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WASTE SITE RECLASSIFICATION FORM

Operable Unit: 100-HR-1 **Control No.:** 2014-110

Waste Site Code(s)/Subsite Code(s): 100-H-43

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-H-43, 1716-H Maintenance Garage, Repair Shop waste site was added to the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD), U.S. Environmental Protection Agency, Region 10, Seattle, Washington (EPA 1999), by 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), as a candidate site.

The 100-H-43 waste site consisted of below-grade remnants of the 1716-H Maintenance Garage, which included a lubrication pit, waste oil tank, floor drains, underground piping, and french drains. The 100-H-43 waste site was recommended for remediation because results of confirmatory sampling at the 100-F-49, 1716-F Maintenance Garage and Lubrication Pit (which shared design details) exceeded direct exposure remedial action goals (RAGs) for lead and polychlorinated biphenyls (PCBs). Due to the 100-F-49 confirmatory sampling results, it was considered likely that sampling results from the 100-H-43 waste site would also exceed RAGs. Therefore, the 100-H-43 waste site was recommended for remove, treat, and dispose without confirmatory sampling.

Remedial action at the 100-H-43 waste site began on March 3, 2014, and was completed March 10, 2014. Additional remediation was conducted on September 18 and 19, 2014. The waste from the site included soil and debris consisting of concrete, asphalt, steel piping, and miscellaneous demolition type debris (e.g., rebar, wood). The excavation extended to a maximum depth of approximately 2.7 m (9 ft) below ground surface.

Approximately 1,500 bank cubic meters (1,960 bank cubic yards) of contaminated soil and debris was removed and staged at a staging pile area (SPA) pending loadout and disposal. This SPA had previously received waste from the 100-H-46 waste site. Waste staging from the 100-H-43 waste site began on March 3, 2014. Additionally, waste from the 100-H-49:1, 100-H-51:1, and 100-H-51:6 waste sites was added to this SPA. Waste loadout of the SPA with disposal at the Environmental Restoration and Disposal Facility (ERDF) was conducted in July 2014. All material removed from the 100-H-43 waste site was disposed at the ERDF; therefore, no overburden was retained for backfill.

Verification samples from the excavation and the SPA were collected from August 18 to 20, 2014. After additional remediation was performed, replacement sampling was conducted on September 22, 2014. The sampling was performed to determine if the waste site met the remedial action objectives and 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.

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WASTE SITE RECLASSIFICATION FORM

Operable Unit: 100-HR-1 **Control No.:** 2014-110

Waste Site Code(s)/Subsite Code(s): 100-H-43

Basis for reclassification:

The verification sampling and modeling results for the 100-H-43 waste site demonstrates that the site meets the remedial action objectives 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-H-43, 1716-H Maintenance Garage, Repair Shop Waste Site* (attached).

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		3/2/15
DOE Federal Project Director (printed)	Signature	Date
N. Menard	Nina M Menard	3/5/15
Ecology Project Manager (printed)	Signature	Date
NA		
EPA Project Manager (printed)	Signature	Date

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REMAINING SITES VERIFICATION PACKAGE FOR THE 100-H-43, 1716-H MAINTENANCE GARAGE, REPAIR SHOP WASTE SITE

Attachment to Waste Site Reclassification Form 2014-110

March 2015

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-H-43, 1716-H MAINTENANCE GARAGE, REPAIR SHOP WASTE SITE

EXECUTIVE SUMMARY

The 100-H-43, 1716-H Maintenance Garage, Repair Shop waste site, located within the 100-HR-1 Operable Unit, consisted of the below-grade remnants of the 1716-H Maintenance Garage. The waste site included a lubrication pit, a waste oil tank, floor drains, underground piping, and two french drains that may have received drainage waste from the facility. The 1716-H Maintenance Garage was built during construction of the 100-H Area reactor and ancillary facilities from 1948 to 1949 to service area vehicles.

Remedial action at the 100-H-43 waste site began on March 3, 2014, and was completed March 10, 2014. The waste from the site included soil and debris consisting of concrete, asphalt, steel piping, and miscellaneous demolition type debris (e.g., rebar, wood). The excavation extended to a maximum depth of approximately 2.7 m (9 ft) below ground surface (bgs).

Approximately 1,500 bank cubic meters (BCM) (1,960 bank cubic yards [BCY]) of contaminated soil and debris was removed and staged at a staging pile area (SPA) pending loadout and disposal. This SPA had previously received waste from the 100-H-46 waste site. Waste staging from the 100-H-43 waste site began on March 3, 2014. Additionally, waste from the 100-H-49:1, 100-H-51:1, and 100-H-51:6 waste sites was added to this SPA. Waste loadout of the SPA with disposal at the Environmental Restoration and Disposal Facility (ERDF) was conducted in July 2014. All material removed from the 100-H-43 waste site was disposed at ERDF; therefore, no overburden was retained for backfill.

Following remediation, verification soil sampling was conducted from August 18 to 20, 2014. Benzo(a)pyrene and arsenic were detected above direct exposure remedial action goals (RAGs); therefore, additional remediation was conducted on September 18 and 19, 2014. An additional 358 BCM (468 BCY) of soil was removed from the excavation and disposed at ERDF. Replacement verification sampling was conducted on September 22, 2014.

The verification sampling results indicate that the waste removal action achieved compliance with the remedial action objectives and RAGs 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).

A summary of the cleanup evaluation for the results from verification sampling against the applicable criteria is presented in Table ES-1. The results of verification sampling are used to make reclassification decisions for the 100-H-43 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-H-43 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 for 1,000 years.	Radionuclides were not COPCs for the 100-H-43 waste site.	NA
Direct Exposure – Nonradionuclides	Attain individual COPC direct exposure RAGs.	All individual COPC concentrations are below the direct exposure RAGs.	Yes
Risk Requirements – Nonradionuclides	Attain a hazard quotient of <1 for all individual noncarcinogens.	The hazard quotients for individual nonradionuclide COPCs are <1.	Yes
	Attain a cumulative hazard quotient of <1 for noncarcinogens.	The cumulative hazard quotient for the 100-H-43 waste site (1.3×10^{-2}) is <1.	
	Attain an excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens.	The excess cancer risk for individual carcinogens are $<1 \times 10^{-6}$.	
	Attain a cumulative excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.	The cumulative excess cancer risk for the 100-H-43 waste site is 1.4×10^{-6}, which is $<1 \times 10^{-5}$.	
Groundwater/River Protection – Radionuclides	Attain single-COPC groundwater and river protection RAGs.	Radionuclides were not COPCs for the 100-H-43 waste site.	NA
	Attain national primary drinking water standards [a]: 4 mrem/yr (beta/gamma) dose rate to target receptor/organs.		
	Meet drinking water standards for alpha emitters: the most stringent of 15 pCi/L MCL or 1/25th of the derived concentration guides from DOE Order 5400.5 [b].		
	Meet total uranium standard of 30 µg/L (21.2 pCi/L) [c].		

Table ES-1. Summary of Remedial Action Goals for the 100-H-43 Waste Site. (2 Pages)

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Groundwater/River Protection – Nonradionuclides	Attain individual nonradionuclide groundwater and river cleanup requirements.	Lead, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, 4-4'-DDE, 4-4'-DDT, and dieldrin exceeded 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), it is predicted that the residual concentrations of these contaminants will not reach groundwater (and thus the Columbia River) within 1,000 years[d].	Yes

[a] "National Primary Drinking Water Regulations" (40 *Code of Federal Regulations* 141).

[b] *Radiation Protection of the Public and the 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 lead, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, 4-4'-DDE, 4-4'-DDT, and dieldrin are not predicted to migrate more than 2.2 m (7.2 ft) vertically within 1,000 years (based on the lowest soil-partitioning coefficient [K_d] of the contaminants [dieldrin with a K_d of 25.6 mL/g]). The vadose zone underlying the 100-H-43 waste site is approximately 10 m (33 ft) thick. Therefore, residual concentrations of lead, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, 4-4'-DDE, 4-4'-DDT, and dieldrin are predicted to be protective of groundwater and the Columbia River.

COPC = contaminant of potential concern
DOE = U.S. Department of Energy
DDE = dichlorodiphenyldichloroethylene
DDT = dichlorodiphenyltrichloroethane
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 support a reclassification of this waste site to Interim Closed Out. The current site conditions achieve the remedial action objectives and the corresponding RAGs of the 100 Area RDR/RAWP (DOE-RL 2009b) and the Remaining Sites ROD (EPA 1999). The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (surface to 4.6 m [15 ft] bgs), and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. 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-H-43 waste site contaminants of potential concern and other constituents (Appendix A). The higher of the maximum or statistical values were considered for comparison. Ecological screening levels from

the *Washington Administrative Code* (WAC) 173-340, "Model Toxics Control Act – Cleanup," were exceeded for arsenic, boron, lead, selenium, and vanadium. The U.S. Environmental Protection Agency's ecological soil screening levels were exceeded for antimony, lead, manganese, selenium, vanadium, dichlorodiphenyltrichloroethane (DDT)/ dichlorodiphenyldichloroethylene (DDE) (total), and dieldrin. Exceedance of screening values is intended to trigger additional evaluation and does not necessarily indicate the existence of risk to ecological receptors. Because concentrations of antimony, manganese, and vanadium are below Hanford Site or Washington State background values (note that state background values are only used when Hanford Site background values are not available), it is believed that the presence of these constituents does not pose a risk to ecological receptors. All exceedances will be evaluated in the context of additional lines of evidence for risk to ecological receptors as part of the final closeout decision for this site.

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-H-43, 1716-H MAINTENANCE GARAGE, REPAIR SHOP WASTE SITE

STATEMENT OF PROTECTIVENESS

The 100-H-43 waste site verification sampling data, site evaluations, and supporting documentation demonstrate that this site meets the objectives established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (100 Area RDR/RAWP) (DOE-RL 2009b) and the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD) (EPA 1999). These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]), and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Contamination above direct exposure levels was not observed in shallow zone soils and is concluded 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-H-43 waste site contaminants of potential concern (COPC) and other constituents (Appendix A). The higher of the maximum or statistical values were considered for comparison. Ecological screening levels from the *Washington Administrative Code* (WAC) 173-340, "Model Toxics Control Act – Cleanup," were exceeded for arsenic, boron, lead, selenium, and vanadium. The U.S. Environmental Protection Agency's (EPA) ecological soil screening levels were exceeded for antimony, lead, manganese, selenium, vanadium, dichlorodiphenyltrichloroethane (DDT)/ dichlorodiphenyldichloroethylene (DDE) (total), and dieldrin. Exceedance of screening values is intended to trigger additional evaluation and does not necessarily indicate the existence of risk to ecological receptors. Because concentrations of antimony, manganese, and vanadium are below Hanford Site or Washington State background values (note that state background values are only used when Hanford Site background values are not available), it is believed that the presence of these constituents does not pose a risk to ecological receptors. All exceedances will be evaluated in the context of additional lines of evidence for risk to ecological receptors as part of the final closeout decision for this site.

GENERAL SITE INFORMATION AND BACKGROUND

The 100-H-43 waste site consisted of the below-grade remnants of the 1716-H Maintenance Garage. The waste site included a lubrication pit, a waste oil tank, floor drains, underground piping, and two french drains that may have received drainage waste from the facility. The overall site locations map is provided in Figure 1. The site features are shown in Figure 2.

Figure 1. Overall Site Location of the 100-H-43 Waste Site.

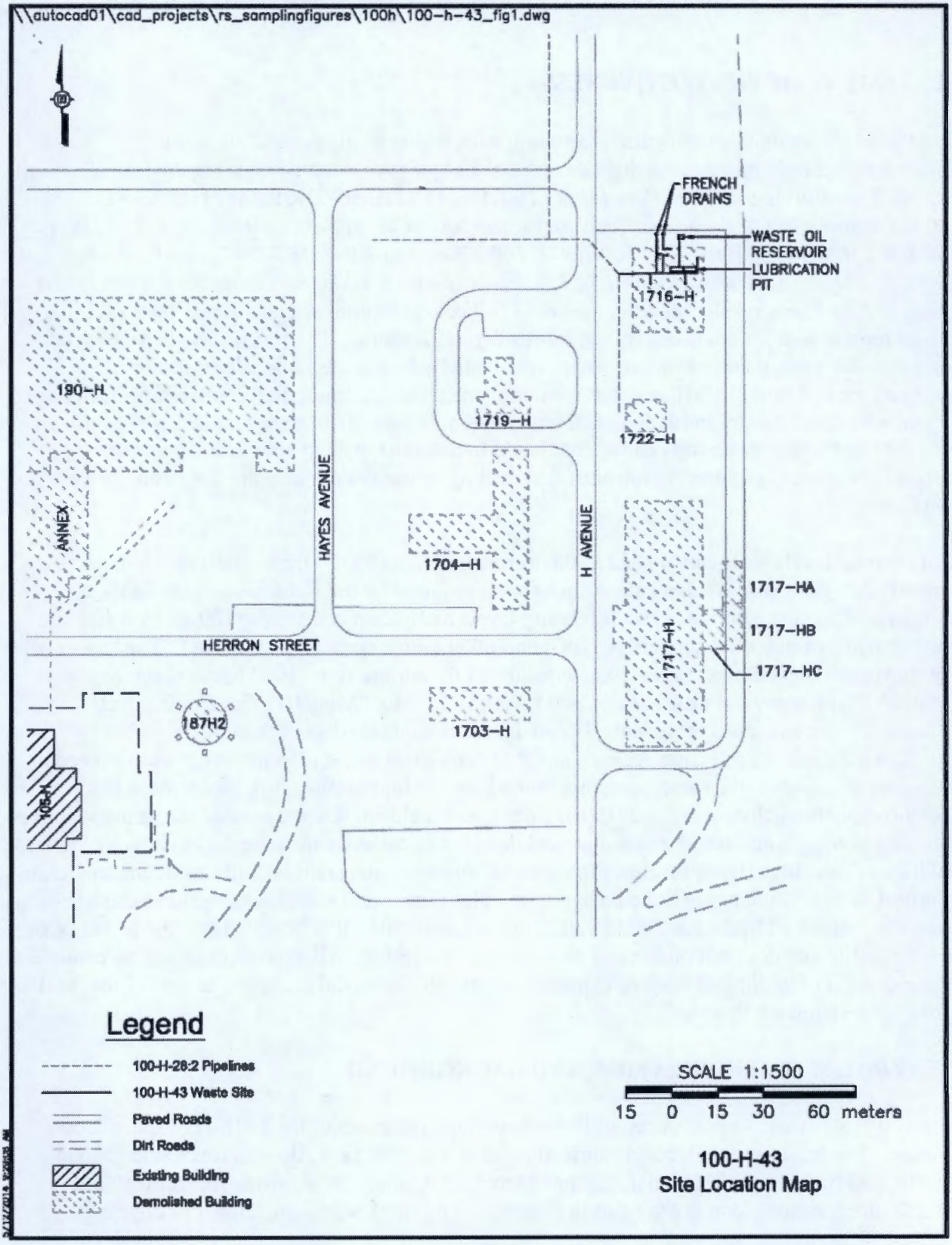
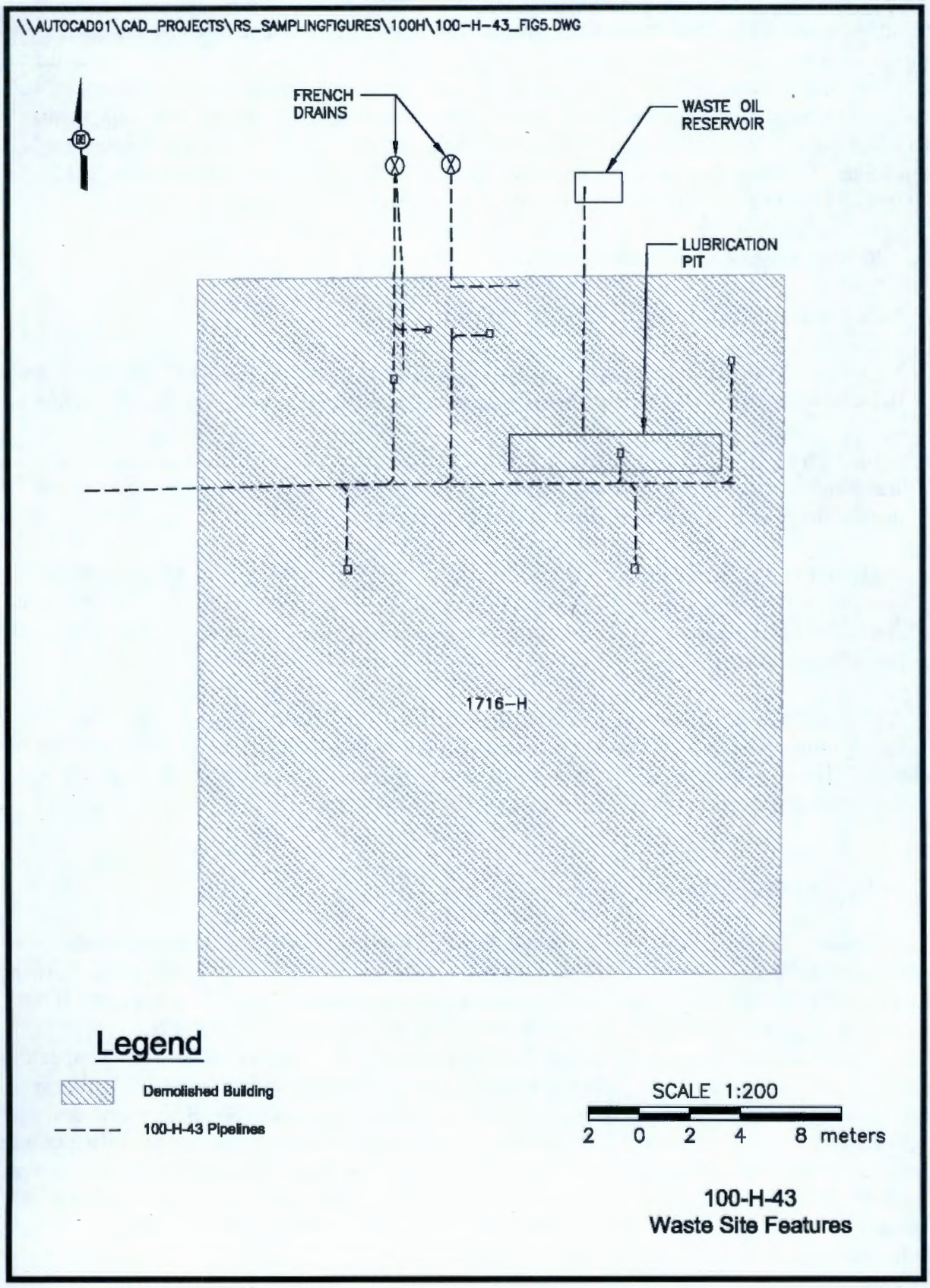


Figure 2. 100-H-43 Waste Site Features.



The 1716-H Maintenance Garage was built during construction of the 100-H Area Reactor and ancillary facilities from 1948 to 1949 to service area vehicles. The original building was a one-story, wood-frame structure with an area of 660 m^2 (7,100 ft^2). The building included a tire shop, battery room, compressor oil storage room, and vehicle service area. At some point during its operation about half of the building was converted to shops for maintenance, calibration, and repair of electrical and electronic instruments. There were also underground fuel storage tanks and a fuel pump island at the site that were within the adjacent 100-H-3, 1716-H Garage Fuel Tanks Site. The 100-H-3 waste site was remediated in 2009 and interim closed out in 2011 (WCH 2011b). The 1716-H Building was demolished and the site leveled in 1974.

The 100-H-43 waste site included the following components:

- An 8.4-m (27.6-ft) long concrete lubrication pit.
- A 2,082-L (550-gal) underground waste oil tank located on the north side of the facility and a 10.2-cm (4-in.)-diameter underground cast iron pipeline running to it from the lubrication pit.
- A 10.2-cm (4-in.)-diameter underground cast iron pipeline that carried waste from floor drains in the battery room, compressor and oil storage room, lubrication pit, and the repair shop to the process sewer (100-H-28:2 waste site).
- A 61-cm (24-in.) french drain on the north side of the 1716-H garage that received steam condensate through a 5.1-cm (2-in.) cast iron pipeline. The french drain may also have been available to receive other wastes through a 10.2-cm (4-in.) cleanout near the wall opening in the battery room.
- A 61-cm (24-in.) french drain on the north side of the 1716-H garage (just west of the french drain described above) that received effluent from a floor drain and sink in the battery room. The two underground pipelines that carried the waste to the french drain were a 7.6-cm (3-in.) cast iron pipe and a 3.8-cm (1.5-in.) lead pipe.

CONFIRMATORY SAMPLING

The 100-H-43, 1716-H Maintenance Garage, Repair Shop waste site shared design details, namely the lubrication pit, with the 100-F-49, 1716-F Maintenance Garage Lubrication Pit waste site. The 1716-F facility also served the same operational purpose during the same general time period as the 1716-H facility. Confirmatory sampling results from the 100-F-49, 1716-F Maintenance Garage Lubrication Pit waste site exceeded direct exposure remedial action guidelines (RAGs) for lead and polychlorinated biphenyls (PCBs), and groundwater and/or river protection RAGs for multiple metals, semivolatile organic compounds (SVOCs), pesticides, and total petroleum hydrocarbons (TPHs) (WCH 2011a). Friable asbestos was also identified in wire insulation at the 100-F-49 waste site. Due to the 100-F-49 confirmatory sampling results, it was considered likely that sampling results from the 100-H-43 waste site would also exceed RAGs. Therefore, the 100-H-43 site was recommended for remove, treat, and dispose without confirmatory sampling (WCH 2009).

REMEDIAL ACTION SUMMARY

Remedial action at the 100-H-43 waste site began on March 3, 2014, and was completed on March 10, 2014. All components of the waste site have been removed. Approximately 1,500 bank cubic meters (BCM) (1,960 bank cubic yards [BCY]) of contaminated soil and debris was removed and staged at a staging pile area (SPA) pending loadout and disposal. The waste from the site included soil and debris consisting of concrete, asphalt, steel piping, and miscellaneous demolition type debris (e.g., rebar, wood). An additional 358 BCM (468 BCY) of soil was removed from the excavation on September 18 and 19, 2014. The excavation extended to a maximum depth of approximately 2.7 m (9 ft) below ground surface. Photographs of the site remediation are presented in Figures 3 through 5.

The SPA had previously received waste from the 100-H-46 waste site. Waste staging from the 100-H-43 waste site began on March 3, 2014. Additionally, waste from the 100-H-49:1, 100-H-51:1, and 100-H-51:6 waste sites was added to this SPA. Waste loadout of the SPA with disposal at the Environmental Restoration and Disposal Facility (ERDF) was conducted in July 2014. All material removed from the 100-H-43 waste site was disposed at ERDF; therefore, no overburden material was stockpiled for use as backfill. No anomalies were discovered during remediation.

Figure 3. 100-H-43 Excavation Looking South.

Figure 4. 100-H-43 Excavation Looking North at East End of Excavation.

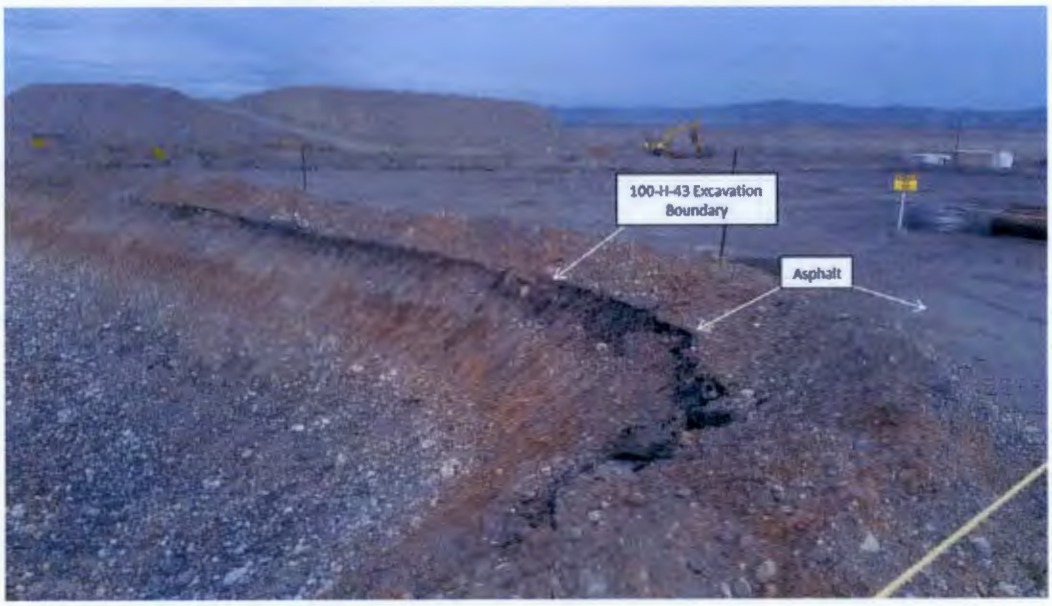


Figure 5. 100-H-43 Excavation Looking West.

The post-remediation walk around boundary survey of the 100-H-43 excavation overlain on the waste site location and the associated SPA boundary are presented in Figure 6.

The 100-H-43 excavation boundary relative to the previously remediated and interim closed out 100-H-3 waste site is presented in Figure 7. The 100-H-3 waste site included the underground fuel storage tanks and a fuel pump island associated with the 1716-H Maintenance Garage. The post-remediation topography survey is provided in Figure 8.

Figure 6. 100-H-43 Excavation and Associated SPA Boundaries.

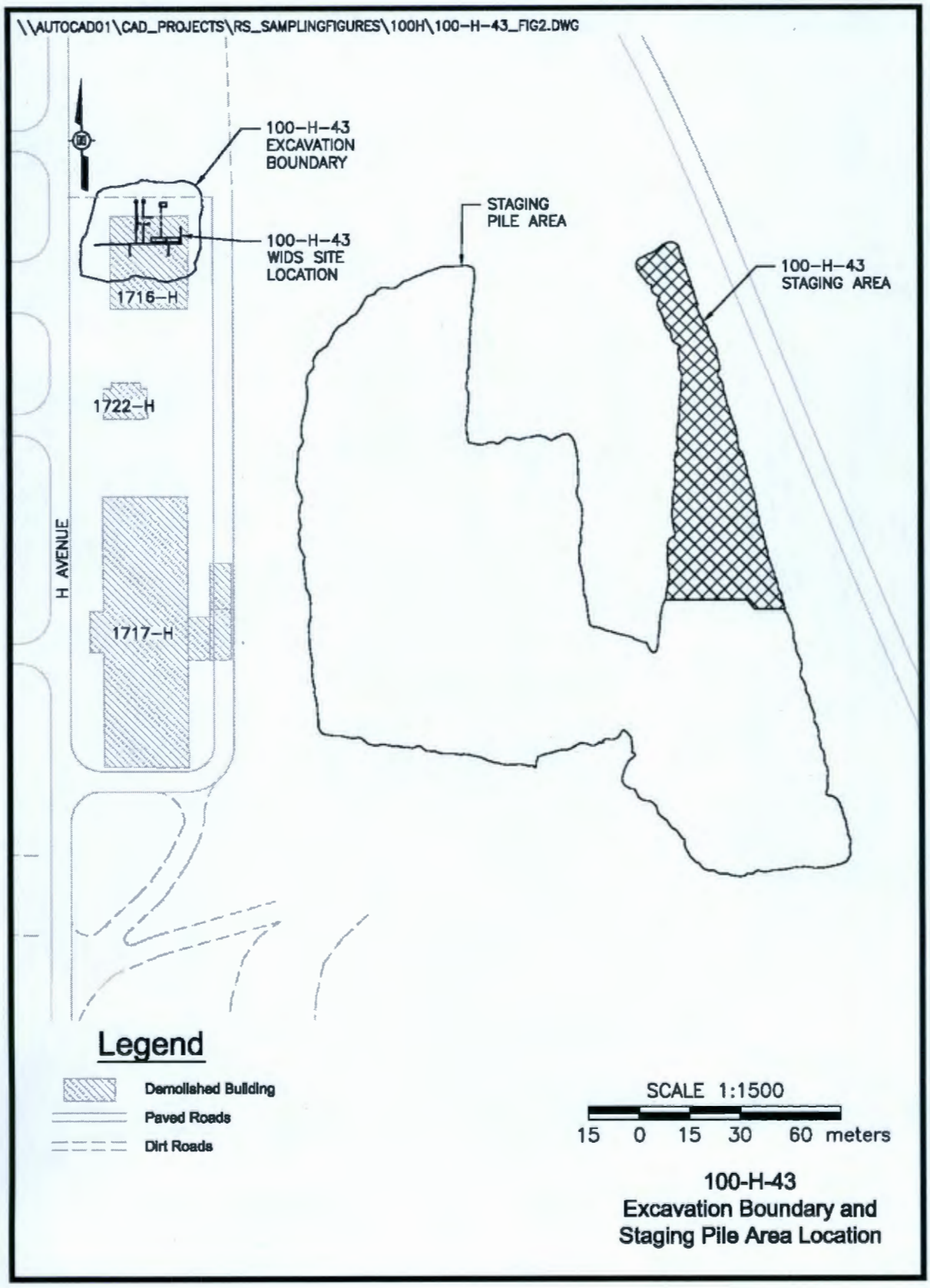


Figure 7. 100-H-43 and 100-H-3 Excavation Boundaries.

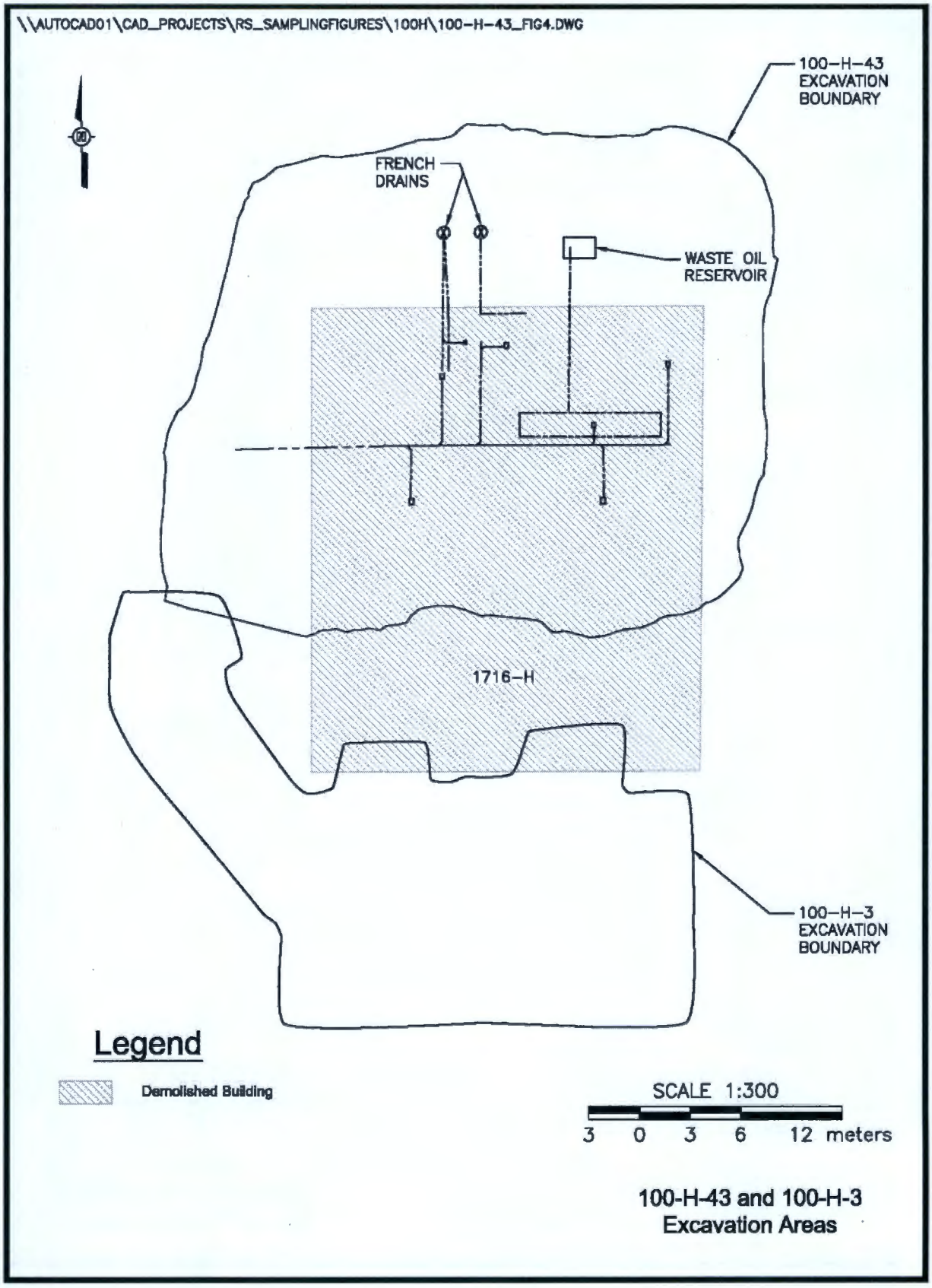
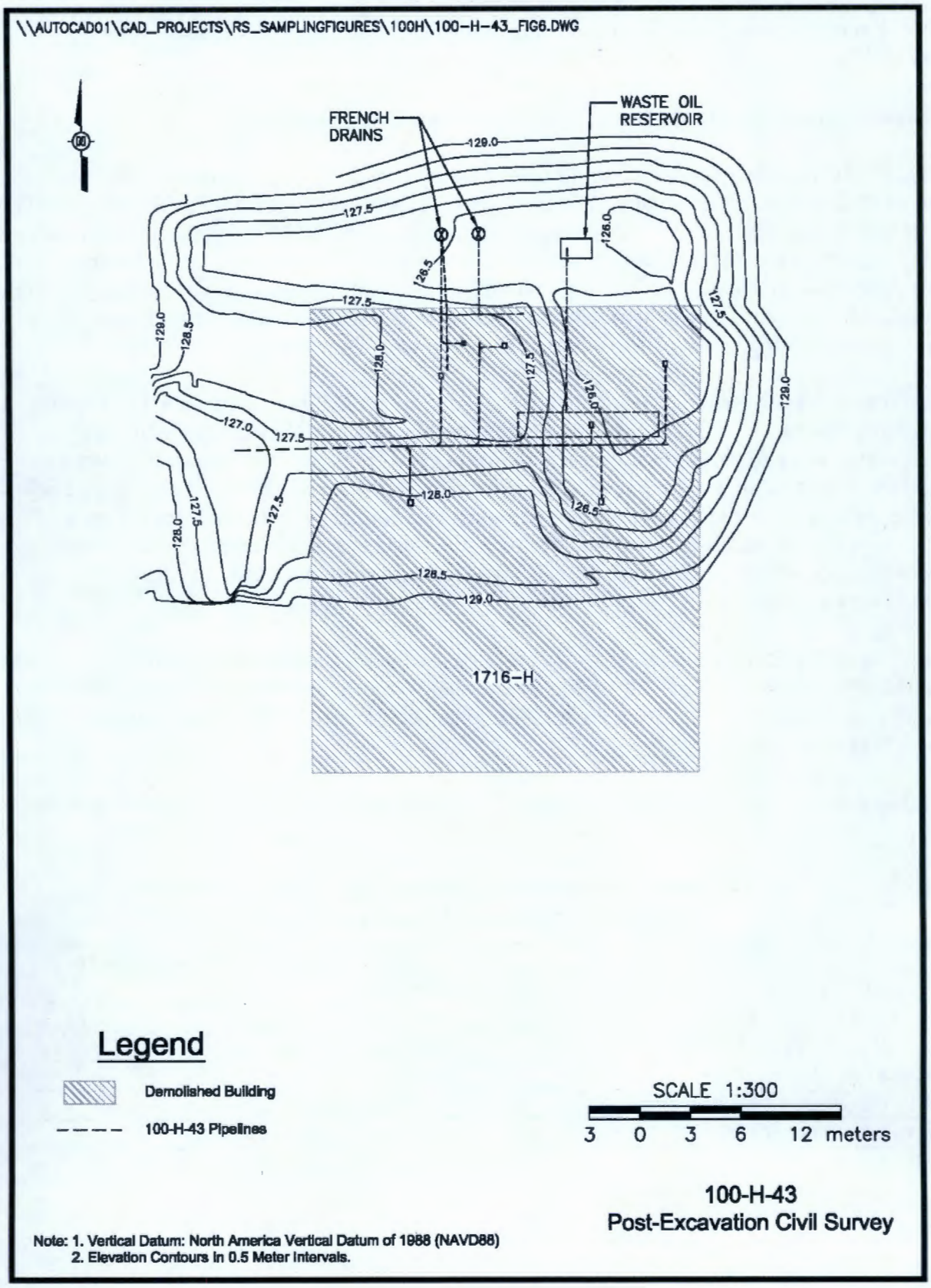


Figure 8. 100-H-43 Post-Remediation Topography Survey.



VERIFICATION SAMPLING

This section describes the basis for selection of a verification sampling design for the 100-H-43 waste site excavation and SPA.

Contaminants of Potential Concern for Verification Sampling

The COPCs identified for the 100-H-43 waste site were determined based on the 100-F-49 waste site COPCs and included mercury, pesticides, SVOCs, polycyclic aromatic hydrocarbons (PAH), TPH, and PCBs. Additional COPCs were added based on the 100-H-43 waste characterization sampling results and included arsenic and lead. Although not considered COPCs, antimony, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc were included in the expanded list of inductively coupled plasma (ICP) metals. Hexavalent chromium was also added.

Asbestos containing materials were not observed during the 100-H-43 remediation; therefore, it was not added as a COPC for verification sampling. Field screening for volatile organic compounds was performed during remediation and volatile organic compounds were not detected; therefore, they were not added as site COPCs. Nitrate and sulfate were detected below background levels in the characterization samples; therefore, they were not included as site COPCs. Gasoline range TPH was undetected in the waste characterization sampling; therefore, gasoline range was not included as a COPC. Radionuclides are not COPCs at the 100-H-43 waste site.

The SPA utilized for the 100-H-43 waste was also used for waste from the 100-H-46, 100-H-49:1, 100-H-51:1, and 100-H-51:6 waste sites. The combined list of COPCs for these waste sites included ICP metals, mercury, hexavalent chromium, PAH, PCBs, pesticides, SVOC, and TPH (diesel range).

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

Table 1. 100-H-43 Excavation and Associated Staging Pile Area Laboratory Analytical Methods. (2 Pages)

Analytical Method	Contaminant of Potential Concern
ICP metals [a] – EPA Method 6010	ICP metals
Mercury – EPA Method 7471	Mercury
Hexavalent chromium – EPA Method 7196	Hexavalent chromium
Pesticides – EPA Method 8081	Pesticides
TPH – EPA Method NWTPH-Dx	Total petroleum hydrocarbons (diesel range)
SVOA – EPA Method 8270	Semivolatile organic compounds
PAH – EPA Method 8310	Polycyclic aromatic hydrocarbons

Table 1. 100-H-43 Excavation and Associated Staging Pile Area Laboratory Analytical Methods. (2 Pages)

Analytical Method	Contaminant of Potential Concern
PCB – EPA Method 8082	Polychlorinated biphenyls

[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 final data package.

