12
1,4-Dichlorobenzene	SVOA	13	U	13	13	U	13	13	U	13	14	U	14
2,4,5-Trichlorophenol	SVOA	9.8	U	9.8	9.2	U	9.2	9.4	U	9.4	9.9	U	9.9
2,4,6-Trichlorophenol	SVOA	9.8	U	9.8	9.2	U	9.2	9.4	U	9.4	9.9	U	9.9
2,4-Dichlorophenol	SVOA	9.8	U	9.8	9.2	U	9.2	9.4	U	9.4	9.9	U	9.9
2,4-Dimethylphenol	SVOA	64	U	64	61	U	61	62	U	62	66	U	66
2,4-Dinitrophenol	SVOA	330	UX	330	310	U	310	310	U	310	330	U	330
2,4-Dinitrotoluene	SVOA	64	U	64	61	U	61	62	U	62	66	U	66
2,6-Dinitrotoluene	SVOA	27	U	27	26	U	26	26	U	26	28	U	28
2-Chloronaphthalene	SVOA	9.8	U	9.8	9.2	U	9.2	9.4	U	9.4	9.9	U	9.9
2-Chlorophenol	SVOA	20	U	20	19	U	19	20	U	20	21	U	21
2-Methylnaphthalene	SVOA	19	U	19	18	U	18	18	U	18	19	U	19
2-Methylphenol (cresol, o-)	SVOA	13	U	13	12	U	12	12	U	12	13	U	13
2-Nitroaniline	SVOA	49	U	49	46	U	46	47	U	47	50	U	50
2-Nitrophenol	SVOA	9.8	U	9.8	9.2	U	9.2	9.4	U	9.4	9.9	U	9.9
3,3'-Dichlorobenzidine	SVOA	88	U	88	83	U	83	85	U	85	89	U	89
3+4 Methylphenol (cresol, m+p)	SVOA	32	U	32	30	U	30	31	U	31	33	U	33
3-Nitroaniline	SVOA	71	U	71	67	U	67	69	U	69	73	U	73
4,6-Dinitro-2-methylphenol	SVOA	320	UX	320	300	U	300	310	U	310	330	U	330
4-Bromophenylphenyl ether	SVOA	19	U	19	18	U	18	18	U	18	19	U	19
4-Chloro-3-methylphenol	SVOA	64	U	64	61	U	61	62	U	62	66	U	66
4-Chloroaniline	SVOA	80	U	80	76	U	76	77	U	77	81	U	81
4-Chlorophenylphenyl ether	SVOA	20	U	20	19	U	19	20	U	20	21	U	21
4-Nitroaniline	SVOA	71	U	71	67	U	67	68	U	68	72	U	72
4-Nitrophenol	SVOA	95	U	95	89	U	89	91	U	91	96	U	96
Acenaphthene	SVOA	10	U	10	9.5	U	9.5	9.7	U	9.7	10	U	10
Acenaphthylene	SVOA	17	U	17	16	U	16	16	U	16	17	U	17
Anthracene	SVOA	17	U	17	16	U	16	16	U	16	17	U	17
Benzo(a)anthracene	SVOA	20	U	20	18	U	18	19	U	19	20	U	20
Benzo(a)pyrene	SVOA	20	U	20	18	U	18	19	U	19	20	U	20
Benzo(b)fluoranthene	SVOA	26	U	26	24	U	24	25	U	25	26	U	26
Benzo(ghi)perylene	SVOA	16	U	16	15	U	15	15	U	15	16	U	16
Benzo(k)fluoranthene	SVOA	39	U	39	37	U	37	38	U	38	40	U	40
Bis(2-chloro-1-methylethyl)ether	SVOA	22	U	22	21	U	21	22	U	22	23	U	23
Bis(2-Chloroethoxy)methane	SVOA	22	U	22	21	U	21	22	U	22	23	U	23
Bis(2-chloroethyl) ether	SVOA	16	U	16	15	U	15	16	U	16	16	U	16
Bis(2-ethylhexyl) phthalate	SVOA	45	U	45	42	U	42	43	U	43	46	U	46
Butylbenzylphthalate	SVOA	42	U	42	40	U	40	40	U	40	43	U	43
Carbazole	SVOA	35	U	35	33	U	33	34	U	34	36	U	36
Chrysene	SVOA	26	U	26	25	U	25	25	U	25	27	U	27
Dibenz(a,h)anthracene	SVOA	19	U	19	18	U	18	18	U	18	19	U	19
Dibenzofuran	SVOA	20	U	20	18	U	18	19	U	19	20	U	20
Diethyl phthalate	SVOA	25	U	25	24	U	24	24	U	24	26	U	26
Dimethyl phthalate	SVOA	22	U	22	21	U	21	22	U	22	23	U	23
Di-n-butylphthalate	SVOA	28	U	28	27	U	27	27	U	27	29	U	29
Di-n-octylphthalate	SVOA	14	U	14	13	U	13	14	U	14	14	U	14
Fluoranthene	SVOA	35	U	35	33	U	33	34	U	34	36	U	36
Fluorene	SVOA	18	U	18	17	U	17	17	U	17	18	U	18
Hexachlorobenzene	SVOA	28	U	28	27	U	27	27	U	27	29	U	29
Hexachlorobutadiene	SVOA	9.8	U	9.8	9.2	U	9.2	9.4	U	9.4	9.9	U	9.9
Hexachlorocyclopentadiene	SVOA	49	U	49	46	U	46	47	U	47	50	U	50
Hexachloroethane	SVOA	21	U	21	20	U	20	20	U	20	21	U	21
Indeno(1,2,3-cd)pyrene	SVOA	21	U	21	20	U	20	21	U	21	22	U	22
Isophorone	SVOA	17	U	17	16	U	16	16	U	16	17	U	17
Naphthalene	SVOA	30	U	30	29	U	29	29	U	29	31	U	31
Nitrobenzene	SVOA	21	U	21	20	U	20	21	U	21	22	U	22
N-Nitroso-di-n-dipropylamine	SVOA	30	U	30	29	U	29	29	U	29	31	U	31
N-Nitrosodiphenylamine	SVOA	20	U	20	19	U	19	20	U	20	21	U	21
Pentachlorophenol	SVOA	320	U	320	300	U	300	310	U	310	330	U	330
Phenanthrene	SVOA	17	U	17	16	U	16	16	U	16	17	U	17
Phenol	SVOA	18	U	18	17	U	17	17	U	17	18	U	18
Pyrene	SVOA	12	U	12	11	U	11	11	U	11	12	U	12

Attachment	1	Sheet No.	9 of 21
Originator	I. B. Berezovskiy	Date	9/22/14
Checked	R. J. Nielson	Date	9/22/14
Calc. No.	0100D-CA-V0552	Rev. No.	0

Attachment 1. 100-D-106 Waste Site Verification Sample Results (SVOAs).

CONSTITUENT	CLASS	J1TWD5, EXC-8			J1TWD6, EXC-9			J1TWD7, EXC-10			J1TWD8, EXC-11		
		07/22/14			07/22/14			07/22/14			07/22/14		
		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	27	U	27	27	U	27
1,2-Dichlorobenzene	SVOA	21	U	21	21	U	21	21	U	21	21	U	21
1,3-Dichlorobenzene	SVOA	11	U	11	11	U	11	12	U	12	11	U	11
1,4-Dichlorobenzene	SVOA	13	U	13	13	U	13	13	U	13	13	U	13
2,4,5-Trichlorophenol	SVOA	9.4	U	9.4	9.3	U	9.3	9.7	U	9.7	9.5	U	9.5
2,4,6-Trichlorophenol	SVOA	9.4	U	9.4	9.3	U	9.3	9.7	U	9.7	9.5	U	9.5
2,4-Dichlorophenol	SVOA	9.4	U	9.4	9.3	U	9.3	9.7	U	9.7	9.5	U	9.5
2,4-Dimethylphenol	SVOA	62	U	62	62	U	62	64	U	64	63	U	63
2,4-Dinitrophenol	SVOA	310	U	310	310	U	310	320	U	320	320	U	320
2,4-Dinitrotoluene	SVOA	62	U	62	62	U	62	64	U	64	63	U	63
2,6-Dinitrotoluene	SVOA	26	U	26	26	U	26	27	U	27	27	U	27
2-Chloronaphthalene	SVOA	9.4	U	9.4	9.3	U	9.3	9.7	U	9.7	9.5	U	9.5
2-Chlorophenol	SVOA	20	U	20	20	U	20	20	U	20	20	U	20
2-Methylnaphthalene	SVOA	18	U	18	18	U	18	18	U	18	18	U	18
2-Methylphenol (cresol, o-)	SVOA	12	U	12	12	U	12	13	U	13	12	U	12
2-Nitroaniline	SVOA	47	U	47	47	U	47	49	U	49	48	U	48
2-Nitrophenol	SVOA	9.4	U	9.4	9.3	U	9.3	9.7	U	9.7	9.5	U	9.5
3,3'-Dichlorobenzidine	SVOA	84	U	84	84	U	84	88	U	88	86	U	86
3+4 Methylphenol (cresol, m+p)	SVOA	31	U	31	31	U	31	32	U	32	31	U	31
3-Nitroaniline	SVOA	68	U	68	68	U	68	71	U	71	70	U	70
4,6-Dinitro-2-methylphenol	SVOA	310	U	310	310	U	310	320	U	320	310	U	310
4-Bromophenylphenyl ether	SVOA	18	U	18	18	U	18	18	U	18	18	U	18
4-Chloro-3-methylphenol	SVOA	62	U	62	62	U	62	64	U	64	63	U	63
4-Chloroaniline	SVOA	77	U	77	76	U	76	80	U	80	78	U	78
4-Chlorophenylphenyl ether	SVOA	20	U	20	20	U	20	20	U	20	20	U	20
4-Nitroaniline	SVOA	68	U	68	68	U	68	71	U	71	69	U	69
4-Nitrophenol	SVOA	91	U	91	90	U	90	94	U	94	92	U	92
Acenaphthene	SVOA	9.7	U	9.7	9.6	U	9.6	10	U	10	9.8	U	9.8
Acenaphthylene	SVOA	16	U	16	16	U	16	17	U	17	16	U	16
Anthracene	SVOA	16	U	16	16	U	16	17	U	17	16	U	16
Benzo(a)anthracene	SVOA	19	U	19	19	U	19	19	U	19	19	U	19
Benzo(a)pyrene	SVOA	19	U	19	19	U	19	19	U	19	19	U	19
Benzo(b)fluoranthene	SVOA	25	U	25	24	U	24	25	U	25	25	U	25
Benzo(ghi)perylene	SVOA	15	U	15	15	U	15	16	U	16	15	U	15
Benzo(k)fluoranthene	SVOA	37	U	37	37	U	37	39	U	39	38	U	38
Bis(2-chloro-1-methylethyl)ether	SVOA	22	U	22	21	U	21	22	U	22	22	U	22
Bis(2-Chloroethoxy)methane	SVOA	22	U	22	21	U	21	22	U	22	22	U	22
Bis(2-chloroethyl) ether	SVOA	16	U	16	15	U	15	16	U	16	16	U	16
Bis(2-ethylhexyl) phthalate	SVOA	43	U	43	43	U	43	45	U	45	44	U	44
Butylbenzylphthalate	SVOA	40	U	40	40	U	40	42	U	42	41	U	41
Carbazole	SVOA	34	U	34	34	U	34	35	U	35	34	U	34
Chrysene	SVOA	25	U	25	25	U	25	26	U	26	26	U	26
Dibenz[a,h]anthracene	SVOA	18	U	18	18	U	18	18	U	18	18	U	18
Dibenzofuran	SVOA	19	U	19	19	U	19	19	U	19	19	U	19
Diethyl phthalate	SVOA	24	U	24	24	U	24	25	U	25	25	U	25
Dimethyl phthalate	SVOA	22	U	22	21	U	21	22	U	22	22	U	22
Di-n-butylphthalate	SVOA	27	U	27	27	U	27	28	U	28	28	U	28
Di-n-octylphthalate	SVOA	13	U	13	13	U	13	14	U	14	14	U	14
Fluoranthene	SVOA	34	U	34	34	U	34	35	U	35	34	U	34
Fluorene	SVOA	17	U	17	17	U	17	18	U	18	17	U	17
Hexachlorobenzene	SVOA	27	U	27	27	U	27	28	U	28	28	U	28
Hexachlorobutadiene	SVOA	9.4	U	9.4	9.3	U	9.3	9.7	U	9.7	9.5	U	9.5
Hexachlorocyclopentadiene	SVOA	47	U	47	47	U	47	49	U	49	48	U	48
Hexachloroethane	SVOA	20	U	20	20	U	20	21	U	21	20	U	20
Indeno(1,2,3-cd)pyrene	SVOA	21	U	21	21	U	21	21	U	21	21	U	21
Isophorone	SVOA	16	U	16	16	U	16	17	U	17	16	U	16
Naphthalene	SVOA	29	U	29	29	U	29	30	U	30	30	U	30
Nitrobenzene	SVOA	21	U	21	21	U	21	21	U	21	21	U	21
N-Nitroso-di-n-dipropylamine	SVOA	29	U	29	29	U	29	30	U	30	30	U	30
N-Nitrosodiphenylamine	SVOA	20	U	20	20	U	20	20	U	20	20	U	20
Pentachlorophenol	SVOA	310	U	310	310	U	310	320	U	320	310	U	310
Phenanthrene	SVOA	16	U	16	16	U	16	17	U	17	16	U	16
Phenol	SVOA	17	U	17	17	U	17	18	U	18	17	U	17
Pyrene	SVOA	11	U	11	11	U	11	12	U	12	12	U	12

Attachment	1	Sheet No.	10 of 21
Originator	I. B. Berezovskiy	Date	9/22/14
Checked	R. J. Nielson	Date	9/22/14
Calc. No.	0100D-CA-V0552	Rev. No.	0

Attachment 1. 100-D-106 Waste Site Verification Sample Results (SVOAs).