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

Verification Sampling Design

Two decision units were identified for the 100-H-43 waste site; specifically, the excavation and the SPA. A statistical sampling design was used to evaluate the SPA and a combination statistical and focused sampling design was used for the excavation. The statistical sampling designs for both of the decision units were developed using Visual Sample Plan[1]. The areas identified for the purpose of statistical verification sampling were delineated in Visual Sample Plan and used as the basis for a random-start systematic grid for verification soil sample collection at the site. Twelve statistical soil samples plus one duplicate were collected from each decision unit, and four focused samples were collected from the excavation. The focused sample locations were the former locations of the two french drains, the waste oil tank, and the lubrication pit. One equipment blank sample was also collected.

Verification Sampling Activities

Verification soil sampling was conducted on August 18 through 20, 2014, per the *Work Instruction for Verification Sampling of the 100-H-43, 1716-H Maintenance Garage, Repair Shop Waste Site* (WCH 2014c). 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). Because arsenic and benzo(a)pyrene were detected above direct exposure RAGs, additional remediation was conducted and replacement samples were collected on September 22, 2014. Additional remediation and resampling was conducted per CCN 176994, "100-H-43 and 100-H-51:1 Additional Remediation and Resampling Agreements" (WCH 2014b).

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). The verification sample results are provided in Appendix B and indicate that the waste removal action achieved compliance with the remedial action objectives and RAGs for the 100-H-43 waste site. The following subsections provide additional discussion of the information used to develop the verification sampling design. The results of verification sampling are also summarized to support interim closure of the site.

[1] Visual Sample Plan is a site map-based user-interface program that may be downloaded at http://vsp.pnnl.gov.

Additional information related to verification sampling can be found in the field sampling logbook (WCH 2014a). The verification sample locations for the excavation and waste SPA are shown in Figures 9 and 10, respectively. The sample summary is provided in Table 2.

Figure 9. 100-H-43 Excavation Verification Sample Locations.

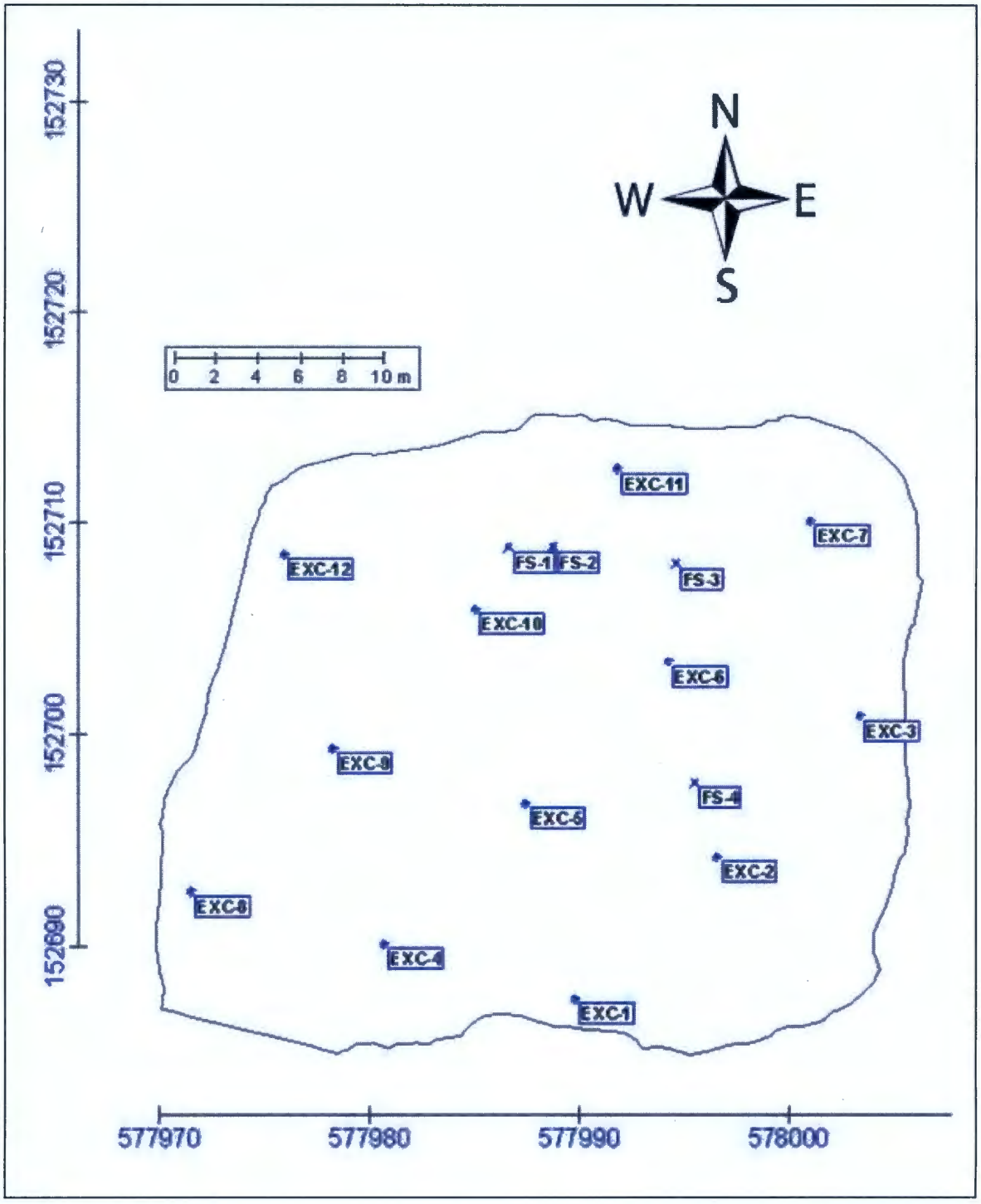


Figure 10. SPA Verification Sample Locations.

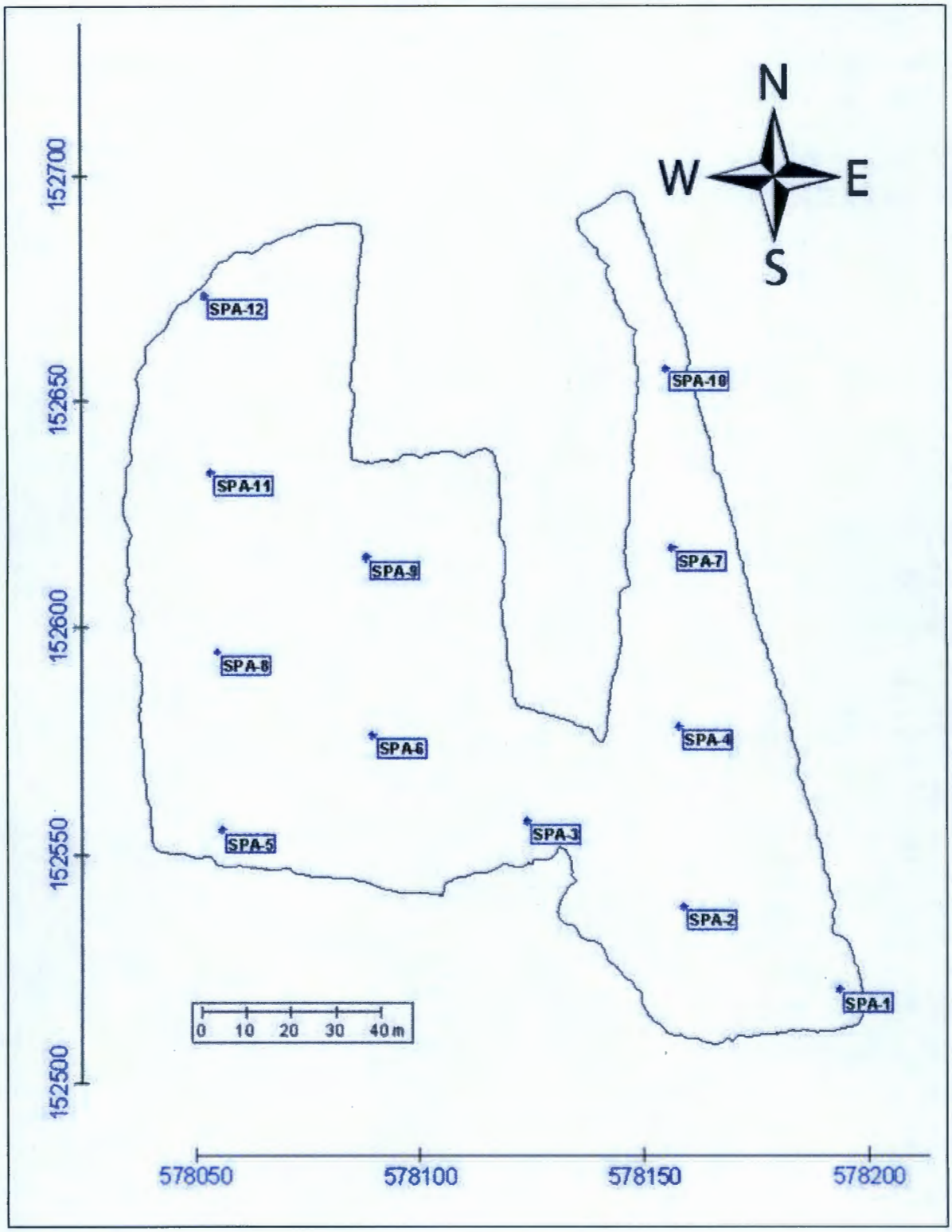


Table 2. 100-H-43 Excavation and Associated SPA Verification Sample Summary. (2 Pages)

Sample Location	HEIS Sample Number	Washington State Plane Coordinates (m)		Sample Analysis
		Northing	Easting	
EXC-1	J1TX87	152687.6	577989.8	ICP metals [a], mercury, hexavalent chromium, pesticides, TPH, SVOA, PAH, and PCB
EXC-2	J1TX88	152694.2	577996.5	
EXC-3	J1TX89	152700.9	578003.3	
EXC-3 (resample) [b]	J1V0F0	152700.9	578003.3	ICP metals [a]
EXC-4	J1TX90	152690.1	577980.6	ICP metals [a], mercury, hexavalent chromium, pesticides, TPH, SVOA, PAH, and PCB
EXC-5 (main)	J1TX91	152696.8	577987.4	
Duplicate of EXC-5	J1TX99	152696.8	577987.4	
EXC-6	J1TX92	152703.4	577994.2	
EXC-7	J1TX93	152710.1	578000.9	
EXC-8	J1TX94	152692.7	577971.5	
EXC-9	J1TX95	152699.3	577978.2	
EXC-10	J1TX96	152706.0	577985.0	
EXC-11	J1TX97	152712.6	577991.8	
EXC-12	J1TX98	152708.5	577975.9	
EXC-12 (resample) [b]	J1V0F1	152708.5	577975.9	ICP metals [a]
SPA-1	J1TXC1	152520.7	578193.4	ICP metals [a], mercury, hexavalent chromium, pesticides, TPH, SVOA, PAH, and PCB
SPA-2	J1TXC2	152539.2	578158.7	
SPA-3	J1TXC3	152557.8	578124.1	
SPA-4	J1TXC4	152578.6	578157.5	
SPA-5	J1TXC5	152555.7	578056.0	
SPA-6 (main)	J1TXC6	152576.4	578089.4	
Duplicate of SPA-6	J1TXD3	152576.4	578089.4	
SPA-7	J1TXC7	152617.9	578156.3	
SPA-8	J1TXC8	152595.0	578054.8	
SPA-9	J1TXC9	152615.7	578088.2	
SPA-10	J1TXD0	152657.2	578155.0	
SPA-11	J1TXD1	152634.3	578053.5	
SPA-12	J1TXD2	152673.6	578052.3	
FS-1 [c]	J1TXD4	152708.9	577986.6	ICP metals [a], mercury, hexavalent chromium, pesticides, TPH, SVOA, PAH, and PCB
FS-2 [d]	J1TXD5	152708.9	577988.7	
FS-3 [e]	J1TXD6	152708.1	577994.6	
FS-4 [f]	J1TXD7	152697.7	577995.5	
FS-4 [f] (resample) [b]	J1V0F2	152697.7	577995.5	PAH

Table 2. 100-H-43 Excavation and Associated SPA Verification Sample Summary. (2 Pages)

Sample Location	HEIS Sample Number	Washington State Plane Coordinates (m)		Sample Analysis
		Northing	Easting	
Equipment blank	J1TXC0	NA	NA	ICP metals [a], mercury, SVOA

[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.
[b] Because arsenic was detected above the direct exposure RAG at locations EXC-3 and EXC-12, and benzo(a)pyrene was detected above the direct exposure RAG at FS-4, additional remediation was conducted and replacement samples were collected per CCN 176994, "100-H-43 and 100-H-51:1 Additional Remediation and Resampling Agreements" (WCH 2014b).
[c] FS-1 was collected at the former location of the french drain north of the former 1716-H Building (west).
[d] FS-2 was collected at the former location of the french drain north of the former 1716-H Building (east).
[e] FS-3 was collected at the former location of the waste oil reservoir tank.
[f] FS-4 was collected at the former location of the lubrication pit.

EXC = excavation
FS = focused sample
HEIS = Hanford Environmental Information System
ICP = inductively coupled plasma
NA = not applicable
PAH = polycyclic aromatic hydrocarbons
PCB = polychlorinated biphenyl
SPA = staging pile area
SVOA = semivolatile organic analysis
TPH = total petroleum hydrocarbons

Verification Sampling 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-H-43 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 each of the decision units as specified by the 100 Area RDR/RAWP (DOE-RL 2009b). The calculations are provided in Appendix B. When a nonradionuclide COPC was detected in fewer than 50% of the verification samples collected for a decision unit, the maximum detected value was used for comparison to the remedial action goals (RAGs). If no detections for a given COPC were reported in the data set, then no statistical calculation or evaluation was performed for that COPC.

Comparisons of the results for site COPCs with the RAGs for each of the decision units are listed 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. Because EPA Method 8310 (PAH) is specifically meant to analyze for PAHs, data from this method is used preferentially over the EPA Method 8270 (SVOA). Therefore, PAH data from Method 8270 are excluded from the tables.

Table 3. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-H-43 Excavation Statistical Verification Samples. (2 Pages)

COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Antimony [c]	0.43 (<BG)	32	5 [d]	5 [d]	No	--
Arsenic	11.8	20 [d]	20 [d]	20 [d]	No	--
Barium	59.0 (<BG)	5,600	200	400	No	--
Beryllium	0.22 (<BG)	10.4 [e]	1.51 [d]	1.51 [d]	No	--
Boron [f]	1.4	7,200	320	-- [g]	No	--
Cadmium [c]	0.088 (<BG)	13.9 [e]	0.81 [d]	0.81 [d]	No	--
Chromium (total)	12.0 (<BG)	80,000	18.5 [d]	18.5 [d]	No	--
Cobalt	5.9 (<BG)	24	15.7 [d]	-- [g]	No	--
Copper	13.4 (<BG)	2,960	59.2	22.0 [d]	No	--
Hexavalent chromium [f]	0.305	2.1 [e]	4.8	2	No	--
Lead	55.4	353	10.2 [d]	10.2 [d]	Yes	Yes [h]
Manganese	269 (<BG)	3,760	512 [d]	512 [d]	No	--
Mercury	0.0057 (<BG)	24	0.33 [d]	0.33 [d]	No	--
Molybdenum [f]	0.37	400	8	-- [g]	No	--
Nickel	11.7 (<BG)	1,600	19.1 [d]	27.4	No	--
Selenium [c]	0.98	400	5	1	No	--
Vanadium	40.0 (<BG)	560	85.1 [d]	-- [g]	No	--
Zinc	35.0 (<BG)	24,000	480	67.8 [d]	No	--
TPH – diesel range	19	200	200	200	No	--
TPH – diesel range, ext.	7.8	200	200	200	No	--
Acenaphthene	0.014	4,800	96	129	No	--
Benzo(a)anthracene	0.082	1.37	0.015 [i]	0.015 [i]	Yes	Yes [h]
Benzo(a)pyrene	0.081	0.137	0.015 [i]	0.015 [i]	Yes	Yes [h]
Benzo(b)fluoranthene	0.077	1.37	0.015 [i]	0.015 [i]	Yes	Yes [h]
Benzo(ghi)perylene [j]	0.043	2,400	48	192	No	--
Benzo(k)fluoranthene	0.041	1.37	0.015 [i]	0.015 [i]	Yes	Yes [h]
Chrysene	0.090	13.7	0.12	0.1 [i]	No	--
Dibenz[a,h]anthracene	0.020	1.37	0.03 [i]	0.03 [i]	No	--
Fluoranthene	0.069	3,200	64	18.0	No	--
Fluorene	0.010	3,200	64	260	No	--
Indeno(1,2,3-cd)pyrene	0.076	1.37	0.33 [i]	0.33 [i]	No	--
Phenanthrene [j]	0.054	24,000	240	1,920	No	--
Pyrene	0.099	2,400	48	192	No	--
Aroclor-1254	0.0030	0.5	0.017 [i]	0.017 [i]	No	--

Table 3. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-H-43 Excavation Statistical Verification Samples. (2 Pages)

COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Dieldrin	0.00076	0.0625	0.0033 [i]	0.0033 [i]	No	--

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

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in the *100-H-43 Waste Site Cleanup Verification 95% UCL Calculations* (Appendix B).

[c] Hanford Site-specific background value is not available. Value used is from *Natural Background Soil Metals Concentrations in Washington State* (Ecology 1994).

[d] 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).

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

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

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

[h] Based on RESRAD modeling discussed in Appendix C of the 100 Area RDR/RAWP (DOE-RL 2009b), the residual concentrations of lead, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and benzo(k)fluoranthene are not expected to migrate more than 1.8 m (5.9 ft) vertically in 1,000 years (based on the lowest soil-partitioning coefficient [K_d]of the contaminants [lead with a K_d of 30 mL/g]). The vadose zone underlying the 100-H-43 waste site is approximately 10 m (33 ft) thick. Therefore, residual concentrations of lead, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and benzo(k)fluoranthene are predicted to be protective of groundwater and the Columbia River.

[i] Where cleanup levels are less than RDLs, cleanup levels default to RDLs per WAC 173-340-707(2) (Ecology 1996).

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

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COPC = contaminant of potential concern
PAH = polycyclic aromatic hydrocarbons
RAG = remedial action goal
RDL = required detection limit
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
SVOA = semivolatile organic analysis
TPH = total petroleum hydrocarbons
WAC = *Washington Administrative Code*

Table 4. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-H-43 Staging Pile Area Statistical Verification Samples. (2 Pages)

COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Antimony [c]	0.56 (<BG)	32	5 [d]	5 [d]	No	--
Arsenic	5.7 (<BG)	20 [d]	20 [d]	20 [d]	No	--
Barium	53.8 (<BG)	5,600	200	400	No	--
Boron [e]	1.9	7,200	320	-- [f]	No	--
Cadmium [c]	0.043 (<BG)	13.9 [g]	0.81 [d]	0.81 [d]	No	--
Chromium (total)	11.6 (<BG)	80,000	18.5 [d]	18.5 [d]	No	--
Cobalt	5.3 (<BG)	24	15.7 [d]	-- [f]	No	--
Copper	12.3 (<BG)	2,960	59.2	22.0 [d]	No	--
Hexavalent chromium [e]	0.321	2.1 [g]	4.8	2	No	--
Lead	18.5	353	10.2 [d]	10.2 [d]	Yes	Yes [h]
Manganese	238 (<BG)	3,760	512 [d]	512 [d]	No	--
Mercury	0.013 (<BG)	24	0.33 [d]	0.33 [d]	No	--
Molybdenum [e]	0.26	400	8	-- [f]	No	--
Nickel	10.6 (<BG)	1,600	19.1 [d]	27.4	No	--
Silver	0.39 (<BG)	400	8	0.73 [d]	No	--
Vanadium	40.7 (<BG)	560	85.1 [d]	-- [f]	No	--
Zinc	35.3 (<BG)	24,000	480	67.8 [d]	No	--
TPH – diesel range	11	200	200	200	No	--
TPH – diesel range, ext.	5.2	200	200	200	No	--
Acenaphthene	0.015	4,800	96	129	No	--
Anthracene	0.0057	24,000	240	1,920	No	--
Benzo(a)anthracene	0.013	1.37	0.015 [i]	0.015 [i]	No	--
Benzo(a)pyrene	0.015	0.137	0.015 [i]	0.015 [i]	Yes	Yes [h]
Benzo(b)fluoranthene	0.017	1.37	0.015 [i]	0.015 [i]	Yes	Yes [h]
Benzo(ghi)perylene [j]	0.022	2,400	48	192	No	--
Benzo(k)fluoranthene	0.018	1.37	0.015 [i]	0.015 [i]	Yes	Yes [h]
Chrysene	0.039	13.7	0.12	0.1 [i]	No	--
Fluoranthene	0.091	3,200	64	18.0	No	--
Fluorene	0.010	3,200	64	260	No	--
Indeno(1,2,3-cd)pyrene	0.048	1.37	0.33 [i]	0.33 [i]	No	--
Phenanthrene [j]	0.039	24,000	240	1,920	No	--
Pyrene	0.034	2,400	48	192	No	--
Aroclor-1260	0.0033	0.5	0.017 [i]	0.017 [i]	No	--

Table 4. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-H-43 Staging Pile Area Statistical Verification Samples. (2 Pages)

COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
4-4'-DDE	0.019	2.94	0.0257	0.0033 [i]	Yes	Yes [h]
4-4'-DDT	0.019	2.94	0.0257	0.0033 [i]	Yes	Yes [h]

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

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in the *100-H-43 Waste Site Cleanup Verification 95% UCL Calculations* (Appendix B).

[c] Hanford Site-specific background value is not available. Value used is from *Natural Background Soil Metals Concentrations in Washington State* (Ecology 1994).

[d] 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).

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

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

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

[h] Based on RESRAD modeling discussed in Appendix C of the 100 Area RDR/RAWP (DOE-RL 2009b), the residual concentrations of lead, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, 4-4'-DDE, and 4-4'-DDT are not expected to migrate more than 1.8 m (5.9 ft) vertically in 1,000 years (based on the lowest soil-partitioning coefficient [K_d] of the contaminants [lead with a K_d of 30 mL/g]). The vadose zone underlying the 100-H-43 waste site is approximately 10 m (33 ft) thick. Therefore, residual concentrations of lead, benzo(b)fluoranthene, benzo(k)fluoranthene, 4-4'-DDE, and 4-4'-DDT are predicted to be protective of groundwater and the Columbia River.

[i] Where cleanup levels are less than RDLs, cleanup levels default to RDLs per WAC 173-340-707(2) (Ecology 1996).

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

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COPC = contaminant of potential concern
DDE = dichlorodiphenyldichloroethylene
DDT = dichlorodiphenyltrichloroethane
PAH = polycyclic aromatic hydrocarbons
RAG = remedial action goal
RDL = required detection limits
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
SVOA = semivolatile organic analysis
TPH = total petroleum hydrocarbons
WAC = *Washington Administrative Code*

Table 5. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-H-43 Focused Verification Samples. (2 Pages)

COPC	Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	13	20 [c]	20 [c]	20 [c]	No	--
Barium	47.9 (<BG)	5,600	200	400	No	--
Beryllium	0.19 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Boron [e]	2.0	7,200	320	-- [f]	No	--
Cadmium [g]	0.048 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	11.7 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	5.5 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	12.2 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [e]	0.227	2.1 [d]	4.8	2	No	--
Lead	37.7	353	10.2 [c]	10.2 [c]	Yes	Yes [h]
Manganese	256 (<BG)	3,760	512 [c]	512 [c]	No	--
Mercury	0.017 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Molybdenum [e]	0.25	400	8	-- [f]	No	--
Nickel	11.0 (<BG)	1,600	19.1 [c]	27.4	No	--
Selenium [g]	0.81	400	5	1	No	--
Silver	0.15 (<BG)	400	8	0.73 [c]	No	--
Vanadium	38.4 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	33.6 (<BG)	24,000	480	67.8 [c]	No	--
TPH – diesel range	70	200	200	200	No	--
TPH – diesel range, ext.	30	200	200	200	No	--
Benzo(a)anthracene	0.0042	1.37	0.015 [i]	0.015 [i]	No	--
Chrysene	0.0060	13.7	0.12	0.1 [i]	No	--
4-4'-DDT	0.0025	2.94	0.0257	0.0033 [i]	No	--
Dieldrin	0.023	0.0625	0.0033 [i]	0.0033 [i]	Yes	Yes [h]

Table 5. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-H-43 Focused Verification Samples. (2 Pages)

COPC	Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Endrin	0.00053	24	0.2	0.039 [i]	No	--

[a] RAGs obtained from the 100 Area RDR/RAWP (DOE-RL 2009b).
[b] Maximum value as described in the *100-H-43 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 per WAC 173-340-750(3) (1996), (Method B for air quality) and an airborne particulate mass loading rate of 0.0001 g/m^3 (*Hanford Guidance for Radiological Cleanup* [WDOH 1997]).
[e] No Hanford Site-specific or Washington State background value available.
[f] No parameters (bioconcentration factors or AWQC values) are available from the Cleanup Levels and Risk Calculations Database (Ecology 2014) or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii] [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 lead and dieldrin are not expected to migrate more than 2.2 m (7.2 ft) vertically in 1,000 years (based on the lowest soil-partitioning coefficient [K_d] of the contaminants [dieldrin with a K_d of 25.6 mL/g]). The vadose zone underlying the 100-H-43 waste site is approximately 10 m (33 ft) thick. Therefore, the residual concentrations of lead and dieldrin are predicted to be protective of groundwater and the Columbia River.
[i] Where cleanup levels are less than RDLs, cleanup levels default to RDLs per WAC 173-340-707(2) (Ecology 1996).

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COPC = contaminant of potential concern
DDT = dichlorodiphenyltrichloroethane
PAH = polycyclic aromatic hydrocarbons
RAG = remedial action goal
RDL = required detection limit
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
SVOA = semivolatile organic analysis
TPH = total petroleum hydrocarbons
WAC = *Washington Administrative Code*

The complete laboratory results for all constituents are stored in a Washington Closure Hanford (WCH) project-specific database prior to archival in the Hanford Environmental Information System (HEIS) and are presented in Attachment 1 of the 95% UCL calculations (Appendix B).

DATA EVALUATION

This section demonstrates that contaminant concentrations at the 100-H-43 subsite achieve the applicable RAGs developed to support unrestricted land use at the 100 Area as established in the Remaining Sites ROD (EPA 1999) and documented in the 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-H-43 waste site 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. All COPCs were quantified below groundwater and/or river protection soil RAGs with the exception of lead, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, 4-4'-DDE, 4-4'-DDT, and dieldrin. However, based on the lowest soil-partitioning coefficient (K_d) of these contaminants (dieldrin with a K_d of 25.6), none would be expected to migrate more than 2.2 m (7.2 ft) vertically in 1,000 years based on RESidual RADioactivity (RESRAD) modeling discussed in Appendix C of the 100 Area RDR/RAWP (DOE-RL 2009b). The vadose zone beneath the 100-H-43 waste site is approximately 10 m (33 ft) thick. Therefore, residual concentrations of lead, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, 4-4'-DDE, 4-4'-DDT, and dieldrin are predicted to be protective of groundwater and the Columbia River.

Three-Part Test for Nonradionuclides

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

The application of the three-part test for the 100-H-43 waste site is included in the *100-H-43 Waste Site Cleanup Verification 95% UCL Calculations* 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 with the exception of lead and method 8310 PAH (benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene), which fail one or more parts of the three-part test to be protective of groundwater and the Columbia River. However, based on RESRAD modeling discussed in Appendix C of the 100 Area RDR/RAWP (DOE-RL 2009b), the residual concentrations of lead, benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene are not predicted to migrate more than 1.8 m (5.9 ft) vertically within 1,000 years (based on the lowest K_d of the contaminants [lead with a K_d of 30 mL/g]). The vadose zone beneath the 100-H-43 waste site is approximately 10 m (33 ft) thick. Therefore, the residual concentrations of lead, benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene are predicted to be protective of groundwater and the Columbia River.

An additional application of the three-part test is included for the statistical data sets that default to the maximum because less than half of the data set was detected. The results of this evaluation indicate that residual COPC concentrations pass the three-part test in comparison against applicable RAGs with the exception of benzo(k)fluoranthene (method 8310), and the method 8270 PAH (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and chrysene), 4-4'-DDE, and 4-4'-DDT, which fail one or more parts of the three-part test to be protective of groundwater and the Columbia River. However, based on RESRAD modeling discussed in Appendix C of the 100 Area RDR/RAWP (DOE-RL 2009b), the residual concentrations of these contaminants are not predicted to migrate vertically within 1,000 years (based on the lowest K_d of the contaminants [4-4'-DDE with a K_d of 86.4 mL/g]). A contaminant with a K_d of 80 mL/g or greater is not predicted to migrate vertically through the soil. Therefore, the residual concentrations of benzo(k)fluoranthene, benzo(a)anthracene, benzo(a)pyrene,

benzo(b)fluoranthene, chrysene, 4-4'-DDE, and 4-4'-DDT 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-H-43 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 1.3×10^{-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 1.4×10^{-6}, which is less than 1×10^{-5}. The 100-H-43 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-H-43 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 K_d 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 10 m (33 ft) in thickness, a K_d of 7.2 mL/g 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-H-43 waste site is 2.7×10^{-1}, which is less than 1.0. No carcinogenic constituents met the criteria for groundwater protection evaluation at the 100-H-43 waste site; therefore, no calculations of excess carcinogenic risk were performed. Therefore, nonradionuclide risk requirements related to groundwater are met.

DATA QUALITY ASSESSMENT

A data quality assessment (DQA) was performed to compare the verification sampling approach (WCH 2014c), 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-H-43 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 WCH project-specific database for data evaluation prior to archival in HEIS and are summarized in Appendix B. The detailed DQA is presented in Appendix C.

SUMMARY FOR INTERIM CLOSURE

The 100-H-43 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 the analytical results indicate that the residual concentrations of COPCs at the site meet the remedial action objectives for direct exposure, groundwater protection, and river protection.

In accordance with this evaluation, the verification sampling results support a reclassification of the 100-H-43 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.

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WCH, 2011b, *Remaining Sites Verification Package for the 100-H-3, 1716-H Garage Fuel Tank Site*, Attachment to Waste Site Reclassification Form 2010-103, Rev. 0, Washington Closure Hanford, Richland, Washington.

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APPENDIX A

ECOLOGICAL RISK COMPARISON TABLE

Table A-1. Maximum Contaminant Concentrations that Exceed Ecological Screening Levels for the 100-H-43 Waste Site [a].

Hazardous Substance		2007 WAC 173-340 Table 749-3			EPA Ecological Soil Screening Levels [b]				Waste Site Analyses
		Plants	Soil Biota	Wildlife	Plants	Soil Biota	Avian [c]	Mammalian [c]	
Metals (mg/kg)									
	Background								
Antimony	5	5	--	--	--	78	--	0.27	0.56 (<BG)
Arsenic III	6.5 [d]	--	--	7	18	--	43	46	13
Arsenic V	6.5 [d]	10	60	132	--	--	--	--	
Boron	--	0.5	--	--	--	--	--	--	2.0
Lead	10.2	50	500	118	120	1,700	11	56	55.4
Manganese	512	1,100 [e]	--	1,500	220	450	4,300	4,000	269 (<BG)
Selenium	0.78	1	70	0.3	0.52	4.1	1.2	0.63	0.98
Vanadium	85.1	2	--	--	--	--	7.8	280	40.7 (<BG)
Pesticides (mg/kg)									
DDT/DDD/DDE (total)	--	--	--	0.75	--	--	0.093	0.021	0.038
Dieldrin	--	--	--	0.07	--	--	0.022	0.0049	0.023

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] The Hanford Site background for arsenic is 6.5 mg/kg. An 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 *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.

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

-- = not available
BG = background
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethylene
DDT = dichlorodiphenyltrichloroethane
EPA = U.S. Environmental Protection Agency
RDR/RAWP = remedial design report/remedial action work plan
WAC = *Washington Administrative Code*

APPENDIX B

CALCULATIONS

APPENDIX B

CALCULATION BRIEFS

The calculations provided in this appendix are copies of the originals that 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. These calculations have been prepared in accordance with ENG-1, *Engineering Services*, ENG-1-4.5, "Project Calculations," Washington Closure Hanford, Richland, Washington. The calculations provided in this appendix include:

100-H-43 Waste Site Cleanup Verification 95% UCL Calculations, 0100H-CA-V0209, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-H-43 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculation, 0100H-CA-V0210, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-H-43 Waste Site Hazard Quotient and Carcinogenic Risk Calculations for Protection of Groundwater, 0100H-CA-V0211, Rev. 0, Washington Closure Hanford, Richland, Washington.

DISCLAIMER FOR CALCULATIONS

The calculations that are 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 in the administrative record.

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CALCULATION COVER SHEET

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

Area: 100-H

Discipline: Environmental *Calculation No: 0100H-CA-V0209

Subject: 100-H-43 Waste Site Cleanup Verification 95% UCL Calculation

Computer Program: Excel Program No: Excel 2010

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

Committed Calculation ☒ Preliminary ☐ Superseded ☐ Voided ☐

Rev.	Sheet Numbers	Originator	Checker	Reviewer	Approval	Date
0	Cover = 1 Sheets = 20 Attm. 1 = 20 Total = 41	J. D. Skoglie	I. B. Berezovsky	T. Q. Howell	S. G. Wilkinson	11/3/14

SUMMARY OF REVISION

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

Washington Closure Hanford **CALCULATION SHEET**

Originator J. D. Skoglie	**Date** 10/23/14	**Calc. No.** 0100H-CA-V0209		**Rev. No.** 0	
Project 100-H Area Closure Operations	**Job No.** 14655	**Checked** I. B. Berezovskiy		**Date** 10/23/14	
Subject 100-H-43 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 4 - Calculation Sheet Summary
Sheets 5 to 13 - Statistical/Maximum Sheets Verification Data Results - Excavation and Staging Pile Area
Sheets 14 to 19 - Ecology Software (MTCAStat) Results
Sheet 20 - Calculation Sheet Duplicate Analysis
Attachment 1 - 100-H-43 Waste Site, Verification Sampling Results (20 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 and maximum data from soil verification samples (Attachment 1) from the 100-H-43 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-H-43 waste site underwent statistical sampling at 2 decision units for verification sampling; excavation and staging pile area. Also, 4 focused samples were taken. Sample locations EXC-3 and EXC-12 failed the direct exposure remedial action goal (RAG) for arsenic and focsued sample FS-4 failed the direct exposure RAG for benzo(a)pyrene. These three locations were remediated and re-sampled. Analytical results for all sampling locations are summarized in the tables provided on sheet 4. Further information of the sample data quality is presented in the data quality assessment section of the associated RSVP.

Washington Closure Hanford **CALCULATION SHEET**

Originator J. D. Skoglie	**Date** 10/23/14	**Calc. No.** 0100H-CA-V0209		**Rev. No.**	0
Project 100-H Area Closure Operations	**Job No.** 14655	**Checked** I. B. Berezovskiy		**Date**	10/23/14
Subject 100-H-43 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 J. D. Skoglie	**Date** 10/23/14	**Calc. No.** 0100H-CA-V0209	**Rev. No.** 0
Project 100-H Area Closure Operations	**Job No.** 14655	**Checked** I. B. Berezovskiy	**Date** 10/23/14
Subject 100-H-43 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 the MDL
J = estimate
M = sample duplicate precision not met
N = recovery is outside control limits
U = undetected
X = serial dilution in the analytical batch indicates that physical and chemical interferences are present

ACRONYM LIST

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

Washington Closure Hanford

CALCULATION SHEET

Originator J. D. Skoglie **Date** 10/23/14 **Calc. No.** 0100H-CA-V0209 **Rev. No.** 0
Project 100-H Area Closure Operations **Job No.** 14655 **Checked** I. B. Berezovskiy **Date** 10/23/14
Subject 100-H-43 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 and/or maximum for the decision units EXC, SPA, focused samples, the WAC 173-340-740(7)(e) 3-part test evaluation, and the RPD calculations, and are for use in risk analysis and the RSVP for this site.

Results Summary [a]

Analyte	EXC 95% UCL Result	EXC Maximum Result	SPA 95% UCL Result	SPA Maximum Result	FS Maximum Result	UNITS
Antimony	--	0.43	0.56	--	--	mg/kg
Arsenic	11.8	--	5.7	--	13	mg/kg
Barium	59.0	--	53.8	--	47.9	mg/kg
Beryllium	0.22	--	--	--	0.19	mg/kg
Boron	--	1.4	--	1.9	2.0	mg/kg
Cadmium	--	0.088	0.043	--	0.048	mg/kg
Chromium	12.0	--	11.6	--	11.7	mg/kg
Cobalt	5.9	--	5.3	--	5.5	mg/kg
Copper	13.4	--	12.3	--	12.2	mg/kg
Hexavalent chromium	0.305	--	--	0.321	0.227	mg/kg
Lead	55.4	--	18.5	--	37.7	mg/kg
Manganese	269	--	238	--	256	mg/kg
Mercury	0.0057	--	--	0.013	0.017	mg/kg
Molybdenum	--	0.37	--	0.26	0.25	mg/kg
Nickel	11.7	--	10.6	--	11.0	mg/kg
Selenium	--	0.98	--	--	0.81	mg/kg
Silver	--	--	--	0.39	0.15	mg/kg
Vanadium	40.0	--	40.7	--	38.4	mg/kg
Zinc	35.0	--	35.3	--	33.6	mg/kg
TPH - Diesel Range EXT	19	--	11	--	70	mg/kg
TPH - Diesel Range	7.8	--	5.2	--	30	mg/kg
Acenaphthene (Method 8310)	--	0.014	--	0.015	--	mg/kg
Anthracene (Method 8270)	--	0.018	--	--	--	mg/kg
Anthracene (Method 8310)	--	--	--	0.0057	--	mg/kg
Benzo(a)anthracene (Method 8270)	--	0.088	--	0.053	0.075	mg/kg
Benzo(a)anthracene (Method 8310)	0.082	--	0.013	--	0.0042	mg/kg
Benzo(a)pyrene (Method 8270)	--	0.086	--	0.047	0.080	mg/kg
Benzo(a)pyrene (Method 8310)	0.081	--	0.015	--	--	mg/kg
Benzo(b)fluoranthene (Method 8270)	--	0.087	--	0.055	0.11	mg/kg
Benzo(b)fluoranthene (Method 8310)	0.077	--	0.017	--	--	mg/kg
Benzo(ghi)perylene (Method 8270)	--	0.049	--	0.032	0.057	mg/kg
Benzo(ghi)perylene (Method 8310)	0.043	--	--	0.022	--	mg/kg
Benzo(k)fluoranthene (Method 8310)	--	0.041	--	0.018	--	mg/kg
Chrysene (Method 8270)	--	0.11	--	0.055	0.085	mg/kg
Chrysene (Method 8310)	0.090	--	--	0.039	0.0060	mg/kg
Dibenz[a,h]anthracene (Method 8310)	--	0.020	--	--	--	mg/kg
Fluoranthene (Method 8270)	--	0.20	--	0.091	0.13	mg/kg
Fluoranthene (Method 8310)	0.069	--	--	0.091	--	mg/kg
Fluorene (Method 8310)	--	0.010	--	0.010	--	mg/kg
Indeno(1,2,3-cd)pyrene (Method 8270)	--	0.10	--	0.090	0.11	mg/kg
Indeno(1,2,3-cd)pyrene (Method 8310)	--	0.076	--	0.048	--	mg/kg
Phenanthrene (Method 8270)	--	0.19	--	0.034	0.071	mg/kg
Phenanthrene (Method 8310)	--	0.054	--	0.039	--	mg/kg
Pyrene (Method 8270)	0.155	--	0.034	--	0.12	mg/kg
Pyrene (Method 8310)	0.099	--	0.034	--	--	mg/kg
Aroclor-1254	--	0.0030	--	--	--	mg/kg
Aroclor-1260	--	--	--	0.0033	--	mg/kg
4-4'-DDE	--	--	--	0.019	--	mg/kg
4-4'-DDT	--	--	--	0.019	0.0025	mg/kg
Dieldrin	--	0.00076	--	--	0.023	mg/kg
Endrin	--	--	--	--	0.00053	mg/kg

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

WAC 173-340 3-Part Test for most stringent RAG:	EXC		SPA	
95% UCL or maximum> Cleanup Limit?	YES	YES	YES	YES
> 10% above Cleanup Limit?	YES	YES	YES	YES
Any sample > 2x Cleanup Limit?	YES	YES	YES	YES

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

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

Analyte	Duplicate Analysis EXC	Duplicate Analysis SPA
Aluminum	5.7%	1.5%
Barium	2.0%	6.1%
Calcium	5.0%	2.6%
Chromium	4.9%	2.0%
Copper	5.2%	3.1%
Iron	6.4%	5.0%
Lead	41.3%	--
Magnesium	6.3%	0.7%
Manganese	1.8%	3.7%
Silicon	9.7%	11.6%
Sodium	2.6%	--
Vanadium	3.9%	5.2%
Zinc	4.5%	6.9%

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-H Area Closure Operations
Subject 100-H-43 Waste Site Cleanup Verification 95% UCL Calculations

Date 10/23/14
Job No. 14655

Calc. No. 0100H-CA-V0209
Checked I. B. Berezovskiy

Rev. No. 0
Date 10/23/14
Sheet No. 5 of 20

100-H-43 Waste Site Statistical Calculations

Verification Data - Decision Unit - EXC

Sample Area	Sample Number	Sample Date	Arsenic mg/kg	Q	PQL	Barium mg/kg	Q	PQL	Beryllium mg/kg	Q	PQL	Chromium mg/kg	Q	PQL	Cobalt mg/kg	Q	PQL	Copper mg/kg	Q	PQL	Hexavalent Chromium mg/kg	Q	PQL	Lead mg/kg	Q	PQL	Manganese mg/kg	Q	PQL	Mercury mg/kg	Q	PQL
EXC-5	J1TX91	8/19/14	9.0		0.63	78.2	X	0.073	0.29		0.032	15.8	JX	0.056	6.1	X	0.096	13.0	X	0.21	0.355		0.155	61.0	X	0.26	269	X	0.096	0.0055	B	0.0054
Duplicate of J1TX91	J1TX99	8/19/14	9.6		0.62	79.8	X	0.071	0.31		0.031	16.6	JX	0.054	6.4	X	0.093	13.7	X	0.20	0.155	U	0.155	40.1	X	0.25	274	X	0.093	0.0055	U	0.0055
EXC-1	J1TX87	8/19/14	5.2		0.67	53.9	X	0.077	0.21		0.033	15.2	JXN	0.059	5.6	X	0.10	14.4	X	0.22	0.155	U	0.155	14.2	X	0.27	327	X	0.10	0.0052	B	0.0052
EXC-2	J1TX88	8/19/14	10.5		0.58	50.8	X	0.067	0.22		0.029	10.1	JX	0.051	5.8	X	0.088	13.0	X	0.19	0.311		0.155	25.7	X	0.24	246	X	0.088	0.0056	B	0.0054
EXC-3 Re-Sample	J1V0F0	9/22/14	15.8		0.60	50.7		0.069	0.030	U	0.030	11.2		0.053	5.9		0.091	12.2	X	0.20				47.5		0.25	273		0.091			
EXC-4	J1TX90	8/19/14	7.4		0.61	64.2	X	0.070	0.27		0.030	11.0	JX	0.053	6.4	X	0.092	14.5	X	0.20	0.440		0.155	20.1	X	0.25	275	X	0.092	0.0088	B	0.0053
EXC-6	J1TX92	8/19/14	4.2		0.56	25.5	X	0.065	0.12	B	0.028	6.3	JX	0.049	3.5	X	0.085	8.1	X	0.18	0.333		0.155	9.0	X	0.23	155	X	0.085	0.0063	B	0.0050
EXC-7	J1TX93	8/19/14	3.5		0.59	38.0	X	0.068	0.17	B	0.029	9.8	JX	0.052	5.1	X	0.089	13.9	X	0.19	0.268		0.155	4.7	X	0.24	222	X	0.089	0.0049	U	0.0049
EXC-8	J1TX94	8/19/14	9.9		0.57	56.9	X	0.065	0.21		0.028	10.1	JX	0.050	6.3	X	0.086	12.8	X	0.19	0.377		0.155	30.9	X	0.23	274	X	0.086	0.0051	U	0.0051
EXC-9	J1TX95	8/19/14	12.1		0.64	52.5	X	0.074	0.23		0.032	10.3	JX	0.056	6.0	X	0.097	13.1	X	0.21	0.155	U	0.155	41.1	X	0.26	251	X	0.097	0.0050	B	0.0050
EXC-10	J1TX96	8/19/14	10.9		0.65	43.0	X	0.075	0.20		0.032	9.6	JX	0.057	5.7	X	0.098	13.3	X	0.21	0.155	U	0.155	20.7	X	0.26	237	X	0.098	0.0049	U	0.0049
EXC-11	J1TX97	8/19/14	3.8		0.63	30.6	X	0.073	0.16	B	0.032	9.2	JX	0.055	4.9	X	0.096	11.5	X	0.21	0.247		0.155	4.0	X	0.26	213	X	0.096	0.0048	U	0.0048
EXC-12 Re-Sample	J1V0F1	9/22/14	3.1		0.57	41.6		0.065	0.028	U	0.028	9.7		0.050	4.8		0.086	11.0	X	0.19				4.4		0.23	222		0.086			

Statistical Computation Input Data

Sample Area	Sample Number	Sample Date	Arsenic mg/kg	Barium mg/kg	Beryllium mg/kg	Chromium mg/kg	Cobalt mg/kg	Copper mg/kg	Hexavalent Chromium mg/kg	Lead mg/kg	Manganese mg/kg	Mercury mg/kg
EXC-5	J1TX91/ J1TX99	8/19/14	9.3	79.0	0.30	16.2	6.3	13.4	0.216	50.6	272	0.0041
EXC-1	J1TX87	8/19/14	5.2	53.9	0.21	15.2	5.6	14.4	0.0775	14.2	327	0.0052
EXC-2	J1TX88	8/19/14	10.5	50.8	0.22	10.1	5.8	13.0	0.311	25.7	246	0.0056
EXC-3 Re-Sample	J1V0F0	9/22/14	15.8	50.7	0.015	11.2	5.9	12.2		47.5	273	
EXC-4	J1TX90	8/19/14	7.4	64.2	0.27	11.0	6.4	14.5	0.440	20.1	275	0.0088
EXC-6	J1TX92	8/19/14	4.2	25.5	0.12	6.3	3.5	8.1	0.333	9.0	155	0.0063
EXC-7	J1TX93	8/19/14	3.5	38.0	0.17	9.8	5.1	13.9	0.268	4.7	222	0.0025
EXC-8	J1TX94	8/19/14	9.9	56.9	0.21	10.1	6.3	12.8	0.377	30.9	274	0.0026
EXC-9	J1TX95	8/19/14	12.1	52.5	0.23	10.3	6.0	13.1	0.0775	41.1	251	0.0050
EXC-10	J1TX96	8/19/14	10.9	43.0	0.20	9.6	5.7	13.3	0.0775	20.7	237	0.0025
EXC-11	J1TX97	8/19/14	3.8	30.6	0.16	9.2	4.9	11.5	0.247	4.0	213	0.0024
EXC-12 Re-Sample	J1V0F1	9/22/14	3.1	41.6	0.014	9.7	4.8	11.0		4.4	222	

Statistical Computations

	Arsenic	Barium	Beryllium	Chromium	Cobalt	Copper	Hexavalent Chromium	Lead	Manganese	Mercury
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 normal distribution.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), use MTCAStat normal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat normal distribution.	Large data set (n ≥ 10), use MTCAStat normal distribution.
N	12	12	12	12	12	12	10	12	12	10
% < Detection limit	0%	0%	17%	0%	0%	0%	30%	0%	0%	40%
Mean	8.0	48.9	0.18	10.7	5.5	12.6	0.242	22.7	247	0.0045
Standard deviation	4.1	14.6	0.089	2.6	0.83	1.8	0.130	16.7	42.8	0.0021
95% UCL on mean	11.8	59.0	0.22	12.0	5.9	13.4	0.305	55.4	269	0.0057
Maximum value	15.8	79.8	0.31	16.6	6.4	14.5	0.440	61.0	327	0.0088
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)	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	10.2 GW & River Protection	512 GW & River Protection	0.33 GW & River Protection
WAC 173-340 3-PART TEST										
95% UCL > Cleanup Limit?	NO	NA	NA	NA	NA	NA	NO	YES	NA	NA
> 10% above Cleanup Limit?	NO	NA	NA	NA	NA	NA	NO	YES	NA	NA
Any sample > 2X Cleanup Limit?	NO	NA	NA	NA	NA	NA	NO	YES	NA	NA
WAC 173-340 Compliance?	The data set meets the 3-part test criteria when compared to the most stringent RAG.	Because all values are below background (132 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (1.51 mg/kg) the WAC 173-340 3-part test is not required.	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.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	Because all values are below background (512 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (0.33 mg/kg) the WAC 173-340 3-part test is not required.

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie **Date** 10/23/14 **Calc. No.** 0100H-CA-V0209 **Rev. No.** 0
Project 100-H Area Closure Operations **Job No.** 14655 **Checked** I. B. Berezovskiy **Date** 10/23/14
Subject 100-H-43 Waste Site Cleanup Verification 95% UCL Calculations **Sheet No.** 6 of 20

100-H-43 Waste Site Statistical Calculations

Verification Data - Decision Unit - EXC

Sample Area	Sample Number	Sample Date	Nickel mg/kg	Nickel Q	Nickel PQL	Vanadium mg/kg	Vanadium Q	Vanadium PQL	Zinc mg/kg	Zinc Q	Zinc PQL
EXC-5	J1TX91	8/19/14	14.4	X	0.12	33.1	X	0.090	39.4	X	0.38
Duplicate of J1TX91	J1TX99	8/19/14	15.4	X	0.11	34.4	X	0.088	41.2	X	0.37
EXC-1	J1TX87	8/19/14	11.0	X	0.12	35.0	X	0.095	27.8	X	0.40
EXC-2	J1TX88	8/19/14	9.5	X	0.11	40.5	X	0.083	33.7	X	0.35
EXC-3 Re-Sample	J1V0F0	9/22/14	12.0		0.11	41.1		0.086	33.7		0.36
EXC-4	J1TX90	8/19/14	10.7	X	0.11	40.4	X	0.086	38.2	X	0.37
EXC-6	J1TX92	8/19/14	6.8	X	0.10	24.1	X	0.080	20.5	X	0.34
EXC-7	J1TX93	8/19/14	11.9	X	0.11	38.7	X	0.084	27.7	X	0.36
EXC-8	J1TX94	8/19/14	9.4	X	0.11	38.2	X	0.081	34.8	X	0.34
EXC-9	J1TX95	8/19/14	10.6	X	0.12	39.9	X	0.091	34.3	X	0.39
EXC-10	J1TX96	8/19/14	9.8	X	0.12	41.0	X	0.092	32.4	X	0.39
EXC-11	J1TX97	8/19/14	9.0	X	0.12	38.7	X	0.090	27.4	X	0.38
EXC-12 Re-Sample	J1V0F1	9/22/14	10.6		0.11	37.2		0.081	26.9		0.34

Statistical Computation Input Data

Sample Area	Sample Number	Sample Date	Nickel mg/kg	Vanadium mg/kg	Zinc mg/kg
EXC-5	J1TX91/ J1TX99	8/19/14	14.9	33.8	40.3
EXC-1	J1TX87	8/19/14	11.0	35.0	27.8
EXC-2	J1TX88	8/19/14	9.5	40.5	33.7
EXC-3 Re-Sample	J1V0F0	9/22/14	12.0	41.1	33.7
EXC-4	J1TX90	8/19/14	10.7	40.4	38.2
EXC-6	J1TX92	8/19/14	6.8	24.1	20.5
EXC-7	J1TX93	8/19/14	11.9	38.7	27.7
EXC-8	J1TX94	8/19/14	9.4	38.2	34.8
EXC-9	J1TX95	8/19/14	10.6	39.9	34.3
EXC-10	J1TX96	8/19/14	9.8	41.0	32.4
EXC-11	J1TX97	8/19/14	9.0	38.7	27.4
EXC-12 Re-Sample	J1V0F1	9/22/14	10.6	37.2	26.9

Statistical Computations

	Nickel	Vanadium	Zinc
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), use MTCAStat lognormal distribution.
N	12	12	12
% < Detection limit	0%	0%	0%
Mean	10.5	37.4	31.5
Standard deviation	2.0	4.8	5.5
95% UCL on mean	11.7	40.0	35.0
Maximum value	15.4	41.1	41.2
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)	19.1 GW Protection	85.1 GW Protection	67.8 River Protection
WAC 173-340 3-PART TEST			
95% UCL > Cleanup Limit?	NA	NA	NA
> 10% above Cleanup Limit?	NA	NA	NA
Any sample > 2X Cleanup Limit?	NA	NA	NA
WAC 173-340 Compliance?	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.

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-H Area Closure Operations
Subject 100-H-43 Waste Site Cleanup Verification 95% UCL Calculations

Date 10/23/14
Job No. 14655

Calc. No. 0100H-CA-V0209
Checked I. B. Berezovskiy

Rev. No. 0
Date 10/23/14
Sheet No. 7 of 20

100-H-43 Waste Site Statistical Calculations
Verification Data - Decision Unit - EXC

1	Sample	Sample	Sample	TPH - Diesel Range Extended			TPH - Diesel Range			Benzo(a)anthracene (Method 8310)			Benzo(a)pyrene (Method 8310)			Benzo(b)fluoranthene (Method 8310)			Benzo(ghi)perylene (Method 8310)			Chrysene (Method 8310)			Fluoranthene (Method 8310)			Pyrene (Method 8310)			Pyrene (Method 8270)		
2	Area	Number	Date	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
3	EXC-5	J1TX91	8/19/14	23000		940	9900		640	5.5	J	3.2	7.0	JX	6.4	16	X	4.2	7.1	U	7.1	6.3	J	4.8	13	U	13	12	U	12	15	J	11
4	Duplicate of J1TX91	J1TX99	8/19/14	3500	J	1000	2200	J	680	3.2	U	3.2	11	J	6.5	9.5	JX	4.2	24	J	7.3	12	J	4.9	14	J	13	16	J	12	12	U	12
5	EXC-1	J1TX87	8/19/14	5400		950	2800	J	650	20	X	3.1	43		6.2	31		4.1	35		7.0	46		4.7	79		13	100		12	86	J	12
6	EXC-2	J1TX88	8/19/14	5300		980	1900	J	670	27		3.2	18		6.4	15		4.2	7.2	U	7.2	19	J	4.9	44		13	40		12	33	J	12
7	EXC-3	J1TX89	8/19/14	23000		970	9300		660	4.3	JX	3.2	14	J	6.5	6.1	J	4.2	56	X	7.2	11	J	4.9	21	J	13	30	J	12	55	J	12
8	EXC-4	J1TX90	8/19/14	9200		1000	5700		680	8.5	JX	3.2	7.6	J	6.4	6.7	JX	4.2	45		7.2	9.5	J	4.8	18	J	13	23	J	12	30	J	12
9	EXC-6	J1TX92	8/19/14	2600	J	1000	1300	J	680	6.8	JX	3.2	6.4	U	6.4	4.2	U	4.2	71		7.2	5.7	J	4.8	13	U	13	12	U	12	14	J	12
10	EXC-7	J1TX93	8/19/14	990	U	990	670	U	670	3.1	U	3.1	6.2	U	6.2	4.1	U	4.1	7.0	U	7.0	4.7	U	4.7	13	U	13	12	U	12	12	U	12
11	EXC-8	J1TX94	8/19/14	3400	J	1000	1400	J	680	9.5	JX	3.2	18		6.5	14	J	4.2	7.3	U	7.3	14	J	4.9	32	J	13	39	J	12	43	J	12
12	EXC-9	J1TX95	8/19/14	6300		1000	3200	J	680	140		3.1	130		6.2	120		4.1	82		7.0	150		4.7	52		13	48		12	12	U	12
13	EXC-10	J1TX96	8/19/14	3100	J	980	1500	J	660	3.1	U	3.1	6.2	U	6.2	4.1	UN	4.1	7.0	U	7.0	4.7	U	4.7	13	U	13	12	U	12	13	J	12
14	EXC-11	J1TX97	8/19/14	1900	J	990	1200	J	670	3.2	U	3.2	6.3	U	6.3	4.1	U	4.1	7.1	U	7.1	4.8	U	4.8	13	U	13	12	U	12	12	U	12
15	EXC-12	J1TX98	8/19/14	9600		1000	4900		690	16	X	3.2	33		6.4	21		4.2	37		7.2	26	JX	4.8	57	X	13	84		12	270	J	12

16 **Statistical Computation Input Data**

17	Sample	Sample	Sample	TPH - Diesel Range Extended	TPH - Diesel Range	Benzo(a)anthracene (Method 8310)	Benzo(a)pyrene (Method 8310)	Benzo(b)fluoranthene (Method 8310)	Benzo(ghi)perylene (Method 8310)	Chrysene (Method 8310)	Fluoranthene (Method 8310)	Pyrene (Method 8310)	Pyrene (Method 8270)
18	Area	Number	Date	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
19	EXC-5	J1TX91/ J1TX99	8/19/14	13250	6050	3.6	9.0	13	14	9.2	10	11	11
20	EXC-1	J1TX87	8/19/14	5400	2800	20	43	31	35	46	79	100	86
21	EXC-2	J1TX88	8/19/14	5300	1900	27	18	15	3.6	19	44	40	33
22	EXC-3	J1TX89	8/19/14	23000	9300	4.3	14	6.1	56	11	21	30	55
23	EXC-4	J1TX90	8/19/14	9200	5700	8.5	7.6	6.7	45	9.5	18	23	30
24	EXC-6	J1TX92	8/19/14	2600	1300	6.8	3.2	2.1	71	5.7	6.5	6.0	14
25	EXC-7	J1TX93	8/19/14	495	335	1.6	3.1	2.1	3.5	2.4	6.5	6.0	6.0
26	EXC-8	J1TX94	8/19/14	3400	1400	9.5	18	14	3.7	14	32	39	43
27	EXC-9	J1TX95	8/19/14	6300	3200	140	130	120	82	150	52	48	6.0
28	EXC-10	J1TX96	8/19/14	3100	1500	1.6	3.1	2.1	3.5	2.4	6.5	6.0	13
29	EXC-11	J1TX97	8/19/14	1900	1200	1.6	3.2	2.1	3.6	2.4	6.5	6.0	6.0
30	EXC-12	J1TX98	8/19/14	9600	4900	16	33	21	37	26	57	84	270

31 **Statistical Computations**

32		TPH - Diesel Range Extended	TPH - Diesel Range	Benzo(a)anthracene (Method 8310)	Benzo(a)pyrene (Method 8310)	Benzo(b)fluoranthene (Method 8310)	Benzo(ghi)perylene (Method 8310)	Chrysene (Method 8310)	Fluoranthene (Method 8310)	Pyrene (Method 8310)	Pyrene (Method 8270)
33	95% UCL based on	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.
34	N	12	12	12	12	12	12	12	12	12	12
35	% < Detection limit	8%	8%	25%	33%	33%	42%	25%	33%	33%	25%
36	Mean	6962	3299	20	24	20	30	25	28	33	48
37	Standard deviation	6241	2665	39	36	33	29	41	24	31	74
38	95% UCL on mean	19180	7800	82	81	77	43	90	69	99	155
39	Maximum value	23000	9900	140	130	120	82	150	79	100	270
40	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (ug/kg)**	200000 DE, GW, and River Protection	200000 DE, GW, and River Protection	15 GW & River Protection	15 GW & River Protection	15 GW & River Protection	48,000 GW Protection	100 River Protection	18,000 River Protection	48,000 GW Protection	48,000 GW Protection
41	**WAC 173-340 3-PART TEST**										
42	95% UCL > Cleanup Limit?	NO	NO	YES	YES	YES	NO	NO	NO	NO	NO
43	> 10% above Cleanup Limit?	NO	NO	YES	YES	YES	NO	NO	NO	NO	NO
44	Any sample > 2X Cleanup Limit?	NO	NO	YES	YES	YES	NO	NO	NO	NO	NO
45	**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.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.

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

MAXIMUM VALUE 3-PART TEST CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-H Area Closure Operations
Subject 100-H-43 Waste Site Cleanup Verification 95% UCL Calculations

Date 10/23/14
Job No. 14655

Calc. No. 0100H-CA-V0209
Checked I. B. Berezovskiy

Rev. No. 0
Date 10/23/14
Sheet No. 8 of 20

100-H-43 Waste Site Maximum Calculations
Verification Data - Decision Unit - EXC

Sample Area	HEIS Number	Sample Date	Antimony			Boron			Cadmium			Molybdenum			Selenium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-5	J1TX91	8/19/14	0.37	UJ	0.37	0.94	U	0.94	0.069	B	0.039	0.25	U	0.25	0.83	U	0.83
Duplicate of J1TX91	J1TX99	8/19/14	0.36	UJ	0.36	0.92	U	0.92	0.070	B	0.038	0.24	U	0.24	0.80	U	0.80
EXC-1	J1TX87	8/19/14	0.43	JB	0.38	1.2	BN	0.99	0.041	U	0.041	0.26	U	0.26	0.87	U	0.87
EXC-2	J1TX88	8/19/14	0.34	UJ	0.34	0.87	B	0.87	0.036	U	0.036	0.23	U	0.23	0.76	U	0.76
EXC-3 Re-Sample	J1V0F0	9/22/14	0.35	U	0.35	1.1	B	0.89	0.037	U	0.037	0.37	B	0.24	0.98		0.78
EXC-4	J1TX90	8/19/14	0.35	UJ	0.35	1.3	B	0.90	0.038	U	0.038	0.24	U	0.24	0.79	U	0.79
EXC-6	J1TX92	8/19/14	0.32	UJ	0.32	0.83	U	0.83	0.035	U	0.035	0.22	U	0.22	0.73	U	0.73
EXC-7	J1TX93	8/19/14	0.34	UJ	0.34	1.4	B	0.87	0.037	U	0.037	0.23	U	0.23	0.77	U	0.77
EXC-8	J1TX94	8/19/14	0.37	JB	0.33	0.84	U	0.84	0.035	U	0.035	0.22	U	0.22	0.74	U	0.74
EXC-9	J1TX95	8/19/14	0.37	UJ	0.37	0.95	U	0.95	0.045	B	0.040	0.25	U	0.25	0.83	U	0.83
EXC-10	J1TX96	8/19/14	0.37	UJ	0.37	0.96	U	0.96	0.040	U	0.040	0.25	U	0.25	0.84	U	0.84
EXC-11	J1TX97	8/19/14	0.36	UJ	0.36	0.94	U	0.94	0.039	U	0.039	0.35	B	0.25	0.82	U	0.82
EXC-12 Re-Sample	J1V0F1	9/22/14	0.33	U	0.33	0.84	U	0.84	0.088	B	0.035	0.22	U	0.22	0.74	U	0.74

Statistical Computations

	Antimony	Boron	Cadmium	Molybdenum	Selenium
% < Detection limit	85%	62%	69%	85%	92%
Maximum value	0.43	1.4	0.088	0.37	0.98
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)	5 GW & River Protection	320 GW Protection	0.81 GW & River Protection	8 GW Protection	1 River Protection
3-PART TEST					
Maximum > Cleanup Limit?	NA	NO	NA	NO	NO
> 10% above Cleanup Limit?	NA	NO	NA	NO	NO
Any sample > 2X Cleanup Limit?	NA	NO	NA	NO	NO
3-Part Test Compliance?	Because all values are below background (5 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	Because all values are below background (0.81 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.

100-H-43 Waste Site Maximum Calculations
Verification Data - Decision Unit - EXC

Sample Area	HEIS Number	Sample Date	Acenaphthene (Method 8310)			Benzo(k)fluoranthene (Method 8310)			Dibenz[a,h]anthracene (Method 8310)			Fluorene (Method 8310)			Indeno(1,2,3-cd)pyrene (Method 8310)			Phenanthrene (Method 8310)			Anthracene (Method 8270)			Benzo(a)anthracene (Method 8270)			Benzo(a)pyrene (Method 8270)		
			ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
EXC-5	J1TX91	8/19/14	9.9	U	9.9	3.9	U	3.9	11	U	11	5.2	U	5.2	12	U	12	12	U	12	16	U	16	19	U	19	19	U	19
Duplicate of J1TX91	J1TX99	8/19/14	10	U	10	4.0	U	4.0	11	U	11	5.3	U	5.3	12	U	12	12	U	12	17	U	17	20	U	20	20	U	20
EXC-1	J1TX87	8/19/14	14	JX	9.7	14	J	3.8	11	U	11	5.1	U	5.1	30		12	53		12	17	U	17	41	J	20	36	J	20
EXC-2	J1TX88	8/19/14	10	U	10	4.9	JX	4.0	11	U	11	5.3	U	5.3	14	JX	12	33	J	12	16	U	16	19	U	19	19	U	19
EXC-3	J1TX89	8/19/14	10	U	10	4.0	U	4.0	11	U	11	5.3	U	5.3	12	U	12	17	J	12	17	U	17	25	J	20	26	J	20
EXC-4	J1TX90	8/19/14	10	U	10	3.9	U	3.9	11	U	11	5.3	U	5.3	12	U	12	12	U	12	17	U	17	20	U	20	20	U	20
EXC-6	J1TX92	8/19/14	10	U	10	3.9	U	3.9	11	U	11	5.3	U	5.3	12	U	12	12	U	12	17	U	17	20	U	20	20	U	20
EXC-7	J1TX93	8/19/14	9.7	U	9.7	3.8	U	3.8	11	U	11	5.1	U	5.1	12	U	12	12	U	12	17	U	17	20	U	20	20	U	20
EXC-8	J1TX94	8/19/14	10	U	10	6.2	J	4.0	11	U	11	5.3	U	5.3	12	J	12	18	J	12	17	U	17	20	U	20	20	U	20
EXC-9	J1TX95	8/19/14	13	JX	9.7	41		3.8	20	J	11	10	JX	5.1	76		12	12	U	12	17	U	17	20	U	20	20	U	20
EXC-10	J1TX96	8/19/14	9.7	U	9.7	3.8	UN	3.8	11	U	11	5.1	U	5.1	12	U	12	12	U	12	17	U	17	20	U	20	20	U	20
EXC-11	J1TX97	8/19/14	9.9	U	9.9	3.9	U	3.9	11	U	11	5.2	U	5.2	12	U	12	12	U	12	17	U	17	20	U	20	20	U	20
EXC-12	J1TX98	8/19/14	9.9	U	9.9	9.5	J	3.9	11	U	11	5.3	U	5.3	32		12	54		12	18	J	17	88	J	20	86	J	20

Statistical Computations

	Acenaphthene (Method 8310)	Benzo(k)fluoranthene (Method 8310)	Dibenz[a,h]anthracene (Method 8310)	Fluorene (Method 8310)	Indeno(1,2,3-cd)pyrene (Method 8310)	Phenanthrene (Method 8310)	Anthracene (Method 8270)	Benzo(a)anthracene (Method 8270)	Benzo(a)pyrene (Method 8270)
% < Detection limit	85%	62%	92%	92%	62%	62%	92%	77%	77%
Maximum value	14	41	20	10	76	54	18	88	86
Most Stringent Cleanup Limit for nonradionuclide and RAG type (ug/kg)	96,000 GW Protection	15 GW & River Protection	30 GW & River Protection	64,000 GW Protection	330 GW & River Protection	240,000 GW Protection	240,000 GW Protection	15 GW & River Protection	15 GW & River Protection
3-PART TEST									
Maximum > Cleanup Limit?	NO	YES	NO	NO	NO	NO	NO	YES	YES
> 10% above Cleanup Limit?	NO	NO	NO	NO	NO	NO	NO	YES	YES
Any sample > 2X Cleanup Limit?	NO	YES	NO	NO	NO	NO	NO	YES	YES
3-Part Test Compliance?	The data set meets the 3-part test criteria when compared to the most stringent RAG.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	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.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.

MAXIMUM VALUE 3-PART TEST CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-H Area Closure Operations
Subject 100-H-43 Waste Site Cleanup Verification 95% UCL Calculations

Date 10/23/14
Job No. 14655

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Checked I. B. Berezovskiy

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Date 10/23/14
Sheet No. 9 of 20

1 **100-H-43 Waste Site Maximum Calculations**

2 **Verification Data - Decision Unit - EXC**

3	Sample Area	HEIS Number	Sample Date	Benzo(b)fluoranthene (Method 8270)			Benzo(ghi)perylene (Method 8270)			Chrysene (Method 8270)			Fluoranthene (Method 8270)			Indeno(1,2,3-cd)pyrene (Method 8270)			Phenanthrene (Method 8270)			Aroclor-1254			Dieldrin		
4				ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
5	EXC-5	J1TX91	8/19/14	25	U	25	15	U	15	26	U	26	34	U	34	21	U	21	16	U	16	2.6	U	2.6	0.21	U	0.21
6	Duplicate of J1TX91	J1TX99	8/19/14	26	U	26	16	U	16	27	U	27	36	U	36	22	U	22	17	U	17	2.6	U	2.6	0.21	U	0.21
7	EXC-1	J1TX87	8/19/14	47	J	26	23	J	16	46	J	27	85	J	36	76	J	22	51	J	17	2.5	U	2.5	0.21	U	0.21
8	EXC-2	J1TX88	8/19/14	25	U	25	16	U	16	26	U	26	35	U	35	21	U	21	16	J	16	2.6	U	2.6	0.76	J	0.20
9	EXC-3	J1TX89	8/19/14	26	U	26	16	U	16	29	J	27	40	J	36	22	U	22	18	J	17	2.5	U	2.5	0.21	U	0.21
10	EXC-4	J1TX90	8/19/14	26	U	26	16	U	16	27	U	27	36	U	36	22	U	22	17	U	17	3.0	J	2.6	0.21	U	0.21
11	EXC-6	J1TX92	8/19/14	26	U	26	16	U	16	26	U	26	35	U	35	22	U	22	17	U	17	2.6	U	2.6	0.21	U	0.21
12	EXC-7	J1TX93	8/19/14	26	U	26	16	U	16	27	U	27	35	U	35	22	U	22	17	U	17	2.6	U	2.6	0.20	U	0.20
13	EXC-8	J1TX94	8/19/14	26	U	26	16	U	16	27	U	27	36	U	36	22	U	22	20	J	17	2.6	U	2.6	0.21	U	0.21
14	EXC-9	J1TX95	8/19/14	26	U	26	16	U	16	27	U	27	36	U	36	22	U	22	17	U	17	2.6	U	2.6	0.20	U	0.20
15	EXC-10	J1TX96	8/19/14	26	U	26	16	U	16	27	U	27	36	U	36	22	U	22	17	U	17	2.6	U	2.6	0.70	J	0.20
16	EXC-11	J1TX97	8/19/14	26	U	26	16	U	16	26	U	26	35	U	35	21	U	21	17	U	17	2.6	U	2.6	0.21	U	0.21
17	EXC-12	J1TX98	8/19/14	87	J	26	49	J	16	110	J	27	200	J	36	100	J	22	190	J	17	2.6	U	2.6	0.21	U	0.21

18 **Statistical Computations**

19		Benzo(b)fluoranthene (Method 8270)	Benzo(ghi)perylene (Method 8270)	Chrysene (Method 8270)	Fluoranthene (Method 8270)	Indeno(1,2,3-cd)pyrene (Method 8270)	Phenanthrene (Method 8270)	Aroclor-1254	Dieldrin
20	% < Detection limit	85%	85%	77%	77%	85%	62%	92%	85%
21	Maximum value	87	49	110	200	100	190	3.0	0.76
22	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (ug/kg)**	15 GW & River Protection	48,000 GW Protection	100 River Protection	18,000 River Protection	330 GW & River Protection	240,000 GW Protection	17 GW & River Protection	3.3 GW & River Protection
23	**3-PART TEST**								
24	Maximum > Cleanup Limit?	YES	NO	YES	NO	NO	NO	NO	NO
25	> 10% above Cleanup Limit?	YES	NO	NO	NO	NO	NO	NO	NO
26	Any sample > 2X Cleanup Limit?	YES	NO	NO	NO	NO	NO	NO	NO
27	**3-Part Test Compliance?**	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.

Washington Closure Hanford

CALCULATION SHEET

Originator J. D. Skoglie
Project 100-H Area Closure Operations
Subject 100-H-43 Waste Site Cleanup Verification 95% UCL Calculations

Date 10/23/14
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Date 10/23/14
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100-H-43 Waste Site Statistical Calculations
Verification Data - Decision Unit - SPA

1	Sample	Sample	Sample	Antimony			Arsenic			Barium			Cadmium			Chromium			Cobalt			Copper			Lead			Manganese			Nickel		
2	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
3	SPA-6	J1TXC6	8/18/14	0.54	B	0.36	3.6		0.62	53.7		0.072	0.065	B	0.039	9.8		0.055	5.2		0.094	13.2		0.20	7.1		0.25	249		0.094	10.6		0.12
4	Duplicate of J1TXC6	J1TXD3	8/18/14	0.49	B	0.37	3.3		0.64	50.5		0.074	0.040	U	0.040	10.0		0.056	5.2		0.097	12.8		0.21	6.8		0.26	240		0.097	10.3		0.12
5	SPA-1	J1TXC1	8/18/14	0.50	B	0.34	2.6		0.59	36.6		0.068	0.039	B	0.037	8.2		0.052	4.6		0.089	9.8		0.19	5.8		0.24	231		0.089	8.0		0.11
6	SPA-2	J1TXC2	8/18/14	0.34	B	0.34	3.3		0.59	46.1		0.067	0.049	B	0.036	13.5		0.051	5.1		0.089	12.3		0.19	8.1		0.24	229		0.089	10.5		0.11
7	SPA-3	J1TXC3	8/18/14	0.52	B	0.36	8.5		0.62	52.9		0.072	0.041	B	0.039	9.5		0.055	5.2		0.095	13.0		0.21	28.2		0.26	237		0.095	9.5		0.12
8	SPA-4	J1TXC4	8/18/14	1.1		0.33	7.1		0.58	53.0		0.067	0.040	B	0.036	11.5		0.051	5.4		0.088	11.7		0.19	28.5		0.24	223		0.088	10.0		0.11
9	SPA-5	J1TXC5	8/18/14	0.33	U	0.33	3.7		0.57	50.0		0.065	0.039	B	0.035	9.7		0.050	4.7		0.086	12.0		0.19	8.6		0.23	216		0.086	9.2		0.11
10	SPA-7	J1TXC7	8/18/14	0.45	B	0.37	2.7		0.64	40.8		0.074	0.040	U	0.040	8.3		0.056	4.2		0.097	9.7		0.21	6.1		0.26	206		0.097	8.8		0.12
11	SPA-8	J1TXC8	8/18/14	0.61		0.36	5.8		0.63	52.6		0.073	0.039	U	0.039	11.8		0.055	5.6		0.096	13.5		0.21	15.0		0.26	264		0.096	10.9		0.12
12	SPA-9	J1TXC9	8/18/14	0.37	U	0.37	2.1		0.65	39.7		0.075	0.059	B	0.040	12.4		0.057	5.3		0.098	12.0		0.21	5.6		0.27	226		0.098	9.9		0.12
13	SPA-10	J1TXD0	8/18/14	0.49	B	0.35	4.1		0.60	61.5		0.070	0.038	U	0.038	12.2		0.053	5.3		0.092	9.5		0.20	4.7		0.25	222		0.092	11.8		0.11
14	SPA-11	J1TXD1	8/18/14	0.35	U	0.35	4.2		0.60	56.0		0.069	0.048	B	0.037	9.0		0.053	5.1		0.091	11.7		0.20	14.3		0.25	224		0.091	9.4		0.11
15	SPA-12	J1TXD2	8/18/14	0.35	U	0.35	5.0		0.61	51.1		0.070	0.038	U	0.038	10.9		0.053	5.6		0.092	12.3		0.20	12.9		0.25	241		0.092	11.1		0.11

16 **Statistical Computation Input Data**

17	Sample	Sample	Sample	Antimony	Arsenic	Barium	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel
18	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
19	SPA-6	J1TXC6/ J1TXD3	8/18/14	0.52	3.5	52.1	0.043	9.9	5.2	13.0	7.0	245	10.5
20	SPA-1	J1TXC1	8/18/14	0.50	2.6	36.6	0.039	8.2	4.6	9.8	5.8	231	8.0
21	SPA-2	J1TXC2	8/18/14	0.34	3.3	46.1	0.049	13.5	5.1	12.3	8.1	229	10.5
22	SPA-3	J1TXC3	8/18/14	0.52	8.5	52.9	0.041	9.5	5.2	13.0	28.2	237	9.5
23	SPA-4	J1TXC4	8/18/14	1.1	7.1	53.0	0.040	11.5	5.4	11.7	28.5	223	10.0
24	SPA-5	J1TXC5	8/18/14	0.17	3.7	50.0	0.039	9.7	4.7	12.0	8.6	216	9.2
25	SPA-7	J1TXC7	8/18/14	0.45	2.7	40.8	0.020	8.3	4.2	9.7	6.1	206	8.8
26	SPA-8	J1TXC8	8/18/14	0.61	5.8	52.6	0.020	11.8	5.6	13.5	15.0	264	10.9
27	SPA-9	J1TXC9	8/18/14	0.19	2.1	39.7	0.059	12.4	5.3	12.0	5.6	226	9.9
28	SPA-10	J1TXD0	8/18/14	0.49	4.1	61.5	0.019	12.2	5.3	9.5	4.7	222	11.8
29	SPA-11	J1TXD1	8/18/14	0.18	4.2	56.0	0.048	9.0	5.1	11.7	14.3	224	9.4
30	SPA-12	J1TXD2	8/18/14	0.18	5.0	51.1	0.019	10.9	5.6	12.3	12.9	241	11.1

31 **Statistical Computations**

32		Antimony	Arsenic	Barium	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel
33	95% UCL based on	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat normal distribution.	Large data set (n ≥ 10), 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.
34	N	12	12	12	12	12	12	12	12	12	12
35	% < Detection limit	33%	0%	0%	33%	0%	0%	0%	0%	0%	0%
36	Mean	0.44	4.4	49.4	0.036	10.6	5.1	11.7	12.1	230	10.0
37	Standard deviation	0.27	1.9	7.3	0.014	1.7	0.42	1.3	8.4	15.0	1.1
38	95% UCL on mean	0.56	5.7	53.8	0.043	11.6	5.3	12.3	18.5	238	10.6
39	Maximum value	1.1	8.5	61.5	0.065	13.5	5.6	13.5	28.5	264	11.8
40	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)**	5 GW & River Protection	20 DE, GW & River Protection	200 GW Protection	0.81 GW & River Protection	18.5 GW & River Protection	15.7 GW Protection	22.0 River Protection	10.2 GW & River Protection	512 GW & River Protection	19.1 GW Protection
41	**WAC 173-340 3-PART TEST**										
42	95% UCL > Cleanup Limit?	NA	NO	NA	NA	NA	NA	NA	YES	NA	NA
43	> 10% above Cleanup Limit?	NA	NO	NA	NA	NA	NA	NA	YES	NA	NA
44	Any sample > 2X Cleanup Limit?	NA	NO	NA	NA	NA	NA	NA	YES	NA	NA
45	**WAC 173-340 Compliance?**	Because all values are below background (5 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	Because all values are below background (132 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (0.81 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (18.5 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (15.7 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (22.0 mg/kg) the WAC 173-340 3-part test is not required.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	Because all values are below background (512 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (19.1 mg/kg) the WAC 173-340 3-part test is not required.