CONSTITUENT	CLASS	J1TWD9, EXC-12			J1TWF0, EXC-13			J1TWC0, SPA-7			J1TWC6, Duplicate of J1TWC0		
		07/22/14			07/22/14			07/16/14			07/16/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	28	U	28	26	U	26	26	U	26	26	U	26
1,2-Dichlorobenzene	SVOA	22	U	22	20	U	20	20	U	20	21	U	21
1,3-Dichlorobenzene	SVOA	12	U	12	11	U	11	11	U	11	11	U	11
1,4-Dichlorobenzene	SVOA	14	U	14	13	U	13	13	U	13	13	U	13
2,4,5-Trichlorophenol	SVOA	10	U	10	9.3	U	9.3	9.2	U	9.2	9.4	U	9.4
2,4,6-Trichlorophenol	SVOA	10	U	10	9.3	U	9.3	9.2	U	9.2	9.4	U	9.4
2,4-Dichlorophenol	SVOA	10	U	10	9.3	U	9.3	9.2	U	9.2	9.4	U	9.4
2,4-Dimethylphenol	SVOA	66	U	66	61	U	61	61	U	61	62	U	62
2,4-Dinitrophenol	SVOA	330	U	330	310	U	310	310	UJ	310	310	UJ	310
2,4-Dinitrotoluene	SVOA	66	U	66	61	U	61	61	U	61	62	U	62
2,6-Dinitrotoluene	SVOA	28	U	28	26	U	26	26	U	26	26	U	26
2-Chloronaphthalene	SVOA	10	U	10	9.3	U	9.3	9.2	U	9.2	9.4	U	9.4
2-Chlorophenol	SVOA	21	U	21	19	U	19	19	U	19	20	U	20
2-Methylnaphthalene	SVOA	19	U	19	18	U	18	17	U	17	18	U	18
2-Methylphenol (cresol, o-)	SVOA	13	U	13	12	U	12	12	U	12	12	U	12
2-Nitroaniline	SVOA	50	U	50	46	U	46	46	U	46	47	U	47
2-Nitrophenol	SVOA	10	U	10	9.3	U	9.3	9.2	U	9.2	9.4	U	9.4
3,3'-Dichlorobenzidine	SVOA	90	U	90	84	U	84	83	U	83	85	U	85
3+4 Methylphenol (cresol, m+p)	SVOA	33	U	33	31	U	31	30	U	30	31	U	31
3-Nitroaniline	SVOA	73	U	73	68	U	68	67	U	67	69	U	69
4,6-Dinitro-2-methylphenol	SVOA	330	U	330	310	U	310	300	U	300	310	U	310
4-Bromophenylphenyl ether	SVOA	19	U	19	18	U	18	17	U	17	18	U	18
4-Chloro-3-methylphenol	SVOA	66	U	66	61	U	61	61	U	61	62	U	62
4-Chloroaniline	SVOA	82	U	82	76	U	76	75	U	75	77	U	77
4-Chlorophenylphenyl ether	SVOA	21	U	21	19	U	19	19	U	19	20	U	20
4-Nitroaniline	SVOA	72	U	72	67	U	67	67	U	67	68	U	68
4-Nitrophenol	SVOA	97	U	97	90	U	90	89	U	89	92	U	92
Acenaphthene	SVOA	10	U	10	9.6	U	9.6	9.5	U	9.5	9.7	U	9.7
Acenaphthylene	SVOA	17	U	17	16	U	16	16	U	16	16	U	16
Anthracene	SVOA	17	U	17	16	U	16	16	U	16	16	U	16
Benzo(a)anthracene	SVOA	20	U	20	19	U	19	18	U	18	19	U	19
Benzo(a)pyrene	SVOA	20	U	20	19	U	19	18	U	18	19	U	19
Benzo(b)fluoranthene	SVOA	26	U	26	24	U	24	24	U	24	25	U	25
Benzo(ghi)perylene	SVOA	16	U	16	15	U	15	15	U	15	15	U	15
Benzo(k)fluoranthene	SVOA	40	U	40	37	U	37	37	U	37	38	U	38
Bis(2-chloro-1-methylethyl)ether	SVOA	23	U	23	21	U	21	21	U	21	22	U	22
Bis(2-Chloroethoxy)methane	SVOA	23	U	23	21	U	21	21	U	21	22	U	22
Bis(2-chloroethyl) ether	SVOA	17	U	17	15	U	15	15	U	15	16	U	16
Bis(2-ethylhexyl) phthalate	SVOA	46	U	46	43	U	43	42	U	42	43	U	43
Butylbenzylphthalate	SVOA	43	U	43	40	U	40	40	U	40	41	U	41
Carbazole	SVOA	36	U	36	33	U	33	33	U	33	34	U	34
Chrysene	SVOA	27	U	27	25	U	25	25	U	25	25	U	25
Dibenz(a,h)anthracene	SVOA	19	U	19	18	U	18	17	U	17	18	U	18
Dibenzofuran	SVOA	20	U	20	19	U	19	18	U	18	19	U	19
Diethyl phthalate	SVOA	26	U	26	24	U	24	24	U	24	25	U	25
Dimethyl phthalate	SVOA	23	U	23	21	U	21	21	U	21	22	U	22
Di-n-butylphthalate	SVOA	29	U	29	27	U	27	27	U	27	27	U	27
Di-n-octylphthalate	SVOA	14	U	14	13	U	13	13	U	13	14	U	14
Fluoranthene	SVOA	36	U	36	33	U	33	33	U	33	34	U	34
Fluorene	SVOA	18	U	18	17	U	17	17	U	17	17	U	17
Hexachlorobenzene	SVOA	29	U	29	27	U	27	27	U	27	27	U	27
Hexachlorobutadiene	SVOA	10	U	10	9.3	U	9.3	9.2	U	9.2	9.4	U	9.4
Hexachlorocyclopentadiene	SVOA	50	U	50	46	U	46	46	U	46	47	U	47
Hexachloroethane	SVOA	21	U	21	20	U	20	20	U	20	20	U	20
Indeno(1,2,3-cd)pyrene	SVOA	22	U	22	20	U	20	20	U	20	21	U	21
Isophorone	SVOA	17	U	17	16	U	16	16	U	16	16	U	16
Naphthalene	SVOA	31	U	31	29	U	29	29	U	29	29	U	29
Nitrobenzene	SVOA	22	U	22	20	U	20	20	U	20	21	U	21
N-Nitroso-di-n-dipropylamine	SVOA	31	U	31	29	U	29	29	U	29	29	U	29
N-Nitrosodiphenylamine	SVOA	21	U	21	19	U	19	19	U	19	20	U	20
Pentachlorophenol	SVOA	330	U	330	310	U	310	300	U	300	310	U	310
Phenanthrene	SVOA	17	U	17	16	U	16	16	U	16	16	U	16
Phenol	SVOA	18	U	18	17	U	17	17	U	17	17	U	17
Pyrene	SVOA	12	U	12	11	U	11	11	U	11	11	U	11

Attachment	1	Sheet No.	11 of 21
Originator	J. B. Berezovskiy	Date	9/22/14
Checked	R. J. Nielson	Date	9/22/14
Calc. No.	0100D-CA-V0552	Rev. No.	0

Attachment 1. 100-D-14 Waste Site Verification Sample Results (SVOAs).

CONSTITUENT	CLASS	J1TW94, SPA-1			J1TW97, SPA-2			J1TW96, SPA-3			J1TW95, SPA-4		
		07/16/14			07/16/14			07/16/14			07/16/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	27	U	27	27	U	27	27	U	27	26	U	26
1,2-Dichlorobenzene	SVOA	21	U	21	22	U	22	21	U	21	20	U	20
1,3-Dichlorobenzene	SVOA	11	U	11	12	U	12	12	U	12	11	U	11
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	9.8	U	9.8	9.6	U	9.6	9.3	U	9.3
2,4,6-Trichlorophenol	SVOA	9.5	U	9.5	9.8	U	9.8	9.6	U	9.6	9.3	U	9.3
2,4-Dichlorophenol	SVOA	9.5	U	9.5	9.8	U	9.8	9.6	U	9.6	9.3	U	9.3
2,4-Dimethylphenol	SVOA	63	U	63	65	U	65	63	U	63	61	U	61
2,4-Dinitrophenol	SVOA	320	UJ	320	330	UXJ	330	320	UJ	320	310	UJ	310
2,4-Dinitrotoluene	SVOA	63	U	63	65	U	65	63	U	63	61	U	61
2,6-Dinitrotoluene	SVOA	27	U	27	27	U	27	27	U	27	26	U	26
2-Chloronaphthalene	SVOA	9.5	U	9.5	9.8	U	9.8	9.6	U	9.6	9.3	U	9.3
2-Chlorophenol	SVOA	20	U	20	21	U	21	20	U	20	19	U	19
2-Methylnaphthalene	SVOA	18	U	18	19	U	19	18	U	18	18	U	18
2-Methylphenol (cresol, o-)	SVOA	12	U	12	13	U	13	13	U	13	12	U	12
2-Nitroaniline	SVOA	48	U	48	49	U	49	48	U	48	46	U	46
2-Nitrophenol	SVOA	9.5	U	9.5	9.8	U	9.8	9.6	U	9.6	9.3	U	9.3
3,3'-Dichlorobenzidine	SVOA	86	U	86	88	U	88	87	U	87	83	U	83
3+4 Methylphenol (cresol, m+p)	SVOA	31	U	31	32	U	32	32	U	32	31	U	31
3-Nitroaniline	SVOA	70	U	70	71	U	71	70	U	70	68	U	68
4,6-Dinitro-2-methylphenol	SVOA	310	U	310	320	U	320	320	U	320	310	U	310
4-Bromophenylphenyl ether	SVOA	18	U	18	19	U	19	18	U	18	18	U	18
4-Chloro-3-methylphenol	SVOA	63	U	63	65	U	65	63	U	63	61	U	61
4-Chloroaniline	SVOA	78	U	78	80	U	80	79	U	79	76	U	76
4-Chlorophenylphenyl ether	SVOA	20	U	20	21	U	21	20	U	20	19	U	19
4-Nitroaniline	SVOA	69	U	69	71	U	71	70	U	70	67	U	67
4-Nitrophenol	SVOA	92	U	92	95	U	95	93	U	93	90	U	90
Acenaphthene	SVOA	9.8	U	9.8	10	U	10	9.9	U	9.9	9.5	U	9.5
Acenaphthylene	SVOA	16	U	16	17	U	17	16	U	16	16	U	16
Anthracene	SVOA	16	U	16	17	U	17	16	U	16	16	U	16
Benzo(a)anthracene	SVOA	19	U	19	20	U	20	19	U	19	19	U	19
Benzo(a)pyrene	SVOA	19	U	19	20	U	20	19	U	19	19	U	19
Benzo(b)fluoranthene	SVOA	25	U	25	26	U	26	25	U	25	24	U	24
Benzo(ghi)perylene	SVOA	15	U	15	16	U	16	15	U	15	15	U	15
Benzo(k)fluoranthene	SVOA	38	U	38	39	U	39	38	U	38	37	U	37
Bis(2-chloro-1-methylethyl)ether	SVOA	22	U	22	23	U	23	22	U	22	21	U	21
Bis(2-Chloroethoxy)methane	SVOA	22	U	22	23	U	23	22	U	22	21	U	21
Bis(2-chloroethyl) ether	SVOA	16	U	16	16	U	16	16	U	16	15	U	15
Bis(2-ethylhexyl) phthalate	SVOA	44	U	44	45	U	45	44	U	44	43	U	43
Butylbenzylphthalate	SVOA	41	U	41	42	U	42	41	U	41	40	U	40
Carbazole	SVOA	34	U	34	35	U	35	35	U	35	33	U	33
Chrysene	SVOA	26	U	26	26	U	26	26	U	26	25	U	25
Dibenz[a,h]anthracene	SVOA	18	U	18	19	U	19	18	U	18	18	U	18
Dibenzofuran	SVOA	19	U	19	20	U	20	19	U	19	19	U	19
Diethyl phthalate	SVOA	25	U	25	25	U	25	25	U	25	24	U	24
Dimethyl phthalate	SVOA	22	U	22	23	U	23	22	U	22	21	U	21
Di-n-butylphthalate	SVOA	28	U	28	28	U	28	28	U	28	27	U	27
Di-n-octylphthalate	SVOA	14	U	14	14	U	14	14	U	14	13	U	13
Fluoranthene	SVOA	34	U	34	35	U	35	35	U	35	33	U	33
Fluorene	SVOA	17	U	17	18	U	18	17	U	17	17	U	17
Hexachlorobenzene	SVOA	28	U	28	28	U	28	28	U	28	27	U	27
Hexachlorobutadiene	SVOA	9.5	U	9.5	9.8	U	9.8	9.6	U	9.6	9.3	U	9.3
Hexachlorocyclopentadiene	SVOA	48	U	48	49	U	49	48	U	48	46	U	46
Hexachloroethane	SVOA	20	U	20	21	U	21	20	U	20	20	U	20
Indeno(1,2,3-cd)pyrene	SVOA	21	U	21	22	U	22	21	U	21	20	U	20
Isophorone	SVOA	16	U	16	17	U	17	16	U	16	16	U	16
Naphthalene	SVOA	30	U	30	30	U	30	30	U	30	29	U	29
Nitrobenzene	SVOA	21	U	21	22	U	22	21	U	21	20	U	20
N-Nitroso-di-n-dipropylamine	SVOA	30	U	30	30	U	30	30	U	30	29	U	29
N-Nitrosodiphenylamine	SVOA	20	U	20	21	U	21	20	U	20	19	U	19
Pentachlorophenol	SVOA	310	U	310	320	U	320	320	U	320	310	U	310
Phenanthrene	SVOA	16	U	16	17	U	17	16	U	16	16	U	16
Phenol	SVOA	17	U	17	18	U	18	17	U	17	17	U	17
Pyrene	SVOA	12	U	12	12	U	12	12	U	12	11	U	11

Attachment	1	Sheet No.	12 of 21
Originator	I. B. Berezovskiy	Date	9/22/14
Checked	R. J. Nielson	Date	9/22/14
Calc. No.	0100D-CA-V0552	Rev. No.	0

Attachment 1. 100-D-106 Waste Site Verification Sample Results (SVOAs).