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie **Date** 10/23/14 **Calc. No.** 0100H-CA-V0209 **Rev. No.** 0
Project 100-H Area Closure Operations **Job No.** 14655 **Checked** I. B. Berezovskiy **Date** 10/23/14
Subject 100-H-43 Waste Site Cleanup Verification 95% UCL Calculations **Sheet No.** 11 of 20

100-H-43 Waste Site Statistical Calculations
Verification Data - Decision Unit - SPA

1	Sample	Sample	Sample	Vanadium			Zinc			TPH - Diesel Range Extended			TPH - Diesel Range			Benzo(a)anthracene (Method 8310)			Benzo(a)pyrene (Method 8310)			Benzo(b)fluoranthene (Method 8310)			Pyrene (Method 8310)			Pyrene (Method 8270)		
2	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
3	SPA-6	J1TXC6	8/18/14	41.3		0.089	34.6	X	0.38	1900	J	980	1000	J	670	3.2	U	3.2	6.4	U	6.4	4.2	U	4.2	12	U	12	12	U	12
4	Duplicate of J1TXC6	J1TXD3	8/18/14	39.2		0.091	32.3	X	0.39	3600	J	980	2100	J	660	3.1	U	3.1	6.2	U	6.2	4.1	U	4.1	12	U	12	12	U	12
5	SPA-1	J1TXC1	8/18/14	32.4		0.084	28.4	X	0.36	1900	J	950	740	J	650	3.1	U	3.1	6.3	U	6.3	4.1	U	4.1	12	U	12	12	U	12
6	SPA-2	J1TXC2	8/18/14	40.5		0.083	32.0	X	0.35	2900	J	970	1300	J	660	4.3	JX	3.2	6.4	JX	6.4	5.2	JX	4.2	12	U	12	13	J	12
7	SPA-3	J1TXC3	8/18/14	40.7		0.089	36.8	X	0.38	6900		990	3100	J	670	5.3	JX	3.1	14	JX	6.3	15		4.1	23	J	12	20	J	12
8	SPA-4	J1TXC4	8/18/14	38.6		0.082	37.4	X	0.35	41000		950	18000		650	10	JN	3.0	14		6.1	12	JN	4.0	25	J	11	55	J	12
9	SPA-5	J1TXC5	8/18/14	38.0		0.081	36.3	X	0.34	4300		960	2200	J	660	3.0	JX	3.0	6.1	U	6.1	4.0	U	4.0	11	U	11	12	U	12
10	SPA-7	J1TXC7	8/18/14	35.0		0.091	27.9	X	0.39	2200	J	940	1400	J	640	3.2	U	3.2	6.4	U	6.4	4.2	U	4.2	21	J	12	12	U	12
11	SPA-8	J1TXC8	8/18/14	43.3		0.090	35.6	X	0.38	2300	J	1000	1300	J	690	3.2	U	3.2	7.8	JX	6.5	4.9	JX	4.3	13	J	12	32	J	12
12	SPA-9	J1TXC9	8/18/14	43.4		0.093	33.2	X	0.39	1700	J	940	870	J	640	3.2	U	3.2	6.4	U	6.4	4.2	U	4.2	12	U	12	12	U	12
13	SPA-10	J1TXD0	8/18/14	33.1		0.086	34.4	X	0.36	980	U	980	660	U	660	3.1	U	3.1	6.2	U	6.2	4.0	U	4.0	12	U	12	12	U	12
14	SPA-11	J1TXD1	8/18/14	40.7		0.086	31.8	X	0.36	3500	J	1000	1800	J	680	7.1	J	3.1	9.0	J	6.3	10	J	4.1	14	J	12	17	J	11
15	SPA-12	J1TXD2	8/18/14	40.1		0.087	35.0	X	0.37	4400		960	2600	J	650	44		3.0	45		6.1	54		4.0	110		11	87	J	11

16 **Statistical Computation Input Data**

17	Sample	Sample	Sample	Vanadium	Zinc	TPH - Diesel Range Extended	TPH - Diesel Range	Benzo(a)anthracene (Method 8310)	Benzo(a)pyrene (Method 8310)	Benzo(b)fluoranthene (Method 8310)	Pyrene (Method 8310)	Pyrene (Method 8270)
18	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
19	SPA-6	J1TXC6/ J1TXD3	8/18/14	40.3	33.5	2750	1550	1.6	3.2	2.1	6.0	6.0
20	SPA-1	J1TXC1	8/18/14	32.4	28.4	1900	740	1.6	3.2	2.1	6.0	6.0
21	SPA-2	J1TXC2	8/18/14	40.5	32.0	2900	1300	4.3	6.4	5.2	6.0	13
22	SPA-3	J1TXC3	8/18/14	40.7	36.8	6900	3100	5.3	14	15	23	20
23	SPA-4	J1TXC4	8/18/14	38.6	37.4	41000	18000	10	14	12	25	55
24	SPA-5	J1TXC5	8/18/14	38.0	36.3	4300	2200	3.0	3.1	2.0	5.5	6.0
25	SPA-7	J1TXC7	8/18/14	35.0	27.9	2200	1400	1.6	3.2	2.1	21	6.0
26	SPA-8	J1TXC8	8/18/14	43.3	35.6	2300	1300	1.6	7.8	4.9	13	32
27	SPA-9	J1TXC9	8/18/14	43.4	33.2	1700	870	1.6	3.2	2.1	6.0	6.0
28	SPA-10	J1TXD0	8/18/14	33.1	34.4	490	330	1.6	3.1	2.0	6.0	6.0
29	SPA-11	J1TXD1	8/18/14	40.7	31.8	3500	1800	7.1	9.0	10	14	17
30	SPA-12	J1TXD2	8/18/14	40.1	35.0	4400	2600	44	45	54	110	87

31 **Statistical Computations**

32		Vanadium	Zinc	TPH - Diesel Range Extended	TPH - Diesel Range	Benzo(a)anthracene (Method 8310)	Benzo(a)pyrene (Method 8310)	Benzo(b)fluoranthene (Method 8310)	Pyrene (Method 8310)	Pyrene (Method 8270)
33	95% UCL based on	Large data set (n ≥ 10), use MTCAStat normal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), 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.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.
34	N	12	12	12	12	12	12	12	12	12
35	% < Detection limit	0%	0%	8%	8%	50%	50%	50%	50%	50%
36	Mean	38.8	33.5	6195	2933	6.9	9.6	9.5	20	22
37	Standard deviation	3.6	3.1	11082	4809	12	12	15	29	25
38	95% UCL on mean	40.7	35.3	11458	5216	13	15	17	34	34
39	Maximum value	43.4	37.4	41000	18000	44	45	54	110	87
40	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)**	85.1 GW Protection	67.8 River Protection	200000 DE, GW, and River Protection	200000 DE, GW, and River Protection	15 GW & River Protection	15 GW & River Protection	15 GW & River Protection	48,000 GW Protection	48,000 GW Protection
41	**WAC 173-340 3-PART TEST**									
42	95% UCL > Cleanup Limit?	NA	NA	NO	NO	NO	YES	YES	NO	NO
43	> 10% above Cleanup Limit?	NA	NA	NO	NO	NO	NO	NO	NO	NO
44	Any sample > 2X Cleanup Limit?	NA	NA	NO	NO	YES	YES	YES	NO	NO
45	**WAC 173-340 Compliance?**	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.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.

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

MAXIMUM VALUE 3-PART TEST CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie **Date** 10/23/14 **Calc. No.** 0100H-CA-V0209 **Rev. No.** 0

Project 100-H Area Closure Operations **Job No.** 14655 **Checked** I. B. Berezovskiy **Date** 10/23/14

Subject 100-H-43 Waste Site Cleanup Verification 95% UCL Calculations **Sheet No.** 12 of 20

1 **100-H-43 Waste Site Maximum Calculations**

2 **Verification Data - Decision Unit - SPA**

3	Sample	Sample	Sample	Boron			Hexavalent Chromium			Mercury			Molybdenum			Silver			Acenaphthene (Method 8310)			Anthracene (Method 8310)			Benzo(ghi)perylene (Method 8310)			Benzo(k)fluoranthene (Method 8310)		
4	Area	Number	Date	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	ug/kg	Q	PQL	ug/kg	Q	PQL
5	SPA-6	J1TXC6	8/18/14	0.92	B	0.92	0.193		0.155	0.0055	U	0.0055	0.25	U	0.25	0.15	U	0.15	10	U	10	3.0	U	3.0	7.2	U	7.2	3.9	U	3.9
6	Duplicate of J1TXC6	J1TXD3	8/18/14	0.95	U	0.95	0.235		0.155	0.0050	U	0.0050	0.25	U	0.25	0.24		0.16	9.7	U	9.7	3.0	U	3.0	7.0	U	7.0	3.8	U	3.8
7	SPA-1	J1TXC1	8/18/14	0.88	U	0.88	0.155	U	0.155	0.0054	U	0.0054	0.23	U	0.23	0.14	U	0.14	9.8	U	9.8	3.0	U	3.0	7.1	U	7.1	3.9	U	3.9
8	SPA-2	J1TXC2	8/18/14	1.4	B	0.87	0.155	U	0.155	0.0052	U	0.0052	0.26	B	0.23	0.39		0.14	10	U	10	3.0	U	3.0	7.2	U	7.2	3.9	U	3.9
9	SPA-3	J1TXC3	8/18/14	1.9		0.93	0.155	U	0.155	0.0061	B	0.0050	0.25	U	0.25	0.19		0.15	9.8	U	9.8	3.0	U	3.0	7.1	U	7.1	5.5	J	3.9
10	SPA-4	J1TXC4	8/18/14	1.7	B	0.86	0.155	U	0.155	0.013	B	0.0052	0.23	U	0.23	0.14	U	0.14	9.5	UN	9.5	2.9	U	2.9	21	JN	6.9	3.9	JN	3.8
11	SPA-5	J1TXC5	8/18/14	0.84	U	0.84	0.215		0.155	0.0053	U	0.0053	0.22	U	0.22	0.14	U	0.14	9.4	U	9.4	2.9	U	2.9	6.8	U	6.8	3.7	U	3.7
12	SPA-7	J1TXC7	8/18/14	0.95	U	0.95	0.155	U	0.155	0.0050	U	0.0050	0.25	U	0.25	0.16	U	0.16	9.9	U	9.9	3.0	U	3.0	7.1	U	7.1	3.9	U	3.9
13	SPA-8	J1TXC8	8/18/14	1.1	B	0.94	0.155	U	0.155	0.0056	U	0.0056	0.25	U	0.25	0.15	U	0.15	10	U	10	3.1	U	3.1	7.3	U	7.3	4.0	U	4.0
14	SPA-9	J1TXC9	8/18/14	0.96	U	0.96	0.321		0.155	0.0055	U	0.0055	0.26	U	0.26	0.16	U	0.16	9.9	U	9.9	3.0	U	3.0	7.2	U	7.2	3.9	U	3.9
15	SPA-10	J1TXD0	8/18/14	0.90	U	0.90	0.155	U	0.155	0.0055	U	0.0055	0.24	U	0.24	0.15	U	0.15	9.6	U	9.6	2.9	U	2.9	6.9	U	6.9	3.8	U	3.8
16	SPA-11	J1TXD1	8/18/14	0.89	U	0.89	0.155	U	0.155	0.0056	U	0.0056	0.24	U	0.24	0.15	U	0.15	9.8	U	9.8	3.0	U	3.0	7.1	U	7.1	3.9	U	3.9
17	SPA-12	J1TXD2	8/18/14	0.90	U	0.90	0.155	U	0.155	0.0051	U	0.0051	0.24	U	0.24	0.16	B	0.15	15	JX	9.5	5.7	J	2.9	22	JX	6.8	18		3.7

18 **Statistical Computations**

19		Boron	Hexavalent Chromium	Mercury	Molybdenum	Silver	Acenaphthene (Method 8310)	Anthracene (Method 8310)	Benzo(ghi)perylene (Method 8310)	Benzo(k)fluoranthene (Method 8310)
20	% < Detection limit	62%	69%	85%	92%	69%	92%	92%	85%	77%
21	Maximum value	1.9	0.321	0.013	0.26	0.39	15	5.7	22	18
22	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless stated otherwise**	320 GW Protection	2 River Protection	0.33 GW & River Protection	8 GW Protection	0.73 River Protection	96000 ug/kg GW Protection	240000 ug/kg GW Protection	48000 ug/kg GW Protection	15 ug/kg GW & River Protection
23	**3-PART TEST**									
24	Maximum > Cleanup Limit?	NO	NO	NA	NO	NA	NO	NO	NO	YES
25	> 10% above Cleanup Limit?	NO	NO	NA	NO	NA	NO	NO	NO	NO
26	Any sample > 2X Cleanup Limit?	NO	NO	NA	NO	NA	NO	NO	NO	NO
27	**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.	Because all values are below background (0.33 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	Because all values are below background (0.73 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.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.

28 **100-H-43 Waste Site Maximum Calculations**

29 **Verification Data - Decision Unit - SPA**

30	Sample	Sample	Sample	Chrysene (Method 8310)			Fluoranthene (Method 8310)			Fluorene (Method 8310)			Indeno(1,2,3-cd)pyrene (Method 8310)			Phenanthrene (Method 8310)			Benzo(a)anthracene (Method 8270)			Benzo(a)pyrene (Method 8270)			Benzo(b)fluoranthene (Method 8270)			Benzo(ghi)perylene (Method 8270)		
31	Area	Number	Date	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
32	SPA-6	J1TXC6	8/18/14	4.8	U	4.8	13	U	13	5.3	U	5.3	12	U	12	12	U	12	20	U	20	20	U	20	26	U	26	16	U	16
33	Duplicate of J1TXC6	J1TXD3	8/18/14	4.7	U	4.7	13	U	13	5.1	U	5.1	12	U	12	12	U	12	20	U	20	20	U	20	26	U	26	16	U	16
34	SPA-1	J1TXC1	8/18/14	4.8	U	4.8	13	U	13	5.2	U	5.2	12	U	12	12	U	12	20	U	20	20	U	20	26	U	26	16	U	16
35	SPA-2	J1TXC2	8/18/14	4.8	U	4.8	13	U	13	5.3	U	5.3	12	U	12	12	U	12	20	U	20	20	U	20	26	U	26	16	U	16
36	SPA-3	J1TXC3	8/18/14	12	J	4.8	17	J	13	5.2	U	5.2	13	J	12	12	U	12	19	U	19	19	U	19	25	U	25	16	U	16
37	SPA-4	J1TXC4	8/18/14	14	J	4.6	32	JN	12	5	UN	5	11	UN	11	22	JN	11	25	J	20	23	J	20	40	JX	26	17	J	16
38	SPA-5	J1TXC5	8/18/14	4.6	U	4.6	12	U	12	5	U	5	11	U	11	11	U	11	19	U	19	19	U	19	25	U	25	15	U	15
39	SPA-7	J1TXC7	8/18/14	7.7	J	4.8	21	J	13	5.2	U	5.2	12	U	12	25	J	12	20	U	20	20	U	20	26	U	26	16	U	16
40	SPA-8	J1TXC8	8/18/14	4.9	U	4.9	13	U	13	5.3	U	5.3	12	U	12	12	U	12	22	J	20	20	U	20	26	U	26	16	U	16
41	SPA-9	J1TXC9	8/18/14	4.8	U	4.8	13	U	13	5.2	U	5.2	12	U	12	12	U	12	20	U	20	20	U	20	26	U	26	16	U	16
42	SPA-10	J1TXD0	8/18/14	4.7	U	4.7	13	U	13	5.1	U	5.1	12	U	12	12	U	12	20	U	20	20	U	20	26	U	26	16	U	16
43	SPA-11	J1TXD1	8/18/14	6.4	J	4.7	13	J	13	5.2	U	5.2	12	U	12	12	U	12	19	U	19	19	U	19	25	U	25	15	U	15
44	SPA-12	J1TXD2	8/18/14	39	X	4.6	91		12	10	J	5	48		11	39		11	53	J	19	47	J	19	55	J	25	32	J	15

45 **Statistical Computations**

46		Chrysene (Method 8310)	Fluoranthene (Method 8310)	Fluorene (Method 8310)	Indeno(1,2,3-cd)pyrene (Method 8310)	Phenanthrene (Method 8310)	Benzo(a)anthracene (Method 8270)	Benzo(a)pyrene (Method 8270)	Benzo(b)fluoranthene (Method 8270)	Benzo(ghi)perylene (Method 8270)
47	% < Detection limit	62%	62%	92%	85%	77%	77%	85%	85%	85%
48	Maximum value	39	91	10	48	39	53	47	55	32
49	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (ug/kg)**	100 River Protection	18,000 River Protection	64,000 GW Protection	330 GW & River Protection	240,000 GW Protection	15 GW & River Protection	15 GW & River Protection	15 GW & River Protection	48,000 GW Protection
50	**3-PART TEST**									
51	Maximum > Cleanup Limit?	NO	NO	NO	NO	NO	YES	YES	YES	NO
52	> 10% above Cleanup Limit?	NO	NO	NO	NO	NO	YES	YES	YES	NO
53	Any sample > 2X Cleanup Limit?	NO	NO	NO	NO	NO	YES	YES	YES	NO
54	**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.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.

MAXIMUM VALUE 3-PART TEST CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie **Date** 10/23/14 **Calc. No.** 0100H-CA-V0209 **Rev. No.** 0
Project 100-H Area Closure Operations **Job No.** 14655 **Checked** I. B. Berezovskiy **Date** 10/23/14
Subject 100-H-43 Waste Site Cleanup Verification 95% UCL Calculations **Sheet No.** 13 of 20

1 **100-H-43 Waste Site Maximum Calculations**

2 **Verification Data - Decision Unit - SPA**

3	Sample	Sample	Sample	Chrysene (Method 8270)			Fluoranthene (Method 8270)			Indeno(1,2,3-cd)pyrene (Method 8270)			Phenanthrene (Method 8270)			Aroclor-1260			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	ug/kg	Q	PQL	ug/kg	Q	PQL
5	SPA-6	J1TXC6	8/18/14	27	U	27	36	U	36	22	U	22	17	U	17	2.5	U	2.5	0.24	U	0.24	0.59	U	0.59
6	Duplicate of J1TXC6	J1TXD3	8/18/14	27	U	27	36	U	36	22	U	22	17	U	17	2.5	U	2.5	0.23	U	0.23	0.57	U	0.57
7	SPA-1	J1TXC1	8/18/14	27	U	27	36	U	36	22	U	22	17	U	17	2.6	U	2.6	0.23	U	0.23	0.57	U	0.57
8	SPA-2	J1TXC2	8/18/14	27	U	27	36	U	36	22	U	22	17	U	17	2.6	U	2.6	0.24	U	0.24	0.59	U	0.59
9	SPA-3	J1TXC3	8/18/14	26	U	26	35	U	35	21	U	21	16	U	16	2.6	U	2.6	0.24	U	0.24	0.60	U	0.60
10	SPA-4	J1TXC4	8/18/14	33	J	27	47	J	36	22	U	22	26	J	17	3.3	J	2.6	19		0.23	19		0.58
11	SPA-5	J1TXC5	8/18/14	26	U	26	35	U	35	21	U	21	16	U	16	2.5	U	2.5	0.24	U	0.24	0.59	U	0.59
12	SPA-7	J1TXC7	8/18/14	26	U	26	35	U	35	21	U	21	17	U	17	2.5	U	2.5	0.23	U	0.23	0.58	U	0.58
13	SPA-8	J1TXC8	8/18/14	26	U	26	35	U	35	63	J	21	17	U	17	2.5	U	2.5	0.24	U	0.24	0.60	U	0.60
14	SPA-9	J1TXC9	8/18/14	27	U	27	36	U	36	22	U	22	17	U	17	2.5	U	2.5	0.23	U	0.23	0.96	J	0.57
15	SPA-10	J1TXD0	8/18/14	26	U	26	35	U	35	22	U	22	17	U	17	2.6	U	2.6	0.24	U	0.24	0.59	U	0.59
16	SPA-11	J1TXD1	8/18/14	26	U	26	34	U	34	21	U	21	16	U	16	2.6	U	2.6	0.23	U	0.23	0.57	U	0.57
17	SPA-12	J1TXD2	8/18/14	55	J	26	91	J	34	90	J	21	34	J	16	2.6	U	2.6	0.24	U	0.24	0.60	U	0.60

18 **Statistical Computations**

19		Chrysene (Method 8270)			Fluoranthene (Method 8270)			Indeno(1,2,3-cd)pyrene (Method 8270)			Phenanthrene (Method 8270)			Aroclor-1260			4-4'-DDE			4-4'-DDT		
20	% < Detection limit	85%			85%			85%			85%			92%			92%			85%		
21	Maximum value	55			91			90			34			3.3			19			19		
22	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (ug/kg)**	100	River Protection		18,000	River Protection		330	GW & River Protection		240,000	GW Protection		17	GW & River Protection		3.3	River Protection		3.3	River Protection	
23	**3-PART TEST**																					
24	Maximum > Cleanup Limit?	NO			NO			NO			NO			NO			YES			YES		
25	> 10% above Cleanup Limit?	NO			NO			NO			NO			NO			NO			NO		
26	Any sample > 2X Cleanup Limit?	NO			NO			NO			NO			NO			YES			YES		
27	**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.			A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.			A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.		

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie **Date** 10/23/14 **Calc. No.** 0100H-CA-V0209 **Rev. No.** 0

Project 100-H Area Closure Operations **Job No.** 14655 **Checked** I. B. Berezovskiy **Date** 10/23/14

Subject 100-H-43 Waste Site Cleanup Verification 95% UCL Calculations **Sheet No.** 14 of 20

Ecology Software (MTCAStat) Results, 100-H-43 Waste Site - Decision Unit EXC

Arsenic 95% UCL Calculation

DATA	ID
	J1TX91/
9.3	J1TX99
5.2	J1TX87
10.5	J1TX88
15.8	J1V0F0
7.4	J1TX90
4.2	J1TX92
3.5	J1TX93
9.9	J1TX94
12.1	J1TX95
10.9	J1TX96
3.8	J1TX97
3.1	J1V0F1

Number of samples		Uncensored values	
Uncensored	12	Mean	8.0
Censored		Lognormal mean	8.1
Detection limit or PQL		Std. devn.	4.1
Method detection limit		Median	8.4
TOTAL	12	Min.	3.1
		Max.	15.8

Lognormal distribution? r-squared is: 0.934
Normal distribution? r-squared is: 0.935
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 11.8

Barium 95% UCL Calculation

DATA	ID
	J1TX91/
79.0	J1TX99
53.9	J1TX87
50.8	J1TX88
50.7	J1V0F0
64.2	J1TX90
25.5	J1TX92
38.0	J1TX93
56.9	J1TX94
52.5	J1TX95
43.0	J1TX96
30.6	J1TX97
41.6	J1V0F1

Number of samples		Uncensored values	
Uncensored	12	Mean	48.9
Censored		Lognormal mean	49.2
Detection limit or PQL		Std. devn.	14.6
Method detection limit		Median	50.8
TOTAL	12	Min.	25.5
		Max.	79.0

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

UCL (Land's method) is 59.0

Beryllium 95% UCL Calculation

DATA	ID
	J1TX91/
0.30	J1TX99
0.21	J1TX87
0.22	J1TX88
0.015	J1V0F0
0.27	J1TX90
0.12	J1TX92
0.17	J1TX93
0.21	J1TX94
0.23	J1TX95
0.20	J1TX96
0.16	J1TX97
0.014	J1V0F1

Number of samples		Uncensored values	
Uncensored	12	Mean	0.18
Censored		Lognormal mean	0.23
Detection limit or PQL		Std. devn.	0.089
Method detection limit		Median	0.21
TOTAL	12	Min.	0.014
		Max.	0.30

Lognormal distribution? r-squared is: 0.669
Normal distribution? r-squared is: 0.905
Recommendations:
Use normal distribution.

UCL (based on t-statistic) is 0.22

Chromium 95% UCL Calculation

DATA	ID
	J1TX91/
16.2	J1TX99
15.2	J1TX87
10.1	J1TX88
11.2	J1V0F0
11.0	J1TX90
6.3	J1TX92
9.8	J1TX93
10.1	J1TX94
10.3	J1TX95
9.6	J1TX96
9.2	J1TX97
9.7	J1V0F1

Number of samples		Uncensored values	
Uncensored	12	Mean	10.7
Censored		Lognormal mean	10.7
Detection limit or PQL		Std. devn.	2.6
Method detection limit		Median	10.1
TOTAL	12	Min.	6.3
		Max.	16.2

Lognormal distribution? r-squared is: 0.854
Normal distribution? r-squared is: 0.829
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 12.0

Cobalt 95% UCL Calculation

DATA	ID
	J1TX91/
6.3	J1TX99
5.6	J1TX87
5.8	J1TX88
5.9	J1V0F0
6.4	J1TX90
3.5	J1TX92
5.1	J1TX93
6.3	J1TX94
6.0	J1TX95
5.7	J1TX96
4.9	J1TX97
4.8	J1V0F1

Number of samples		Uncensored values	
Uncensored	12	Mean	5.5
Censored		Lognormal mean	5.5
Detection limit or PQL		Std. devn.	0.83
Method detection limit		Median	5.8
TOTAL	12	Min.	3.5
		Max.	6.4

Lognormal distribution? r-squared is: 0.809
Normal distribution? r-squared is: 0.871
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 5.9

Copper 95% UCL Calculation

DATA	ID
	J1TX91/
13.4	J1TX99
14.4	J1TX87
13.0	J1TX88
12.2	J1V0F0
14.5	J1TX90
8.1	J1TX92
13.9	J1TX93
12.8	J1TX94
13.1	J1TX95
13.3	J1TX96
11.5	J1TX97
11.0	J1V0F1

Number of samples		Uncensored values	
Uncensored	12	Mean	12.6
Censored		Lognormal mean	12.6
Detection limit or PQL		Std. devn.	1.8
Method detection limit		Median	13.1
TOTAL	12	Min.	8.1
		Max.	14.5

Lognormal distribution? r-squared is: 0.781
Normal distribution? r-squared is: 0.849
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 13.4

Hexavalent chromium 95% UCL Calculation

DATA	ID
	J1TX91/
0.216	J1TX99
0.0775	J1TX87
0.311	J1TX88
	J1V0F0
0.440	J1TX90
0.333	J1TX92
0.268	J1TX93
0.377	J1TX94
0.0775	J1TX95
0.0775	J1TX96
0.247	J1TX97
	J1V0F1

Number of samples		Uncensored values	
Uncensored	10	Mean	0.242
Censored		Lognormal mean	0.258
Detection limit or PQL		Std. devn.	0.130
Method detection limit		Median	0.258
TOTAL	10	Min.	0.0775
		Max.	0.440

Lognormal distribution? r-squared is: 0.551
Normal distribution? r-squared is: 0.942
Recommendations:
Use normal distribution.

UCL (based on t-statistic) is 0.305

Lead 95% UCL Calculation

DATA	ID
	J1TX91/
50.6	J1TX99
14.2	J1TX87
25.7	J1TX88
47.5	J1V0F0
20.1	J1TX90
9.0	J1TX92
4.7	J1TX93
30.9	J1TX94
41.1	J1TX95
20.7	J1TX96
4.0	J1TX97
4.4	J1V0F1

Number of samples		Uncensored values	
Uncensored	12	Mean	22.7
Censored		Lognormal mean	25.2
Detection limit or PQL		Std. devn.	16.7
Method detection limit		Median	20.4
TOTAL	12	Min.	4.0
		Max.	50.6

Lognormal distribution? r-squared is: 0.925
Normal distribution? r-squared is: 0.930
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 55.4

Manganese 95% UCL Calculation

DATA	ID
	J1TX91/
272	J1TX99
327	J1TX87
246	J1TX88
273	J1V0F0
275	J1TX90
155	J1TX92
222	J1TX93
274	J1TX94
251	J1TX95
237	J1TX96
213	J1TX97
222	J1V0F1

Number of samples		Uncensored values	
Uncensored	12	Mean	247
Censored		Lognormal mean	248
Detection limit or PQL		Std. devn.	43
Method detection limit		Median	249
TOTAL	12	Min.	155
		Max.	327

Lognormal distribution? r-squared is: 0.887
Normal distribution? r-squared is: 0.929
Recommendations:
Use normal distribution.

UCL (based on t-statistic) is 269

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-H Area Closure Operations
Subject 100-H-43 Waste Site Cleanup Verification 95% UCL Calculations

Date 10/23/14
Job No. 14655

Calc. No. 0100H-CA-V0209
Checked I. B. Berezovskiy

Rev. No. 0
Date 10/23/14
Sheet No. 15 of 20

Ecology Software (MTCAStat) Results, 100-H-43 Waste Site - Decision Unit EXC

Mercury 95% UCL Calculation

DATA	ID
	J1TX91/
0.0041	J1TX99
0.0052	J1TX87
0.0056	J1TX88
	J1V0F0
0.0088	J1TX90
0.0063	J1TX92
0.0025	J1TX93
0.0026	J1TX94
0.0050	J1TX95
0.0025	J1TX96
0.0024	J1TX97
	J1V0F1

Number of samples		Uncensored values	
Uncensored	10	Mean	0.0045
Censored		Lognormal mean	0.0048
Detection limit or PQL		Std. devn.	0.0021
Method detection limit		Median	0.0046
TOTAL	10	Min.	0.0024
		Max.	0.0088

Lognormal distribution? r-squared is: 0.616
Normal distribution? r-squared is: 0.961
Recommendations:
Use normal distribution.

UCL (based on t-statistic) is 0.0057

Nickel 95% UCL Calculation

DATA	ID
	J1TX91/
14.9	J1TX99
11.0	J1TX87
9.5	J1TX88
12.0	J1V0F0
10.7	J1TX90
6.8	J1TX92
11.9	J1TX93
9.4	J1TX94
10.6	J1TX95
9.8	J1TX96
9.0	J1TX97
10.6	J1V0F1

Number of samples		Uncensored values	
Uncensored	12	Mean	10.5
Censored		Lognormal mean	10.5
Detection limit or PQL		Std. devn.	2.0
Method detection limit		Median	10.6
TOTAL	12	Min.	6.8
		Max.	14.9

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

UCL (Land's method) is 11.7

Vanadium 95% UCL Calculation

DATA	ID
	J1TX91/
33.8	J1TX99
35.0	J1TX87
40.5	J1TX88
41.1	J1V0F0
40.4	J1TX90
24.1	J1TX92
38.7	J1TX93
38.2	J1TX94
39.9	J1TX95
41.0	J1TX96
38.7	J1TX97
37.2	J1V0F1

Number of samples		Uncensored values	
Uncensored	12	Mean	37.4
Censored		Lognormal mean	37.5
Detection limit or PQL		Std. devn.	4.8
Method detection limit		Median	38.7
TOTAL	12	Min.	24.1
		Max.	41.1

Lognormal distribution? r-squared is: 0.663
Normal distribution? r-squared is: 0.726
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 40.0

Zinc 95% UCL Calculation

DATA	ID
	J1TX91/
40.3	J1TX99
27.8	J1TX87
33.7	J1TX88
33.7	J1V0F0
38.2	J1TX90
20.5	J1TX92
27.7	J1TX93
34.8	J1TX94
34.3	J1TX95
32.4	J1TX96
27.4	J1TX97
26.9	J1V0F1

Number of samples		Uncensored values	
Uncensored	12	Mean	31.5
Censored		Lognormal mean	31.5
Detection limit or PQL		Std. devn.	5.5
Method detection limit		Median	33.1
TOTAL	12	Min.	20.5
		Max.	40.3

Lognormal distribution? r-squared is: 0.919
Normal distribution? r-squared is: 0.949
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 35.0

TPH - Diesel Range EXT 95% UCL Calculation

DATA	ID
	J1TX91/
13250	J1TX99
5400	J1TX87
5300	J1TX88
23000	J1TX89
9200	J1TX90
2600	J1TX92
495	J1TX93
3400	J1TX94
6300	J1TX95
3100	J1TX96
1900	J1TX97
9600	J1TX98

Number of samples		Uncensored values	
Uncensored	12	Mean	6962
Censored		Lognormal mean	7865
Detection limit or PQL		Std. devn.	6241
Method detection limit		Median	5350
TOTAL	12	Min.	495
		Max.	23000

Lognormal distribution? r-squared is: 0.951
Normal distribution? r-squared is: 0.828
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 19180

TPH - Diesel Range 95% UCL Calculation

DATA	ID
	J1TX91/
6050	J1TX99
2800	J1TX87
1900	J1TX88
9300	J1TX89
5700	J1TX90
1300	J1TX92
335	J1TX93
1400	J1TX94
3200	J1TX95
1500	J1TX96
1200	J1TX97
4900	J1TX98

Number of samples		Uncensored values	
Uncensored	12	Mean	3299
Censored		Lognormal mean	3605
Detection limit or PQL		Std. devn.	2665
Method detection limit		Median	2350
TOTAL	12	Min.	335
		Max.	9300

Lognormal distribution? r-squared is: 0.948
Normal distribution? r-squared is: 0.879
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 7800

Benzo(a)anthracene (Method 8310) 95% UCL Calculation

DATA	ID
	J1TX91/
3.6	J1TX99
20	J1TX87
27	J1TX88
4.3	J1TX89
8.5	J1TX90
6.8	J1TX92
1.6	J1TX93
9.5	J1TX94
140	J1TX95
1.6	J1TX96
1.6	J1TX97
16	J1TX98

Number of samples		Uncensored values	
Uncensored	12	Mean	20
Censored		Lognormal mean	19
Detection limit or PQL		Std. devn.	39
Method detection limit		Median	7.7
TOTAL	12	Min.	1.6
		Max.	140

Lognormal distribution? r-squared is: 0.938
Normal distribution? r-squared is: 0.476
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 81.9

Benzo(a)pyrene (Method 8310) 95% UCL Calculation

DATA	ID
	J1TX91/
9.0	J1TX99
43	J1TX87
18	J1TX88
14	J1TX89
7.6	J1TX90
3.2	J1TX92
3.1	J1TX93
18	J1TX94
130	J1TX95
3.1	J1TX96
3.2	J1TX97
33	J1TX98

Number of samples		Uncensored values	
Uncensored	12	Mean	24
Censored		Lognormal mean	24
Detection limit or PQL		Std. devn.	36
Method detection limit		Median	12
TOTAL	12	Min.	3.1
		Max.	130

Lognormal distribution? r-squared is: 0.924
Normal distribution? r-squared is: 0.593
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 80.8

Benzo(b)fluoranthene (Method 8310) 95% UCL Calculation

DATA	ID
	J1TX91/
13	J1TX99
31	J1TX87
15	J1TX88
6.1	J1TX89
6.7	J1TX90
2.1	J1TX92
2.1	J1TX93
14	J1TX94
120	J1TX95
2.1	J1TX96
2.1	J1TX97
21	J1TX98

Number of samples		Uncensored values	
Uncensored	12	Mean	20
Censored		Lognormal mean	20
Detection limit or PQL		Std. devn.	33
Method detection limit		Median	10
TOTAL	12	Min.	2.1
		Max.	120

Lognormal distribution? r-squared is: 0.915
Normal distribution? r-squared is: 0.533
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 76.9

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-H Area Closure Operations
Subject 100-H-43 Waste Site Cleanup Verification 95% UCL Calculations

Date 10/23/14
Job No. 14655

Calc. No. 0100H-CA-V0209
Checked I. B. Berezovskiy

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Date 10/23/14
Sheet No. 16 of 20

Ecology Software (MTCAStat) Results, 100-H-43 Waste Site - Decision Unit EXC

	DATA	ID	Benzo(ghi)perylene (Method 8310) 95% UCL Calculation			
1		J1TX91/				
2	14	J1TX99				
3	35	J1TX87				
4	3.6	J1TX88	Number of samples		Uncensored values	
5	56	J1TX89	Uncensored	12	Mean	30
6	45	J1TX90	Censored		Lognormal mean	38
7	71	J1TX92	Detection limit or PQL		Std. devn.	29
8	3.5	J1TX93	Method detection limit		Median	24
9	3.7	J1TX94	TOTAL	12	Min.	3.5
10	82	J1TX95			Max.	82
11	3.5	J1TX96				
12	3.6	J1TX97				
13	37	J1TX98				
14			Lognormal distribution?		Normal distribution?	
15			r-squared is: 0.833		r-squared is: 0.870	
16			Recommendations:			
17			Reject BOTH lognormal and normal distributions.			
18						
19			UCL (based on Z-statistic) is		43	
20						

	DATA	ID	Chrysene (Method 8310) 95% UCL Calculation			
		J1TX91/				
	9.2	J1TX99				
	46	J1TX87				
	19	J1TX88	Number of samples		Uncensored values	
	11	J1TX89	Uncensored	12	Mean	25
	9.5	J1TX90	Censored		Lognormal mean	25
	5.7	J1TX92	Detection limit or PQL		Std. devn.	41
	2.4	J1TX93	Method detection limit		Median	10
	14	J1TX94	TOTAL	12	Min.	2.4
	150	J1TX95			Max.	150
	2.4	J1TX96				
	2.4	J1TX97				
	26	J1TX98				
			Lognormal distribution?		Normal distribution?	
			r-squared is: 0.944		r-squared is: 0.543	
			Recommendations:			
			Use lognormal distribution.			
			UCL (Land's method) is		90.3	

	DATA	ID	Fluoranthene (Method 8310) 95% UCL Calculation			
		J1TX91/				
	10	J1TX99				
	79	J1TX87				
	44	J1TX88	Number of samples		Uncensored values	
	21	J1TX89	Uncensored	12	Mean	28
	18	J1TX90	Censored		Lognormal mean	30
	6.5	J1TX92	Detection limit or PQL		Std. devn.	24
	6.5	J1TX93	Method detection limit		Median	20
	32	J1TX94	TOTAL	12	Min.	6.5
	52	J1TX95			Max.	79
	6.5	J1TX96				
	6.5	J1TX97				
	57	J1TX98				
			Lognormal distribution?		Normal distribution?	
			r-squared is: 0.903		r-squared is: 0.869	
			Recommendations:			
			Use lognormal distribution.			
			UCL (Land's method) is		69	

	DATA	ID	Pyrene (Method 8310) 95% UCL Calculation			
21		J1TX91/				
22	11	J1TX99				
23	100	J1TX87				
24	40	J1TX88	Number of samples		Uncensored values	
25	30	J1TX89	Uncensored	12	Mean	33
26	23	J1TX90	Censored		Lognormal mean	37
27	6.0	J1TX92	Detection limit or PQL		Std. devn.	31
28	6.0	J1TX93	Method detection limit		Median	27
29	39	J1TX94	TOTAL	12	Min.	6.0
30	48	J1TX95			Max.	100
31	6.0	J1TX96				
32	6.0	J1TX97				
33	84	J1TX98				
34			Lognormal distribution?		Normal distribution?	
35			r-squared is: 0.903		r-squared is: 0.844	
36			Recommendations:			
37			Use lognormal distribution.			
38						
39			UCL (Land's method) is		99	
40						

	DATA	ID	Pyrene (Method 8270) 95% UCL Calculation			
		J1TX91/				
	11	J1TX99				
	86	J1TX87				
	33	J1TX88	Number of samples		Uncensored values	
	55	J1TX89	Uncensored	12	Mean	48
	30	J1TX90	Censored		Lognormal mean	47
	14	J1TX92	Detection limit or PQL		Std. devn.	74
	6.0	J1TX93	Method detection limit		Median	22
	43	J1TX94	TOTAL	12	Min.	6.0
	6.0	J1TX95			Max.	270
	13	J1TX96				
	6.0	J1TX97				
	270	J1TX98				
			Lognormal distribution?		Normal distribution?	
			r-squared is: 0.936		r-squared is: 0.573	
			Recommendations:			
			Use lognormal distribution.			
			UCL (Land's method) is		155	

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie **Date** 10/23/14 **Calc. No.** 0100H-CA-V0209 **Rev. No.** 0

Project 100-H Area Closure Operations **Job No.** 14655 **Checked** I. B. Berezovskiy **Date** 10/23/14

Subject 100-H-43 Waste Site Cleanup Verification 95% UCL Calculations **Sheet No.** 17 of 20

Ecology Software (MTCAStat) Results, 100-H-43 - Decision Unit SPA

Antimony 95% UCL Calculation

DATA	ID
0.52	J1TXC6/ J1TXD3
0.50	J1TXC1
0.34	J1TXC2
0.52	J1TXC3
1.1	J1TXC4
0.17	J1TXC5
0.45	J1TXC7
0.61	J1TXC8
0.19	J1TXC9
0.49	J1TXD0
0.18	J1TXD1
0.18	J1TXD2

Number of samples		Uncensored values	
Uncensored	12	Mean	0.44
Censored		Lognormal mean	0.44
Detection limit or PQL		Std. devn.	0.27
Method detection limit		Median	0.47
TOTAL	12	Min.	0.17
		Max.	1.1

Lognormal distribution? r-squared is: 0.892
Normal distribution? r-squared is: 0.830
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.56

Arsenic 95% UCL Calculation

DATA	ID
3.5	J1TXC6/ J1TXD3
2.6	J1TXC1
3.3	J1TXC2
8.5	J1TXC3
7.1	J1TXC4
3.7	J1TXC5
2.7	J1TXC7
5.8	J1TXC8
2.1	J1TXC9
4.1	J1TXD0
4.2	J1TXD1
5.0	J1TXD2

Number of samples		Uncensored values	
Uncensored	12	Mean	4.4
Censored		Lognormal mean	4.4
Detection limit or PQL		Std. devn.	1.9
Method detection limit		Median	3.9
TOTAL	12	Min.	2.1
		Max.	8.5

Lognormal distribution? r-squared is: 0.984
Normal distribution? r-squared is: 0.913
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 5.7

Barium 95% UCL Calculation

DATA	ID
52.1	J1TXC6/ J1TXD3
36.6	J1TXC1
46.1	J1TXC2
52.9	J1TXC3
53.0	J1TXC4
50.0	J1TXC5
40.8	J1TXC7
52.6	J1TXC8
39.7	J1TXC9
61.5	J1TXD0
56.0	J1TXD1
51.1	J1TXD2

Number of samples		Uncensored values	
Uncensored	12	Mean	49.4
Censored		Lognormal mean	49.4
Detection limit or PQL		Std. devn.	7.3
Method detection limit		Median	51.6
TOTAL	12	Min.	36.6
		Max.	61.5

Lognormal distribution? r-squared is: 0.916
Normal distribution? r-squared is: 0.935
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 53.8

Cadmium 95% UCL Calculation

DATA	ID
0.043	J1TXC6/ J1TXD3
0.039	J1TXC1
0.049	J1TXC2
0.041	J1TXC3
0.040	J1TXC4
0.039	J1TXC5
0.020	J1TXC7
0.020	J1TXC8
0.059	J1TXC9
0.019	J1TXD0
0.048	J1TXD1
0.019	J1TXD2

Number of samples		Uncensored values	
Uncensored	12	Mean	0.036
Censored		Lognormal mean	0.037
Detection limit or PQL		Std. devn.	0.014
Method detection limit		Median	0.040
TOTAL	12	Min.	0.019
		Max.	0.059

Lognormal distribution? r-squared is: 0.840
Normal distribution? r-squared is: 0.890
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.043

Chromium 95% UCL Calculation

DATA	ID
9.9	J1TXC6/ J1TXD3
8.2	J1TXC1
13.5	J1TXC2
9.5	J1TXC3
11.5	J1TXC4
9.7	J1TXC5
8.3	J1TXC7
11.8	J1TXC8
12.4	J1TXC9
12.2	J1TXD0
9.0	J1TXD1
10.9	J1TXD2

Number of samples		Uncensored values	
Uncensored	12	Mean	10.6
Censored		Lognormal mean	10.6
Detection limit or PQL		Std. devn.	1.7
Method detection limit		Median	10.4
TOTAL	12	Min.	8.2
		Max.	13.5

Lognormal distribution? r-squared is: 0.968
Normal distribution? r-squared is: 0.968
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 11.6

Cobalt 95% UCL Calculation

DATA	ID
5.2	J1TXC6/ J1TXD3
4.6	J1TXC1
5.1	J1TXC2
5.2	J1TXC3
5.4	J1TXC4
4.7	J1TXC5
4.2	J1TXC7
5.6	J1TXC8
5.3	J1TXC9
5.3	J1TXD0
5.1	J1TXD1
5.6	J1TXD2

Number of samples		Uncensored values	
Uncensored	12	Mean	5.1
Censored		Lognormal mean	5.1
Detection limit or PQL		Std. devn.	0.42
Method detection limit		Median	5.2
TOTAL	12	Min.	4.2
		Max.	5.6

Lognormal distribution? r-squared is: 0.882
Normal distribution? r-squared is: 0.904
Recommendations:
Use normal distribution.