CONSTITUENT	CLASS	J1TW98, SPA-5			J1TW99, SPA-6			J1TWC1, SPA-8			J1TWC2, SPA-9		
		07/16/14			07/16/14			07/16/14			07/16/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	27	U	27	27	U	27	28	U	28	28	U	28
1,2-Dichlorobenzene	SVOA	21	U	21	21	U	21	22	U	22	22	U	22
1,3-Dichlorobenzene	SVOA	12	U	12	12	U	12	12	U	12	12	U	12
1,4-Dichlorobenzene	SVOA	13	U	13	13	U	13	14	U	14	13	U	13
2,4,5-Trichlorophenol	SVOA	9.7	U	9.7	9.7	U	9.7	9.9	U	9.9	9.8	U	9.8
2,4,6-Trichlorophenol	SVOA	9.7	U	9.7	9.7	U	9.7	9.9	U	9.9	9.8	U	9.8
2,4-Dichlorophenol	SVOA	9.7	U	9.7	9.7	U	9.7	9.9	U	9.9	9.8	U	9.8
2,4-Dimethylphenol	SVOA	64	U	64	64	U	64	66	U	66	65	U	65
2,4-Dinitrophenol	SVOA	320	UJ	320	320	UJ	320	330	UJ	330	330	UJ	330
2,4-Dinitrotoluene	SVOA	64	U	64	64	U	64	66	U	66	65	U	65
2,6-Dinitrotoluene	SVOA	27	U	27	27	U	27	28	U	28	28	U	28
2-Chloronaphthalene	SVOA	9.7	U	9.7	9.7	U	9.7	9.9	U	9.9	9.8	U	9.8
2-Chlorophenol	SVOA	20	U	20	20	U	20	21	U	21	21	U	21
2-Methylnaphthalene	SVOA	18	U	18	18	U	18	19	U	19	19	U	19
2-Methylphenol (cresol, o-)	SVOA	13	U	13	13	U	13	13	U	13	13	U	13
2-Nitroaniline	SVOA	49	U	49	49	U	49	50	U	50	49	U	49
2-Nitrophenol	SVOA	9.7	U	9.7	9.7	U	9.7	9.9	U	9.9	9.8	U	9.8
3,3'-Dichlorobenzidine	SVOA	88	U	88	87	U	87	89	U	89	88	U	88
3+4 Methylphenol (cresol, m+p)	SVOA	32	U	32	32	U	32	33	U	33	32	U	32
3-Nitroaniline	SVOA	71	U	71	71	U	71	72	U	72	72	U	72
4,6-Dinitro-2-methylphenol	SVOA	320	U	320	320	U	320	330	U	330	320	U	320
4-Bromophenylphenyl ether	SVOA	18	U	18	18	U	18	19	U	19	19	U	19
4-Chloro-3-methylphenol	SVOA	64	U	64	64	U	64	66	U	66	65	U	65
4-Chloroaniline	SVOA	80	U	80	80	U	80	81	U	81	80	U	80
4-Chlorophenylphenyl ether	SVOA	20	U	20	20	U	20	21	U	21	21	U	21
4-Nitroaniline	SVOA	71	U	71	70	U	70	72	U	72	71	U	71
4-Nitrophenol	SVOA	94	U	94	94	U	94	96	U	96	95	U	95
Acenaphthene	SVOA	10	U	10	10	U	10	10	U	10	10	U	10
Acenaphthylene	SVOA	17	U	17	17	U	17	17	U	17	17	U	17
Anthracene	SVOA	17	U	17	17	U	17	17	U	17	17	U	17
Benzo(a)anthracene	SVOA	19	U	19	19	U	19	20	U	20	20	U	20
Benzo(a)pyrene	SVOA	19	U	19	19	U	19	20	U	20	20	U	20
Benzo(b)fluoranthene	SVOA	26	U	26	25	U	25	26	U	26	26	U	26
Benzo(ghi)perylene	SVOA	16	U	16	16	U	16	16	U	16	16	U	16
Benzo(k)fluoranthene	SVOA	39	U	39	39	U	39	40	U	40	39	U	39
Bis(2-chloro-1-methylethyl)ether	SVOA	22	U	22	22	U	22	23	U	23	23	U	23
Bis(2-Chloroethoxy)methane	SVOA	22	U	22	22	U	22	23	U	23	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	45	U	45	45	U	45	46	U	46	45	U	45
Butylbenzylphthalate	SVOA	42	U	42	42	U	42	43	U	43	42	U	42
Carbazole	SVOA	35	U	35	35	U	35	36	U	36	35	U	35
Chrysene	SVOA	26	U	26	26	U	26	27	U	27	27	U	27
Dibenz[a,h]anthracene	SVOA	18	U	18	18	U	18	19	U	19	19	U	19
Dibenzofuran	SVOA	19	U	19	19	U	19	20	U	20	20	U	20
Diethyl phthalate	SVOA	25	U	25	25	U	25	26	U	26	26	U	26
Dimethyl phthalate	SVOA	22	U	22	22	U	22	23	U	23	23	U	23
Di-n-butylphthalate	SVOA	28	U	28	28	U	28	29	U	29	29	U	29
Di-n-octylphthalate	SVOA	14	U	14	14	U	14	14	U	14	14	U	14
Fluoranthene	SVOA	35	U	35	35	U	35	36	U	36	35	U	35
Fluorene	SVOA	18	U	18	17	U	17	18	U	18	18	U	18
Hexachlorobenzene	SVOA	28	U	28	28	U	28	29	U	29	29	U	29
Hexachlorobutadiene	SVOA	9.7	U	9.7	9.7	U	9.7	9.9	U	9.9	9.8	U	9.8
Hexachlorocyclopentadiene	SVOA	49	U	49	49	U	49	50	U	50	49	U	49
Hexachloroethane	SVOA	21	U	21	21	U	21	21	U	21	21	U	21
Indeno(1,2,3-cd)pyrene	SVOA	21	U	21	21	U	21	22	U	22	22	U	22
Isophorone	SVOA	17	U	17	17	U	17	17	U	17	17	U	17
Naphthalene	SVOA	30	U	30	30	U	30	31	U	31	30	U	30
Nitrobenzene	SVOA	21	U	21	21	U	21	22	U	22	22	U	22
N-Nitroso-di-n-dipropylamine	SVOA	30	U	30	30	U	30	31	U	31	30	U	30
N-Nitrosodiphenylamine	SVOA	20	U	20	20	U	20	21	U	21	21	U	21
Pentachlorophenol	SVOA	320	U	320	320	U	320	330	U	330	320	U	320
Phenanthrene	SVOA	17	U	17	17	U	17	17	U	17	17	U	17
Phenol	SVOA	18	U	18	17	U	17	18	U	18	18	U	18
Pyrene	SVOA	12	U	12	12	U	12	12	U	12	12	U	12

Attachment	1	Sheet No.	13 of 21
Originator	I. B. Berezovskiy	Date	9/22/14
Checked	R. J. Nielson	Date	9/22/14
Calc. No.	0100D-CA-V0552	Rev. No.	0

Attachment 1. 100-D-106 Waste Site Verification Sample Results (SVOAs).

CONSTITUENT	CLASS	J1TWC3, SPA-10			J1TWC4, SPA-11			J1TWC5, SPA-12			J1THH1, FS-1		
		07/16/14			07/16/14			07/16/14			04/02/14		
		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	30	U	30
1,2-Dichlorobenzene	SVOA	22	U	22	21	U	21	22	U	22	23	U	23
1,3-Dichlorobenzene	SVOA	12	U	12	12	U	12	12	U	12	13	U	13
1,4-Dichlorobenzene	SVOA	14	U	14	13	U	13	13	U	13	14	U	14
2,4,5-Trichlorophenol	SVOA	10	U	10	9.6	U	9.6	9.9	U	9.9	11	U	11
2,4,6-Trichlorophenol	SVOA	10	U	10	9.6	U	9.6	9.9	U	9.9	11	U	11
2,4-Dichlorophenol	SVOA	10	U	10	9.6	U	9.6	9.9	U	9.9	11	U	11
2,4-Dimethylphenol	SVOA	67	U	67	63	U	63	65	U	65	70	U	70
2,4-Dinitrophenol	SVOA	340	UJ	340	320	UJ	320	330	UJ	330	350	U	350
2,4-Dinitrotoluene	SVOA	67	U	67	63	U	63	65	U	65	70	U	70
2,6-Dinitrotoluene	SVOA	28	U	28	27	U	27	28	U	28	30	U	30
2-Chloronaphthalene	SVOA	10	U	10	9.6	U	9.6	9.9	U	9.9	11	U	11
2-Chlorophenol	SVOA	21	U	21	20	U	20	21	U	21	22	U	22
2-Methylnaphthalene	SVOA	19	U	19	18	U	18	19	U	19	20	U	20
2-Methylphenol (cresol, o-)	SVOA	13	U	13	12	U	12	13	U	13	14	U	14
2-Nitroaniline	SVOA	50	U	50	48	U	48	50	U	50	53	U	53
2-Nitrophenol	SVOA	10	U	10	9.6	U	9.6	9.9	U	9.9	11	U	11
3,3'-Dichlorobenzidine	SVOA	91	U	91	86	U	86	89	U	89	96	U	96
3+4 Methylphenol (cresol, m+p)	SVOA	33	U	33	32	U	32	33	U	33	35	U	35
3-Nitroaniline	SVOA	74	U	74	70	U	70	72	U	72	78	U	78
4,6-Dinitro-2-methylphenol	SVOA	330	U	330	320	U	320	330	U	330	350	U	350
4-Bromophenylphenyl ether	SVOA	19	U	19	18	U	18	19	U	19	20	U	20
4-Chloro-3-methylphenol	SVOA	67	U	67	63	U	63	65	U	65	70	U	70
4-Chloroaniline	SVOA	83	U	83	79	U	79	81	U	81	87	U	87
4-Chlorophenylphenyl ether	SVOA	21	U	21	20	U	20	21	U	21	22	U	22
4-Nitroaniline	SVOA	73	U	73	70	U	70	72	U	72	77	U	77
4-Nitrophenol	SVOA	98	U	98	93	U	93	96	U	96	100	U	100
Acenaphthene	SVOA	10	U	10	9.9	U	9.9	10	U	10	11	U	11
Acenaphthylene	SVOA	17	U	17	16	U	16	17	U	17	18	U	18
Anthracene	SVOA	17	U	17	16	U	16	17	U	17	18	U	18
Benzo(a)anthracene	SVOA	20	U	20	19	U	19	20	U	20	21	U	21
Benzo(a)pyrene	SVOA	20	U	20	19	U	19	20	U	20	21	U	21
Benzo(b)fluoranthene	SVOA	26	U	26	25	U	25	26	U	26	28	U	28
Benzo(ghi)perylene	SVOA	16	U	16	15	U	15	16	U	16	17	U	17
Benzo(k)fluoranthene	SVOA	40	U	40	38	U	38	40	U	40	42	U	42
Bis(2-chloro-1-methylethyl)ether	SVOA	23	U	23	22	U	22	23	U	23	24	U	24
Bis(2-Chloroethoxy)methane	SVOA	23	U	23	22	U	22	23	U	23	24	U	24
Bis(2-chloroethyl) ether	SVOA	17	U	17	16	U	16	16	U	16	18	U	18
Bis(2-ethylhexyl) phthalate	SVOA	46	U	46	44	U	44	46	U	46	49	U	49
Butylbenzylphthalate	SVOA	43	U	43	41	U	41	43	U	43	46	U	46
Carbazole	SVOA	36	U	36	35	U	35	36	U	36	38	U	38
Chrysene	SVOA	27	U	27	26	U	26	27	U	27	29	U	29
Dibenz(a,h)anthracene	SVOA	19	U	19	18	U	18	19	U	19	20	U	20
Dibenzofuran	SVOA	20	U	20	19	U	19	20	U	20	21	U	21
Diethyl phthalate	SVOA	26	U	26	25	U	25	26	U	26	28	U	28
Dimethyl phthalate	SVOA	23	U	23	22	U	22	23	U	23	24	U	24
Di-n-butylphthalate	SVOA	29	U	29	28	U	28	29	U	29	31	U	31
Di-n-octylphthalate	SVOA	15	U	15	14	U	14	14	U	14	15	U	15
Fluoranthene	SVOA	36	U	36	35	U	35	36	U	36	38	U	38
Fluorene	SVOA	18	U	18	17	U	17	18	U	18	19	U	19
Hexachlorobenzene	SVOA	29	U	29	28	U	28	29	U	29	31	U	31
Hexachlorobutadiene	SVOA	10	U	10	9.6	U	9.6	9.9	U	9.9	11	U	11
Hexachlorocyclopentadiene	SVOA	50	U	50	48	U	48	50	U	50	53	U	53
Hexachloroethane	SVOA	21	U	21	20	U	20	21	U	21	23	U	23
Indeno(1,2,3-cd)pyrene	SVOA	22	U	22	21	U	21	22	U	22	23	U	23
Isophorone	SVOA	17	U	17	16	U	16	17	U	17	18	U	18
Naphthalene	SVOA	31	U	31	30	U	30	31	U	31	33	U	33
Nitrobenzene	SVOA	22	U	22	21	U	21	22	U	22	23	U	23
N-Nitroso-di-n-dipropylamine	SVOA	31	U	31	30	U	30	31	U	31	33	U	33
N-Nitrosodiphenylamine	SVOA	21	U	21	20	U	20	21	U	21	22	U	22
Pentachlorophenol	SVOA	330	U	330	320	U	320	330	U	330	350	U	350
Phenanthrene	SVOA	17	U	17	16	U	16	17	U	17	18	U	18
Phenol	SVOA	18	U	18	17	U	17	18	U	18	19	U	19
Pyrene	SVOA	12	U	12	12	U	12	12	U	12	13	U	13

Attachment	1	Sheet No.	14 of 21
Originator	I. B. Berezovskiy	Date	9/22/14
Checked	R. J. Nielson	Date	9/22/14
Calc. No.	0100D-CA-V0552	Rev. No.	0

Attachment 1. 100-D-106 Waste Site Verification Sample Results (SVOAs).