UCL (based on t-statistic) is 5.3

Copper 95% UCL Calculation

DATA	ID
13.0	J1TXC6/ J1TXD3
9.8	J1TXC1
12.3	J1TXC2
13.0	J1TXC3
11.7	J1TXC4
12.0	J1TXC5
9.7	J1TXC7
13.5	J1TXC8
12.0	J1TXC9
9.5	J1TXD0
11.7	J1TXD1
12.3	J1TXD2

Number of samples		Uncensored values	
Uncensored	12	Mean	11.7
Censored		Lognormal mean	11.7
Detection limit or PQL		Std. devn.	1.3
Method detection limit		Median	12.0
TOTAL	12	Min.	9.5
		Max.	13.5

Lognormal distribution? r-squared is: 0.870
Normal distribution? r-squared is: 0.892
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 12.3

Lead 95% UCL Calculation

DATA	ID
7.0	J1TXC6/ J1TXD3
5.8	J1TXC1
8.1	J1TXC2
28.2	J1TXC3
28.5	J1TXC4
8.6	J1TXC5
6.1	J1TXC7
15.0	J1TXC8
5.6	J1TXC9
4.7	J1TXD0
14.3	J1TXD1
12.9	J1TXD2

Number of samples		Uncensored values	
Uncensored	12	Mean	12.1
Censored		Lognormal mean	12.1
Detection limit or PQL		Std. devn.	8.4
Method detection limit		Median	8.4
TOTAL	12	Min.	4.7
		Max.	28.5

Lognormal distribution? r-squared is: 0.919
Normal distribution? r-squared is: 0.794
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 18.5

Manganese 95% UCL Calculation

DATA	ID
245	J1TXC6/ J1TXD3
231	J1TXC1
229	J1TXC2
237	J1TXC3
223	J1TXC4
216	J1TXC5
206	J1TXC7
264	J1TXC8
226	J1TXC9
222	J1TXD0
224	J1TXD1
241	J1TXD2

Number of samples		Uncensored values	
Uncensored	12	Mean	230
Censored		Lognormal mean	230
Detection limit or PQL		Std. devn.	15
Method detection limit		Median	228
TOTAL	12	Min.	206
		Max.	264

Lognormal distribution? r-squared is: 0.954
Normal distribution? r-squared is: 0.941
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 238

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-H Area Closure Operations
Subject 100-H-43 Waste Site Cleanup Verification 95% UCL Calculations

Date 10/23/14
Job No. 14655

Calc. No. 0100H-CA-V0209
Checked I. B. Berezovskiy

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Ecology Software (MTCAStat) Results, 100-H-43 Waste Site - Decision Unit SPA

Nickel 95% UCL Calculation

DATA	ID
10.5	J1TXC6/ J1TXD3
8.0	J1TXC1
10.5	J1TXC2
9.5	J1TXC3
10.0	J1TXC4
9.2	J1TXC5
8.8	J1TXC7
10.9	J1TXC8
9.9	J1TXC9
11.8	J1TXD0
9.4	J1TXD1
11.1	J1TXD2

Number of samples		Uncensored values	
Uncensored	12	Mean	10.0
Censored		Lognormal mean	10.0
Detection limit or PQL		Std. devn.	1.1
Method detection limit		Median	10.0
TOTAL	12	Min.	8.0
		Max.	11.8

Lognormal distribution? r-squared is: 0.985
Normal distribution? r-squared is: 0.992
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 10.6

Vanadium 95% UCL Calculation

DATA	ID
40.3	J1TXC6/ J1TXD3
32.4	J1TXC1
40.5	J1TXC2
40.7	J1TXC3
38.6	J1TXC4
38.0	J1TXC5
35.0	J1TXC7
43.3	J1TXC8
43.4	J1TXC9
33.1	J1TXD0
40.7	J1TXD1
40.1	J1TXD2

Number of samples		Uncensored values	
Uncensored	12	Mean	38.8
Censored		Lognormal mean	38.9
Detection limit or PQL		Std. devn.	3.6
Method detection limit		Median	40.2
TOTAL	12	Min.	32.4
		Max.	43.4

Lognormal distribution? r-squared is: 0.893
Normal distribution? r-squared is: 0.908
Recommendations:
Use normal distribution.

UCL (based on t-statistic) is 40.7

Zinc 95% UCL Calculation

DATA	ID
33.5	J1TXC6/ J1TXD3
28.4	J1TXC1
32.0	J1TXC2
36.8	J1TXC3
37.4	J1TXC4
36.3	J1TXC5
27.9	J1TXC7
35.6	J1TXC8
33.2	J1TXC9
34.4	J1TXD0
31.8	J1TXD1
35.0	J1TXD2

Number of samples		Uncensored values	
Uncensored	12	Mean	33.5
Censored		Lognormal mean	33.5
Detection limit or PQL		Std. devn.	3.1
Method detection limit		Median	33.9
TOTAL	12	Min.	27.9
		Max.	37.4

Lognormal distribution? r-squared is: 0.920
Normal distribution? r-squared is: 0.938
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 35.3

TPH - Diesel Range EXT 95% UCL Calculation

DATA	ID
2750	J1TXC6/ J1TXD3
1900	J1TXC1
2900	J1TXC2
6900	J1TXC3
41000	J1TXC4
4300	J1TXC5
2200	J1TXC7
2300	J1TXC8
1700	J1TXC9
490	J1TXD0
3500	J1TXD1
4400	J1TXD2

Number of samples		Uncensored values	
Uncensored	12	Mean	6195
Censored		Lognormal mean	5480
Detection limit or PQL		Std. devn.	11082
Method detection limit		Median	2825
TOTAL	12	Min.	490
		Max.	41000

Lognormal distribution? r-squared is: 0.854
Normal distribution? r-squared is: 0.428
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 11458

TPH - Diesel Range 95% UCL Calculation

DATA	ID
1550	J1TXC6/ J1TXD3
740	J1TXC1
1300	J1TXC2
3100	J1TXC3
18000	J1TXC4
2200	J1TXC5
1400	J1TXC7
1300	J1TXC8
870	J1TXC9
330	J1TXD0
1800	J1TXD1
2600	J1TXD2

Number of samples		Uncensored values	
Uncensored	12	Mean	2933
Censored		Lognormal mean	2643
Detection limit or PQL		Std. devn.	4809
Method detection limit		Median	1475
TOTAL	12	Min.	330
		Max.	18000

Lognormal distribution? r-squared is: 0.877
Normal distribution? r-squared is: 0.448
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 5216

Benzo(a)anthracene (Method 8310) 95% UCL Calculation

DATA	ID
1.6	J1TXC6/ J1TXD3
1.6	J1TXC1
4.3	J1TXC2
5.3	J1TXC3
10	J1TXC4
3.0	J1TXC5
1.6	J1TXC7
1.6	J1TXC8
1.6	J1TXC9
1.6	J1TXD0
7.1	J1TXD1
44	J1TXD2

Number of samples		Uncensored values	
Uncensored	12	Mean	6.9
Censored		Lognormal mean	6.0
Detection limit or PQL		Std. devn.	12
Method detection limit		Median	2.3
TOTAL	12	Min.	1.6
		Max.	44

Lognormal distribution? r-squared is: 0.800
Normal distribution? r-squared is: 0.476
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 12.6

Benzo(a)pyrene (Method 8310) 95% UCL Calculation

DATA	ID
3.2	J1TXC6/ J1TXD3
3.2	J1TXC1
6.4	J1TXC2
14	J1TXC3
14	J1TXC4
3.1	J1TXC5
3.2	J1TXC7
7.8	J1TXC8
3.2	J1TXC9
3.1	J1TXD0
9.0	J1TXD1
45	J1TXD2

Number of samples		Uncensored values	
Uncensored	12	Mean	10
Censored		Lognormal mean	9.1
Detection limit or PQL		Std. devn.	12
Method detection limit		Median	4.8
TOTAL	12	Min.	3.1
		Max.	45

Lognormal distribution? r-squared is: 0.823
Normal distribution? r-squared is: 0.578
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 15.2

Benzo(b)fluoranthene (Method 8310) 95% UCL Calculation

DATA	ID
2.1	J1TXC6/ J1TXD3
2.1	J1TXC1
5.2	J1TXC2
15	J1TXC3
12	J1TXC4
2.0	J1TXC5
2.1	J1TXC7
4.9	J1TXC8
2.1	J1TXC9
2.0	J1TXD0
10	J1TXD1
54	J1TXD2

Number of samples		Uncensored values	
Uncensored	12	Mean	9.5
Censored		Lognormal mean	8.8
Detection limit or PQL		Std. devn.	15
Method detection limit		Median	3.5
TOTAL	12	Min.	2.0
		Max.	54

Lognormal distribution? r-squared is: 0.826
Normal distribution? r-squared is: 0.540
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 16.5

Pyrene (Method 8310) 95% UCL Calculation

DATA	ID
6.0	J1TXC6/ J1TXD3
6.0	J1TXC1
6.0	J1TXC2
23	J1TXC3
25	J1TXC4
5.5	J1TXC5
21	J1TXC7
13	J1TXC8
6.0	J1TXC9
6.0	J1TXD0
14	J1TXD1
110	J1TXD2

Number of samples		Uncensored values	
Uncensored	12	Mean	20
Censored		Lognormal mean	18
Detection limit or PQL		Std. devn.	29
Method detection limit		Median	10
TOTAL	12	Min.	5.5
		Max.	110

Lognormal distribution? r-squared is: 0.806
Normal distribution? r-squared is: 0.506
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 34.0

Acronyms and qualifiers are defined on sheet 3.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie

Project 100-H Area Closure Operations

Subject 100-H-43 Waste Site Cleanup Verification 95% UCL Calculations

Date 10/23/14

Job No. 14655

Calc. No. 0100H-CA-V0209

Checked I. B. Berezovskiy

Rev. No. 0

Date 10/23/14

Sheet No. 19 of 20

Ecology Software (MTCAStat) Results, 100-H-43 Waste Site - Decision Unit SPA

1	DATA	ID	Pyrene (Method 8270) 95% UCL Calculation			
		J1TXC6/				
2	6.0	J1TXD3				
3	6.0	J1TXC1				
4	13	J1TXC2	Number of samples		Uncensored values	
5	20	J1TXC3	Uncensored	12	Mean	22
6	55	J1TXC4	Censored		Lognormal mean	21
7	6.0	J1TXC5	Detection limit or PQL		Std. devn.	25
8	6.0	J1TXC7	Method detection limit		Median	10
9	32	J1TXC8	TOTAL	12	Min.	6.0
10	6.0	J1TXC9			Max.	87
11	6.0	J1TXD0				
12	17	J1TXD1				
13	87	J1TXD2				
14			Lognormal distribution?		Normal distribution?	
15			r-squared is: 0.832		r-squared is: 0.690	
16			Recommendations:			
17			Reject BOTH lognormal and normal distributions.			
18						
19			UCL (based on Z-statistic) is		33.7	
20						

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

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-H Area Closure Operations
Subject 100-H-43 Waste Site Cleanup Verification 95% UCL Calculations

Date 10/23/14
Job No. 14655

Calc. No. 0100H-CA-V0209
Checked I. B. Berezovskiy

Rev. No. 0
Date 10/23/14
Sheet No. 20 of 20

Duplicate Analysis - 100-H-43 Waste Site Excavation

Sampling Area	Sample Number	Sample Date	Aluminum			Arsenic			Barium			Beryllium			Cadmium			Calcium			Chromium			Cobalt			Copper			Iron		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-5	J1TX91	8/19/14	8350	X	1.5	9.0		0.63	78.2	X	0.073	0.29		0.032	0.069	B	0.039	5840	X	13.5	15.8	JX	0.056	6.1	X	0.096	13.0	X	0.21	15100	X	3.7
Duplicate of J1TX91	J1TX99	8/19/14	8840	X	1.4	9.6		0.62	79.8	X	0.071	0.31		0.031	0.07	B	0.038	6140	X	13.2	16.6	JX	0.054	6.4	X	0.093	13.7	X	0.20	16100	X	3.6

Analysis:

		Aluminum	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron
TDL		5	10	2	0.2	0.2	100	1	2	1	5
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	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)	Yes (calc RPD)	Yes (calc RPD)
	RPD	5.7%		2.0%			5.0%	4.9%		5.2%	6.4%
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable

Duplicate Analysis - 100-H-43 Waste Site Excavation

Sampling Area	Sample Number	Sample Date	Lead			Magnesium			Manganese			Nickel			Potassium			Silicon			Sodium			Vanadium			Zinc			TPH - Diesel Range Extended		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	ug/kg	Q	PQL
EXC-5	J1TX91	8/19/14	61.0	X	0.26	5270	X	3.6	269	X	0.096	14.4	X	0.12	1360		39.4	303	J	5.4	261		56.7	33.1	X	0.090	39.4	X	0.38	23000		940
Duplicate of J1TX91	J1TX99	8/19/14	40.1	X	0.25	5610	X	3.5	274	X	0.093	15.4	X	0.11	1460		38.3	334	J	5.3	268		55.2	34.4	X	0.088	41.2	X	0.37	3500	J	1000

Analysis:

		Lead	Magnesium	Manganese	Nickel	Potassium	Silicon	Sodium	Vanadium	Zinc	TPH - Diesel Range Extended
TDL		5	75	5	4	400	2	50	2.5	1	5000
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)
	RPD	*41.3%*	6.3%	1.8%			9.7%	2.6%	3.9%	4.5%	
	Difference > 2 TDL?	Not applicable	Not applicable	Not applicable	No - acceptable	No - acceptable	Not applicable	Not applicable	Not applicable	Not applicable	Yes - assess further

Duplicate Analysis - 100-H-43 Waste Site Excavation

Sampling Area	Sample Number	Sample Date	TPH - Diesel Range			Benzo(a)pyrene (Method 8310)			Benzo(b)fluoranthene (Method 8310)			Chrysene (Method 8310)		
			ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
EXC-5	J1TX91	8/19/14	9900		640	7	JX	6.4	16	X	4.2	6.3	J	4.8
Duplicate of J1TX91	J1TX99	8/19/14	2200	J	680	11	J	6.5	9.5	JX	4.2	12	J	4.9

Analysis:

		TPH - Diesel Range	Benzo(a)pyrene (Method 8310)	Benzo(b)fluoranthene (Method 8310)	Chrysene (Method 8310)
TDL		5000	15	15	15
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)
	RPD				
	Difference > 2 TDL?	No - acceptable	No - acceptable	No - acceptable	No - acceptable

Duplicate Analysis - 100-H-43 Waste Site SPA

Sampling Area	Sample Number	Sample Date	Aluminum			Antimony			Arsenic			Barium			Calcium			Chromium			Cobalt			Copper			Hexavalent Chromium			Iron		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
SPA-6	J1TXC6	8/18/14	6070		1.5	0.54	B	0.36	3.6		0.62	53.7		0.072	4640		13.3	9.8		0.055	5.2		0.094	13.2		0.20	0.193		0.155	16300		3.6
Duplicate of J1TXC6	J1TXD3	8/18/14	5980		1.5	0.49	B	0.37	3.3		0.64	50.5		0.074	4520		13.7	10.0		0.056	5.2		0.097	12.8		0.21	0.235		0.155	15500		3.7

Analysis:

		Aluminum	Antimony	Arsenic	Barium	Calcium	Chromium	Cobalt	Copper	Hexavalent Chromium	Iron
TDL		5	0.6	10	2	100	1	2	1	0.5	5
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	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)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)
	RPD	1.5%			6.1%	2.6%	2.0%		3.1%		5.0%
	Difference > 2 TDL?	Not applicable	No - acceptable	No - acceptable	Not applicable	Not applicable	Not applicable	No - acceptable	Not applicable	No - acceptable	Not applicable

Duplicate Analysis - 100-H-43 Waste Site SPA

Sampling Area	Sample Number	Sample Date	Lead			Magnesium			Manganese			Nickel			Potassium			Silicon			Sodium			Vanadium			Zinc			TPH - Diesel Range Extended		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	ug/kg	Q	PQL
SPA-6	J1TXC6	8/18/14	7.1		0.25	4170		3.5	249		0.094	10.6		0.12	731		38.7	195		5.3	206		55.7	41.3		0.089	34.6	X	0.38	1900	J	980
Duplicate of J1TXC6	J1TXD3	8/18/14	6.8		0.26	4200		3.6	240		0.097	10.3		0.12	699		39.6	219		5.5	243		57.2	39.2		0.091	32.3	X	0.39	3600	J	980

Analysis:

		Lead	Magnesium	Manganese	Nickel	Potassium	Silicon	Sodium	Vanadium	Zinc	TPH - Diesel Range Extended
TDL		5	75	5	4	400	2	50	2.5	1	5000
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	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)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)
	RPD		0.7%	3.7%			11.6%		5.2%	6.9%	
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable

Duplicate Analysis - 100-H-43 Waste Site SPA

Sampling Area	Sample Number	Sample Date	TPH - Diesel Range		
			ug/kg	Q	PQL
SPA-6	J1TXC6	8/18/14	1000	J	670
Duplicate of J1TXC6	J1TXD3	8/18/14	2100	J	660

Analysis:

		TPH - Diesel Range
TDL		5000
Duplicate Analysis	Both > PQL?	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)
	RPD	
	Difference > 2 TDL?	No - acceptable

Attachment 1. 100-H-43 Waste Site Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Aluminum			Antimony			Arsenic			Barium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-5	J1TX91	8/19/14	8350	X	1.5	0.37	UJ	0.37	9.0		0.63	78.2	X	0.073
Duplicate of J1TX91	J1TX99	8/19/14	8840	X	1.4	0.36	UJ	0.36	9.6		0.62	79.8	X	0.071
EXC-1	J1TX87	8/19/14	5590	X	1.6	0.43	JB	0.38	5.2		0.67	53.9	X	0.077
EXC-2	J1TX88	8/19/14	6460	X	1.4	0.34	UJ	0.34	10.5		0.58	50.8	X	0.067
EXC-3 Re-Sample	J1V0F0	9/22/14	7300		1.4	0.35	U	0.35	15.8		0.60	50.7		0.069
EXC-4	J1TX90	8/19/14	7740	X	1.4	0.35	UJ	0.35	7.4		0.61	64.2	X	0.070
EXC-6	J1TX92	8/19/14	3700	X	1.3	0.32	UJ	0.32	4.2		0.56	25.5	X	0.065
EXC-7	J1TX93	8/19/14	5610	X	1.4	0.34	UJ	0.34	3.5		0.59	38.0	X	0.068
EXC-8	J1TX94	8/19/14	6630	X	1.3	0.37	JB	0.33	9.9		0.57	56.9	X	0.065
EXC-9	J1TX95	8/19/14	6860	X	1.5	0.37	UJ	0.37	12.1		0.64	52.5	X	0.074
EXC-10	J1TX96	8/19/14	6030	X	1.5	0.37	UJ	0.37	10.9		0.65	43.0	X	0.075
EXC-11	J1TX97	8/19/14	5250	X	1.5	0.36	UJ	0.36	3.8		0.63	30.6	X	0.073
EXC-12 Re-Sample	J1V0F1	9/22/14	5390		1.3	0.33	U	0.33	3.1		0.57	41.6		0.065
SPA-6	J1TXC6	8/18/14	6070		1.5	0.54	B	0.36	3.6		0.62	53.7		0.072
Duplicate of J1TXC6	J1TXD3	8/18/14	5980		1.5	0.49	B	0.37	3.3		0.64	50.5		0.074
SPA-1	J1TXC1	8/18/14	5040		1.4	0.50	B	0.34	2.6		0.59	36.6		0.068
SPA-2	J1TXC2	8/18/14	5950		1.4	0.34	B	0.34	3.3		0.59	46.1		0.067
SPA-3	J1TXC3	8/18/14	6310		1.5	0.52	B	0.36	8.5		0.62	52.9		0.072
SPA-4	J1TXC4	8/18/14	5880		1.4	1.1		0.33	7.1		0.58	53.0		0.067
SPA-5	J1TXC5	8/18/14	5730		1.3	0.33	U	0.33	3.7		0.57	50.0		0.065
SPA-7	J1TXC7	8/18/14	5120		1.5	0.45	B	0.37	2.7		0.64	40.8		0.074
SPA-8	J1TXC8	8/18/14	6440		1.5	0.61		0.36	5.8		0.63	52.6		0.073
SPA-9	J1TXC9	8/18/14	5390		1.5	0.37	U	0.37	2.1		0.65	39.7		0.075
SPA-10	J1TXD0	8/18/14	6540		1.4	0.49	B	0.35	4.1		0.60	61.5		0.070
SPA-11	J1TXD1	8/18/14	5550		1.4	0.35	U	0.35	4.2		0.60	56.0		0.069
SPA-12	J1TXD2	8/18/14	6080		1.4	0.35	U	0.35	5.0		0.61	51.1		0.070
FS-1	J1TXD4	8/20/14	5630		1.5	0.36	U	0.36	5.7		0.62	34.1		0.072
FS-2	J1TXD5	8/20/14	5180		1.3	0.33	U	0.33	3.0		0.57	31.2		0.065
FS-3	J1TXD6	8/20/14	5740		1.4	0.35	U	0.35	13		0.60	47.9		0.069
FS-4	J1TXD7	8/20/14	5920		1.3	0.33	U	0.33	8.5		0.57	46.8		0.065
EXC-3	J1TX89	8/19/14	8450	X	1.5	0.37	UJ	0.37	26.7		0.64	101	X	0.074
EXC-12	J1TX98	8/19/14	8560	X	1.4	0.35	UJ	0.35	44.2		0.60	79.1	X	0.069
Equipment Blank	J1TXC0	8/19/14	176	X	1.4	0.35	UJ	0.35	0.61	U	0.61	1.9	X	0.070

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, M, N, and/or X are considered acceptbale values.

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

EXC = excavation

FS = focused sample

HEIS = Hanford Environmental Information System

J = estimate

M = sample duplicate precision not met

N = recovery is outside control limits

PAH = polycyclic aromatic hydrocarbons

PCB = polychlorinated biphenyls

PQL = practical quantitative limit

Q = qualifier

R = rejected

SPA = staging pile area

SVOA = semivolatile organic analysis

U = undetected

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

X (organics) = >40% difference between the primary and confirmation detector results. The lower of the two results is reported.

Attachment	1	Sheet No.	1 of 20
Originator	J. D. Skoglie	Date	10/23/14
Checked	I. B. Berezovskiy	Date	10/23/14
Calc. No.	0100H-CA-V0209	Rev. No.	0

Attachment 1. 100-H-43 Waste Site Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Beryllium			Boron			Cadmium			Calcium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-5	J1TX91	8/19/14	0.29		0.032	0.94	U	0.94	0.069	B	0.039	5840	X	13.5
Duplicate of J1TX91	J1TX99	8/19/14	0.31		0.031	0.92	U	0.92	0.07	B	0.038	6140	X	13.2
EXC-1	J1TX87	8/19/14	0.21		0.033	1.2	BN	0.99	0.041	U	0.041	5700	X	14.3
EXC-2	J1TX88	8/19/14	0.22		0.029	0.87	B	0.87	0.036	U	0.036	6810	X	12.5
EXC-3 Re-Sample	J1V0F0	9/22/14	0.030	U	0.030	1.1	B	0.89	0.037	U	0.037	5750		12.8
EXC-4	J1TX90	8/19/14	0.27		0.030	1.3	B	0.90	0.038	U	0.038	6370	X	12.9
EXC-6	J1TX92	8/19/14	0.12	B	0.028	0.83	U	0.83	0.035	U	0.035	3670	X	12.0
EXC-7	J1TX93	8/19/14	0.17	B	0.029	1.4	B	0.87	0.037	U	0.037	6040	X	12.6
EXC-8	J1TX94	8/19/14	0.21		0.028	0.84	U	0.84	0.035	U	0.035	5360	X	12.1
EXC-9	J1TX95	8/19/14	0.23		0.032	0.95	U	0.95	0.045	B	0.040	5370	X	13.7
EXC-10	J1TX96	8/19/14	0.20		0.032	0.96	U	0.96	0.040	U	0.040	5710	X	13.8
EXC-11	J1TX97	8/19/14	0.16	B	0.032	0.94	U	0.94	0.039	U	0.039	4390	X	13.5
EXC-12 Re-Sample	J1V0F1	9/22/14	0.028	U	0.028	0.84	U	0.84	0.088	B	0.035	4930		12.1
SPA-6	J1TXC6	8/18/14	0.031	U	0.031	0.92	B	0.92	0.065	B	0.039	4640		13.3
Duplicate of J1TXC6	J1TXD3	8/18/14	0.032	U	0.032	0.95	U	0.95	0.040	U	0.040	4520		13.7
SPA-1	J1TXC1	8/18/14	0.030	U	0.030	0.88	U	0.88	0.039	B	0.037	4920		12.6
SPA-2	J1TXC2	8/18/14	0.029	U	0.029	1.4	B	0.87	0.049	B	0.036	5920		12.5
SPA-3	J1TXC3	8/18/14	0.031	U	0.031	1.9		0.93	0.041	B	0.039	6650		13.3
SPA-4	J1TXC4	8/18/14	0.029	U	0.029	1.7	B	0.86	0.040	B	0.036	5020		12.4
SPA-5	J1TXC5	8/18/14	0.028	U	0.028	0.84	U	0.84	0.039	B	0.035	5290		12.1
SPA-7	J1TXC7	8/18/14	0.032	U	0.032	0.95	U	0.95	0.040	U	0.040	6110		13.7
SPA-8	J1TXC8	8/18/14	0.032	U	0.032	1.1	B	0.94	0.039	U	0.039	6300		13.5
SPA-9	J1TXC9	8/18/14	0.032	U	0.032	0.96	U	0.96	0.059	B	0.040	6900		13.9
SPA-10	J1TXD0	8/18/14	0.030	U	0.030	0.90	U	0.90	0.038	U	0.038	6640		12.9
SPA-11	J1TXD1	8/18/14	0.030	U	0.030	0.89	U	0.89	0.048	B	0.037	4850		12.9
SPA-12	J1TXD2	8/18/14	0.030	U	0.030	0.90	U	0.90	0.038	U	0.038	6820		13.0
FS-1	J1TXD4	8/20/14	0.17	B	0.031	1.0	BN	0.92	0.039	U	0.039	4010		13.3
FS-2	J1TXD5	8/20/14	0.16	B	0.028	2.0		0.84	0.035	U	0.035	5140		12.1
FS-3	J1TXD6	8/20/14	0.18		0.030	1.1	B	0.89	0.048	B	0.037	5840		12.8
FS-4	J1TXD7	8/20/14	0.19		0.028	0.84	U	0.84	0.035	U	0.035	5330		12.1
EXC-3	J1TX89	8/19/14	0.31		0.032	0.95	U	0.95	0.054	B	0.040	4390	X	13.7
EXC-12	J1TX98	8/19/14	0.29		0.030	1.6	B	0.89	0.095	B	0.037	3690	X	12.8
Equipment Blank	J1TXC0	8/19/14	0.030	U	0.030	0.90	U	0.90	0.038	U	0.038	35.1	BX	12.9

Sample Location	HEIS Number	Sample Date	Chromium			Cobalt			Copper			Hexavalent Chromium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-5	J1TX91	8/19/14	15.8	JX	0.056	6.1	X	0.096	13.0	X	0.21	0.355		0.155
Duplicate of J1TX91	J1TX99	8/19/14	16.6	JX	0.054	6.4	X	0.093	13.7	X	0.20	0.155	U	0.155
EXC-1	J1TX87	8/19/14	15.2	JXN	0.059	5.6	X	0.10	14.4	X	0.22	0.155	U	0.155
EXC-2	J1TX88	8/19/14	10.1	JX	0.051	5.8	X	0.088	13.0	X	0.19	0.311		0.155
EXC-3 Re-Sample	J1V0F0	9/22/14	11.2		0.053	5.9		0.091	12.2	X	0.20			
EXC-4	J1TX90	8/19/14	11.0	JX	0.053	6.4	X	0.092	14.5	X	0.20	0.440		0.155
EXC-6	J1TX92	8/19/14	6.3	JX	0.049	3.5	X	0.085	8.1	X	0.18	0.333		0.155
EXC-7	J1TX93	8/19/14	9.8	JX	0.052	5.1	X	0.089	13.9	X	0.19	0.268		0.155
EXC-8	J1TX94	8/19/14	10.1	JX	0.050	6.3	X	0.086	12.8	X	0.19	0.377		0.155
EXC-9	J1TX95	8/19/14	10.3	JX	0.056	6.0	X	0.097	13.1	X	0.21	0.155	U	0.155
EXC-10	J1TX96	8/19/14	9.6	JX	0.057	5.7	X	0.098	13.3	X	0.21	0.155	U	0.155
EXC-11	J1TX97	8/19/14	9.2	JX	0.055	4.9	X	0.096	11.5	X	0.21	0.247		0.155
EXC-12 Re-Sample	J1V0F1	9/22/14	9.7		0.050	4.8		0.086	11.0	X	0.19			
SPA-6	J1TXC6	8/18/14	9.8		0.055	5.2		0.094	13.2		0.20	0.193		0.155
Duplicate of J1TXC6	J1TXD3	8/18/14	10.0		0.056	5.2		0.097	12.8		0.21	0.235		0.155
SPA-1	J1TXC1	8/18/14	8.2		0.052	4.6		0.089	9.8		0.19	0.155	U	0.155
SPA-2	J1TXC2	8/18/14	13.5		0.051	5.1		0.089	12.3		0.19	0.155	U	0.155
SPA-3	J1TXC3	8/18/14	9.5		0.055	5.2		0.095	13.0		0.21	0.155	U	0.155
SPA-4	J1TXC4	8/18/14	11.5		0.051	5.4		0.088	11.7		0.19	0.155	U	0.155
SPA-5	J1TXC5	8/18/14	9.7		0.050	4.7		0.086	12.0		0.19	0.215		0.155
SPA-7	J1TXC7	8/18/14	8.3		0.056	4.2		0.097	9.7		0.21	0.155	U	0.155
SPA-8	J1TXC8	8/18/14	11.8		0.055	5.6		0.096	13.5		0.21	0.155	U	0.155
SPA-9	J1TXC9	8/18/14	12.4		0.057	5.3		0.098	12.0		0.21	0.321		0.155
SPA-10	J1TXD0	8/18/14	12.2		0.053	5.3		0.092	9.5		0.20	0.155	U	0.155
SPA-11	J1TXD1	8/18/14	9.0		0.053	5.1		0.091	11.7		0.20	0.155	U	0.155
SPA-12	J1TXD2	8/18/14	10.9		0.053	5.6		0.092	12.3		0.20	0.155	U	0.155
FS-1	J1TXD4	8/20/14	9.8		0.055	5.2		0.094	12.0		0.20	0.227		0.155
FS-2	J1TXD5	8/20/14	10.1		0.050	5.1		0.086	11.5		0.19	0.155	U	0.155
FS-3	J1TXD6	8/20/14	8.8		0.053	5.5		0.091	12.2		0.20	0.155	U	0.155
FS-4	J1TXD7	8/20/14	11.7		0.050	5.2		0.086	11.9		0.19	0.155	U	0.155
EXC-3	J1TX89	8/19/14	11.1	JX	0.056	7.2	X	0.097	13.6	X	0.21	0.155	U	0.155
EXC-12	J1TX98	8/19/14	11.1	JX	0.053	6.6	X	0.091	13.4	X	0.20	0.155	U	0.155
Equipment Blank	J1TXC0	8/19/14	0.12	JBX	0.053	0.092	UX	0.092	0.20	UX	0.20			

Attachment	1	Sheet No.	2 of 20
Originator	J. D. Skoglie	Date	10/23/14
Checked	I. B. Berezovskiy	Date	10/23/14
Calc. No.	0100H-CA-V0209	Rev. No.	0

Attachment 1. 100-H-43 Waste Site Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Iron			Lead			Magnesium			Manganese		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-5	J1TX91	8/19/14	15100	X	3.7	61.0	X	0.26	5270	X	3.6	269	X	0.096
Duplicate of J1TX91	J1TX99	8/19/14	16100	X	3.6	40.1	X	0.25	5610	X	3.5	274	X	0.093
EXC-1	J1TX87	8/19/14	14100	X	3.8	14.2	X	0.27	3450	X	3.7	327	X	0.10
EXC-2	J1TX88	8/19/14	15100	X	3.4	25.7	X	0.24	4150	X	3.3	246	X	0.088
EXC-3 Re-Sample	J1V0F0	9/22/14	17000		3.5	47.5		0.25	4210		3.4	273		0.091
EXC-4	J1TX90	8/19/14	16500	X	3.5	20.1	X	0.25	4480	X	3.4	275	X	0.092
EXC-6	J1TX92	8/19/14	8810	X	3.2	9.0	X	0.23	2650	X	3.2	155	X	0.085
EXC-7	J1TX93	8/19/14	13400	X	3.4	4.7	X	0.24	3940	X	3.3	222	X	0.089
EXC-8	J1TX94	8/19/14	15100	X	3.3	30.9	X	0.23	4100	X	3.2	274	X	0.086
EXC-9	J1TX95	8/19/14	14900	X	3.7	41.1	X	0.26	4290	X	3.6	251	X	0.097
EXC-10	J1TX96	8/19/14	14400	X	3.7	20.7	X	0.26	3890	X	3.6	237	X	0.098
EXC-11	J1TX97	8/19/14	13000	X	3.6	4.0	X	0.26	3690	X	3.5	213	X	0.096
EXC-12 Re-Sample	J1V0F1	9/22/14	14000		3.3	4.4		0.23	3710	N	3.2	222		0.086
SPA-6	J1TXC6	8/18/14	16300		3.6	7.1		0.25	4170		3.5	249		0.094
Duplicate of J1TXC6	J1TXD3	8/18/14	15500		3.7	6.8		0.26	4200		3.6	240		0.097
SPA-1	J1TXC1	8/18/14	13500		3.4	5.8		0.24	3650		3.3	231		0.089
SPA-2	J1TXC2	8/18/14	14900		3.4	8.1		0.24	4030		3.3	229		0.089
SPA-3	J1TXC3	8/18/14	16300		3.6	28.2		0.26	3790		3.5	237		0.095
SPA-4	J1TXC4	8/18/14	15700		3.3	28.5		0.24	3820		3.2	223		0.088
SPA-5	J1TXC5	8/18/14	15200		3.3	8.6		0.23	3750		3.2	216		0.086
SPA-7	J1TXC7	8/18/14	13200		3.7	6.1		0.26	3650		3.6	206		0.097
SPA-8	J1TXC8	8/18/14	16800		3.6	15.0		0.26	4290		3.5	264		0.096
SPA-9	J1TXC9	8/18/14	16200		3.7	5.6		0.27	3970		3.6	226		0.098
SPA-10	J1TXD0	8/18/14	17200		3.5	4.7		0.25	4190		3.4	222		0.092
SPA-11	J1TXD1	8/18/14	15000		3.5	14.3		0.25	3740		3.4	224		0.091
SPA-12	J1TXD2	8/18/14	15800		3.5	12.9		0.25	4060		3.4	241		0.092
FS-1	J1TXD4	8/20/14	13600		3.6	11.8		0.25	3840		3.5	228		0.094
FS-2	J1TXD5	8/20/14	12000		3.3	3.9		0.23	3820		3.2	256		0.086
FS-3	J1TXD6	8/20/14	13400		3.5	37.7		0.25	3720		3.4	226		0.091
FS-4	J1TXD7	8/20/14	12600		3.3	29.7		0.23	4090		3.2	217		0.086
EXC-3	J1TX89	8/19/14	17500	X	3.7	77.1	X	0.26	4370	X	3.6	310	X	0.097
EXC-12	J1TX98	8/19/14	16400	X	3.5	153	X	0.25	4110	X	3.4	271	X	0.091
Equipment Blank	J1TXC0	8/19/14	206	X	3.5	0.59	X	0.25	20.1	X	3.4	4.9	X	0.092