CONSTITUENT	CLASS	J1THK6, FS-2			J1TWF2, FS-3			J1TWC7, Equipment		
		04/02/14			07/22/14			07/16/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	28	U	28	26	U	26	27	U	27
1,2-Dichlorobenzene	SVOA	22	U	22	20	U	20	21	U	21
1,3-Dichlorobenzene	SVOA	12	U	12	11	U	11	11	U	11
1,4-Dichlorobenzene	SVOA	14	U	14	13	U	13	13	U	13
2,4,5-Trichlorophenol	SVOA	10	U	10	9.2	U	9.2	9.6	U	9.6
2,4,6-Trichlorophenol	SVOA	10	U	10	9.2	U	9.2	9.6	U	9.6
2,4-Dichlorophenol	SVOA	10	U	10	9.2	U	9.2	9.6	U	9.6
2,4-Dimethylphenol	SVOA	67	U	67	61	U	61	63	U	63
2,4-Dinitrophenol	SVOA	340	U	340	310	UX	310	320	U	320
2,4-Dinitrotoluene	SVOA	67	U	67	61	U	61	63	U	63
2,6-Dinitrotoluene	SVOA	28	U	28	26	U	26	27	U	27
2-Chloronaphthalene	SVOA	10	U	10	9.2	U	9.2	9.6	U	9.6
2-Chlorophenol	SVOA	21	U	21	19	U	19	20	U	20
2-Methylnaphthalene	SVOA	19	U	19	18	U	18	18	U	18
2-Methylphenol (cresol, o-)	SVOA	13	U	13	12	U	12	12	U	12
2-Nitroaniline	SVOA	51	U	51	46	U	46	48	U	48
2-Nitrophenol	SVOA	10	U	10	9.2	U	9.2	9.6	U	9.6
3,3'-Dichlorobenzidine	SVOA	91	U	91	83	U	83	86	U	86
3+4 Methylphenol (cresol, m+p)	SVOA	33	U	33	31	U	31	32	U	32
3-Nitroaniline	SVOA	74	U	74	68	U	68	70	U	70
4,6-Dinitro-2-methylphenol	SVOA	330	U	330	310	UX	310	320	U	320
4-Bromophenylphenyl ether	SVOA	19	U	19	18	U	18	18	U	18
4-Chloro-3-methylphenol	SVOA	67	U	67	61	U	61	63	U	63
4-Chloroaniline	SVOA	83	U	83	76	U	76	78	U	78
4-Chlorophenylphenyl ether	SVOA	21	U	21	19	U	19	20	U	20
4-Nitroaniline	SVOA	73	U	73	67	U	67	69	U	69
4-Nitrophenol	SVOA	98	U	98	90	U	90	93	U	93
Acenaphthene	SVOA	10	U	10	9.5	U	9.5	9.8	U	9.8
Acenaphthylene	SVOA	17	U	17	16	U	16	16	U	16
Anthracene	SVOA	17	U	17	16	U	16	16	U	16
Benzo(a)anthracene	SVOA	20	U	20	18	U	18	19	U	19
Benzo(a)pyrene	SVOA	20	U	20	18	U	18	19	U	19
Benzo(b)fluoranthene	SVOA	27	U	27	24	U	24	25	U	25
Benzo(ghi)perylene	SVOA	16	U	16	15	U	15	15	U	15
Benzo(k)fluoranthene	SVOA	41	U	41	37	U	37	38	U	38
Bis(2-chloro-1-methylethyl)ether	SVOA	23	U	23	21	U	21	22	U	22
Bis(2-Chloroethoxy)methane	SVOA	23	U	23	21	U	21	22	U	22
Bis(2-chloroethyl) ether	SVOA	17	U	17	15	U	15	16	U	16
Bis(2-ethylhexyl) phthalate	SVOA	47	U	47	43	U	43	44	U	44
Butylbenzylphthalate	SVOA	44	U	44	40	U	40	41	U	41
Carbazole	SVOA	36	U	36	33	U	33	34	U	34
Chrysene	SVOA	27	U	27	25	U	25	26	U	26
Dibenz[a,h]anthracene	SVOA	19	U	19	18	U	18	18	U	18
Dibenzofuran	SVOA	20	U	20	18	U	18	19	U	19
Diethyl phthalate	SVOA	26	U	26	24	U	24	25	U	25
Dimethyl phthalate	SVOA	23	U	23	21	U	21	22	U	22
Di-n-butylphthalate	SVOA	29	U	29	27	U	27	28	U	28
Di-n-octylphthalate	SVOA	15	U	15	13	U	13	14	U	14
Fluoranthene	SVOA	36	U	36	33	U	33	34	U	34
Fluorene	SVOA	18	U	18	17	U	17	17	U	17
Hexachlorobenzene	SVOA	29	U	29	27	U	27	28	U	28
Hexachlorobutadiene	SVOA	10	U	10	9.2	U	9.2	9.6	U	9.6
Hexachlorocyclopentadiene	SVOA	51	U	51	46	U	46	48	U	48
Hexachloroethane	SVOA	22	U	22	20	U	20	20	U	20
Indeno(1,2,3-cd)pyrene	SVOA	22	U	22	20	U	20	21	U	21
Isophorone	SVOA	17	U	17	16	U	16	16	U	16
Naphthalene	SVOA	31	U	31	29	U	29	30	U	30
Nitrobenzene	SVOA	22	U	22	20	U	20	21	U	21
N-Nitroso-di-n-dipropylamine	SVOA	31	U	31	29	U	29	30	U	30
N-Nitrosodiphenylamine	SVOA	21	U	21	19	U	19	20	U	20
Pentachlorophenol	SVOA	330	U	330	310	U	310	320	U	320
Phenanthrene	SVOA	17	U	17	16	U	16	16	U	16
Phenol	SVOA	18	U	18	17	U	17	17	U	17
Pyrene	SVOA	12	U	12	11	U	11	12	U	12

Attachment	1	Sheet No.	15 of 21
Originator	I. B. Berezovskiy	Date	9/22/14
Checked	R. J. Nielson	Date	9/22/14
Calc. No.	0100D-CA-V0552	Rev. No.	0

Attachment 1. 100-D-106 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1TWC8, EXC-1			J1TWF1, Duplicate of J1TWC8			J1TWC9, EXC-2			J1TWD0, EXC-3			J1TWD1, EXC-4		
		07/22/14			07/22/14			07/22/14			07/22/14			07/22/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	9.7	U	9.7	9.9	U	9.9	10	U	10	9.6	U	9.6	9.7	U	9.7
Acenaphthylene	PAH	8.8	U	8.8	8.9	U	8.9	9.0	U	9.0	8.7	U	8.7	8.7	U	8.7
Anthracene	PAH	3.0	U	3.0	3.0	U	3.0	3.1	U	3.1	2.9	U	2.9	3.0	U	3.0
Benzo(a)anthracene	PAH	3.1	U	3.1	12	J	3.1	3.2	U	3.2	3.1	U	3.1	3.1	U	3.1
Benzo(a)pyrene	PAH	6.2	U	6.2	7.6	J	6.3	6.4	U	6.4	6.2	U	6.2	6.2	U	6.2
Benzo(b)fluoranthene	PAH	4.1	U	4.1	4.1	U	4.1	4.2	U	4.2	4.0	U	4.0	4.1	U	4.1
Benzo(ghi)perylene	PAH	7.0	U	7.0	7.1	U	7.1	7.2	U	7.2	6.9	U	6.9	7.0	U	7.0
Benzo(k)fluoranthene	PAH	3.8	U	3.8	3.9	U	3.9	3.9	U	3.9	3.8	U	3.8	3.8	U	3.8
Chrysene	PAH	4.7	U	4.7	10	J	4.8	4.8	U	4.8	4.7	U	4.7	4.7	U	4.7
Dibenz[a,h]anthracene	PAH	11	U	11	11	U	11	11	U	11	11	U	11	11	U	11
Fluoranthene	PAH	13	U	13	19	J	13	13	U	13	13	U	13	13	U	13
Fluorene	PAH	5.1	U	5.1	5.2	U	5.2	5.3	U	5.3	5.1	U	5.1	5.1	U	5.1
Indeno(1,2,3-cd)pyrene	PAH	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12
Naphthalene	PAH	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12
Phenanthrene	PAH	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12
Pyrene	PAH	12	U	12	15	J	12	12	U	12	12	U	12	12	U	12
Aroclor-1016	PCB	2.7	U	2.7	2.7	U	2.7	2.7	U	2.7	2.7	U	2.7	2.7	U	2.7
Aroclor-1221	PCB	7.8	U	7.8	7.8	U	7.8	7.8	U	7.8	7.9	U	7.9	7.9	U	7.9
Aroclor-1232	PCB	1.9	U	1.9	2.0	U	2.0	1.9	U	1.9	2.0	U	2.0	2.0	U	2.0
Aroclor-1242	PCB	4.5	U	4.5	4.6	U	4.6	4.5	U	4.5	4.6	U	4.6	4.6	U	4.6
Aroclor-1248	PCB	4.5	U	4.5	4.6	U	4.6	4.5	U	4.5	4.6	U	4.6	4.6	U	4.6
Aroclor-1254	PCB	2.5	U	2.5	2.5	U	2.5	2.5	U	2.5	2.6	U	2.6	2.6	U	2.6
Aroclor-1260	PCB	2.5	U	2.5	2.5	U	2.5	2.5	U	2.5	2.6	U	2.6	2.6	U	2.6
Aldrin	PEST	0.25	U	0.25	0.25	U	0.25	0.23	U	0.23	0.24	U	0.24	0.24	U	0.24
Alpha-BHC	PEST	0.21	U	0.21	0.21	U	0.21	0.20	U	0.20	0.21	U	0.21	0.20	U	0.20
alpha-Chlordane	PEST	0.32	U	0.32	0.32	U	0.32	0.30	U	0.30	0.31	U	0.31	0.31	U	0.31
beta-1,2,3,4,5,6-Hexachlorocyclohexane	PEST	0.67	UN	0.67	0.65	U	0.65	0.62	U	0.62	0.64	U	0.64	0.63	U	0.63
Delta-BHC	PEST	0.40	U	0.40	0.39	U	0.39	0.37	U	0.37	0.39	U	0.39	0.38	U	0.38
Dichlorodiphenyldichloroethane	PEST	0.55	U	0.55	0.54	U	0.54	0.51	U	0.51	0.53	U	0.53	0.52	U	0.52
Dichlorodiphenyldichloroethylene	PEST	0.39	J	0.24	0.51	J	0.23	0.22	U	0.22	0.23	U	0.23	0.62	J	0.23
Dichlorodiphenyltrichloroethane	PEST	1.1	J	0.59	1.4	JY	0.58	0.55	U	0.55	0.57	U	0.57	3.8		0.56
Dieldrin	PEST	0.21	U	0.21	0.21	U	0.21	0.20	U	0.20	0.20	U	0.20	0.20	U	0.20
Endosulfan I	PEST	0.18	UN	0.18	0.17	U	0.17	0.16	U	0.16	0.17	U	0.17	0.17	U	0.17
Endosulfan II	PEST	0.29	U	0.29	0.28	U	0.28	0.27	U	0.27	0.28	U	0.28	0.27	U	0.27
Endosulfan sulfate	PEST	0.28	U	0.28	0.27	U	0.27	0.26	U	0.26	0.27	U	0.27	0.26	U	0.26
Endrin	PEST	0.31	U	0.31	0.30	U	0.30	0.28	U	0.28	0.29	U	0.29	0.29	U	0.29
Endrin aldehyde	PEST	0.17	U	0.17	0.17	U	0.17	0.16	U	0.16	0.16	U	0.16	0.16	U	0.16
Endrin ketone	PEST	0.49	U	0.49	0.48	U	0.48	0.45	U	0.45	0.47	U	0.47	0.47	U	0.47
Gamma-BHC (Lindane)	PEST	0.47	U	0.47	0.45	U	0.45	0.43	U	0.43	0.45	U	0.45	0.44	U	0.44
gamma-Chlordane	PEST	0.27	U	0.27	0.26	U	0.26	0.25	U	0.25	0.26	U	0.26	0.25	U	0.25
Heptachlor	PEST	0.21	U	0.21	0.21	U	0.21	0.20	U	0.20	0.21	U	0.21	0.20	U	0.20
Heptachlor epoxide	PEST	0.43	U	0.43	0.42	U	0.42	0.40	U	0.40	0.41	U	0.41	0.41	U	0.41
Methoxychlor	PEST	0.45	U	0.45	0.44	U	0.44	0.42	U	0.42	0.43	U	0.43	0.43	U	0.43
Toxaphene	PEST	16	U	16	15	U	15	15	U	15	15	U	15	15	U	15

Attachment	J	Sheet No.	16 of 21
Originator	I. B. Berezovskiy	Date	9/22/14
Checked	R. J. Nielson	Date	9/22/14
Calc. No.	0100D-CA-V0552	Rev. No.	0

Attachment 1. 100-D-106 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1TWD2, EXC-5			J1TWD3, EXC-6			J1TWD4, EXC-7			J1TWD5, EXC-8			J1TWD6, EXC-9		
		07/22/14			07/22/14			07/22/14			07/22/14			07/22/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	9.5	U	9.5	9.7	U	9.7	9.6	U	9.6	10	U	10	9.6	U	9.6
Acenaphthylene	PAH	8.5	U	8.5	8.7	U	8.7	8.7	U	8.7	9.0	U	9.0	8.7	U	8.7
Anthracene	PAH	2.9	U	2.9	2.9	U	2.9	2.9	U	2.9	3.1	U	3.1	2.9	U	2.9
Benzo(a)anthracene	PAH	3.0	U	3.0	3.1	U	3.1	3.1	U	3.1	3.2	U	3.2	3.1	U	3.1
Benzo(a)pyrene	PAH	6.1	U	6.1	6.2	U	6.2	6.2	U	6.2	6.4	U	6.4	6.2	U	6.2
Benzo(b)fluoranthene	PAH	4.0	U	4.0	4.1	U	4.1	4.1	U	4.1	4.2	U	4.2	4.0	U	4.0
Benzo(ghi)perylene	PAH	6.8	U	6.8	7.0	U	7.0	6.9	U	6.9	7.2	U	7.2	6.9	U	6.9
Benzo(k)fluoranthene	PAH	3.7	U	3.7	3.8	U	3.8	3.8	U	3.8	3.9	U	3.9	3.8	U	3.8
Chrysene	PAH	4.6	U	4.6	4.7	U	4.7	4.7	U	4.7	4.9	U	4.9	4.7	U	4.7
Dibenz[a,h]anthracene	PAH	10	U	10	11	U	11	11	U	11	11	U	11	11	U	11
Fluoranthene	PAH	12	U	12	13	U	13	13	U	13	13	U	13	13	U	13
Fluorene	PAH	5.0	U	5.0	5.1	U	5.1	5.1	U	5.1	5.3	U	5.3	5.1	U	5.1
Indeno(1,2,3-cd)pyrene	PAH	11	U	11	12	U	12	12	U	12	12	U	12	12	U	12
Naphthalene	PAH	11	U	11	12	U	12	12	U	12	12	U	12	12	U	12
Phenanthrene	PAH	11	U	11	12	U	12	12	U	12	12	U	12	12	U	12
Pyrene	PAH	11	U	11	12	U	12	12	U	12	12	U	12	12	U	12
Aroclor-1016	PCB	2.7	U	2.7	2.8	U	2.8	2.8	U	2.8	2.7	U	2.7	2.8	U	2.8
Aroclor-1221	PCB	7.7	U	7.7	8.0	U	8.0	8.1	U	8.1	7.9	U	7.9	8.0	U	8.0
Aroclor-1232	PCB	1.9	U	1.9	2.0	U	2.0	2.0	U	2.0	2.0	U	2.0	2.0	U	2.0
Aroclor-1242	PCB	4.5	U	4.5	4.7	U	4.7	4.7	U	4.7	4.6	U	4.6	4.6	U	4.6
Aroclor-1248	PCB	4.5	U	4.5	4.7	U	4.7	4.7	U	4.7	4.6	U	4.6	4.6	U	4.6
Aroclor-1254	PCB	2.5	U	2.5	2.6	U	2.6	2.6	U	2.6	2.6	U	2.6	2.6	U	2.6
Aroclor-1260	PCB	2.5	U	2.5	2.6	U	2.6	2.6	U	2.6	2.6	U	2.6	2.6	U	2.6
Aldrin	PEST	0.25	U	0.25	0.25	U	0.25	0.23	U	0.23	0.25	U	0.25	0.24	U	0.24
Alpha-BHC	PEST	0.21	U	0.21	0.21	U	0.21	0.20	U	0.20	0.21	U	0.21	0.20	U	0.20
alpha-Chlordane	PEST	0.32	U	0.32	0.32	U	0.32	0.30	U	0.30	0.32	U	0.32	0.30	U	0.30
beta-1,2,3,4,5,6-Hexachlorocyclohexane	PEST	0.66	U	0.66	0.66	U	0.66	0.62	U	0.62	0.66	U	0.66	0.62	U	0.62
Delta-BHC	PEST	0.40	U	0.40	0.40	U	0.40	0.37	U	0.37	0.40	U	0.40	0.38	U	0.38
Dichlorodiphenyldichloroethane	PEST	0.54	U	0.54	0.54	U	0.54	0.51	U	0.51	0.54	U	0.54	0.51	U	0.51
Dichlorodiphenyldichloroethylene	PEST	0.24	U	0.24	0.24	U	0.24	0.22	U	0.22	0.24	U	0.24	0.22	U	0.22
Dichlorodiphenyltrichloroethane	PEST	0.59	U	0.59	0.59	U	0.59	0.55	U	0.55	0.58	U	0.58	0.55	U	0.55
Dieldrin	PEST	0.21	U	0.21	0.21	U	0.21	0.20	U	0.20	0.21	U	0.21	0.20	U	0.20
Endosulfan I	PEST	0.17	U	0.17	0.17	U	0.17	0.16	U	0.16	0.17	U	0.17	0.17	U	0.17
Endosulfan II	PEST	0.28	U	0.28	0.28	U	0.28	0.27	U	0.27	0.28	U	0.28	0.27	U	0.27
Endosulfan sulfate	PEST	0.27	U	0.27	0.27	U	0.27	0.26	U	0.26	0.27	U	0.27	0.26	U	0.26
Endrin	PEST	0.30	U	0.30	0.30	U	0.30	0.29	U	0.29	0.30	U	0.30	0.29	U	0.29
Endrin aldehyde	PEST	0.17	U	0.17	0.17	U	0.17	0.16	U	0.16	0.17	U	0.17	0.16	U	0.16
Endrin ketone	PEST	0.49	U	0.49	0.49	U	0.49	0.46	U	0.46	0.48	U	0.48	0.46	U	0.46
Gamma-BHC (Lindane)	PEST	0.46	U	0.46	0.46	U	0.46	0.43	U	0.43	0.46	U	0.46	0.44	U	0.44
gamma-Chlordane	PEST	0.26	U	0.26	0.26	U	0.26	0.25	U	0.25	0.26	U	0.26	0.25	U	0.25
Heptachlor	PEST	0.21	U	0.21	0.21	U	0.21	0.20	U	0.20	0.21	U	0.21	0.20	U	0.20
Heptachlor epoxide	PEST	0.42	U	0.42	0.42	U	0.42	0.40	U	0.40	0.42	U	0.42	0.40	U	0.40
Methoxychlor	PEST	0.45	U	0.45	0.45	U	0.45	0.42	U	0.42	0.45	U	0.45	0.42	U	0.42
Toxaphene	PEST	16	U	16	16	U	16	15	U	15	16	U	16	15	U	15

Attachment	1	Sheet No.	17 of 21
Originator	I. B. Berezovskiy	Date	9/22/14
Checked	R. J. Nielson	Date	9/22/14
Calc. No.	0100D-CA-V0552	Rev. No.	0

Attachment 1. 100-D-106 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1TWD7, EXC-10			J1TWD8, EXC-11			J1TWD9, EXC-12			J1TWF0, EXC-13			J1TWC0, SPA-7		
		07/22/14			07/22/14			07/22/14			07/22/14			07/16/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	9.6	U	9.6	10	U	10	10	U	10	9.6	U	9.6	9.4	U	9.4
Acenaphthylene	PAH	8.6	U	8.6	9.0	U	9.0	9.0	U	9.0	8.6	U	8.6	8.5	U	8.5
Anthracene	PAH	2.9	U	2.9	3.1	U	3.1	3.0	U	3.0	2.9	U	2.9	2.9	U	2.9
Benzo(a)anthracene	PAH	3.1	U	3.1	3.2	U	3.2	3.2	U	3.2	3.1	U	3.1	3.0	U	3.0
Benzo(a)pyrene	PAH	6.2	U	6.2	6.4	U	6.4	6.4	U	6.4	6.2	U	6.2	6.0	U	6.0
Benzo(b)fluoranthene	PAH	4.0	U	4.0	4.2	U	4.2	4.2	U	4.2	4.0	U	4.0	4.0	U	4.0
Benzo(ghi)perylene	PAH	6.9	U	6.9	7.2	U	7.2	7.2	U	7.2	6.9	U	6.9	6.8	U	6.8
Benzo(k)fluoranthene	PAH	3.8	U	3.8	3.9	U	3.9	3.9	U	3.9	3.8	U	3.8	3.7	U	3.7
Chrysene	PAH	4.6	U	4.6	4.8	U	4.8	4.8	U	4.8	4.6	U	4.6	4.6	U	4.6
Dibenz[a,h]anthracene	PAH	11	U	11	11	U	11	11	U	11	11	U	11	10	U	10
Fluoranthene	PAH	12	U	12	13	U	13	13	U	13	12	U	12	12	U	12
Fluorene	PAH	5.1	U	5.1	5.3	U	5.3	5.3	U	5.3	5.1	U	5.1	5.0	U	5.0
Indeno(1,2,3-cd)pyrene	PAH	12	U	12	12	U	12	12	U	12	12	U	12	11	U	11
Naphthalene	PAH	12	U	12	12	U	12	12	U	12	12	U	12	11	U	11
Phenanthrene	PAH	12	U	12	12	U	12	12	U	12	12	U	12	11	U	11
Pyrene	PAH	12	U	12	12	U	12	12	U	12	12	U	12	11	U	11
Aroclor-1016	PCB	2.7	U	2.7	2.8	U	2.8	2.8	U	2.8	2.8	U	2.8	2.6	U	2.6
Aroclor-1221	PCB	7.8	U	7.8	8.0	U	8.0	8.0	U	8.0	8.1	U	8.1	7.5	U	7.5
Aroclor-1232	PCB	1.9	U	1.9	2.0	U	2.0	2.0	U	2.0	2.0	U	2.0	1.9	U	1.9
Aroclor-1242	PCB	4.5	U	4.5	4.6	U	4.6	4.7	U	4.7	4.7	U	4.7	4.3	U	4.3
Aroclor-1248	PCB	4.5	U	4.5	4.6	U	4.6	4.7	U	4.7	4.7	U	4.7	4.3	U	4.3
Aroclor-1254	PCB	2.5	U	2.5	2.6	U	2.6	2.6	U	2.6	2.6	U	2.6	2.4	U	2.4
Aroclor-1260	PCB	2.5	U	2.5	2.6	U	2.6	2.6	U	2.6	2.6	U	2.6	2.4	U	2.4
Aldrin	PEST	0.25	U	0.25	0.25	U	0.25	0.25	U	0.25	0.24	U	0.24	0.24	U	0.24
Alpha-BHC	PEST	0.21	U	0.21	0.21	U	0.21	0.21	U	0.21	0.20	U	0.20	0.20	U	0.20
alpha-Chlordane	PEST	0.32	U	0.32	0.32	U	0.32	0.32	U	0.32	0.30	U	0.30	0.30	U	0.30
beta-1,2,3,4,5,6-Hexachlorocyclohexane	PEST	0.65	U	0.65	0.65	U	0.65	0.65	U	0.65	0.62	U	0.62	0.63	U	0.63
Delta-BHC	PEST	0.40	U	0.40	0.39	U	0.39	0.39	U	0.39	0.38	U	0.38	0.38	U	0.38
Dichlorodiphenyldichloroethane	PEST	0.54	U	0.54	0.54	U	0.54	0.54	U	0.54	0.51	U	0.51	0.52	U	0.52
Dichlorodiphenyldichloroethylene	PEST	0.23	U	0.23	0.23	U	0.23	0.23	U	0.23	0.22	U	0.22	0.22	U	0.22
Dichlorodiphenyltrichloroethane	PEST	0.58	U	0.58	0.58	U	0.58	0.58	U	0.58	0.55	U	0.55	0.56	U	0.56
Dieldrin	PEST	0.21	U	0.21	0.21	U	0.21	0.21	U	0.21	0.20	U	0.20	0.20	U	0.20
Endosulfan I	PEST	0.17	U	0.17	0.17	U	0.17	0.17	U	0.17	0.16	U	0.16	0.17	U	0.17
Endosulfan II	PEST	0.28	U	0.28	0.28	U	0.28	0.28	U	0.28	0.27	U	0.27	0.27	U	0.27
Endosulfan sulfate	PEST	0.27	U	0.27	0.27	U	0.27	0.27	U	0.27	0.26	U	0.26	0.26	U	0.26
Endrin	PEST	0.30	U	0.30	0.30	U	0.30	0.30	U	0.30	0.29	U	0.29	0.29	U	0.29
Endrin aldehyde	PEST	0.17	U	0.17	0.17	U	0.17	0.17	U	0.17	0.16	U	0.16	0.16	U	0.16
Endrin ketone	PEST	0.48	U	0.48	0.48	U	0.48	0.48	U	0.48	0.46	U	0.46	0.46	U	0.46
Gamma-BHC (Lindane)	PEST	0.46	U	0.46	0.46	U	0.46	0.46	U	0.46	0.43	U	0.43	0.44	U	0.44
gamma-Chlordane	PEST	0.26	U	0.26	0.26	U	0.26	0.26	U	0.26	0.25	U	0.25	0.25	U	0.25
Heptachlor	PEST	0.21	U	0.21	0.21	U	0.21	0.21	U	0.21	0.20	U	0.20	0.20	U	0.20
Heptachlor epoxide	PEST	0.42	U	0.42	0.42	U	0.42	0.42	U	0.42	0.40	U	0.40	0.40	U	0.40
Methoxychlor	PEST	0.44	U	0.44	0.44	U	0.44	0.44	U	0.44	0.42	U	0.42	0.42	U	0.42
Toxaphene	PEST	16	U	16	16	U	16	16	U	16	15	U	15	15	UJ	15