Sample Location	HEIS Number	Sample Date	Mercury			Molybdenum			Nickel			Potassium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-5	J1TX91	8/19/14	0.0055	B	0.0054	0.25	U	0.25	14.4	X	0.12	1360		39.4
Duplicate of J1TX91	J1TX99	8/19/14	0.0055	U	0.0055	0.24	U	0.24	15.4	X	0.11	1460		38.3
EXC-1	J1TX87	8/19/14	0.0052	B	0.0052	0.26	U	0.26	11.0	X	0.12	1000		41.4
EXC-2	J1TX88	8/19/14	0.0056	B	0.0054	0.23	U	0.23	9.5	X	0.11	980		36.3
EXC-3 Re-Sample	J1V0F0	9/22/14				0.37	B	0.24	12.0		0.11	1060		37.4
EXC-4	J1TX90	8/19/14	0.0088	B	0.0053	0.24	U	0.24	10.7	X	0.11	1320		37.6
EXC-6	J1TX92	8/19/14	0.0063	B	0.005	0.22	U	0.22	6.8	X	0.10	490		34.9
EXC-7	J1TX93	8/19/14	0.0049	U	0.0049	0.23	U	0.23	11.9	X	0.11	685		36.6
EXC-8	J1TX94	8/19/14	0.0051	U	0.0051	0.22	U	0.22	9.4	X	0.11	1070		35.2
EXC-9	J1TX95	8/19/14	0.0050	B	0.0050	0.25	U	0.25	10.6	X	0.12	1010		39.8
EXC-10	J1TX96	8/19/14	0.0049	U	0.0049	0.25	U	0.25	9.8	X	0.12	783		40.2
EXC-11	J1TX97	8/19/14	0.0048	U	0.0048	0.35	B	0.25	9.0	X	0.12	619		39.2
EXC-12 Re-Sample	J1V0F1	9/22/14				0.22	U	0.22	10.6		0.11	547		35.2
SPA-6	J1TXC6	8/18/14	0.0055	U	0.0055	0.25	U	0.25	10.6		0.12	731		38.7
Duplicate of J1TXC6	J1TXD3	8/18/14	0.0050	U	0.0050	0.25	U	0.25	10.3		0.12	699		39.8
SPA-1	J1TXC1	8/18/14	0.0054	U	0.0054	0.23	U	0.23	8.0		0.11	621		36.7
SPA-2	J1TXC2	8/18/14	0.0052	U	0.0052	0.26	B	0.23	10.5		0.11	849		36.4
SPA-3	J1TXC3	8/18/14	0.0061	B	0.0050	0.25	U	0.25	9.5		0.12	916		38.8
SPA-4	J1TXC4	8/18/14	0.013	B	0.0052	0.23	U	0.23	10.0		0.11	961		36.0
SPA-5	J1TXC5	8/18/14	0.0053	U	0.0053	0.22	U	0.22	9.2		0.11	702		35.1
SPA-7	J1TXC7	8/18/14	0.0050	U	0.0050	0.25	U	0.25	8.8		0.12	648		39.7
SPA-8	J1TXC8	8/18/14	0.0056	U	0.0056	0.25	U	0.25	10.9		0.12	963		39.2
SPA-9	J1TXC9	8/18/14	0.0055	U	0.0055	0.26	U	0.26	9.9		0.12	769		40.4
SPA-10	J1TXD0	8/18/14	0.0055	U	0.0055	0.24	U	0.24	11.8		0.11	1090		37.6
SPA-11	J1TXD1	8/18/14	0.0056	U	0.0056	0.24	U	0.24	9.4		0.11	749		37.4
SPA-12	J1TXD2	8/18/14	0.0051	U	0.0051	0.24	U	0.24	11.1		0.11	849		37.8
FS-1	J1TXD4	8/20/14	0.0052	U	0.0052	0.25	U	0.25	9.0		0.12	669		38.7
FS-2	J1TXD5	8/20/14	0.0050	U	0.0050	0.22	U	0.22	9.7		0.11	616		35.3
FS-3	J1TXD6	8/20/14	0.0053	U	0.0053	0.24	U	0.24	9.7		0.11	809		37.2
FS-4	J1TXD7	8/20/14	0.017		0.0049	0.22	U	0.22	11.0		0.11	905		35.2
EXC-3	J1TX89	8/19/14	0.0054	U	0.0054	0.25	U	0.25	11.6	X	0.12	1720		39.7
EXC-12	J1TX98	8/19/14	0.0050	U	0.0050	0.24	U	0.24	10.7	X	0.11	1710		37.3
Equipment Blank	J1TXC0	8/19/14	0.0054	U	0.0054	0.24	U	0.24	0.11	UX	0.11	37.6	U	37.6

Attachment	1	Sheet No.	3 of 20
Originator	J. D. Skoglie	Date	10/23/14
Checked	I. B. Berezovskiy	Date	10/23/14
Calc. No.	0100H-CA-V0209	Rev. No.	0

Attachment 1. 100-H-43 Waste Site Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Selenium			Silicon			Silver			Sodium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-5	J1TX91	8/19/14	0.83	U	0.83	303	J	5.4	0.15	U	0.15	261		56.7
Duplicate of J1TX91	J1TX99	8/19/14	0.80	U	0.80	334	J	5.3	0.15	U	0.15	268		55.2
EXC-1	J1TX87	8/19/14	0.87	U	0.87	234	JN	5.7	0.16	U	0.16	166		59.6
EXC-2	J1TX88	8/19/14	0.76	U	0.76	229	J	5.0	0.14	U	0.14	245		52.2
EXC-3 Re-Sample	J1V0F0	9/22/14	0.98		0.78	284		5.2	0.15	U	0.15	201		53.7
EXC-4	J1TX90	8/19/14	0.79	U	0.79	345	J	5.2	0.15	U	0.15	251		54.1
EXC-6	J1TX92	8/19/14	0.73	U	0.73	112	J	4.8	0.14	U	0.14	128		50.2
EXC-7	J1TX93	8/19/14	0.77	U	0.77	194	J	5.1	0.14	U	0.14	192		52.7
EXC-8	J1TX94	8/19/14	0.74	U	0.74	225	J	4.9	0.14	U	0.14	196		50.6
EXC-9	J1TX95	8/19/14	0.83	U	0.83	242	J	5.5	0.16	U	0.16	241		57.2
EXC-10	J1TX96	8/19/14	0.84	U	0.84	191	J	5.5	0.16	U	0.16	226		57.8
EXC-11	J1TX97	8/19/14	0.82	U	0.82	193	J	5.4	0.15	U	0.15	167		56.4
EXC-12 Re-Sample	J1V0F1	9/22/14	0.74	U	0.74	128		4.9	0.14	U	0.14	164		50.6
SPA-6	J1TXC6	8/18/14	0.81	U	0.81	195		5.3	0.15	U	0.15	206		55.7
Duplicate of J1TXC6	J1TXD3	8/18/14	0.83	U	0.83	219		5.5	0.24		0.16	243		57.2
SPA-1	J1TXC1	8/18/14	0.77	U	0.77	203		5.1	0.14	U	0.14	185	M	52.8
SPA-2	J1TXC2	8/18/14	0.76	U	0.76	231		5.0	0.39		0.14	229		52.3
SPA-3	J1TXC3	8/18/14	0.81	U	0.81	249		5.4	0.19		0.15	248		55.8
SPA-4	J1TXC4	8/18/14	0.75	U	0.75	213		5.0	0.14	U	0.14	228		51.8
SPA-5	J1TXC5	8/18/14	0.74	U	0.74	169		4.8	0.14	U	0.14	205		50.5
SPA-7	J1TXC7	8/18/14	0.83	U	0.83	164		5.5	0.16	U	0.16	192		57.2
SPA-8	J1TXC8	8/18/14	0.82	U	0.82	233		5.4	0.15	U	0.15	283		56.4
SPA-9	J1TXC9	8/18/14	0.85	U	0.85	236		5.6	0.16	U	0.16	232		58.1
SPA-10	J1TXD0	8/18/14	0.79	U	0.79	285		5.2	0.15	U	0.15	150		54
SPA-11	J1TXD1	8/18/14	0.78	U	0.78	193		5.2	0.15	U	0.15	237		53.9
SPA-12	J1TXD2	8/18/14	0.79	U	0.79	226		5.2	0.16	B	0.15	247		54.3
FS-1	J1TXD4	8/20/14	0.81	U	0.81	147	N	5.3	0.15	U	0.15	236		55.6
FS-2	J1TXD5	8/20/14	0.74	U	0.74	140		4.9	0.14	U	0.14	156		50.7
FS-3	J1TXD6	8/20/14	0.78	U	0.78	166		5.1	0.15	U	0.15	236		53.6
FS-4	J1TXD7	8/20/14	0.74	U	0.74	163		4.9	0.14	U	0.14	202		50.7
EXC-3	J1TX89	8/19/14	0.83	U	0.83	344	J	5.5	0.15	U	0.15	196		57.1
EXC-12	J1TX98	8/19/14	0.78	U	0.78	277	J	5.1	0.15	U	0.15	218		53.7
Equipment Blank	J1TXC0	8/19/14	0.79	U	0.79	110	J	5.2	0.15	U	0.15	54.1	U	54.1

Sample Location	HEIS Number	Sample Date	Vanadium			Zinc		
			mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-5	J1TX91	8/19/14	33.1	X	0.090	39.4	X	0.38
Duplicate of J1TX91	J1TX99	8/19/14	34.4	X	0.088	41.2	X	0.37
EXC-1	J1TX87	8/19/14	35.0	X	0.095	27.8	X	0.40
EXC-2	J1TX88	8/19/14	40.5	X	0.083	33.7	X	0.35
EXC-3 Re-Sample	J1V0F0	9/22/14	41.1		0.086	33.7		0.36
EXC-4	J1TX90	8/19/14	40.4	X	0.086	38.2	X	0.37
EXC-6	J1TX92	8/19/14	24.1	X	0.080	20.5	X	0.34
EXC-7	J1TX93	8/19/14	38.7	X	0.084	27.7	X	0.36
EXC-8	J1TX94	8/19/14	38.2	X	0.081	34.8	X	0.34
EXC-9	J1TX95	8/19/14	39.9	X	0.091	34.3	X	0.39
EXC-10	J1TX96	8/19/14	41.0	X	0.092	32.4	X	0.39
EXC-11	J1TX97	8/19/14	38.7	X	0.090	27.4	X	0.38
EXC-12 Re-Sample	J1V0F1	9/22/14	37.2		0.081	26.9		0.34
SPA-6	J1TXC6	8/18/14	41.3		0.089	34.6	X	0.38
Duplicate of J1TXC6	J1TXD3	8/18/14	39.2		0.091	32.3	X	0.39
SPA-1	J1TXC1	8/18/14	32.4		0.084	28.4	X	0.36
SPA-2	J1TXC2	8/18/14	40.5		0.083	32.0	X	0.35
SPA-3	J1TXC3	8/18/14	40.7		0.089	36.8	X	0.38
SPA-4	J1TXC4	8/18/14	38.6		0.082	37.4	X	0.35
SPA-5	J1TXC5	8/18/14	38.0		0.081	36.3	X	0.34
SPA-7	J1TXC7	8/18/14	35.0		0.091	27.9	X	0.39
SPA-8	J1TXC8	8/18/14	43.3		0.090	35.6	X	0.38
SPA-9	J1TXC9	8/18/14	43.4		0.093	33.2	X	0.39
SPA-10	J1TXD0	8/18/14	33.1		0.086	34.4	X	0.36
SPA-11	J1TXD1	8/18/14	40.7		0.086	31.8	X	0.36
SPA-12	J1TXD2	8/18/14	40.1		0.087	35.0	X	0.37
FS-1	J1TXD4	8/20/14	38.3		0.089	29.2	X	0.38
FS-2	J1TXD5	8/20/14	32.5		0.081	27.0	X	0.34
FS-3	J1TXD6	8/20/14	38.4		0.085	33.6	X	0.36
FS-4	J1TXD7	8/20/14	32.4		0.081	32.9	X	0.34
EXC-3	J1TX89	8/19/14	39.7	X	0.091	39.9	X	0.39
EXC-12	J1TX98	8/19/14	36.8	X	0.086	41.2	X	0.36
Equipment Blank	J1TXC0	8/19/14	0.24	BX	0.086	1.0	X	0.37

Attachment	1	Sheet No.	4 of 20
Originator	J. D. Skoglie	Date	10/23/14
Checked	I. B. Berezovskiy	Date	10/23/14
Calc. No.	0100H-CA-V0209	Rev. No.	0

Attachment 1. 100-H-43 Waste Site Verification Sample Results (TCLP Metals).

Sample Location	HEIS Number	Sample Date	Arsenic			Barium			Cadmium			Chromium		
			TCLP			TCLP			TCLP			TCLP		
			mg/L	Q	PQL	mg/L	Q	PQL	mg/L	Q	PQL	mg/L	Q	PQL
EXC-12	J1TX98	8/19/14	0.48	B	0.022	0.49	BX	0.002	0.002	U	0.002	0.003	U	0.003

Sample Location	HEIS Number	Sample Date	Lead			Selenium			Silver		
			TCLP			TCLP			TCLP		
			mg/L	Q	PQL	mg/L	Q	PQL	mg/L	Q	PQL
EXC-12	J1TX98	8/19/14	0.15	B	0.013	0.024	U	0.024	0.004	U	0.004

Attachment	1	Sheet No.	5 of 20
Originator	J. D. Skoglie	Date	10/23/14
Checked	I. B. Berezovskiy	Date	10/23/14
Calc. No.	0100H-CA-V0209	Rev. No.	0

Attachment 1. 100-H-43 Waste Site Verification Sample Results (TPH and Physical).

Sample Location	HEIS Number	Sample Date	TPH - Diesel Range Extended			TPH - Diesel Range			TPH - Gasoline Range			Percent moisture (wet sample)		
			ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	%	Q	PQL
EXC-5	J1TX91	8/19/14	23000		940	9900		640	340	U	340	1.8		0.10
R Tie To J1TX91	J1TX99	8/19/14	3500	J	1000	2200	J	680	340	U	340	1.9		0.10
EXC-1	J1TX87	8/19/14	5400		950	2800	J	650	310	U	310	1.1		0.10
EXC-2	J1TX88	8/19/14	5300		980	1900	J	670	330	U	330	1.7		0.10
EXC-3	J1TX89	8/19/14	23000		970	9300		660	340	U	340	1.7		0.10
EXC-4	J1TX90	8/19/14	9200		1000	5700		680	350	U	350	1.8		0.10
EXC-6	J1TX92	8/19/14	2600	J	1000	1300	J	680	330	U	330	1.3		0.10
EXC-7	J1TX93	8/19/14	990	U	990	670	U	670	340	U	340	0.88		0.10
EXC-8	J1TX94	8/19/14	3400	J	1000	1400	J	680	320	U	320	2.1		0.10
EXC-9	J1TX95	8/19/14	6300		1000	3200	J	680	340	U	340	0.85		0.10
EXC-10	J1TX96	8/19/14	3100	J	980	1500	J	660	320	U	320	0.97		0.10
EXC-11	J1TX97	8/19/14	1900	J	990	1200	J	670	320	U	320	0.44		0.10
EXC-12	J1TX98	8/19/14	9600		1000	4900		690	320	U	320	2.7		0.10
SPA-6	J1TXC6	8/18/14	1900	J	980	1000	J	670	320	UN	320	1.9		0.10
R Tie To J1TXC6	J1TXD3	8/18/14	3600	J	980	2100	J	660	340	UN	340	1.8		0.10
SPA-1	J1TXC1	8/18/14	1900	J	950	740	J	650	340	UN	340	1.9		0.10
SPA-2	J1TXC2	8/18/14	2900	J	970	1300	J	660	340	UN	340	2.0		0.10
SPA-3	J1TXC3	8/18/14	6900		990	3100	J	670	340	UN	340	2.2		0.10
SPA-4	J1TXC4	8/18/14	41000		950	18000		650	330	UN	330	1.8		0.10
SPA-5	J1TXC5	8/18/14	4300		960	2200	J	660	330	UN	330	1.9		0.10
SPA-7	J1TXC7	8/18/14	2200	J	940	1400	J	640	330	UN	330	1.7		0.10
SPA-8	J1TXC8	8/18/14	2300	J	1000	1300	J	690	340	UN	340	2.2		0.10
SPA-9	J1TXC9	8/18/14	1700	J	940	870	J	640	350	UN	350	2.3		0.10
SPA-10	J1TXD0	8/18/14	980	U	980	660	U	660	320	UN	320	2.5		0.10
SPA-11	J1TXD1	8/18/14	3500	J	1000	1800	J	680	320	UN	320	2.2		0.10
SPA-12	J1TXD2	8/18/14	4400		960	2600	J	650	340	UN	340	2.2		0.10
FS-1	J1TXD4	8/20/14	7500		970	3300	J	660	340	U	340	0.90		0.10
FS-2	J1TXD5	8/20/14	70000		1000	30000		680	340	U	340	1.5		0.10
FS-3	J1TXD6	8/20/14	2800	J	950	1600	J	650	330	U	330	0.83	M	0.10
FS-4	J1TXD7	8/20/14	25000		980	11000		670	340	U	340	1.4		0.10
EXC-3 Re-Sample	J1V0F0	9/22/14										1.1		0.10
EXC-12 Re-Sample	J1V0F1	9/22/14										1.2		0.10
FS-4 Re-Sample	J1V0F2	9/22/14										0.33		0.10
EB Tie To J1TX91	J1TXC0	8/19/14										0.10	U	0.10

Attachment	1	Sheet No.	6 of 20
Originator	J. D. Skoglie	Date	10/23/14
Checked	I. B. Berezovskiy	Date	10/23/14
Calc. No.	0100H-CA-V0209	Rev. No.	0

Attachment 1. 100-H-43 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	EXC-5 - J1TX91			Duplicate of J1TX91 - J1TX99			EXC-1 - J1TX87			EXC-2 - J1TX88			EXC-3 - J1TX89		
		8/19/14			8/19/14			8/19/14			8/19/14			8/19/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	9.9	U	9.9	10	U	10	14	JX	9.7	10	U	10	10	U	10
Acenaphthylene	PAH	8.9	U	8.9	9.1	U	9.1	8.7	U	8.7	9.0	U	9.0	9.1	U	9.1
Anthracene	PAH	3.0	U	3.0	3.1	U	3.1	3.0	U	3.0	3.1	U	3.1	3.1	U	3.1
Benzo(a)anthracene	PAH	5.5	J	3.2	3.2	U	3.2	20	X	3.1	27		3.2	4.3	JX	3.2
Benzo(a)pyrene	PAH	7.0	JX	6.4	11	J	6.5	43		6.2	18		6.4	14	J	6.5
Benzo(b)fluoranthene	PAH	16	X	4.2	9.5	JX	4.2	31		4.1	15		4.2	6.1	J	4.2
Benzo(ghi)perylene	PAH	7.1	U	7.1	24	J	7.3	35		7.0	7.2	U	7.2	56	X	7.2
Benzo(k)fluoranthene	PAH	3.9	U	3.9	4.0	U	4.0	14	J	3.8	4.9	JX	4.0	4.0	U	4.0
Chrysene	PAH	6.3	J	4.8	12	J	4.9	46		4.7	19	J	4.9	11	J	4.9
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	14	J	13	79		13	44		13	21	J	13
Fluorene	PAH	5.2	U	5.2	5.3	U	5.3	5.1	U	5.1	5.3	U	5.3	5.3	U	5.3
Indeno(1,2,3-cd)pyrene	PAH	12	U	12	12	U	12	30		12	14	JX	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	53		12	33	J	12	17	J	12
Pyrene	PAH	12	U	12	16	J	12	100		12	40		12	30	J	12
Aroclor-1016	PCB	2.8	U	2.8	2.7	U	2.7	2.7	U	2.7	2.8	U	2.8	2.7	U	2.7
Aroclor-1221	PCB	8.1	U	8.1	8.0	U	8.0	7.8	U	7.8	8.0	U	8.0	7.8	U	7.8
Aroclor-1232	PCB	2.0	U	2.0	2.0	U	2.0	2.0	U	2.0	2.0	U	2.0	2.0	U	2.0
Aroclor-1242	PCB	4.7	U	4.7	4.6	U	4.6	4.5	U	4.5	4.6	U	4.6	4.6	U	4.6
Aroclor-1248	PCB	4.7	U	4.7	4.6	U	4.6	4.5	U	4.5	4.6	U	4.6	4.6	U	4.6
Aroclor-1254	PCB	2.6	U	2.6	2.6	U	2.6	2.5	U	2.5	2.6	U	2.6	2.5	U	2.5
Aroclor-1260	PCB	2.6	U	2.6	2.6	U	2.6	2.5	U	2.5	2.6	U	2.6	2.5	U	2.5
Aldrin	PEST	0.25	U	0.25	0.25	U	0.25	0.25	U	0.25	0.23	U	0.23	0.25	U	0.25
Alpha-BHC	PEST	0.21	U	0.21	0.21	U	0.21	0.21	U	0.21	0.20	U	0.20	0.22	U	0.22
alpha-Chlordane	PEST	0.32	U	0.32	0.32	U	0.32	0.32	U	0.32	0.30	U	0.30	0.33	U	0.33
Beta-BHC	PEST	0.65	U	0.65	0.65	U	0.65	0.65	U	0.65	0.62	U	0.62	0.67	U	0.67
Delta-BHC	PEST	0.40	U	0.40	0.40	U	0.40	0.39	U	0.39	0.37	U	0.37	0.40	U	0.40
4-4'-DDD	PEST	0.54	U	0.54	0.54	U	0.54	0.54	U	0.54	0.51	U	0.51	0.55	U	0.55
4-4'-DDE	PEST	0.23	U	0.23	0.23	U	0.23	0.23	U	0.23	0.22	U	0.22	0.24	U	0.24
4-4'-DDT	PEST	0.58	U	0.58	0.58	U	0.58	0.58	U	0.58	0.55	U	0.55	0.59	U	0.59
Dieldrin	PEST	0.21	U	0.21	0.21	U	0.21	0.21	U	0.21	0.76	J	0.20	0.21	U	0.21
Endosulfan I	PEST	0.17	U	0.17	0.17	U	0.17	0.17	U	0.17	0.16	U	0.16	0.18	U	0.18
Endosulfan II	PEST	0.28	U	0.28	0.28	U	0.28	0.28	U	0.28	0.27	U	0.27	0.29	U	0.29
Endosulfan sulfate	PEST	0.27	U	0.27	0.27	U	0.27	0.27	U	0.27	0.26	U	0.26	0.28	U	0.28
Endrin	PEST	0.30	U	0.30	0.30	U	0.30	0.30	U	0.30	0.29	U	0.29	0.31	U	0.31
Endrin aldehyde	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
Endrin ketone	PEST	0.48	U	0.48	0.48	U	0.48	0.48	U	0.48	0.46	U	0.46	0.49	U	0.49
Gamma-BHC (Lindane)	PEST	0.46	U	0.46	0.46	U	0.46	0.46	U	0.46	0.43	U	0.43	0.47	U	0.47
gamma-Chlordane	PEST	0.26	U	0.26	0.26	U	0.26	0.26	U	0.26	0.25	U	0.25	0.27	U	0.27
Heptachlor	PEST	0.21	U	0.21	0.21	U	0.21	0.21	U	0.21	0.20	U	0.20	0.22	U	0.22
Heptachlor epoxide	PEST	0.42	U	0.42	0.42	U	0.42	0.42	U	0.42	0.40	U	0.40	0.43	U	0.43
Methoxychlor	PEST	0.44	U	0.44	0.44	U	0.44	0.44	U	0.44	0.42	U	0.42	0.45	U	0.45
Toxaphene	PEST	16	UJ	16	16	UJ	16	16	UJ	16	15	UJ	15	16	UJ	16

Attachment	1	Sheet No.	7 of 20
Originator	J. D. Skoglie	Date	10/23/14
Checked	I. B. Berezovskiy	Date	10/23/14
Calc. No.	0100H-CA-V0209	Rev. No.	0

Attachment 1. 100-H-43 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	EXC-4 - J1TX90			EXC-6 - J1TX92			EXC-7 - J1TX93			EXC-8 - J1TX94			EXC-9 - J1TX95		
		8/19/14			8/19/14			8/19/14			8/19/14			8/19/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	10	U	10	10	U	10	9.7	U	9.7	10	U	10	13	JX	9.7
Acenaphthylene	PAH	9.0	U	9.0	9.0	U	9.0	8.7	U	8.7	9.1	U	9.1	8.7	U	8.7
Anthracene	PAH	3.0	U	3.0	3.0	U	3.0	3.0	U	3.0	3.1	U	3.1	2.9	U	2.9
Benzo(a)anthracene	PAH	8.5	JX	3.2	6.8	JX	3.2	3.1	U	3.1	9.5	JX	3.2	140		3.1
Benzo(a)pyrene	PAH	7.6	J	6.4	6.4	U	6.4	6.2	U	6.2	18		6.5	130		6.2
Benzo(b)fluoranthene	PAH	6.7	JX	4.2	4.2	U	4.2	4.1	U	4.1	14	J	4.2	120		4.1
Benzo(ghi)perylene	PAH	45		7.2	71		7.2	7.0	U	7.0	7.3	U	7.3	82		7.0
Benzo(k)fluoranthene	PAH	3.9	U	3.9	3.9	U	3.9	3.8	U	3.8	6.2	J	4.0	41		3.8
Chrysene	PAH	9.5	J	4.8	5.7	J	4.8	4.7	U	4.7	14	J	4.9	150		4.7
Dibenz[a,h]anthracene	PAH	11	U	11	11	U	11	11	U	11	11	U	11	20	J	11
Fluoranthene	PAH	18	J	13	13	U	13	13	U	13	32	J	13	52		13
Fluorene	PAH	5.3	U	5.3	5.3	U	5.3	5.1	U	5.1	5.3	U	5.3	10	JX	5.1
Indeno(1,2,3-cd)pyrene	PAH	12	U	12	12	U	12	12	U	12	12	J	12	76		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	18	J	12	12	U	12
Pyrene	PAH	23	J	12	12	U	12	12	U	12	39	J	12	48		12
Aroclor-1016	PCB	2.7	U	2.7	2.7	U	2.7	2.7	U	2.7	2.8	U	2.8	2.7	U	2.7
Aroclor-1221	PCB	7.9	U	7.9	7.9	U	7.9	7.9	U	7.9	8.1	U	8.1	7.9	U	7.9
Aroclor-1232	PCB	2.0	U	2.0	2.0	U	2.0	2.0	U	2.0	2.0	U	2.0	2.0	U	2.0
Aroclor-1242	PCB	4.6	U	4.6	4.6	U	4.6	4.6	U	4.6	4.7	U	4.7	4.6	U	4.6
Aroclor-1248	PCB	4.6	U	4.6	4.6	U	4.6	4.6	U	4.6	4.7	U	4.7	4.6	U	4.6
Aroclor-1254	PCB	3.0	J	2.6	2.6	U	2.6	2.6	U	2.6	2.6	U	2.6	2.6	U	2.6
Aroclor-1260	PCB	2.6	U	2.6	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	0.24	U	0.24	0.25	U	0.25	0.24	U	0.24
Alpha-BHC	PEST	0.22	U	0.22	0.21	U	0.21	0.21	U	0.21	0.22	U	0.22	0.20	U	0.20
alpha-Chlordane	PEST	0.33	U	0.33	0.32	U	0.32	0.31	U	0.31	0.33	U	0.33	0.31	U	0.31
Beta-BHC	PEST	0.67	U	0.67	0.65	U	0.65	0.64	U	0.64	0.67	U	0.67	0.63	U	0.63
Delta-BHC	PEST	0.41	U	0.41	0.39	U	0.39	0.39	U	0.39	0.40	U	0.40	0.38	U	0.38
4-4'-DDD	PEST	0.55	U	0.55	0.54	U	0.54	0.52	U	0.52	0.55	U	0.55	0.52	U	0.52
4-4'-DDE	PEST	0.24	U	0.24	0.23	U	0.23	0.23	U	0.23	0.24	U	0.24	0.23	U	0.23
4-4'-DDT	PEST	0.60	U	0.60	0.58	U	0.58	0.57	U	0.57	0.59	U	0.59	0.56	U	0.56
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	0.18	U	0.18	0.17	U	0.17	0.17	U	0.17	0.18	U	0.18	0.17	U	0.17
Endosulfan II	PEST	0.29	U	0.29	0.28	U	0.28	0.28	U	0.28	0.29	U	0.29	0.27	U	0.27
Endosulfan sulfate	PEST	0.28	U	0.28	0.27	U	0.27	0.27	U	0.27	0.28	U	0.28	0.26	U	0.26
Endrin	PEST	0.31	U	0.31	0.30	U	0.30	0.29	U	0.29	0.31	U	0.31	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	0.50	U	0.50	0.48	U	0.48	0.47	U	0.47	0.49	U	0.49	0.47	U	0.47
Gamma-BHC (Lindane)	PEST	0.47	U	0.47	0.46	U	0.46	0.45	U	0.45	0.47	U	0.47	0.44	U	0.44
gamma-Chlordane	PEST	0.27	U	0.27	0.26	U	0.26	0.26	U	0.26	0.27	U	0.27	0.25	U	0.25
Heptachlor	PEST	0.22	U	0.22	0.21	U	0.21	0.21	U	0.21	0.22	U	0.22	0.20	U	0.20
Heptachlor epoxide	PEST	0.43	U	0.43	0.42	U	0.42	0.41	U	0.41	0.43	U	0.43	0.41	U	0.41
Methoxychlor	PEST	0.46	U	0.46	0.44	U	0.44	0.43	U	0.43	0.45	U	0.45	0.43	U	0.43
Toxaphene	PEST	16	UJ	16	15	UJ	15	15	UJ	15	16	UJ	16	15	UJ	15

Attachment	1	Sheet No.	8 of 20
Originator	J. D. Skoglie	Date	10/23/14
Checked	I. B. Berezovskiy	Date	10/23/14
Calc. No.	0100H-CA-V0209	Rev. No.	0

Attachment 1. 100-H-43 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	EXC-10 - J1TX96			EXC-11 - J1TX97			EXC-12 - J1TX98			SPA-6 - J1TXC6			Duplicate of J1TXC6 - J1TXD3		
		8/19/14			8/19/14			8/19/14			8/18/14			8/18/14		
		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	9.9	U	9.9	10	U	10	9.7	U	9.7
Acenaphthylene	PAH	8.7	U	8.7	8.9	U	8.9	9.0	U	9.0	9.0	U	9.0	8.7	U	8.7
Anthracene	PAH	3.0	U	3.0	3.0	U	3.0	3.0	U	3.0	3.0	U	3.0	3.0	U	3.0
Benzo(a)anthracene	PAH	3.1	U	3.1	3.2	U	3.2	16	X	3.2	3.2	U	3.2	3.1	U	3.1
Benzo(a)pyrene	PAH	6.2	U	6.2	6.3	U	6.3	33		6.4	6.4	U	6.4	6.2	U	6.2
Benzo(b)fluoranthene	PAH	4.1	UN	4.1	4.1	U	4.1	21		4.2	4.2	U	4.2	4.1	U	4.1
Benzo(ghi)perylene	PAH	7.0	U	7.0	7.1	U	7.1	37		7.2	7.2	U	7.2	7.0	U	7.0
Benzo(k)fluoranthene	PAH	3.8	UN	3.8	3.9	U	3.9	9.5	J	3.9	3.9	U	3.9	3.8	U	3.8
Chrysene	PAH	4.7	U	4.7	4.8	U	4.8	26	JX	4.8	4.8	U	4.8	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	13	U	13	57	X	13	13	U	13	13	U	13
Fluorene	PAH	5.1	U	5.1	5.2	U	5.2	5.3	U	5.3	5.3	U	5.3	5.1	U	5.1
Indeno(1,2,3-cd)pyrene	PAH	12	U	12	12	U	12	32		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	54		12	12	U	12	12	U	12
Pyrene	PAH	12	U	12	12	U	12	84		12	12	U	12	12	U	12
Aroclor-1016	PCB	2.8	U	2.8	2.7	U	2.7	2.8	U	2.8	2.7	U	2.7	2.7	U	2.7
Aroclor-1221	PCB	8.0	U	8.0	7.9	U	7.9	8.0	U	8.0	7.8	U	7.8	7.8	U	7.8
Aroclor-1232	PCB	2.0	U	2.0	2.0	U	2.0	2.0	U	2.0	1.9	U	1.9	1.9	U	1.9
Aroclor-1242	PCB	4.7	U	4.7	4.6	U	4.6	4.6	U	4.6	4.5	U	4.5	4.5	U	4.5
Aroclor-1248	PCB	4.7	U	4.7	4.6	U	4.6	4.6	U	4.6	4.5	U	4.5	4.5	U	4.5
Aroclor-1254	PCB	2.6	U	2.6	2.6	U	2.6	2.6	U	2.6	2.5	U	2.5	2.5	U	2.5
Aroclor-1260	PCB	2.6	U	2.6	2.6	U	2.6	2.6	U	2.6	2.5	U	2.5	2.5	U	2.5
Aldrin	PEST	0.23	U	0.23	0.25	U	0.25	0.25	U	0.25	0.25	U	0.25	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	0.21	U	0.21
alpha-Chlordane	PEST	0.3	U	0.3	0.32	U	0.32	0.33	U	0.33	0.32	U	0.32	0.31	U	0.31
Beta-BHC	PEST	0.62	U	0.62	0.66	U	0.66	0.67	U	0.67	0.66	U	0.66	0.65	U	0.65
Delta-BHC	PEST	0.37	U	0.37	0.40	U	0.40	0.40	U	0.40	0.40	U	0.40	0.39	U	0.39
4-4'-DDD	PEST	0.51	U	0.51	0.54	U	0.54	0.55	U	0.55	0.54	U	0.54	0.53	U	0.53
4-4'-DDE	PEST	0.22	U	0.22	0.24	U	0.24	0.24	U	0.24	0.24	U	0.24	0.23	U	0.23
4-4'-DDT	PEST	0.55	U	0.55	0.59	U	0.59	0.59	U	0.59	0.59	U	0.59	0.57	U	0.57
Dieldrin	PEST	0.70	J	0.20	0.21	U	0.21	0.21	U	0.21	0.21	U	0.21	0.20	U	0.20
Endosulfan I	PEST	0.16	U	0.16	0.18	U	0.18	0.18	U	0.18	0.18	U	0.18	0.17	U	0.17
Endosulfan II	PEST	0.27	U	0.27	0.29	U	0.29	0.29	U	0.29	0.29	U	0.29	0.28	U	0.28
Endosulfan sulfate	PEST	0.26	U	0.26	0.28	U	0.28	0.28	U	0.28	0.27	U	0.27	0.27	U	0.27
Endrin	PEST	0.29	U	0.29	0.31	U	0.31	0.31	U	0.31	0.30	U	0.30	0.30	U	0.30
Endrin aldehyde	PEST	0.16	U	0.16	0.17	U	0.17	0.17	U	0.17	0.17	U	0.17	0.17	U	0.17
Endrin ketone	PEST	0.46	U	0.46	0.49	U	0.49	0.49	U	0.49	0.49	U	0.49	0.48	U	0.48
Gamma-BHC (Lindane)	PEST	0.43	U	0.43	0.46	U	0.46	0.47	U	0.47	0.46	U	0.46	0.45	U	0.45
gamma-Chlordane	PEST	0.25	U	0.25	0.27	U	0.27	0.27	U	0.27	0.26	U	0.26	0.26	U	0.26
Heptachlor	PEST	0.20	U	0.20	0.21	U	0.21	0.22	U	0.22	0.21	U	0.21	0.21	U	0.21
Heptachlor epoxide	PEST	0.40	U	0.40	0.43	U	0.43	0.43	U	0.43	0.42	U	0.42	0.41	U	0.41
Methoxychlor	PEST	0.42	U	0.42	0.45	U	0.45	0.45	U	0.45	0.45	U	0.45	0.44	U	0.44
Toxaphene	PEST	15	UJ	15	16	UJ	16	16	UJ	16	16	U	16	15	U	15

Attachment	1	Sheet No.	9 of 20
Originator	J. D. Skoglie	Date	10/23/14
Checked	I. B. Berezovskiy	Date	10/23/14
Calc. No.	0100H-CA-V0209	Rev. No.	0