Attachment	1	Sheet No.	18 of 21
Originator	I. B. Berezovskiy	Date	9/22/14
Checked	R. J. Nielson	Date	9/22/14
Calc. No.	0100D-CA-V0552	Rev. No	0

Attachment 1. 100-D-106 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1TWC6, Duplicate of J1TWC0			J1TW94, SPA-1			J1TW97, SPA-2			J1TW96, SPA-3			J1TW95, SPA-4		
		07/16/14			07/16/14			07/16/14			07/16/14			07/16/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	9.6	U	9.6	9.3	U	9.3	9.6	U	9.6	9.4	U	9.4	9.6	U	9.6
Acenaphthylene	PAH	8.6	U	8.6	8.4	U	8.4	8.6	U	8.6	8.5	U	8.5	8.6	U	8.6
Anthracene	PAH	2.9	U	2.9	2.9	U	2.9	2.9	U	2.9	2.9	U	2.9	2.9	U	2.9
Benzo(a)anthracene	PAH	3.1	U	3.1	3.0	U	3.0	3.1	U	3.1	3.0	U	3.0	3.1	U	3.1
Benzo(a)pyrene	PAH	6.1	U	6.1	6.0	U	6.0	6.2	U	6.2	6.1	U	6.1	6.1	U	6.1
Benzo(b)fluoranthene	PAH	4.0	U	4.0	3.9	U	3.9	4.0	U	4.0	4.0	U	4.0	4.0	UN	4.0
Benzo(ghi)perylene	PAH	6.9	U	6.9	6.7	U	6.7	6.9	U	6.9	6.8	U	6.8	6.9	U	6.9
Benzo(k)fluoranthene	PAH	3.8	U	3.8	3.7	U	3.7	3.8	U	3.8	3.7	U	3.7	3.8	U	3.8
Chrysene	PAH	4.6	U	4.6	4.5	U	4.5	4.6	U	4.6	4.6	U	4.6	4.6	U	4.6
Dibenz[a,h]anthracene	PAH	11	U	11	10	U	10	11	U	11	10	U	10	11	U	11
Fluoranthene	PAH	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12
Fluorene	PAH	5.1	U	5.1	4.9	U	4.9	5.1	U	5.1	5.0	U	5.0	5.1	U	5.1
Indeno(1,2,3-cd)pyrene	PAH	12	U	12	11	U	11	12	U	12	11	U	11	11	U	11
Naphthalene	PAH	12	U	12	11	U	11	12	U	12	11	U	11	11	U	11
Phenanthrene	PAH	12	U	12	11	U	11	12	U	12	11	U	11	11	U	11
Pyrene	PAH	12	U	12	11	U	11	12	U	12	11	U	11	11	U	11
Aroclor-1016	PCB	2.6	U	2.6	2.6	U	2.6	2.8	U	2.8	2.6	U	2.6	2.6	U	2.6
Aroclor-1221	PCB	7.5	U	7.5	7.4	U	7.4	8.0	U	8.0	7.5	U	7.5	7.6	U	7.6
Aroclor-1232	PCB	1.9	U	1.9	1.9	U	1.9	2.0	U	2.0	1.9	U	1.9	1.9	U	1.9
Aroclor-1242	PCB	4.3	U	4.3	4.3	U	4.3	4.7	U	4.7	4.4	U	4.4	4.4	U	4.4
Aroclor-1248	PCB	4.3	U	4.3	4.3	U	4.3	4.7	U	4.7	4.4	U	4.4	4.4	U	4.4
Aroclor-1254	PCB	2.4	U	2.4	2.4	U	2.4	2.6	U	2.6	2.4	U	2.4	2.5	U	2.5
Aroclor-1260	PCB	2.4	U	2.4	2.4	U	2.4	2.6	U	2.6	2.4	U	2.4	2.5	U	2.5
Aldrin	PEST	0.24	U	0.24	0.24	U	0.24	0.23	U	0.23	0.24	U	0.24	0.25	U	0.25
Alpha-BHC	PEST	0.21	U	0.21	0.20	U	0.20	0.20	U	0.20	0.21	U	0.21	0.21	U	0.21
alpha-Chlordane	PEST	0.31	U	0.31	0.31	U	0.31	0.30	U	0.30	0.31	U	0.31	0.32	U	0.32
beta-1,2,3,4,5,6-Hexachlorocyclohexane	PEST	0.64	U	0.64	0.63	U	0.63	0.61	U	0.61	0.64	U	0.64	0.66	U	0.66
Delta-BHC	PEST	0.39	U	0.39	0.38	U	0.38	0.37	U	0.37	0.39	U	0.39	0.40	U	0.40
Dichlorodiphenyldichloroethane	PEST	0.53	U	0.53	0.52	U	0.52	0.50	U	0.50	0.53	U	0.53	0.54	U	0.54
Dichlorodiphenyldichloroethylene	PEST	0.23	U	0.23	0.23	U	0.23	0.22	U	0.22	0.23	U	0.23	0.24	U	0.24
Dichlorodiphenyltrichloroethane	PEST	0.57	U	0.57	0.56	U	0.56	0.54	U	0.54	0.57	U	0.57	0.59	U	0.59
Dieldrin	PEST	0.20	U	0.20	0.20	U	0.20	0.19	U	0.19	0.20	U	0.20	0.21	U	0.21
Endosulfan I	PEST	0.17	U	0.17	0.17	U	0.17	0.16	U	0.16	0.17	U	0.17	0.17	U	0.17
Endosulfan II	PEST	0.28	U	0.28	0.27	U	0.27	0.26	U	0.26	0.28	U	0.28	0.28	U	0.28
Endosulfan sulfate	PEST	0.27	U	0.27	0.26	U	0.26	0.25	U	0.25	0.27	U	0.27	0.27	U	0.27
Endrin	PEST	0.30	U	0.30	0.29	U	0.29	0.28	U	0.28	0.30	U	0.30	0.30	U	0.30
Endrin aldehyde	PEST	0.17	U	0.17	0.16	U	0.16	0.16	U	0.16	0.17	U	0.17	0.17	U	0.17
Endrin ketone	PEST	0.47	U	0.47	0.47	U	0.47	0.45	U	0.45	0.47	U	0.47	0.48	U	0.48
Gamma-BHC (Lindane)	PEST	0.45	U	0.45	0.44	U	0.44	0.43	U	0.43	0.45	U	0.45	0.46	U	0.46
gamma-Chlordane	PEST	0.26	U	0.26	0.25	U	0.25	0.24	U	0.24	0.26	U	0.26	0.26	U	0.26
Heptachlor	PEST	0.21	U	0.21	0.20	U	0.20	0.20	U	0.20	0.21	U	0.21	0.21	U	0.21
Heptachlor epoxide	PEST	0.41	U	0.41	0.41	U	0.41	0.39	U	0.39	0.41	U	0.41	0.42	U	0.42
Methoxychlor	PEST	0.44	U	0.44	0.43	U	0.43	0.41	U	0.41	0.44	U	0.44	0.45	U	0.45
Toxaphene	PEST	15	UJ	15	15	UJ	15	15	UJ	15	15	UJ	15	16	UJ	16

Attachment	1	Sheet No.	19 of 21
Originator	I. B. Berezovskiy	Date	9/22/14
Checked	R. J. Nielson	Date	9/22/14
Calc. No.	0100D-CA-V0552	Rev. No.	0

Attachment 1. 100-D-106 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1TW98, SPA-5			J1TW99, SPA-6			J1TWC1, SPA-8			J1TWC2, SPA-9			J1TWC3, SPA-10		
		07/16/14			07/16/14			07/16/14			07/16/14			07/16/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	9.7	U	9.7	9.3	U	9.3	9.7	U	9.7	10	U	10	9.8	U	9.8
Acenaphthylene	PAH	8.7	U	8.7	8.4	U	8.4	8.7	U	8.7	9.1	U	9.1	8.8	U	8.8
Anthracene	PAH	2.9	U	2.9	2.9	U	2.9	3.0	U	3.0	3.1	U	3.1	3.0	U	3.0
Benzo(a)anthracene	PAH	3.1	U	3.1	3.0	U	3.0	3.1	U	3.1	3.2	U	3.2	3.1	U	3.1
Benzo(a)pyrene	PAH	6.2	U	6.2	6.0	U	6.0	6.2	U	6.2	6.5	U	6.5	6.3	U	6.3
Benzo(b)fluoranthene	PAH	4.1	U	4.1	3.9	U	3.9	4.1	U	4.1	4.2	U	4.2	4.1	U	4.1
Benzo(ghi)perylene	PAH	7.0	U	7.0	6.7	U	6.7	7.0	U	7.0	7.3	U	7.3	7.1	U	7.1
Benzo(k)fluoranthene	PAH	3.8	U	3.8	3.7	U	3.7	3.8	U	3.8	4.0	U	4.0	3.9	U	3.9
Chrysene	PAH	4.7	U	4.7	4.5	U	4.5	4.7	U	4.7	4.9	U	4.9	4.7	U	4.7
Dibenz[a,h]anthracene	PAH	11	U	11	10	U	10	11	U	11	11	U	11	11	U	11
Fluoranthene	PAH	13	U	13	12	U	12	13	U	13	13	U	13	13	U	13
Fluorene	PAH	5.1	U	5.1	4.9	U	4.9	5.1	U	5.1	5.3	U	5.3	5.2	U	5.2
Indeno(1,2,3-cd)pyrene	PAH	12	U	12	11	U	11	12	U	12	12	U	12	12	U	12
Naphthalene	PAH	12	U	12	11	U	11	12	U	12	12	U	12	12	U	12
Phenanthrene	PAH	12	U	12	11	U	11	12	U	12	12	U	12	12	U	12
Pyrene	PAH	12	U	12	11	U	11	12	U	12	12	U	12	12	U	12
Aroclor-1016	PCB	2.7	U	2.7	2.7	U	2.7	2.6	U	2.6	2.7	U	2.7	2.7	U	2.7
Aroclor-1221	PCB	7.9	U	7.9	7.8	U	7.8	7.6	U	7.6	7.9	U	7.9	7.8	U	7.8
Aroclor-1232	PCB	2.0	U	2.0	2.0	U	2.0	1.9	U	1.9	2.0	U	2.0	1.9	U	1.9
Aroclor-1242	PCB	4.6	U	4.6	4.6	U	4.6	4.4	U	4.4	4.6	U	4.6	4.5	U	4.5
Aroclor-1248	PCB	4.6	U	4.6	4.6	U	4.6	4.4	U	4.4	4.6	U	4.6	4.5	U	4.5
Aroclor-1254	PCB	2.5	U	2.5	2.5	U	2.5	2.5	U	2.5	2.6	U	2.6	2.5	U	2.5
Aroclor-1260	PCB	2.5	U	2.5	2.5	U	2.5	2.5	U	2.5	2.6	U	2.6	2.5	U	2.5
Aldrin	PEST	0.24	U	0.24	0.24	U	0.24	0.25	U	0.25	0.24	U	0.24	0.24	U	0.24
Alpha-BHC	PEST	0.20	U	0.20	0.21	U	0.21	0.22	U	0.22	0.21	U	0.21	0.20	U	0.20
alpha-Chlordane	PEST	0.30	U	0.30	0.31	U	0.31	0.33	U	0.33	0.31	U	0.31	0.30	U	0.30
beta-1,2,3,4,5,6-Hexachlorocyclohexane	PEST	0.62	U	0.62	0.64	U	0.64	0.67	U	0.67	0.65	U	0.65	0.63	U	0.63
Delta-BHC	PEST	0.38	U	0.38	0.39	U	0.39	0.40	U	0.40	0.39	U	0.39	0.38	U	0.38
Dichlorodiphenyldichloroethane	PEST	0.51	U	0.51	0.53	U	0.53	0.55	U	0.55	0.53	U	0.53	0.52	U	0.52
Dichlorodiphenyldichloroethylene	PEST	0.22	U	0.22	0.23	U	0.23	0.24	U	0.24	0.23	U	0.23	0.22	U	0.22
Dichlorodiphenyltrichloroethane	PEST	0.55	U	0.55	0.57	U	0.57	0.60	U	0.60	0.57	U	0.57	0.56	U	0.56
Dieldrin	PEST	0.20	U	0.20	0.20	U	0.20	0.21	U	0.21	0.20	U	0.20	0.20	U	0.20
Endosulfan I	PEST	0.16	U	0.16	0.17	U	0.17	0.18	U	0.18	0.17	U	0.17	0.17	U	0.17
Endosulfan II	PEST	0.27	U	0.27	0.28	U	0.28	0.29	U	0.29	0.28	U	0.28	0.27	U	0.27
Endosulfan sulfate	PEST	0.26	U	0.26	0.27	U	0.27	0.28	U	0.28	0.27	U	0.27	0.26	U	0.26
Endrin	PEST	0.29	U	0.29	0.30	U	0.30	0.31	U	0.31	0.30	U	0.30	0.29	U	0.29
Endrin aldehyde	PEST	0.16	U	0.16	0.17	U	0.17	0.17	U	0.17	0.17	U	0.17	0.16	U	0.16
Endrin ketone	PEST	0.46	U	0.46	0.47	U	0.47	0.49	U	0.49	0.48	U	0.48	0.46	U	0.46
Gamma-BHC (Lindane)	PEST	0.43	U	0.43	0.45	U	0.45	0.47	U	0.47	0.45	U	0.45	0.44	U	0.44
gamma-Chlordane	PEST	0.25	U	0.25	0.26	U	0.26	0.27	U	0.27	0.26	U	0.26	0.25	U	0.25
Heptachlor	PEST	0.20	U	0.20	0.21	U	0.21	0.22	U	0.22	0.21	U	0.21	0.20	U	0.20
Heptachlor epoxide	PEST	0.40	U	0.4	0.41	U	0.41	0.43	U	0.43	0.41	U	0.41	0.40	U	0.40
Methoxychlor	PEST	0.42	U	0.42	0.44	U	0.44	0.45	U	0.45	0.44	U	0.44	0.42	U	0.42
Toxaphene	PEST	15	UJ	15	15	UJ	15	16	UJ	16	15	UJ	15	15	UJ	15