Attachment 1. 100-H-43 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	SPA-1 - J1TXC1			SPA-2 - J1TXC2			SPA-3 - J1TXC3			SPA-4 - J1TXC4			SPA-5 - J1TXC5		
		8/18/14			8/18/14			8/18/14			8/18/14			8/18/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	9.8	U	9.8	10	U	10	9.8	U	9.8	9.5	UN	9.5	9.4	U	9.4
Acenaphthylene	PAH	8.9	U	8.9	9.0	U	9.0	8.8	U	8.8	8.6	UN	8.6	8.5	U	8.5
Anthracene	PAH	3.0	U	3.0	3.0	U	3.0	3.0	U	3.0	2.9	U	2.9	2.9	U	2.9
Benzo(a)anthracene	PAH	3.1	U	3.1	4.3	JX	3.2	5.3	JX	3.1	10	JN	3.0	3.0	JX	3.0
Benzo(a)pyrene	PAH	6.3	U	6.3	6.4	JX	6.4	14	JX	6.3	14		6.1	6.1	U	6.1
Benzo(b)fluoranthene	PAH	4.1	U	4.1	5.2	JX	4.2	15		4.1	12	JN	4.0	4.0	U	4.0
Benzo(ghi)perylene	PAH	7.1	U	7.1	7.2	U	7.2	7.1	U	7.1	21	JN	6.9	6.8	U	6.8
Benzo(k)fluoranthene	PAH	3.9	U	3.9	3.9	U	3.9	5.5	J	3.9	3.9	JN	3.8	3.7	U	3.7
Chrysene	PAH	4.8	U	4.8	4.8	U	4.8	12	J	4.8	14	J	4.6	4.6	U	4.6
Dibenz[a,h]anthracene	PAH	11	U	11	11	U	11	11	U	11	10	UN	10	10	U	10
Fluoranthene	PAH	13	U	13	13	U	13	17	J	13	32	JN	12	12	U	12
Fluorene	PAH	5.2	U	5.2	5.3	U	5.3	5.2	U	5.2	5.0	UN	5.0	5.0	U	5.0
Indeno(1,2,3-cd)pyrene	PAH	12	U	12	12	U	12	13	J	12	11	UN	11	11	U	11
Naphthalene	PAH	12	U	12	12	U	12	12	U	12	11	UN	11	11	U	11
Phenanthrene	PAH	12	U	12	12	U	12	12	U	12	22	JN	11	11	U	11
Pyrene	PAH	12	U	12	12	U	12	23	J	12	25	J	11	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	2.7	U	2.7
Aroclor-1221	PCB	7.9	U	7.9	8.1	U	8.1	8.1	U	8.1	8.1	U	8.1	7.7	U	7.7
Aroclor-1232	PCB	2.0	U	2.0	2.0	U	2.0	2.0	U	2.0	2.0	U	2.0	1.9	U	1.9
Aroclor-1242	PCB	4.6	U	4.6	4.7	U	4.7	4.7	U	4.7	4.7	U	4.7	4.5	U	4.5
Aroclor-1248	PCB	4.6	U	4.6	4.7	U	4.7	4.7	U	4.7	4.7	U	4.7	4.5	U	4.5
Aroclor-1254	PCB	2.6	U	2.6	2.6	U	2.6	2.6	U	2.6	2.6	U	2.6	2.5	U	2.5
Aroclor-1260	PCB	2.6	U	2.6	2.6	U	2.6	2.6	U	2.6	3.3	J	2.6	2.5	U	2.5
Aldrin	PEST	0.24	U	0.24	0.25	U	0.25	0.25	U	0.25	0.25	U	0.25	0.25	U	0.25
Alpha-BHC	PEST	0.21	U	0.21	0.21	U	0.21	0.22	U	0.22	0.21	U	0.21	0.21	U	0.21
alpha-Chlordane	PEST	0.31	U	0.31	0.32	U	0.32	0.33	U	0.33	0.32	U	0.32	0.32	U	0.32
Beta-BHC	PEST	0.64	U	0.64	0.67	U	0.67	0.67	U	0.67	0.65	U	0.65	0.66	U	0.66
Delta-BHC	PEST	0.39	U	0.39	0.40	U	0.40	0.41	U	0.41	0.39	U	0.39	0.40	U	0.40
4-4'-DDD	PEST	0.53	U	0.53	0.55	U	0.55	0.55	U	0.55	0.54	U	0.54	0.54	U	0.54
4-4'-DDE	PEST	0.23	U	0.23	0.24	U	0.24	0.24	U	0.24	19		0.23	0.24	U	0.24
4-4'-DDT	PEST	0.57	U	0.57	0.59	U	0.59	0.60	U	0.60	19		0.58	0.59	U	0.59
Dieldrin	PEST	0.20	U	0.20	0.21	U	0.21	0.21	U	0.21	0.21	U	0.21	0.21	U	0.21
Endosulfan I	PEST	0.17	U	0.17	0.18	U	0.18	0.18	U	0.18	0.17	U	0.17	0.17	U	0.17
Endosulfan II	PEST	0.28	U	0.28	0.29	U	0.29	0.29	U	0.29	0.28	U	0.28	0.29	U	0.29
Endosulfan sulfate	PEST	0.27	U	0.27	0.28	U	0.28	0.28	U	0.28	0.27	U	0.27	0.27	U	0.27
Endrin	PEST	0.30	U	0.30	0.31	U	0.31	0.31	U	0.31	0.30	U	0.30	0.30	U	0.30
Endrin aldehyde	PEST	0.16	U	0.16	0.17	U	0.17	0.17	U	0.17	0.17	U	0.17	0.17	U	0.17
Endrin ketone	PEST	0.47	U	0.47	0.49	U	0.49	0.50	U	0.50	0.48	U	0.48	0.49	U	0.49
Gamma-BHC (Lindane)	PEST	0.45	U	0.45	0.47	U	0.47	0.47	U	0.47	0.46	U	0.46	0.46	U	0.46
gamma-Chlordane	PEST	0.26	U	0.26	0.27	U	0.27	0.27	U	0.27	0.26	U	0.26	0.26	U	0.26
Heptachlor	PEST	0.21	U	0.21	0.21	U	0.21	0.22	U	0.22	0.21	U	0.21	0.21	U	0.21
Heptachlor epoxide	PEST	0.41	U	0.41	0.43	U	0.43	0.43	U	0.43	0.42	U	0.42	0.42	U	0.42
Methoxychlor	PEST	0.43	U	0.43	0.45	U	0.45	0.46	U	0.46	0.44	U	0.44	0.45	U	0.45
Toxaphene	PEST	15	U	15	16	U	16	16	U	16	16	U	16	16	U	16

Attachment	1	Sheet No.	10 of 20
Originator	J. D. Skoglie	Date	10/23/14
Checked	I. B. Berezovskiy	Date	10/23/14
Calc. No.	0100H-CA-V0209	Rev. No.	0

Attachment 1. 100-H-43 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	SPA-7 - J1TXC7			SPA-8 - J1TXC8			SPA-9 - J1TXC9			SPA-10 - J1TXD0			SPA-11 - J1TXD1		
		8/18/14			8/18/14			8/18/14			8/18/14			8/18/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	9.9	U	9.9	10	U	10	9.9	U	9.9	9.6	U	9.6	9.8	U	9.8
Acenaphthylene	PAH	8.9	U	8.9	9.1	U	9.1	8.9	U	8.9	8.7	U	8.7	8.8	U	8.8
Anthracene	PAH	3.0	U	3.0	3.1	U	3.1	3.0	U	3.0	2.9	U	2.9	3.0	U	3.0
Benzo(a)anthracene	PAH	3.2	U	3.2	3.2	U	3.2	3.2	U	3.2	3.1	U	3.1	7.1	J	3.1
Benzo(a)pyrene	PAH	6.4	U	6.4	7.8	JX	6.5	6.4	U	6.4	6.2	U	6.2	9.0	J	6.3
Benzo(b)fluoranthene	PAH	4.2	U	4.2	4.9	JX	4.3	4.2	U	4.2	4.0	U	4.0	10	J	4.1
Benzo(ghi)perylene	PAH	7.1	U	7.1	7.3	U	7.3	7.2	U	7.2	6.9	U	6.9	7.1	U	7.1
Benzo(k)fluoranthene	PAH	3.9	U	3.9	4.0	U	4.0	3.9	U	3.9	3.8	U	3.8	3.9	U	3.9
Chrysene	PAH	7.7	J	4.8	4.9	U	4.9	4.8	U	4.8	4.7	U	4.7	6.4	J	4.7
Dibenz[a,h]anthracene	PAH	11	U	11	11	U	11	11	U	11	11	U	11	11	U	11
Fluoranthene	PAH	21	J	13	13	U	13	13	U	13	13	U	13	13	J	13
Fluorene	PAH	5.2	U	5.2	5.3	U	5.3	5.2	U	5.2	5.1	U	5.1	5.2	U	5.2
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	25	J	12	12	U	12	12	U	12	12	U	12	12	U	12
Pyrene	PAH	21	J	12	13	J	12	12	U	12	12	U	12	14	J	12
Aroclor-1016	PCB	2.7	U	2.7	2.6	U	2.6	2.7	U	2.7	2.7	U	2.7	2.8	U	2.8
Aroclor-1221	PCB	7.8	U	7.8	7.7	U	7.7	7.7	U	7.7	7.9	U	7.9	8.1	U	8.1
Aroclor-1232	PCB	2.0	U	2.0	1.9	U	1.9	1.9	U	1.9	2.0	U	2.0	2.0	U	2.0
Aroclor-1242	PCB	4.6	U	4.6	4.5	U	4.5	4.5	U	4.5	4.6	U	4.6	4.7	U	4.7
Aroclor-1248	PCB	4.6	U	4.6	4.5	U	4.5	4.5	U	4.5	4.6	U	4.6	4.7	U	4.7
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	0.24	U	0.24	0.25	U	0.25	0.24	U	0.24	0.25	U	0.25	0.24	U	0.24
Alpha-BHC	PEST	0.21	U	0.21	0.22	U	0.22	0.21	U	0.21	0.22	U	0.22	0.21	U	0.21
alpha-Chlordane	PEST	0.32	U	0.32	0.33	U	0.33	0.31	U	0.31	0.32	U	0.32	0.31	U	0.31
Beta-BHC	PEST	0.65	U	0.65	0.67	U	0.67	0.65	U	0.65	0.67	U	0.67	0.64	U	0.64
Delta-BHC	PEST	0.39	U	0.39	0.41	U	0.41	0.39	U	0.39	0.40	U	0.40	0.38	U	0.38
4-4'-DDD	PEST	0.53	U	0.53	0.55	U	0.55	0.53	U	0.53	0.55	U	0.55	0.52	U	0.52
4-4'-DDE	PEST	0.23	U	0.23	0.24	U	0.24	0.23	U	0.23	0.24	U	0.24	0.23	U	0.23
4-4'-DDT	PEST	0.58	U	0.58	0.60	U	0.60	0.96	J	0.57	0.59	U	0.59	0.57	U	0.57
Dieldrin	PEST	0.20	U	0.20	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	0.18	U	0.18	0.17	U	0.17	0.18	U	0.18	0.17	U	0.17
Endosulfan II	PEST	0.28	U	0.28	0.29	U	0.29	0.28	U	0.28	0.29	U	0.29	0.28	U	0.28
Endosulfan sulfate	PEST	0.27	U	0.27	0.28	U	0.28	0.27	U	0.27	0.28	U	0.28	0.26	U	0.26
Endrin	PEST	0.30	U	0.30	0.31	U	0.31	0.30	U	0.30	0.31	U	0.31	0.29	U	0.29
Endrin aldehyde	PEST	0.17	U	0.17	0.17	U	0.17	0.17	U	0.17	0.17	U	0.17	0.16	U	0.16
Endrin ketone	PEST	0.48	U	0.48	0.50	U	0.50	0.48	U	0.48	0.49	U	0.49	0.47	U	0.47
Gamma-BHC (Lindane)	PEST	0.45	U	0.45	0.47	U	0.47	0.45	U	0.45	0.47	U	0.47	0.44	U	0.44
gamma-Chlordane	PEST	0.26	U	0.26	0.27	U	0.27	0.26	U	0.26	0.27	U	0.27	0.25	U	0.25
Heptachlor	PEST	0.21	U	0.21	0.22	U	0.22	0.21	U	0.21	0.22	U	0.22	0.21	U	0.21
Heptachlor epoxide	PEST	0.42	U	0.42	0.43	U	0.43	0.41	U	0.41	0.43	U	0.43	0.41	U	0.41
Methoxychlor	PEST	0.44	U	0.44	0.46	U	0.46	0.44	U	0.44	0.45	U	0.45	0.43	U	0.43
Toxaphene	PEST	15	U	15	16	U	16	15	U	15	16	U	16	15	U	15

Attachment	1	Sheet No.	11 of 20
Originator	J. D. Skoglie	Date	10/23/14
Checked	I. B. Berezovskiy	Date	10/23/14
Calc. No.	0100H-CA-V0209	Rev. No.	0

Attachment 1. 100-H-43 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	SPA-12 - J1TXD2			FS-1 - J1TXD4			FS-2 - J1TXD5			FS-3 - J1TXD6			FS-4 - J1TXD7		
		8/18/14			8/20/14			8/20/14			8/20/14			8/20/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	15	JX	9.5	9.8	U	9.8	10	U	10	9.5	U	9.5	56	JX	9.5
Acenaphthylene	PAH	8.5	U	8.5	8.8	U	8.8	9.1	U	9.1	8.5	U	8.5	8.5	U	8.5
Anthracene	PAH	5.7	J	2.9	3.0	U	3.0	3.1	U	3.1	2.9	U	2.9	63		2.9
Benzo(a)anthracene	PAH	44		3.0	3.1	U	3.1	3.2	U	3.2	4.2	J	3.0	140	X	3.0
Benzo(a)pyrene	PAH	45		6.1	6.3	U	6.3	6.5	U	6.5	6.1	U	6.1	340		6.1
Benzo(b)fluoranthene	PAH	54		4.0	4.1	U	4.1	4.2	U	4.2	4.0	U	4.0	260		4.0
Benzo(ghi)perylene	PAH	22	JX	6.8	7.0	U	7.0	7.3	U	7.3	6.8	U	6.8	290	X	6.8
Benzo(k)fluoranthene	PAH	18		3.7	3.8	U	3.8	4.0	U	4.0	3.7	U	3.7	89	X	3.7
Chrysene	PAH	39	X	4.6	4.7	U	4.7	4.9	U	4.9	6.0	J	4.6	210		4.6
Dibenz[a,h]anthracene	PAH	10	U	10	11	U	11	11	U	11	10	U	10	10	U	10
Fluoranthene	PAH	91		12	13	U	13	13	U	13	12	U	12	430		12
Fluorene	PAH	10	J	5.0	5.2	U	5.2	5.3	U	5.3	5.0	U	5.0	36	X	5.0
Indeno(1,2,3-cd)pyrene	PAH	48		11	12	U	12	12	U	12	11	U	11	290		11
Naphthalene	PAH	11	U	11	12	U	12	12	U	12	11	U	11	16	JX	11
Phenanthrene	PAH	39		11	12	U	12	12	U	12	11	U	11	250		11
Pyrene	PAH	110		11	12	U	12	12	U	12	11	U	11	440		11
Aroclor-1016	PCB	2.8	U	2.8	2.7	U	2.7	2.7	U	2.7	2.6	U	2.6	2.7	U	2.7
Aroclor-1221	PCB	8.1	U	8.1	7.9	U	7.9	7.8	U	7.8	7.4	U	7.4	7.8	U	7.8
Aroclor-1232	PCB	2.0	U	2.0	2.0	U	2.0	1.9	U	1.9	1.8	U	1.8	2.0	U	2.0
Aroclor-1242	PCB	4.7	U	4.7	4.6	U	4.6	4.5	U	4.5	4.3	U	4.3	4.6	U	4.6
Aroclor-1248	PCB	4.7	U	4.7	4.6	U	4.6	4.5	U	4.5	4.3	U	4.3	4.6	U	4.6
Aroclor-1254	PCB	2.6	U	2.6	2.5	U	2.5	2.5	U	2.5	2.4	U	2.4	2.5	U	2.5
Aroclor-1260	PCB	2.6	U	2.6	2.5	U	2.5	2.5	U	2.5	2.4	U	2.4	2.5	U	2.5
Aldrin	PEST	0.25	U	0.25	0.24	U	0.24	0.25	UN	0.25	0.25	U	0.25	0.24	U	0.24
Alpha-BHC	PEST	0.22	U	0.22	0.20	U	0.20	0.21	UN	0.21	0.21	U	0.21	0.21	U	0.21
alpha-Chlordane	PEST	0.33	U	0.33	0.31	U	0.31	0.32	UN	0.32	0.32	U	0.32	0.31	U	0.31
Beta-BHC	PEST	0.67	U	0.67	0.63	U	0.63	0.65	UN	0.65	0.66	U	0.66	0.64	U	0.64
Delta-BHC	PEST	0.41	U	0.41	0.38	U	0.38	0.40	UN	0.40	0.40	U	0.40	0.38	U	0.38
4-4'-DDD	PEST	0.55	U	0.55	0.52	U	0.52	0.54	UN	0.54	0.55	U	0.55	0.52	U	0.52
4-4'-DDE	PEST	0.24	U	0.24	0.23	U	0.23	0.23	UN	0.23	0.24	U	0.24	0.23	U	0.23
4-4'-DDT	PEST	0.60	U	0.60	0.56	U	0.56	2.5	N	0.58	0.59	U	0.59	0.57	U	0.57
Dieldrin	PEST	0.21	U	0.21	0.20	U	0.20	0.21	UN	0.21	0.21	U	0.21	23		0.20
Endosulfan I	PEST	0.18	U	0.18	0.17	U	0.17	0.17	UN	0.17	0.18	U	0.18	0.17	U	0.17
Endosulfan II	PEST	0.29	U	0.29	0.27	U	0.27	0.28	UN	0.28	0.29	U	0.29	0.28	U	0.28
Endosulfan sulfate	PEST	0.28	U	0.28	0.26	U	0.26	0.27	UN	0.27	0.28	U	0.28	0.26	U	0.26
Endrin	PEST	0.31	U	0.31	0.29	U	0.29	0.30	UN	0.3	0.31	U	0.31	0.53	JY	0.29
Endrin aldehyde	PEST	0.17	U	0.17	0.16	U	0.16	0.17	U	0.17	0.17	U	0.17	0.16	U	0.16
Endrin ketone	PEST	0.50	U	0.50	0.47	U	0.47	0.48	UN	0.48	0.49	U	0.49	0.47	U	0.47
Gamma-BHC (Lindane)	PEST	0.47	U	0.47	0.44	U	0.44	0.46	UN	0.46	0.46	U	0.46	0.45	U	0.45
gamma-Chlordane	PEST	0.27	U	0.27	0.25	U	0.25	0.26	UN	0.26	0.27	U	0.27	0.26	U	0.26
Heptachlor	PEST	0.22	U	0.22	0.20	U	0.20	0.21	U	0.21	0.21	U	0.21	0.21	U	0.21
Heptachlor epoxide	PEST	0.43	U	0.43	0.41	U	0.41	0.42	UN	0.42	0.43	U	0.43	0.41	U	0.41
Methoxychlor	PEST	0.46	U	0.46	0.43	U	0.43	0.44	UN	0.44	0.45	U	0.45	0.43	U	0.43
Toxaphene	PEST	16	U	16	15	U	15	16	U	16	16	U	16	15	U	15

Attachment	1	Sheet No.	12 of 20
Originator	J. D. Skoglie	Date	10/23/14
Checked	I. B. Berezovskiy	Date	10/23/14
Calc. No.	0100H-CA-V0209	Rev. No.	0

Attachment 1. 100-H-43 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	FS-4 Re-Sample - J1V0F2		
		9/22/14		
		ug/kg	Q	PQL
Acenaphthene	PAH	9.8	U	9.8
Acenaphthylene	PAH	8.9	U	8.9
Anthracene	PAH	3.0	U	3.0
Benzo(a)anthracene	PAH	3.1	U	3.1
Benzo(a)pyrene	PAH	6.3	U	6.3
Benzo(b)fluoranthene	PAH	4.1	U	4.1
Benzo(ghi)perylene	PAH	7.1	U	7.1
Benzo(k)fluoranthene	PAH	3.9	U	3.9
Chrysene	PAH	4.8	U	4.8
Dibenz[a,h]anthracene	PAH	11	UN	11
Fluoranthene	PAH	13	U	13
Fluorene	PAH	5.2	U	5.2
Indeno(1,2,3-cd)pyrene	PAH	12	U	12
Naphthalene	PAH	12	U	12
Phenanthrene	PAH	12	U	12
Pyrene	PAH	12	U	12
Aroclor-1016	PCB			
Aroclor-1221	PCB			
Aroclor-1232	PCB			
Aroclor-1242	PCB			
Aroclor-1248	PCB			
Aroclor-1254	PCB			
Aroclor-1260	PCB			
Aldrin	PEST			
Alpha-BHC	PEST			
alpha-Chlordane	PEST			
Beta-BHC	PEST			
Delta-BHC	PEST			
4-4'-DDD	PEST			
4-4'-DDE	PEST			
4-4'-DDT	PEST			
Dieldrin	PEST			
Endosulfan I	PEST			
Endosulfan II	PEST			
Endosulfan sulfate	PEST			
Endrin	PEST			
Endrin aldehyde	PEST			
Endrin ketone	PEST			
Gamma-BHC (Lindane)	PEST			
gamma-Chlordane	PEST			
Heptachlor	PEST			
Heptachlor epoxide	PEST			
Methoxychlor	PEST			
Toxaphene	PEST			

Attachment	1	Sheet No.	13 of 20
Originator	J. D. Skoglie	Date	10/23/14
Checked	I. B. Berezovskiy	Date	10/23/14
Calc. No.	0100H-CA-V0209	Rev. No.	0

Attachment 1. 100-H-43 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	EXC-5 - J1TX91			Duplicate of J1TX91 J1TX99			EXC-1 - J1TX87			EXC-2 - J1TX88			EXC-3 - J1TX89		
		8/19/14			8/19/14			8/19/14			8/19/14			8/19/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	26	U	26	28	U	28	28	U	28	27	U	27	28	U	28
1,2-Dichlorobenzene	SVOA	21	U	21	22	U	22	22	U	22	21	U	21	22	U	22
1,3-Dichlorobenzene	SVOA	11	U	11	12	U	12	12	U	12	12	U	12	12	U	12
1,4-Dichlorobenzene	SVOA	13	U	13	13	U	13	13	U	13	13	U	13	14	U	14
2,4,5-Trichlorophenol	SVOA	9.5	U	9.5	9.9	U	9.9	9.9	U	9.9	9.7	U	9.7	10	U	10
2,4,6-Trichlorophenol	SVOA	9.5	U	9.5	9.9	U	9.9	9.9	U	9.9	9.7	U	9.7	10	U	10
2,4-Dichlorophenol	SVOA	9.5	U	9.5	9.9	U	9.9	9.9	U	9.9	9.7	U	9.7	10	U	10
2,4-Dimethylphenol	SVOA	62	U	62	65	U	65	65	U	65	64	U	64	66	U	66
2,4-Dinitrophenol	SVOA	310	U	310	330	U	330	330	U	330	320	U	320	330	U	330
2,4-Dinitrotoluene	SVOA	62	U	62	65	U	65	65	U	65	64	U	64	66	U	66
2,6-Dinitrotoluene	SVOA	26	U	26	28	U	28	28	U	28	27	U	27	28	U	28
2-Chloronaphthalene	SVOA	9.5	U	9.5	9.9	U	9.9	9.9	U	9.9	9.7	U	9.7	10	U	10
2-Chlorophenol	SVOA	20	U	20	21	U	21	21	U	21	20	U	20	21	U	21
2-Methylnaphthalene	SVOA	18	U	18	19	U	19	19	U	19	18	U	18	19	U	19
2-Methylphenol (cresol, o-)	SVOA	12	U	12	13	U	13	13	U	13	13	U	13	13	U	13
2-Nitroaniline	SVOA	47	U	47	49	U	49	50	U	50	48	U	48	50	U	50
2-Nitrophenol	SVOA	9.5	U	9.5	9.9	U	9.9	9.9	U	9.9	9.7	U	9.7	10	U	10
3,3'-Dichlorobenzidine	SVOA	85	U	85	89	U	89	89	U	89	87	U	87	90	U	90
3+4 Methylphenol (cresol, m+p)	SVOA	31	U	31	33	U	33	33	U	33	32	U	32	33	U	33
3-Nitroaniline	SVOA	69	U	69	72	U	72	72	U	72	71	U	71	73	U	73
4,6-Dinitro-2-methylpheno	SVOA	310	U	310	330	U	330	330	U	330	320	U	320	330	U	330
4-Bromophenylphenyl ether	SVOA	18	U	18	19	U	19	19	U	19	18	U	18	19	U	19
4-Chloro-3-methylpheno	SVOA	62	U	62	65	U	65	65	U	65	64	U	64	66	U	66
4-Chloroaniline	SVOA	77	U	77	81	U	81	81	U	81	79	U	79	82	U	82
4-Chlorophenylphenyl ether	SVOA	20	U	20	21	U	21	21	U	21	20	U	20	21	U	21
4-Nitroaniline	SVOA	69	U	69	71	U	71	72	U	72	70	U	70	72	U	72
4-Nitrophenol	SVOA	92	U	92	96	U	96	96	U	96	94	U	94	97	U	97
Acenaphthene	SVOA	9.7	U	9.7	10	U	10	10	U	10	10	U	10	10	U	10
Acenaphthylene	SVOA	16	U	16	17	U	17	17	U	17	16	U	16	17	U	17
Anthracene	SVOA	16	U	16	17	U	17	17	U	17	16	U	16	17	U	17
Benzo(a)anthracene	SVOA	19	U	19	20	U	20	41	J	20	19	U	19	25	J	20
Benzo(a)pyrene	SVOA	19	U	19	20	U	20	36	J	20	19	U	19	26	J	20
Benzo(b)fluoranthene	SVOA	25	U	25	26	U	26	47	J	26	25	U	25	26	U	26
Benzo(ghi)perylene	SVOA	15	U	15	16	U	16	23	J	16	16	U	16	16	U	16
Benzo(k)fluoranthene	SVOA	38	U	38	39	U	39	40	U	40	39	U	39	40	U	40
Bis(2-chloro-1-methylethyl)ethe	SVOA	22	U	22	23	U	23	23	U	23	22	U	22	23	U	23
Bis(2-Chloroethoxy)methane	SVOA	22	U	22	23	U	23	23	U	23	22	U	22	23	U	23
Bis(2-chloroethyl) ether	SVOA	16	U	16	16	U	16	16	U	16	16	U	16	17	U	17
Bis(2-ethylhexyl) phthalate	SVOA	44	U	44	45	U	45	46	U	46	45	U	45	46	U	46
Butylbenzylphthalate	SVOA	41	U	41	42	U	42	43	U	43	42	U	42	43	U	43
Carbazole	SVOA	34	U	34	36	U	36	36	U	36	35	U	35	36	U	36
Chrysene	SVOA	26	U	26	27	U	27	46	J	27	26	U	26	29	J	27
Dibenz[a,h]anthracene	SVOA	18	U	18	19	U	19	19	U	19	18	U	18	19	U	19
Dibenzofuran	SVOA	19	U	19	20	U	20	20	U	20	19	U	19	20	U	20
Diethyl phthalate	SVOA	25	U	25	26	U	26	26	U	26	25	U	25	26	U	26
Dimethyl phthalate	SVOA	22	U	22	23	U	23	23	U	23	22	U	22	23	U	23
Di-n-butylphthalate	SVOA	27	U	27	29	U	29	29	U	29	28	U	28	29	U	29
Di-n-octylphthalate	SVOA	14	U	14	14	U	14	14	U	14	14	U	14	14	U	14
Fluoranthene	SVOA	34	U	34	36	U	36	85	J	36	35	U	35	40	J	36
Fluorene	SVOA	17	U	17	18	U	18	18	U	18	17	U	17	18	U	18
Hexachlorobenzene	SVOA	27	U	27	29	U	29	29	U	29	28	U	28	29	U	29
Hexachlorobutadiene	SVOA	9.5	U	9.5	9.9	U	9.9	9.9	U	9.9	9.7	U	9.7	10	U	10
Hexachlorocyclopentadiene	SVOA	47	U	47	49	U	49	50	U	50	48	U	48	50	U	50
Hexachloroethane	SVOA	20	U	20	21	U	21	21	U	21	21	U	21	21	U	21
Indeno(1,2,3-cd)pyrene	SVOA	21	U	21	22	U	22	76	J	22	21	U	21	22	U	22
Isophorone	SVOA	16	U	16	17	U	17	17	U	17	16	U	16	17	U	17
Naphthalene	SVOA	29	U	29	31	U	31	31	U	31	30	U	30	31	U	31
Nitrobenzene	SVOA	21	U	21	22	U	22	22	U	22	21	U	21	22	U	22
N-Nitroso-di-n-dipropylamine	SVOA	29	U	29	31	U	31	31	U	31	30	U	30	31	U	31
N-Nitrosodiphenylamine	SVOA	20	U	20	21	U	21	21	U	21	20	U	20	21	U	21
Pentachlorophenol	SVOA	310	U	310	330	U	330	330	U	330	320	U	320	330	U	330
Phenanthrene	SVOA	16	U	16	17	U	17	51	J	17	16	J	16	18	J	17
Phenol	SVOA	17	U	17	18	U	18	18	U	18	17	U	17	18	U	18
Pyrene	SVOA	15	J	11	12	U	12	86	J	12	33	J	12	55	J	12

Attachment	1	Sheet No.	14 of 20
Originator	J. D. Skoglie	Date	10/23/14
Checked	I. B. Berezovskiy	Date	10/23/14
Calc. No.	0100H-CA-V0209	Rev. No.	0

Attachment 1. 100-H-43 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	EXC-4 - J1TX90			EXC-6 - J1TX92			EXC-7 - J1TX93			EXC-8 - J1TX94			EXC-9 - J1TX95		
		8/19/14			8/19/14			8/19/14			8/19/14			8/19/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	28	U	28	27	U	27	28	U	28	28	U	28	28	U	28
1,2-Dichlorobenzene	SVOA	22	U	22	22	U	22	22	U	22	22	U	22	22	U	22
1,3-Dichlorobenzene	SVOA	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12
1,4-Dichlorobenzene	SVOA	13	U	13	13	U	13	13	U	13	14	U	14	13	U	13
2,4,5-Trichlorophenol	SVOA	9.9	U	9.9	9.8	U	9.8	9.9	U	9.9	10	U	10	9.9	U	9.9
2,4,6-Trichlorophenol	SVOA	9.9	U	9.9	9.8	U	9.8	9.9	U	9.9	10	U	10	9.9	U	9.9
2,4-Dichlorophenol	SVOA	9.9	U	9.9	9.8	U	9.8	9.9	U	9.9	10	U	10	9.9	U	9.9
2,4-Dimethylphenol	SVOA	65	U	65	65	U	65	65	U	65	67	U	67	65	U	65
2,4-Dinitrophenol	SVOA	330	U	330	330	U	330	330	U	330	340	U	340	330	U	330
2,4-Dinitrotoluene	SVOA	65	U	65	65	U	65	65	U	65	67	U	67	65	U	65
2,6-Dinitrotoluene	SVOA	28	U	28	27	U	27	28	U	28	28	U	28	28	U	28
2-Chloronaphthalene	SVOA	9.9	U	9.9	9.8	U	9.8	9.9	U	9.9	10	U	10	9.9	U	9.9
2-Chlorophenol	SVOA	21	U	21	21	U	21	21	U	21	21	U	21	21	U	21
2-Methylnaphthalene	SVOA	19	U	19	19	U	19	19	U	19	19	U	19	19	U	19
2-Methylphenol (cresol, o-)	SVOA	13	U	13	13	U	13	13	U	13	13	U	13	13	U	13
2-Nitroaniline	SVOA	49	U	49	49	U	49	49	U	49	51	U	51	49	U	49
2-Nitrophenol	SVOA	9.9	U	9.9	9.8	U	9.8	9.9	U	9.9	10	U	10	9.9	U	9.9
3,3'-Dichlorobenzidine	SVOA	89	U	89	88	U	88	89	U	89	91	U	91	89	U	89
3+4 Methylphenol (cresol, m+p)	SVOA	33	U	33	32	U	32	33	U	33	33	U	33	33	U	33
3-Nitroaniline	SVOA	72	U	72	72	U	72	72	U	72	74	U	74	72	U	72
4,6-Dinitro-2-methylphenol	SVOA	330	U	330	320	U	320	330	U	330	330	U	330	330	U	330
4-Bromophenylphenyl ether	SVOA	19	U	19	19	U	19	19	U	19	19	U	19	19	U	19
4-Chloro-3-methylphenol	SVOA	65	U	65	65	U	65	65	U	65	67	U	67	65	U	65
4-Chloroaniline	SVOA	81	U	81	80	U	80	81	U	81	83	U	83	81	U	81
4-Chlorophenylphenyl ether	SVOA	21	U	21	21	U	21	21	U	21	21	U	21	21	U	21
4-Nitroaniline	SVOA	72	U	72	71	U	71	71	U	71	73	U	73	72	U	72
4-Nitrophenol	SVOA	96	U	96	95	U	95	96	U	96	98	U	98	96	U	96
Acenaphthene	SVOA	10	U	10	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	17	U	17
Anthracene	SVOA	17	U	17	17	U	17	17	U	17	17	U	17	17	U	17
Benzo(a)anthracene	SVOA	20	U	20	20	U	20	20	U	20	20	U	20	20	U	20
Benzo(a)pyrene	SVOA	20	U	20	20	U	20	20	U	20	20	U	20	20	U	20
Benzo(b)fluoranthene	SVOA	26	U	26	26	U	26	26	U	26	26	U	26	26	U	26
Benzo(ghi)perylene	SVOA	16	U	16	16	U	16	16	U	16	16	U	16	16	U	16
Benzo(k)fluoranthene	SVOA	40	U	40	39	U	39	39	U	39	40	U	40	40	U	40
Bis(2-chloro-1-methylethyl)ether	SVOA	23	U	23	23	U	23	23	U	23	23	U	23	23	U	23
Bis(2-Chloroethoxy)methane	SVOA	23	U	23	23	U	23	23	U	23	23	U	23	23	U	23
Bis(2-chloroethyl) ether	SVOA	16	U	16	16	U	16	16	U	16	17	U	17	16	U	16
Bis(2-ethylhexyl) phthalate	SVOA	45	U	45	45	U	45	45	U	45	47	U	47	45	U	45
Butylbenzylphthalate	SVOA	43	U	43	42	U	42	42	U	42	43	U	43	43	U	43
Carbazole	SVOA	36	U	36	35	U	35	35	U	35	36	U	36	36	U	36
Chrysene	SVOA	27	U	27	26	U	26	27	U	27	27	U	27	27	U	27
Dibenz[a,h]anthracene	SVOA	19	U	19	19	U	19	19	U	19	19	U	19	19	U	19
Dibenzofuran	SVOA	20	U	20	20	U	20	20	U	20	20	U	20	20	U	20
Diethyl phthalate	SVOA	26	U	26	26	U	26	26	U	26	26	U	26	26	U	26
Dimethyl phthalate	SVOA	23	U	23	23	U	23	23	U	23	23	U	23	23	U	23
Di-n-butylphthalate	SVOA	29	U	29	28	U	28	29	U	29	29	U	29	29	U	29
Di-n-octylphthalate	SVOA	14	U	14	14	U	14	14	U	14	15	U	15	14	U	14
Fluoranthene	SVOA	36	U	36	35	U	35	35	U	35	36	U	36	36	U	36
Fluorene	SVOA	18	U	18	18	U	18	18	U	18	18	U	18	18	U	18
Hexachlorobenzene	SVOA	29	U	29	28	U	28	29	U	29	29	U	29	29	U	29
Hexachlorobutadiene	SVOA	9.9	U	9.9	9.8	U	9.8	9.9	U	9.9	10	U	10	9.9	U	9.9
Hexachlorocyclopentadiene	SVOA	49	U	49	49	U	49	49	U	49	51	U	51	49	U	49
Hexachloroethane	SVOA	21	U	21	21	U	21	21	U	21	22	U	22	21	U	21
Indeno(1,2,3-cd)pyrene	SVOA	22	U	22	22	U	22	22	U	22	22	U	22	22	U	22
Isophorone	SVOA	17	U	17	17	U	17	17	U	17	17	U	17	17	U	17
Naphthalene	SVOA	31	U	31	30	U	30	31	U	31	31	U	31	31	U	31
Nitrobenzene	SVOA	22	U	22	22	U	22	22	U	22	22	U	22	22	U	22
N-Nitroso-di-n-dipropylamine	SVOA	31	U	31	30	U	30	31	U	31	31	U	31	31	U	31
N-Nitrosodiphenylamine	SVOA	21	U	21	21	U	21	21	U	21	21	U	21	21	U	21
Pentachlorophenol	SVOA	330	U	330	320	U	320	330	U	330	330	U	330	330	U	330
Phenanthrene	SVOA	17	U	17	17	U	17	17	U	17	20	J	17	17	U	17
Phenol	SVOA	18	U	18	18	U	18	18	U	18	18	U	18	18	U	18
Pyrene	SVOA	30	J	12	14	J	12	12	U	12	43	J	12	12	U	12

Attachment	1	Sheet No.	15 of 20
Originator	J. D. Skoglie	Date	10/23/14
Checked	I. B. Berezovskiy	Date	10/23/14
Calc. No.	0100H-CA-V0209	Rev. No.	0