Attachment	1	Sheet No.	20 of 21
Originator	J. B. Berezovskiy	Date	9/22/14
Checked	R. J. Nielson	Date	9/22/14
Calc. No.	0100D-CA-V0552	Rev. No.	0

Attachment 1. 100-D-106 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1TWC4, SPA-11			J1TWC5, SPA-12			J1THH1, FS-1			J1THK6, FS-2			J1TWF2, FS-3		
		07/16/14			07/16/14			04/02/14			04/02/14			07/22/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	9.5	U	9.5	9.4	U	9.4	10	U	10	11	U	11	10	U	10
Acenaphthylene	PAH	8.5	U	8.5	8.5	U	8.5	9.3	U	9.3	9.6	U	9.6	9.0	U	9.0
Anthracene	PAH	2.9	U	2.9	2.9	U	2.9	3.2	U	3.2	3.3	U	3.3	3.0	U	3.0
Benzo(a)anthracene	PAH	3.0	U	3.0	3.0	U	3.0	3.3	U	3.3	3.4	U	3.4	3.2	U	3.2
Benzo(a)pyrene	PAH	6.1	U	6.1	6.1	U	6.1	6.7	U	6.7	6.9	U	6.9	6.4	U	6.4
Benzo(b)fluoranthene	PAH	4.0	U	4.0	4.0	U	4.0	4.4	U	4.4	4.5	UN	4.5	4.2	U	4.2
Benzo(ghi)perylene	PAH	6.8	U	6.8	6.8	U	6.8	7.5	U	7.5	7.7	U	7.7	7.2	U	7.2
Benzo(k)fluoranthene	PAH	3.7	U	3.7	3.7	U	3.7	4.1	U	4.1	4.2	U	4.2	3.9	U	3.9
Chrysene	PAH	4.6	U	4.6	4.6	U	4.6	5.0	U	5.0	5.2	U	5.2	4.8	U	4.8
Dibenz[a,h]anthracene	PAH	10	U	10	10	U	10	11	U	11	12	UN	12	11	U	11
Fluoranthene	PAH	12	U	12	12	U	12	13	U	13	14	U	14	13	U	13
Fluorene	PAH	5.0	U	5.0	5.0	U	5.0	50		5.5	5.7	U	5.7	5.3	U	5.3
Indeno(1,2,3-cd)pyrene	PAH	11	U	11	11	U	11	12	U	12	13	UN	13	12	U	12
Naphthalene	PAH	11	U	11	11	U	11	12	U	12	13	U	13	12	U	12
Phenanthrene	PAH	11	U	11	11	U	11	12	U	12	13	U	13	12	U	12
Pyrene	PAH	11	U	11	11	U	11	12	U	12	13	U	13	12	U	12
Aroclor-1016	PCB	2.7	U	2.7	2.7	U	2.7	3.0	U	3.0	3.0	U	3.0	2.6	U	2.6
Aroclor-1221	PCB	8.0	U	8.0	7.9	U	7.9	8.7	U	8.7	8.6	U	8.6	7.6	U	7.6
Aroclor-1232	PCB	2.0	U	2.0	2.0	U	2.0	2.2	U	2.2	2.1	U	2.1	1.9	U	1.9
Aroclor-1242	PCB	4.6	U	4.6	4.6	U	4.6	5.0	U	5.0	5.0	U	5.0	4.4	U	4.4
Aroclor-1248	PCB	4.6	U	4.6	4.6	U	4.6	5.0	U	5.0	5.0	U	5.0	4.4	U	4.4
Aroclor-1254	PCB	2.6	U	2.6	2.6	U	2.6	2.8	U	2.8	2.8	U	2.8	2.5	U	2.5
Aroclor-1260	PCB	2.6	U	2.6	2.6	U	2.6	2.8	U	2.8	2.8	U	2.8	2.5	U	2.5
Aldrin	PEST	0.24	U	0.24	0.24	U	0.24	0.27	U	0.27	0.25	U	0.25	0.24	U	0.24
Alpha-BHC	PEST	0.21	U	0.21	0.21	U	0.21	0.23	U	0.23	0.21	U	0.21	0.21	U	0.21
alpha-Chlordane	PEST	0.32	U	0.32	0.31	U	0.31	0.34	U	0.34	0.32	U	0.32	3.8		0.31
beta-1,2,3,4,5,6-Hexachlorocyclohexane	PEST	0.65	U	0.65	0.64	U	0.64	0.70	U	0.70	0.66	U	0.66	0.64	U	0.64
Delta-BHC	PEST	0.39	U	0.39	0.38	U	0.38	0.42	U	0.42	0.40	U	0.40	0.39	U	0.39
Dichlorodiphenyldichloroethane	PEST	0.53	U	0.53	0.52	U	0.52	0.58	U	0.58	0.55	U	0.55	0.53	U	0.53
Dichlorodiphenyldichloroethylene	PEST	0.23	U	0.23	0.23	U	0.23	0.25	U	0.25	0.24	U	0.24	0.23	U	0.23
Dichlorodiphenyltrichloroethane	PEST	0.58	U	0.58	0.57	U	0.57	1.0	J	0.62	0.66	JX	0.59	0.69	J	0.57
Dieldrin	PEST	0.20	U	0.20	0.20	U	0.20	0.22	U	0.22	0.21	U	0.21	0.20	U	0.20
Endosulfan I	PEST	0.17	U	0.17	0.17	U	0.17	0.19	U	0.19	0.18	U	0.18	0.17	U	0.17
Endosulfan II	PEST	0.28	U	0.28	0.28	U	0.28	0.30	U	0.30	0.29	U	0.29	0.28	U	0.28
Endosulfan sulfate	PEST	0.27	U	0.27	0.26	U	0.26	0.29	U	0.29	0.28	U	0.28	0.27	U	0.27
Endrin	PEST	0.30	U	0.30	0.29	U	0.29	0.32	U	0.32	0.31	U	0.31	0.30	U	0.30
Endrin aldehyde	PEST	0.17	U	0.17	0.16	U	0.16	0.18	U	0.18	0.17	U	0.17	0.17	U	0.17
Endrin ketone	PEST	0.48	U	0.48	0.47	U	0.47	0.52	U	0.52	0.49	U	0.49	0.47	U	0.47
Gamma-BHC (Lindane)	PEST	0.45	U	0.45	0.45	U	0.45	0.49	U	0.49	0.46	U	0.46	0.45	U	0.45
gamma-Chlordane	PEST	0.26	U	0.26	0.26	U	0.26	0.28	U	0.28	0.27	U	0.27	3.9		0.26
Heptachlor	PEST	0.21	U	0.21	0.21	U	0.21	0.23	U	0.23	0.21	U	0.21	0.21	U	0.21
Heptachlor epoxide	PEST	0.42	U	0.42	0.41	U	0.41	0.45	U	0.45	0.43	U	0.43	0.41	U	0.41
Methoxychlor	PEST	0.44	U	0.44	0.43	U	0.43	0.48	U	0.48	0.45	U	0.45	0.44	U	0.44
Toxaphene	PEST	15	UJ	15	15	UJ	15	17	U	17	16	U	16	15	U	15

Attachment	1	Sheet No.	21 of 21
Originator	I. B. Berezovskiy	Date	9/22/14
Checked	R. J. Nielson	Date	9/22/14
Calc. No.	0100D-CA-V0552	Rev. No.	0

Acrobat 8.0

CALCULATION COVER SHEET

Project Title: 100-D Area Closure Operations **Job No. 14655**

Area: 100-D

Discipline: Environmental *Calculation No: 0100D-CA-V0553

Subject: 100-D-106 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk 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 = 3 Total = 4	A.B. Berezovskiy	R. J. Nielson	J. D. Skoglie	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:	09/22/14	Calc. No.:	0100D-CA-V0553	Rev.:	0
Project:	100-D Area Closure Operations	Job No:	14655	Checked:	R. J. Nielson	Date:	09/22/14
Subject:	100-D-106 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculation					Sheet No.	1 of 3

PURPOSE:

Provide documentation to support the calculation of the direct contact hazard quotient (HQ) and excess carcinogenic risk for the 100-D-106 waste site. In accordance with the remedial action goals (RAGs) in the remedial design report/remedial action work plan (RDR/RAWP) (DOE-RL 2009a), the following criteria must be met:

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

GIVEN/REFERENCES:

1) DOE-RL, 2009a, *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.

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

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

4) WCH, 2014, *100-D-106 Waste Site Cleanup Verification 95% UCL Calculation*, 0100D-CA-V0552, 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 2009a).

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

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

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:	09/26/14	Calc. No.:	0100D-CA-V0553	Rev.:	0
Project:	100-D Area Closure Operations	Job No:	14655	Checked:	R. J. Nielson	Date:	09/26/14
Subject:	100-D-106 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculation					Sheet No.	2 of 3

METHODOLOGY:

The 100-D-106 waste site is comprised of two decision units for verification sampling; excavation and staging pile area. In addition, three focused samples were collected from the excavation area. The direct contact hazard quotient and carcinogenic risk calculations for the 100-D-106 waste site were conservatively calculated for the entire waste site 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, the detected polycyclic aromatic hydrocarbons, and pesticides require HQ and risk calculations because these analytes were detected and a Washington State or Hanford Site background value is not available. Zinc, selenium, fluoride, and nitrogen in nitrite and nitrate require HQ and risk calculations because these analytes were detected above a Washington State or Hanford Site background value. Although total petroleum hydrocarbons (diesel range extended) were detected and no background value is available, the risk associated with total petroleum hydrocarbons do not contribute to the cumulative toxicity calculation. All other site nonradionuclide COPCs were not detected or were quantified below background levels. An example of the HQ and risk calculations is presented below:

1) For example, the statistical value for boron is 2.0 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 2.8×10^{-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 0.321 mg/kg; divided by 2.1 mg/kg, and multiplied as indicated, is 1.5×10^{-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 2.2×10^{-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:	09/22/14	Calc. No.:	0100D-CA-V0553	Rev.:	0
Project:	100-D Area Closure Operations	Job No:	14655	Checked:	R. J. Nielson	Date:	09/22/14
Subject:	100-D-106 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculation					Sheet No.	3 of 3

Table 1. Direct Contact Hazard Quotient and Excess Cancer Risk Results for the 100-D-106 Waste Site.

Contaminants of Potential Concern	Maximum or Statistical Value [a] (mg/kg)	Noncarcinogen RAG [b] (mg/kg)	Hazard Quotient	Carcinogen RAG [b] (mg/kg)	Carcinogen Risk
Metals					
Boron	2.0	7,200	2.8E-04	--	--
Chromium, hexavalent [c]	0.321	240	1.3E-03	2.1	1.5E-07
Molybdenum	0.78	400	2.0E-03	--	--
Selenium	1.2	400	3.0E-03	--	--
Zinc	147	24,000	6.1E-03	--	--
Anions					
Fluoride	4.2	4,800	8.8E-04	--	--
Nitrogen in nitrite and nitrate	14.1	128,000	1.1E-04	--	--
Polyaromatic Hydrocarbons					
Benzo(a)anthracene	0.012	--	--	1.37	8.8E-09
Benzo(a)pyrene	0.0076	--	--	0.137	5.5E-08
Chrysene	0.010	--	--	13.7	7.3E-10
Fluoranthene	0.019	3,200	5.9E-06	--	--
Fluorene	0.050	3,200	1.6E-05	--	--
Pyrene	0.015	2,400	6.3E-06	--	--
Pesticides					
Chlordane (alpha, gamma)	0.0077	40	1.9E-04	2.86	2.7E-09
DDD, 4,4'-	0.00051	--	--	4.17	1.2E-10
DDT, 4,4'-	0.0014	40	3.5E-05	2.94	4.8E-10
Total Petroleum Hydrocarbons					
TPH - diesel range extended [d]	29	200	--	--	--
Totals					
Cumulative Hazard Quotient:			**1.4E-02**		
Cumulative Excess Cancer Risk:					**2.2E-07**

Notes:

[a] = From WCH (2014).

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

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

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

-- = not applicable

RAG = remedial action goal

CONCLUSION:

The calculations in Table 1 demonstrate that the 100-D-106 waste site meets the requirements for the direct contact hazard quotient and carcinogenic (excess cancer) risk, respectively, as identified in the RDR/RAWP (DOE-RL 2009a) and SAP (DOE-RL 2009b). The direct contact hazard quotient and carcinogenic (excess cancer) risk calculations are for use in the RSVP for this site.

Acrobat 8.0

CALCULATION COVER SHEET

Project Title: 100-D Area Closure Operations **Job No. 14655**

Area: 100-D

Discipline: Environmental *Calculation No: 0100D-CA-V0554

Subject: 100-D-106 Waste Site 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. Berezovsky	R. J. Nielson	J. D. Skoglie	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:	9/22/2014	Calc. No.:	0100D-CA-V0554	Rev.:	0
Project:	100-D Area Closure Operations	Job No:	14655	Checked:	R. J. Nielson	Date:	9/22/2014
Subject:	100-D-106 Waste Site 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-106 waste site. 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-106 Waste Site Cleanup Verification 95% UCL Calculations*, 0100D-CA-V0552, 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:	9/22/2014	Calc. No.:	0100D-CA-V0554	Rev.:	0
Project:	100-D Area Closure Operations	Job No:	14655	Checked:	R. J. Nielson	Date:	9/22/2014
Subject:	100-D-106 Waste Site Hazard Quotient and Carcinogenic Risk Calculation for Protection of Groundwater					Sheet No. 2 of 3	

METHODOLOGY:

The 100-D-106 waste site was divided into two decision units for the purpose of verification sampling; excavation and staging pile area. In addition, three focused samples were collected from the excavation area. Hazard quotient and carcinogenic risk calculations for potential impact to groundwater at the 100-D-106 waste site were conservatively calculated for the entire waste site using the greater of the statistical or maximum value for each analyte in all decision units from the 95% UCL calculation (WCH 2014). Based on this model and a vadose zone of approximately 12.6 m (41.3 ft) thickness, a K_d of 5.8 or greater is required to show no predicted migration to groundwater in 1,000 years. Of the contaminants of potential concern (COPCs) for this site, boron, hexavalent chromium, and nitrogen in nitrite and nitrate 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). Selenium is included because it was detected above background and has a K_d less than 5.8. All other site nonradionuclide COPCs were not detected, quantified below background levels, or have a K_d greater than or equal to 5.8. 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 2.0 mg/kg, divided by the noncarcinogenic RAG value of 320 mg/kg is 6.3×10^{-3}. 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-106 waste site is 3.2×10^{-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-106 waste site doesn't have any constituents with carcinogen RAG, the criterion for excess cancer 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:	9/22/2014	Calc. No.:	0100D-CA-V0554	Rev.:	0
Project:	100-D Area Closure Operations	Job No:	14655	Checked:	R. J. Nielson RJN	Date:	9/22/2014
Subject:	100-D-106 Waste Site 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-106 Waste Site.

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					
Boron	2.0	320	6.3E-03	--	--
Chromium, hexavalent	0.321	4.8	6.7E-02	--	--
Selenium	1.2	5	2.4E-01	--	--
Anions					
Nitrogen in nitrate and nitrite	14.1	2,560	5.5E-03	--	--
Totals					
Cumulative Hazard Quotient:			**3.2E-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.
-- = not applicable
RAG = remedial action goal

CONCLUSION:

This calculation demonstrates that the 100-D-106 waste site 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 life cycle (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-106 waste site were provided by the laboratories in four sample delivery groups (SDGs) (SDG JP0833, SDG JP0834, SDG J02131, and SDG JP0835). SDG JP0833 was submitted for third-party validation. Major and minor deficiencies are discussed for the 100-D-106 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 300.0 ion chromatography (IC) anions analysis of greater than twice the limit of 48 hours, third-party validation qualified the all undetected nitrite results in SDG JP0833 as rejected with "R" flags. All detected nitrate and orthophosphate data was qualified by third-party validation as estimated with "J" flags. This result was anticipated, and the U.S. Environmental Protection Agency analytical method 353.2 was also 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-106 waste site. Phosphate is not a regulated chemical under *Washington Administrative Code* (WAC) 173-340, "Model Toxics Control Act-Cleanup."

MINOR DEFICIENCIES

SDG JP0833

This SDG comprises 13 statistical soil samples (J1TW94 through J1TW99, J1TWC0 through J1TWC5) from the staging pile area. This SDG includes one field duplicate pair (J1TWC0/J1TWC6). All samples were analyzed for inductively coupled plasma (ICP) metals, mercury, hexavalent chromium, IC anions, nitrate/nitrite, pesticides, polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCBs), and semivolatile organic compounds (SVOCs). In addition, one field equipment blank sample (J1TWC7) was collected and analyzed for ICP metals, mercury, and SVOCs. SDG JP0833 was submitted for third-party validation. Minor deficiencies are as follows.

In the SVOC analysis, the matrix spike (MS) and matrix spike duplicate (MSD) recoveries for 2,4-dinitrophenol are below the project quality control (QC) limit at 30% and 30%, respectively. All 2,4-dinitrophenol results for SDG JP0833 were qualified by third-party validation as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, due to method blank (MB) contamination, third-party validation qualified all chromium, copper, and zinc results for sample J1TWC7 as undetected with "UJ" flags. Data are usable for decision-making purposes.

In the ICP metals analysis, the MS recoveries are outside the project acceptance criteria for six analytes (aluminum [726%], antimony [54%], beryllium [64%], iron [911%], manganese [205%], and silicon [14%]). 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, beryllium, and silicon did not have a mismatched spike and native concentrations in the MS. All antimony, beryllium, and silicon results for SDG JP0833 were qualified by third-party validation as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the ICP analysis, the laboratory control sample (LCS) recovery for silicon is below the project QC limits at 10%. All silicon results for SDG JP0833 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 relative percent difference (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 JP0833 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 molybdenum (44%) is 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 molybdenum results in SDG JP0833 may be considered estimated. Estimated data are usable for decision-making purposes.

In the pesticides analysis, all of the toxaphene data in SDG JP0833 was qualified by third-party validation as estimated with "J" flags due to lack of an MS, MSD, and LCS analysis. Estimated or "J"-flagged data are acceptable for decision-making purposes.

In the IC anions analysis, holding times were exceeded by more than twice the specified holding time for nitrate and orthophosphate. All nitrate and orthophosphate results in SDG JP0833 were qualified by third-party validation as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the IC anions analysis, due to MB contamination, all sulfate results for samples J1TW98, J1TWC0, J1TWC1, J1TWC2, and J1TWC6 were qualified by third-party validation as undetected with "U" flags. Data are usable for decision-making purposes.

In the IC anions analysis, the MS recovery for fluoride (69%) is outside the project QC limits. Third-party validation qualified all fluoride results in SDG JP0833 as estimated with "J" flags. Estimated data are usable for decision-making purposes.

SDG JP0834

This SDG comprises 13 statistical soil samples (J1TWC8, J1TWC9, J1TWD0 through J1TWD9, and J1TWF0) from the excavation area. This SDG includes one field duplicate pair (J1TWC8/J1TWF1). All samples were analyzed for ICP metals, mercury, hexavalent chromium, IC anions, nitrate/nitrite, pesticides, PAH, PCBs, and SVOCs. Minor deficiencies are as follows.

In the SVOC analysis, the LCS recoveries were below the QC limit for 4-chloroanaline (42%) and 3,3-dichlorobenzidine (40%). Although not qualified for LCS recoveries below QC limits, 4-chloroanaline and 3,3-dichlorobenzidine results for SDG JP0834 may be considered estimated. Estimated data are usable for decision-making purposes.

In the SVOC analysis, the MS and MSD recoveries for 4,6-dinitro-2-methylphenol (39% and 36%) and 2,4-dinitrophenol (15% and 11%) are below the QC limit. Although not qualified for MS and MSD recoveries below QC limits, all 4,6-dinitro-2-methylphenol and 2,4-dinitrophenol data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP analysis, the LCS recovery for silicon is below the project QC limits at 11%. Although not qualified for LCS recovery below the QC limit, all silicon results for SDG JP0834 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 for five analytes (aluminum [884%], antimony [60%], iron [1,508%], manganese [143%], and silicon [11%]). 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 JP0834 may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the RPD recoveries for lead (158%) and selenium (40%) 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 lead and selenium data for SDG JP0834 may be considered estimated. Estimated data are usable for decision-making purposes.

In the IC anions analysis, the RPD recoveries for sulfate (65% and 45%) are above the project QC limit. 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 sulfate data for SDG JP0834 may be considered estimated. Estimated data are usable for decision-making purposes.

In the IC anions analysis, the MS recoveries for fluoride (65% and 58%) are below the project QC limits. Although not qualified for MS recoveries below the QC limits, all fluoride data for SDG JP0834 may be considered estimated. Estimated data are usable for decision-making purposes.

In the IC anions analysis, holding times were exceeded by less than twice the specified holding time for nitrate and orthophosphate. Although not qualified for hold time exceedance of less than twice the limit, all nitrate and orthophosphate results in SDG JP0834 may be considered estimated. Estimated data are usable for decision-making purposes.

SDG J02131

This SDG comprises two discrete focused soil samples (J1THH1 and J1THK6) from the road crossing locations within the excavation area. All samples were analyzed for ICP metals, mercury, hexavalent chromium, nitrate/nitrite, pesticides, total petroleum hydrocarbons, PAH, PCBs, and SVOCs. Minor deficiencies are as follows.

In the SVOC analysis, the MS recovery for hexachlorocyclopentadiene (49%) is below the QC limit. Although not qualified for MS recovery below QC limits, all hexachlorocyclopentadiene data may be considered estimated. Estimated data are usable for decision-making purposes.

In the PAH analysis, the RPD recovery for dibenzo(a,h)anthracene (31%) is 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 dibenzo(a,h)anthracene data for SDG J02131 may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, arsenic is detected in the MB at very low levels, less than 1/30th of the most stringent clean-up limit. Although not qualified for MB contamination, all arsenic results

in SDG J02131 may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP analysis, the LCS recovery for silicon is below the project QC limits at 19%. Although not qualified for LCS recovery below the QC limit, all silicon results for SDG J02131 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 for five analytes (aluminum [1,198%], antimony [59%], iron [765%], manganese [134%], and silicon [29%]). 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 J02131 may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the RPD recovery for cadmium (38%) is 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 recovery above QC limits, all cadmium data for SDG J02131 may be considered estimated. Estimated data are usable for decision-making purposes.

SDG JP0835

This SDG comprises one discrete focused soil sample (J1TWF2) from the french drain excavation area. This sample was analyzed for ICP metals, mercury, hexavalent chromium, IC anions, nitrate/nitrite, pesticides, PAH, PCBs, and SVOCs. Minor deficiencies are as follows.

In the SVOC analysis, the LCS recoveries are below the QC limit for 4-chloroanaline (42%) and 3,3-dichlorobenzidine (39%). Although not qualified for LCS recoveries below QC limits, 4-chloroanaline and 3,3-dichlorobenzidine results for SDG JP0835 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 (20% and 27%) are below the QC limit. Although not qualified for MS and MSD recoveries below QC limits, all 2,4-dinitrophenol data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, manganese is detected in the MB at very low levels, less than 1/1,000th of the most stringent clean-up limit. Although not qualified for MB contamination, all manganese results in SDG JP0835 may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP analysis, the LCS recovery for silicon is below the project QC limits at 10%. Although not qualified for LCS recovery below the QC limit, all silicon results for SDG JP0835 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 for five analytes (aluminum [914%], antimony [61%], iron [1,205%], manganese [174%], and silicon [6%]). 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 JP0835 may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the RPD recoveries for antimony (37%), boron (31%), and selenium (38%) 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, boron, and selenium data for SDG JP0835 may be considered estimated. Estimated data are usable for decision-making purposes.

In the IC anions analysis, chloride is detected in the MB at very low levels, less than 1/1,000th of the most stringent clean-up limit. Although not qualified for MB contamination, all chloride results in SDG JP0835 may be considered estimated. Estimated data are usable for decision-making purposes.

In the IC anions analysis, holding times were exceeded by less than twice the specified holding time for nitrate and orthophosphate. Although not qualified for hold time exceedance of less than twice the limit, all nitrate and orthophosphate results in SDG JP0835 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	J1TWC8	J1TWF1
Staging Pile Area	J1TWC0	J1TWC6

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.

In the staging pile area duplicate evaluation, the RPD calculated for silicon (33.6%) is below 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 total detection limit is used (Appendix B) to indicate that a visual check of the data is required by the reviewer. Sulfate in the excavation area duplicate evaluation 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-106 waste site 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-106 waste site concludes that the reviewed data are of the right type, quality, and quantity to support the intended use. The analytical data were found acceptable for decision-making purposes.

The 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. 19-22 and 63-70, Washington Closure Hanford, Richland, Washington.

WCH, 2014b, *Work Instruction for Verification Sampling of the 100-D-106, 1607-D1 Influent Pipelines,* 0100D-WI-G0140, Rev. 0, Washington Closure Hanford, Richland, Washington.