Attachment 1. 100-H-43 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	EXC-10 - J1TX96			EXC-11 - J1TX97			EXC-12 - J1TX98			SPA-6 - J1TXC6			Duplicate of J1TXC6 - J1TXD3		
		8/19/14			8/19/14			8/19/14			8/18/14			8/18/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	28	U	28	27	U	27	28	U	28	28	U	28	28	U	28
1,2-Dichlorobenzene	SVOA	22	U	22	21	U	21	22	U	22	22	U	22	22	U	22
1,3-Dichlorobenzene	SVOA	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12
1,4-Dichlorobenzene	SVOA	14	U	14	13	U	13	13	U	13	14	U	14	14	U	14
2,4,5-Trichlorophenol	SVOA	10	U	10	9.8	U	9.8	9.9	U	9.9	10	U	10	10	U	10
2,4,6-Trichlorophenol	SVOA	10	U	10	9.8	U	9.8	9.9	U	9.9	10	U	10	10	U	10
2,4-Dichlorophenol	SVOA	10	U	10	9.8	U	9.8	9.9	U	9.9	10	U	10	10	U	10
2,4-Dimethylphenol	SVOA	66	U	66	64	U	64	65	U	65	67	U	67	66	U	66
2,4-Dinitrophenol	SVOA	330	U	330	320	U	320	330	U	330	340	U	340	330	U	330
2,4-Dinitrotoluene	SVOA	66	U	66	64	U	64	65	U	65	67	U	67	66	U	66
2,6-Dinitrotoluene	SVOA	28	U	28	27	U	27	28	U	28	28	U	28	28	U	28
2-Chloronaphthalene	SVOA	10	U	10	9.8	U	9.8	9.9	U	9.9	10	U	10	10	U	10
2-Chlorophenol	SVOA	21	U	21	20	U	20	21	U	21	21	U	21	21	U	21
2-Methylnaphthalene	SVOA	19	U	19	19	U	19	19	U	19	19	U	19	19	U	19
2-Methylphenol (cresol, o-)	SVOA	13	U	13	13	U	13	13	U	13	13	U	13	13	U	13
2-Nitroaniline	SVOA	50	U	50	49	U	49	49	U	49	50	U	50	50	U	50
2-Nitrophenol	SVOA	10	U	10	9.8	U	9.8	9.9	U	9.9	10	U	10	10	U	10
3,3'-Dichlorobenzidine	SVOA	90	U	90	88	U	88	89	U	89	91	U	91	90	U	90
3+4 Methylphenol (cresol, m+p)	SVOA	33	U	33	32	U	32	33	U	33	33	U	33	33	U	33
3-Nitroaniline	SVOA	73	U	73	71	U	71	72	U	72	74	U	74	73	U	73
4,6-Dinitro-2-methylpheno	SVOA	330	U	330	320	U	320	330	U	330	330	U	330	330	U	330
4-Bromophenylphenyl ethe	SVOA	19	U	19	19	U	19	19	U	19	19	U	19	19	U	19
4-Chloro-3-methylpheno	SVOA	66	U	66	64	U	64	65	U	65	67	U	67	66	U	66
4-Chloroaniline	SVOA	82	U	82	80	U	80	81	U	81	83	U	83	82	U	82
4-Chlorophenylphenyl ethe	SVOA	21	U	21	20	U	20	21	U	21	21	U	21	21	U	21
4-Nitroaniline	SVOA	72	U	72	71	U	71	72	U	72	73	U	73	73	U	73
4-Nitrophenol	SVOA	97	U	97	95	U	95	96	U	96	98	U	98	97	U	97
Acenaphthene	SVOA	10	U	10	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	17	U	17
Anthracene	SVOA	17	U	17	17	U	17	18	J	17	17	U	17	17	U	17
Benzo(a)anthracene	SVOA	20	U	20	20	U	20	88	J	20	20	U	20	20	U	20
Benzo(a)pyrene	SVOA	20	U	20	20	U	20	86	J	20	20	U	20	20	U	20
Benzo(b)fluoranthene	SVOA	26	U	26	26	U	26	87	J	26	26	U	26	26	U	26
Benzo(ghi)perylene	SVOA	16	U	16	16	U	16	49	J	16	16	U	16	16	U	16
Benzo(k)fluoranthene	SVOA	40	U	40	39	U	39	40	U	40	40	U	40	40	U	40
Bis(2-chloro-1-methylethyl)ethe	SVOA	23	U	23	22	U	22	23	U	23	23	U	23	23	U	23
Bis(2-Chloroethoxy)methane	SVOA	23	U	23	22	U	22	23	U	23	23	U	23	23	U	23
Bis(2-chloroethyl) ethe	SVOA	17	U	17	16	U	16	16	U	16	17	U	17	17	U	17
Bis(2-ethylhexyl) phthalate	SVOA	46	U	46	45	U	45	45	U	45	46	U	46	46	U	46
Butylbenzylphthalate	SVOA	43	U	43	42	U	42	42	U	42	43	U	43	43	U	43
Carbazole	SVOA	36	U	36	35	U	35	36	U	36	36	U	36	36	U	36
Chrysene	SVOA	27	U	27	26	U	26	110	J	27	27	U	27	27	U	27
Dibenz[a,h]anthracene	SVOA	19	U	19	19	U	19	19	U	19	19	U	19	19	U	19
Dibenzofuran	SVOA	20	U	20	20	U	20	20	U	20	20	U	20	20	U	20
Diethyl phthalate	SVOA	26	U	26	25	U	25	26	U	26	26	U	26	26	U	26
Dimethyl phthalate	SVOA	23	U	23	22	U	22	23	U	23	23	U	23	23	U	23
Di-n-butylphthalate	SVOA	29	U	29	28	U	28	29	U	29	29	U	29	29	U	29
Di-n-octylphthalate	SVOA	14	U	14	14	U	14	14	U	14	15	U	15	14	U	14
Fluoranthene	SVOA	36	U	36	35	U	35	200	J	36	36	U	36	36	U	36
Fluorene	SVOA	18	U	18	18	U	18	18	U	18	18	U	18	18	U	18
Hexachlorobenzene	SVOA	29	U	29	28	U	28	29	U	29	29	U	29	29	U	29
Hexachlorobutadiene	SVOA	10	U	10	9.8	U	9.8	9.9	U	9.9	10	U	10	10	U	10
Hexachlorocyclopentadiene	SVOA	50	U	50	49	U	49	49	U	49	50	U	50	50	U	50
Hexachloroethane	SVOA	21	U	21	21	U	21	21	U	21	21	U	21	21	U	21
Indeno(1,2,3-cd)pyrene	SVOA	22	U	22	21	U	21	100	J	22	22	U	22	22	U	22
Isophorone	SVOA	17	U	17	17	U	17	17	U	17	17	U	17	17	U	17
Naphthalene	SVOA	31	U	31	30	U	30	31	U	31	31	U	31	31	U	31
Nitrobenzene	SVOA	22	U	22	21	U	21	22	U	22	22	U	22	22	U	22
N-Nitroso-di-n-dipropylamine	SVOA	31	U	31	30	U	30	31	U	31	31	U	31	31	U	31
N-Nitrosodiphenylamine	SVOA	21	U	21	20	U	20	21	U	21	21	U	21	21	U	21
Pentachlorophenol	SVOA	330	U	330	320	U	320	330	U	330	330	U	330	330	U	330
Phenanthrene	SVOA	17	U	17	17	U	17	190	J	17	17	U	17	17	U	17
Phenol	SVOA	18	U	18	18	U	18	18	U	18	18	U	18	18	U	18
Pyrene	SVOA	13	J	12	12	U	12	270	J	12	12	U	12	12	U	12

Attachment	1	Sheet No.	16 of 20
Originator	J. D. Skoglie	Date	10/23/14
Checked	I. B. Berezovskiy	Date	10/23/14
Calc. No.	0100H-CA-V0209	Rev. No.	0

Attachment 1. 100-H-43 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	SPA-1 - J1TXC1			SPA-2 - J1TXC2			SPA-3 - J1TXC3			SPA-4 - J1TXC4			SPA-5 - J1TXC5		
		8/18/14			8/18/14			8/18/14			8/18/14			8/18/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	28	U	28	28	U	28	27	U	27	28	U	28	27	U	27
1,2-Dichlorobenzene	SVOA	22	U	22	22	U	22	21	U	21	22	U	22	21	U	21
1,3-Dichlorobenzene	SVOA	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12
1,4-Dichlorobenzene	SVOA	14	U	14	14	U	14	13	U	13	14	U	14	13	U	13
2,4,5-Trichlorophenol	SVOA	10	U	10	10	U	10	9.7	U	9.7	10	U	10	9.6	U	9.6
2,4,6-Trichlorophenol	SVOA	10	U	10	10	U	10	9.7	U	9.7	10	U	10	9.6	U	9.6
2,4-Dichlorophenol	SVOA	10	U	10	10	U	10	9.7	U	9.7	10	U	10	9.6	U	9.6
2,4-Dimethylphenol	SVOA	66	U	66	66	U	66	64	U	64	67	U	67	63	U	63
2,4-Dinitrophenol	SVOA	330	U	330	330	U	330	320	U	320	340	U	340	320	U	320
2,4-Dinitrotoluene	SVOA	66	U	66	66	U	66	64	U	64	67	U	67	63	U	63
2,6-Dinitrotoluene	SVOA	28	U	28	28	U	28	27	U	27	28	U	28	27	U	27
2-Chloronaphthalene	SVOA	10	U	10	10	U	10	9.7	U	9.7	10	U	10	9.6	U	9.6
2-Chlorophenol	SVOA	21	U	21	21	U	21	20	U	20	21	U	21	20	U	20
2-Methylnaphthalene	SVOA	19	U	19	19	U	19	18	U	18	19	U	19	18	U	18
2-Methylphenol (cresol, o-)	SVOA	13	U	13	13	U	13	13	U	13	13	U	13	13	U	13
2-Nitroaniline	SVOA	50	U	50	50	U	50	49	U	49	50	U	50	48	U	48
2-Nitrophenol	SVOA	10	U	10	10	U	10	9.7	U	9.7	10	U	10	9.6	U	9.6
3,3'-Dichlorobenzidine	SVOA	90	U	90	90	U	90	87	U	87	91	U	91	87	U	87
3+4 Methylphenol (cresol, m+p)	SVOA	33	U	33	33	U	33	32	U	32	33	U	33	32	U	32
3-Nitroaniline	SVOA	73	U	73	73	U	73	71	U	71	74	U	74	70	U	70
4,6-Dinitro-2-methylpheno	SVOA	330	U	330	330	U	330	320	U	320	330	U	330	320	U	320
4-Bromophenylphenyl ether	SVOA	19	U	19	19	U	19	18	U	18	19	U	19	18	U	18
4-Chloro-3-methylpheno	SVOA	66	U	66	66	U	66	64	U	64	67	U	67	63	U	63
4-Chloroaniline	SVOA	82	U	82	82	U	82	79	U	79	83	U	83	79	U	79
4-Chlorophenylphenyl ether	SVOA	21	U	21	21	U	21	20	U	20	21	U	21	20	U	20
4-Nitroaniline	SVOA	72	U	72	73	U	73	70	U	70	73	U	73	70	U	70
4-Nitrophenol	SVOA	97	U	97	97	U	97	94	U	94	98	U	98	93	U	93
Acenaphthene	SVOA	10	U	10	10	U	10	10	U	10	10	U	10	9.9	U	9.9
Acenaphthylene	SVOA	17	U	17	17	U	17	16	U	16	17	U	17	16	U	16
Anthracene	SVOA	17	U	17	17	U	17	16	U	16	17	U	17	16	U	16
Benzo(a)anthracene	SVOA	20	U	20	20	U	20	19	U	19	25	J	20	19	U	19
Benzo(a)pyrene	SVOA	20	U	20	20	U	20	19	U	19	23	J	20	19	U	19
Benzo(b)fluoranthene	SVOA	26	U	26	26	U	26	25	U	25	40	JX	26	25	U	25
Benzo(ghi)perylene	SVOA	16	U	16	16	U	16	16	U	16	17	J	16	15	U	15
Benzo(k)fluoranthene	SVOA	40	U	40	40	U	40	39	U	39	40	UX	40	38	U	38
Bis(2-chloro-1-methylethyl)ethe	SVOA	23	U	23	23	U	23	22	U	22	23	U	23	22	U	22
Bis(2-Chloroethoxy)methane	SVOA	23	U	23	23	U	23	22	U	22	23	U	23	22	U	22
Bis(2-chloroethyl) ether	SVOA	17	U	17	17	U	17	16	U	16	17	U	17	16	U	16
Bis(2-ethylhexyl) phthalate	SVOA	46	U	46	46	U	46	45	U	45	46	U	46	44	U	44
Butylbenzylphthalate	SVOA	43	U	43	43	U	43	42	U	42	43	U	43	41	U	41
Carbazole	SVOA	36	U	36	36	U	36	35	U	35	36	U	36	35	U	35
Chrysene	SVOA	27	U	27	27	U	27	26	U	26	33	J	27	26	U	26
Dibenz[a,h]anthracene	SVOA	19	U	19	19	U	19	18	U	18	19	U	19	18	U	18
Dibenzofuran	SVOA	20	U	20	20	U	20	19	U	19	20	U	20	19	U	19
Diethyl phthalate	SVOA	26	U	26	26	U	26	25	U	25	26	U	26	25	U	25
Dimethyl phthalate	SVOA	23	U	23	23	U	23	22	U	22	23	U	23	22	U	22
Di-n-butylphthalate	SVOA	29	U	29	29	U	29	28	U	28	29	U	29	28	U	28
Di-n-octylphthalate	SVOA	14	U	14	14	U	14	14	U	14	15	U	15	14	U	14
Fluoranthene	SVOA	36	U	36	36	U	36	35	U	35	47	J	36	35	U	35
Fluorene	SVOA	18	U	18	18	U	18	17	U	17	18	U	18	17	U	17
Hexachlorobenzene	SVOA	29	U	29	29	U	29	28	U	28	29	U	29	28	U	28
Hexachlorobutadiene	SVOA	10	U	10	10	U	10	9.7	U	9.7	10	U	10	9.6	U	9.6
Hexachlorocyclopentadiene	SVOA	50	U	50	50	U	50	49	U	49	50	U	50	48	U	48
Hexachloroethane	SVOA	21	U	21	21	U	21	21	U	21	21	U	21	20	U	20
Indeno(1,2,3-cd)pyrene	SVOA	22	U	22	22	U	22	21	U	21	22	U	22	21	U	21
Isophorone	SVOA	17	U	17	17	U	17	16	U	16	17	U	17	16	U	16
Naphthalene	SVOA	31	U	31	31	U	31	30	U	30	31	U	31	30	U	30
Nitrobenzene	SVOA	22	U	22	22	U	22	21	U	21	22	U	22	21	U	21
N-Nitroso-di-n-dipropylamine	SVOA	31	U	31	31	U	31	30	U	30	31	U	31	30	U	30
N-Nitrosodiphenylamine	SVOA	21	U	21	21	U	21	20	U	20	21	U	21	20	U	20
Pentachlorophenol	SVOA	330	U	330	330	U	330	320	U	320	330	U	330	320	U	320
Phenanthrene	SVOA	17	U	17	17	U	17	16	U	16	26	J	17	16	U	16
Phenol	SVOA	18	U	18	18	U	18	17	U	17	18	U	18	17	U	17
Pyrene	SVOA	12	U	12	13	J	12	20	J	12	55	J	12	12	U	12

Attachment	1	Sheet No.	17 of 20
Originator	J. D. Skoglie	Date	10/23/14
Checked	I. B. Berezovskiy	Date	10/23/14
Calc. No.	0100H-CA-V0209	Rev. No.	0

Attachment 1. 100-H-43 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	SPA-7 - J1TXC7			SPA-8 - J1TXC8			SPA-9 - J1TXC9			SPA-10 - J1TXD0			SPA-11 - J1TXD1		
		8/18/14			8/18/14			8/18/14			8/18/14			8/18/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	27	U	27	27	U	27	28	U	28	27	U	27	27	U	27
1,2-Dichlorobenzene	SVOA	21	U	21	21	U	21	22	U	22	22	U	22	21	U	21
1,3-Dichlorobenzene	SVOA	12	U	12	12	U	12	12	U	12	12	U	12	11	U	11
1,4-Dichlorobenzene	SVOA	13	U	13	13	U	13	14	U	14	13	U	13	13	U	13
2,4,5-Trichlorophenol	SVOA	9.8	U	9.8	9.8	U	9.8	9.9	U	9.9	9.8	U	9.8	9.5	U	9.5
2,4,6-Trichlorophenol	SVOA	9.8	U	9.8	9.8	U	9.8	9.9	U	9.9	9.8	U	9.8	9.5	U	9.5
2,4-Dichlorophenol	SVOA	9.8	U	9.8	9.8	U	9.8	9.9	U	9.9	9.8	U	9.8	9.5	U	9.5
2,4-Dimethylphenol	SVOA	64	U	64	64	U	64	66	U	66	65	U	65	62	U	62
2,4-Dinitrophenol	SVOA	320	U	320	330	U	330	330	U	330	330	U	330	320	U	320
2,4-Dinitrotoluene	SVOA	64	U	64	64	U	64	66	U	66	65	U	65	62	U	62
2,6-Dinitrotoluene	SVOA	27	U	27	27	U	27	28	U	28	27	U	27	27	U	27
2-Chloronaphthalene	SVOA	9.8	U	9.8	9.8	U	9.8	9.9	U	9.9	9.8	U	9.8	9.5	U	9.5
2-Chlorophenol	SVOA	20	U	20	21	U	21	21	U	21	21	U	21	20	U	20
2-Methylnaphthalene	SVOA	19	U	19	19	U	19	19	U	19	19	U	19	18	U	18
2-Methylphenol (cresol, o-)	SVOA	13	U	13	13	U	13	13	U	13	13	U	13	12	U	12
2-Nitroaniline	SVOA	49	U	49	49	U	49	50	U	50	49	U	49	47	U	47
2-Nitrophenol	SVOA	9.8	U	9.8	9.8	U	9.8	9.9	U	9.9	9.8	U	9.8	9.5	U	9.5
3,3'-Dichlorobenzidine	SVOA	88	U	88	88	U	88	89	U	89	88	U	88	85	U	85
3+4 Methylphenol (cresol, m+p)	SVOA	32	U	32	32	U	32	33	U	33	32	U	32	31	U	31
3-Nitroaniline	SVOA	71	U	71	71	U	71	73	U	73	72	U	72	69	U	69
4,6-Dinitro-2-methylpheno	SVOA	320	U	320	320	U	320	330	U	330	320	U	320	310	U	310
4-Bromophenylphenyl ether	SVOA	19	U	19	19	U	19	19	U	19	19	U	19	18	U	18
4-Chloro-3-methylpheno	SVOA	64	U	64	64	U	64	66	U	66	65	U	65	62	U	62
4-Chloroaniline	SVOA	80	U	80	80	U	80	81	U	81	80	U	80	78	U	78
4-Chlorophenylphenyl ether	SVOA	20	U	20	21	U	21	21	U	21	21	U	21	20	U	20
4-Nitroaniline	SVOA	71	U	71	71	U	71	72	U	72	71	U	71	69	U	69
4-Nitrophenol	SVOA	95	U	95	95	U	95	96	U	96	95	U	95	92	U	92
Acenaphthene	SVOA	10	U	10	10	U	10	10	U	10	10	U	10	9.7	U	9.7
Acenaphthylene	SVOA	17	U	17	17	U	17	17	U	17	17	U	17	16	U	16
Anthracene	SVOA	17	U	17	17	U	17	17	U	17	17	U	17	16	U	16
Benzo(a)anthracene	SVOA	20	U	20	22	J	20	20	U	20	20	U	20	19	U	19
Benzo(a)pyrene	SVOA	20	U	20	20	U	20	20	U	20	20	U	20	19	U	19
Benzo(b)fluoranthene	SVOA	26	U	26	26	U	26	26	U	26	26	U	26	25	U	25
Benzo(ghi)perylene	SVOA	16	U	16	16	U	16	16	U	16	16	U	16	15	U	15
Benzo(k)fluoranthene	SVOA	39	U	39	39	U	39	40	U	40	39	U	39	38	U	38
Bis(2-chloro-1-methylethyl)ethe	SVOA	22	U	22	22	U	22	23	U	23	23	U	23	22	U	22
Bis(2-Chloroethoxy)methane	SVOA	22	U	22	22	U	22	23	U	23	23	U	23	22	U	22
Bis(2-chloroethyl) ether	SVOA	16	U	16	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	44	U	44
Butylbenzylphthalate	SVOA	42	U	42	42	U	42	43	U	43	42	U	42	41	U	41
Carbazole	SVOA	35	U	35	35	U	35	36	U	36	35	U	35	34	U	34
Chrysene	SVOA	26	U	26	26	U	26	27	U	27	26	U	26	26	U	26
Dibenz[a,h]anthracene	SVOA	19	U	19	19	U	19	19	U	19	19	U	19	18	U	18
Dibenzofuran	SVOA	20	U	20	20	U	20	20	U	20	20	U	20	19	U	19
Diethyl phthalate	SVOA	25	U	25	25	U	25	26	U	26	25	U	25	25	U	25
Dimethyl phthalate	SVOA	22	U	22	22	U	22	23	U	23	23	U	23	22	U	22
Di-n-butylphthalate	SVOA	28	U	28	28	U	28	29	U	29	28	U	28	27	U	27
Di-n-octylphthalate	SVOA	14	U	14	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	34	U	34
Fluorene	SVOA	18	U	18	18	U	18	18	U	18	18	U	18	17	U	17
Hexachlorobenzene	SVOA	28	U	28	28	U	28	29	U	29	28	U	28	27	U	27
Hexachlorobutadiene	SVOA	9.8	U	9.8	9.8	U	9.8	9.9	U	9.9	9.8	U	9.8	9.5	U	9.5
Hexachlorocyclopentadiene	SVOA	49	U	49	49	U	49	50	U	50	49	U	49	47	U	47
Hexachloroethane	SVOA	21	U	21	21	U	21	21	U	21	21	U	21	20	U	20
Indeno(1,2,3-cd)pyrene	SVOA	21	U	21	63	J	21	22	U	22	22	U	22	21	U	21
Isophorone	SVOA	17	U	17	17	U	17	17	U	17	17	U	17	16	U	16
Naphthalene	SVOA	30	U	30	30	U	30	31	U	31	30	U	30	29	U	29
Nitrobenzene	SVOA	21	U	21	21	U	21	22	U	22	22	U	22	21	U	21
N-Nitroso-di-n-dipropylamine	SVOA	30	U	30	30	U	30	31	U	31	30	U	30	29	U	29
N-Nitrosodiphenylamine	SVOA	20	U	20	21	U	21	21	U	21	21	U	21	20	U	20
Pentachlorophenol	SVOA	320	U	320	320	U	320	330	U	330	320	U	320	310	U	310
Phenanthrene	SVOA	17	U	17	17	U	17	17	U	17	17	U	17	16	U	16
Phenol	SVOA	18	U	18	18	U	18	18	U	18	18	U	18	17	U	17
Pyrene	SVOA	12	U	12	32	J	12	12	U	12	12	U	12	17	J	11

Attachment	1	Sheet No.	18 of 20
Originator	J. D. Skoglie	Date	10/23/14
Checked	I. B. Berezovskiy	Date	10/23/14
Calc. No.	0100H-CA-V0209	Rev. No.	0

Attachment 1. 100-H-43 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	SPA-12 - J1TXD2			FS-1 - J1TXD4			FS-2 - J1TXD5			FS-3 - J1TXD6			FS-4 - J1TXD7		
		8/18/14			8/20/14			8/20/14			8/20/14			8/20/14		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	27	U	27	28	U	28	27	U	27	27	U	27	28	U	28
1,2-Dichlorobenzene	SVOA	21	U	21	22	U	22	22	U	22	21	U	21	22	U	22
1,3-Dichlorobenzene	SVOA	11	U	11	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	13	U	13	13	U	13
2,4,5-Trichlorophenol	SVOA	9.5	U	9.5	10	U	10	9.8	U	9.8	9.5	U	9.5	9.8	U	9.8
2,4,6-Trichlorophenol	SVOA	9.5	U	9.5	10	U	10	9.8	U	9.8	9.5	U	9.5	9.8	U	9.8
2,4-Dichlorophenol	SVOA	9.5	U	9.5	10	U	10	9.8	U	9.8	9.5	U	9.5	9.8	U	9.8
2,4-Dimethylphenol	SVOA	63	U	63	66	U	66	65	U	65	63	U	63	65	U	65
2,4-Dinitrophenol	SVOA	320	U	320	330	U	330	330	U	330	320	U	320	330	U	330
2,4-Dinitrotoluene	SVOA	63	U	63	66	U	66	65	U	65	63	U	63	65	U	65
2,6-Dinitrotoluene	SVOA	27	U	27	28	U	28	27	U	27	27	U	27	28	U	28
2-Chloronaphthalene	SVOA	9.5	U	9.5	10	U	10	9.8	U	9.8	9.5	U	9.5	9.8	U	9.8
2-Chlorophenol	SVOA	20	U	20	21	U	21	21	U	21	20	U	20	21	U	21
2-Methylnaphthalene	SVOA	18	U	18	19	U	19	19	U	19	18	U	18	19	U	19
2-Methylphenol (cresol, o-)	SVOA	12	U	12	13	U	13	13	U	13	12	U	12	13	U	13
2-Nitroaniline	SVOA	47	U	47	50	U	50	49	U	49	48	U	48	49	U	49
2-Nitrophenol	SVOA	9.5	U	9.5	10	U	10	9.8	U	9.8	9.5	U	9.5	9.8	U	9.8
3,3'-Dichlorobenzidine	SVOA	85	U	85	91	U	91	88	U	88	86	U	86	89	U	89
3+4 Methylphenol (cresol, m+p)	SVOA	31	U	31	33	U	33	32	U	32	31	U	31	32	U	32
3-Nitroaniline	SVOA	69	U	69	73	U	73	71	U	71	70	U	70	72	U	72
4,6-Dinitro-2-methylpheno	SVOA	310	U	310	330	U	330	320	U	320	310	U	310	320	U	320
4-Bromophenylphenyl ether	SVOA	18	U	18	19	U	19	19	U	19	18	U	18	19	U	19
4-Chloro-3-methylpheno	SVOA	63	U	63	66	U	66	65	U	65	63	U	63	65	U	65
4-Chloroaniline	SVOA	78	U	78	82	U	82	80	U	80	78	U	78	81	U	81
4-Chlorophenylphenyl ether	SVOA	20	U	20	21	U	21	21	U	21	20	U	20	21	U	21
4-Nitroaniline	SVOA	69	U	69	73	U	73	71	U	71	69	U	69	71	U	71
4-Nitrophenol	SVOA	92	U	92	98	U	98	95	U	95	93	U	93	96	U	96
Acenaphthene	SVOA	9.8	U	9.8	10	U	10	10	U	10	9.8	U	9.8	10	U	10
Acenaphthylene	SVOA	16	U	16	17	U	17	17	U	17	16	U	16	17	U	17
Anthracene	SVOA	16	U	16	17	U	17	17	U	17	16	U	16	17	U	17
Benzo(a)anthracene	SVOA	53	J	19	20	U	20	20	U	20	19	U	19	75	J	20
Benzo(a)pyrene	SVOA	47	J	19	20	U	20	20	U	20	19	U	19	80	J	20
Benzo(b)fluoranthene	SVOA	55	J	25	26	U	26	26	U	26	25	U	25	110	J	26
Benzo(ghi)perylene	SVOA	32	J	15	16	U	16	16	U	16	15	U	15	57	J	16
Benzo(k)fluoranthene	SVOA	38	U	38	40	U	40	39	U	39	38	U	38	39	U	39
Bis(2-chloro-1-methylethyl)ethe	SVOA	22	U	22	23	U	23	23	U	23	22	U	22	23	U	23
Bis(2-Chloroethoxy)methane	SVOA	22	U	22	23	U	23	23	U	23	22	U	22	23	U	23
Bis(2-chloroethyl) ether	SVOA	16	U	16	17	U	17	16	U	16	16	U	16	16	U	16
Bis(2-ethylhexyl) phthalate	SVOA	44	U	44	46	U	46	45	U	45	44	U	44	45	U	45
Butylbenzylphthalate	SVOA	41	U	41	43	U	43	42	U	42	41	U	41	42	U	42
Carbazole	SVOA	34	U	34	36	U	36	35	U	35	34	U	34	35	U	35
Chrysene	SVOA	55	J	26	27	U	27	26	U	26	26	U	26	85	J	27
Dibenz[a,h]anthracene	SVOA	18	U	18	19	U	19	19	U	19	18	U	18	19	U	19
Dibenzofuran	SVOA	19	U	19	20	U	20	20	U	20	19	U	19	20	U	20
Diethyl phthalate	SVOA	25	U	25	26	U	26	25	U	25	25	U	25	26	U	26
Dimethyl phthalate	SVOA	22	U	22	23	U	23	23	U	23	22	U	22	23	U	23
Di-n-butylphthalate	SVOA	28	U	28	29	U	29	28	U	28	28	U	28	29	U	29
Di-n-octylphthalate	SVOA	14	U	14	14	U	14	14	U	14	14	U	14	14	U	14
Fluoranthene	SVOA	91	J	34	36	U	36	35	U	35	34	U	34	130	J	35
Fluorene	SVOA	17	U	17	18	U	18	18	U	18	17	U	17	18	U	18
Hexachlorobenzene	SVOA	28	U	28	29	U	29	28	U	28	28	U	28	29	U	29
Hexachlorobutadiene	SVOA	9.5	U	9.5	10	U	10	9.8	U	9.8	9.5	U	9.5	9.8	U	9.8
Hexachlorocyclopentadiene	SVOA	47	U	47	50	U	50	49	U	49	48	U	48	49	U	49
Hexachloroethane	SVOA	20	U	20	21	U	21	21	U	21	20	U	20	21	U	21
Indeno(1,2,3-cd)pyrene	SVOA	90	J	21	22	U	22	22	U	22	21	U	21	110	J	22
Isophorone	SVOA	16	U	16	17	U	17	17	U	17	16	U	16	17	U	17
Naphthalene	SVOA	29	U	29	31	U	31	30	U	30	30	U	30	31	U	31
Nitrobenzene	SVOA	21	U	21	22	U	22	22	U	22	21	U	21	22	U	22
N-Nitroso-di-n-dipropylamine	SVOA	29	U	29	31	U	31	30	U	30	30	U	30	31	U	31
N-Nitrosodiphenylamine	SVOA	20	U	20	21	U	21	21	U	21	20	U	20	21	U	21
Pentachlorophenol	SVOA	310	U	310	330	U	330	320	U	320	310	U	310	320	U	320
Phenanthrene	SVOA	34	J	16	17	U	17	17	U	17	16	U	16	71	J	17
Phenol	SVOA	17	U	17	18	U	18	18	U	18	17	U	17	18	U	18
Pyrene	SVOA	87	J	11	12	U	12	26	J	12	12	U	12	120	J	12

Attachment	1	Sheet No.	19 of 20
Originator	J. D. Skoglie	Date	10/23/14
Checked	I. B. Berezovskiy	Date	10/23/14
Calc. No.	0100H-CA-V0209	Rev. No.	0

Attachment 1. 100-H-43 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	Equipment Blank - J1TXC0 8/19/14		
		ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	27	U	27
1,2-Dichlorobenzene	SVOA	21	U	21
1,3-Dichlorobenzene	SVOA	12	U	12
1,4-Dichlorobenzene	SVOA	13	U	13
2,4,5-Trichlorophenol	SVOA	9.7	U	9.7
2,4,6-Trichlorophenol	SVOA	9.7	U	9.7
2,4-Dichlorophenol	SVOA	9.7	U	9.7
2,4-Dimethylphenol	SVOA	64	U	64
2,4-Dinitrophenol	SVOA	320	U	320
2,4-Dinitrotoluene	SVOA	64	U	64
2,6-Dinitrotoluene	SVOA	27	U	27
2-Chloronaphthalene	SVOA	9.7	U	9.7
2-Chlorophenol	SVOA	20	U	20
2-Methylnaphthalene	SVOA	18	U	18
2-Methylphenol (cresol, o-)	SVOA	13	U	13
2-Nitroaniline	SVOA	49	U	49
2-Nitrophenol	SVOA	9.7	U	9.7
3,3'-Dichlorobenzidine	SVOA	87	U	87
3+4 Methylphenol (cresol, m+p)	SVOA	32	U	32
3-Nitroaniline	SVOA	71	U	71
4,6-Dinitro-2-methylphenol	SVOA	320	U	320
4-Bromophenylphenyl ether	SVOA	18	U	18
4-Chloro-3-methylphenol	SVOA	64	U	64
4-Chloroaniline	SVOA	80	U	80
4-Chlorophenylphenyl ether	SVOA	20	U	20
4-Nitroaniline	SVOA	70	U	70
4-Nitrophenol	SVOA	94	U	94
Acenaphthene	SVOA	10	U	10
Acenaphthylene	SVOA	17	U	17
Anthracene	SVOA	17	U	17
Benzo(a)anthracene	SVOA	19	U	19
Benzo(a)pyrene	SVOA	19	U	19
Benzo(b)fluoranthene	SVOA	25	U	25
Benzo(ghi)perylene	SVOA	16	U	16
Benzo(k)fluoranthene	SVOA	39	U	39
Bis(2-chloro-1-methylethyl)ether	SVOA	22	U	22
Bis(2-Chloroethoxy)methane	SVOA	22	U	22
Bis(2-chloroethyl) ether	SVOA	16	U	16
Bis(2-ethylhexyl) phthalate	SVOA	45	U	45
Butylbenzylphthalate	SVOA	42	U	42
Carbazole	SVOA	35	U	35
Chrysene	SVOA	26	U	26
Dibenz[a,h]anthracene	SVOA	18	U	18
Dibenzofuran	SVOA	19	U	19
Diethyl phthalate	SVOA	25	U	25
Dimethyl phthalate	SVOA	22	U	22
Di-n-butylphthalate	SVOA	28	U	28
Di-n-octylphthalate	SVOA	14	U	14
Fluoranthene	SVOA	35	U	35
Fluorene	SVOA	17	U	17
Hexachlorobenzene	SVOA	28	U	28
Hexachlorobutadiene	SVOA	9.7	U	9.7
Hexachlorocyclopentadiene	SVOA	49	U	49
Hexachloroethane	SVOA	21	U	21
Indeno(1,2,3-cd)pyrene	SVOA	21	U	21
Isophorone	SVOA	17	U	17
Naphthalene	SVOA	30	U	30
Nitrobenzene	SVOA	21	U	21
N-Nitroso-di-n-dipropylamine	SVOA	30	U	30
N-Nitrosodiphenylamine	SVOA	20	U	20
Pentachlorophenol	SVOA	320	U	320
Phenanthrene	SVOA	17	U	17
Phenol	SVOA	17	U	17
Pyrene	SVOA	12	U	12

Attachment	1	Sheet No.	20 of 20
Originator	J. D. Skoglie	Date	10/23/14
Checked	I. B. Berezovskiy	Date	10/23/14
Calc. No.	0100H-CA-V0209	Rev. No.	0

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CALCULATION COVER SHEET

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

Area: 100-H

Discipline: Environmental *Calculation No: 0100H-CA-V0210

Subject: 100-H-43 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 = 4 Total = 5	J. D. Skoglie	T. Q. Howell	R. J. Nielson	S. G. Wilkinson	11/3/14

SUMMARY OF REVISION

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

Washington Closure Hanford CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	11/3/2014	Calc. No.:	0100H-CA-V0210	Rev.:	0
Project:	100-H Area Closure Operations	Job No:	14655	Checked:	T. Q. Howell	Date:	11/3/2014
Subject:	100-H-43 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 1 of 4	

PURPOSE:

Provide documentation to support the calculation of the direct contact hazard quotient (HQ) and excess carcinogenic risk for the 100-H-43 waste site. In accordance with the remedial action goals (RAGs) in the remedial design report/remedial action work plan (RDR/RAWP) (DOE-RL 2009b), the following criteria must be met:

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

GIVEN/REFERENCES:

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

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

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

4) WCH, 2014, *100-H-43 Waste Site Cleanup Verification 95% UCL Calculations*, Calculation Number 0100H-CA-V0209, Washington Closure Hanford, Richland, Washington.

SOLUTION:

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

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

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

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

Washington Closure Hanford CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	11/3/2014	Calc. No.:	0100H-CA-V0210	Rev.:	0
Project:	100-H Area Closure Operations	Job No:	14655	Checked:	T. Q. Howell	Date:	11/3/2014
Subject:	100-H-43 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 2 of 4	

METHODOLOGY:

The 100-H-43 waste site underwent statistical sampling at 2 decision units for verification sampling; an excavation and staging pile area. Four focused samples were also collected. Sample locations EXC-3 and EXC-12 failed the direct exposure remedial action goal (RAG) for arsenic and focused sample FS-4 failed the direct exposure RAG for benzo(a)pyrene. These three locations were remediated and re-sampled. Both semivolatile organic analysis (Method 8270 - SVOAs) and polycyclic aromatic hydrocarbons (Method 8310 - PAHs) were performed, however, Method 8310 will be used preferentially over Method 8270 for the PAH analytes. The direct contact hazard quotient and carcinogenic risk calculations for the 100-H-43 waste site were conservatively calculated for the entire data set using the greater of the maximum and the statistical verification soil sample results (WCH 2014). Of the contaminants of potential concern (COPCs) for this site, boron, hexavalent chromium, molybdenum, the detected polycyclic aromatic hydrocarbons (PAHs), the detected pesticides, and the detected polychlorinated biphenyls (PCBs) require HQ and risk calculations because these analytes were detected and a Washington State or Hanford Site background value is not available. Selenium was included because this constituent was detected above the Washington State background value. Lead was detected above background; however, lead does not have a reference dose for calculation of a hazard quotient because toxic effects of lead are correlated with blood-lead levels rather than exposure levels or daily intake. Although total petroleum hydrocarbons (diesel range EXT) were detected and no background value is available, the risk associated with total petroleum hydrocarbons do not contribute to the cumulative toxicity calculation. Additionally, arsenic was detected above background; however, the arsenic standard is not toxicity based. All other site nonradionuclide COPCs were either 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 1.3×10^{-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 and all other individual values to the requirement of $<1 \times 10^{-6}$, this criterion is met.

4) After these calculations are completed for the carcinogenic analytes, the cumulative excess cancer risk can be obtained by summing the individual values. The excess cancer risk for these is 1.4×10^{-6}. Comparing this value to the requirement of $<1 \times 10^{-5}$, this criterion is met.

Washington Closure Hanford CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	11/3/2014	Calc. No.:	0100H-CA-V0210	Rev.:	0
Project:	100-H Area Closure Operations	Job No:	14655	Checked:	T. Q. Howell	Date:	11/3/2014
Subject:	100-H-43 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 3 of 4	

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 hazard quotient and excess cancer risk calculations.

Table 1. Direct Contact Hazard Quotient and Excess Cancer Risk Results for the 100-H-43 Waste Site (2 pages).

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					
Arsenic [c]	13	20	–	–	–
Boron	2.0	7200	2.8E-04	–	–
Chromium, hexavalent [d]	0.321	240	1.3E-03	2.1	1.5E-07
Lead [e]	55.4	353	–	–	–
Molybdenum	0.37	400	9.3E-04	–	–
Selenium	0.98	400	2.5E-03	–	–
Polycyclic Aromatic Hydrocarbons					
Acenaphthene	0.015	4800	3.1E-06	–	–
Anthracene	0.0057	24000	2.4E-07	–	–
Benzo(a)anthracene	0.082	–	–	1.37	6.0E-08
Benzo(a)pyrene	0.081	–	–	0.137	5.9E-07
Benzo(b)fluoranthene	0.077	–	–	1.37	5.6E-08
Benzo(ghi)perylene [f]	0.043	2400	1.8E-05	–	–
Benzo(k)fluoranthene	0.041	–	–	1.37	3.0E-08
Chrysene	0.090	–	–	13.7	6.6E-09
Dibenz(a,h)anthracene	0.020	–	–	1.37	1.5E-08
Fluoranthene	0.091	3200	2.8E-05	–	–
Fluorene	0.010	3200	3.1E-06		–
Indeno(1,2,3-cd)pyrene	0.076	–	–	1.37	5.5E-08
Phenanthrene [f]	0.054	24000	2.3E-06	–	–
Pyrene	0.099	2400	4.1E-05	–	–

Washington Closure Hanford CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	11/3/2014	Calc. No.:	0100H-CA-V0210	Rev.:	0
Project:	100-H Area Closure Operations	Job No:	14655	Checked:	T. Q. Howell	Date:	11/3/2014
Subject:	100-H-43 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 4 of 4	

Table 1. Direct Contact Hazard Quotient and Excess Cancer Risk Results for the 100-H-43 Waste Site (2 pages).

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
Pesticides					
DDE, 4,4'-	0.019	--	--	2.94	6.5E-09
DDT, 4,4'-	0.019	40	4.8E-04	2.94	6.5E-09
Dieldrin	0.023	4	5.8E-03	0.0625	3.7E-07
Endrin (and ketone, aldehyde)	0.00053	24	2.2E-05		
Polychlorinated Biphenyls					
Aroclor-1254	0.0030	1.6	1.9E-03	0.5	6.0E-09
Aroclor-1260	0.0033	--	--	0.5	6.6E-09
Total Petroleum Hydrocarbons					
TPH - diesel range extended [g]	70	200	--	--	--
Totals					
Cumulative Hazard Quotient:			**1.3E-02**		
Cumulative Excess Cancer Risk:					**1.4E-06**

Notes:

[a] = From Attachment 1.

[b] = Value obtained from the 100 Area RDR/RAWP (DOE-RL 2009b) or *Washington Administrative Code* (WAC) 173-340-740(3), Method B, 1996, unless otherwise noted.

[c] = The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement Project Managers as discussed in Section 2.1.2.1 of the RDR/RAWP (DOE-RL 2009a).

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

[e] = Value for the noncarcinogenic RAG calculated using Guidance Manual for the Integrated Exposure Uptake Biokinetic Model for Lead in Children, EPA/540/R 93/081, Publication No. 9285.7, U.S. Environmental Protection Agency, Washington, D.C.

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

[g] = 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-H-43 waste site meets the requirements for the direct contact hazard quotient and carcinogenic (excess cancer) risk as identified in the RDR/RAWP (DOE-RL 2009b) and SAP (DOE-RL 2009a). The direct contact hazard quotient and carcinogenic (excess cancer) risk calculations are for use in the RSVP for this site.

Acrobat 8.0

CALCULATION COVER SHEET

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

Area: 100-H

Discipline: Environmental *Calculation No: 0100H-CA-V0211

Subject: 100-H-43 Waste Site Hazard Quotient and Carcinogenic Risk Calculations for Protection of Groundwater

Computer Program: Excel Program No: Excel 2010

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

Committed Calculation ☒ Preliminary ☐ Superseded ☐ Voided ☐

Rev.	Sheet Numbers	Originator	Checker	Reviewer	Approval	Date
0	Cover = 1 Sheets = 3 Total = 4	J. D. Skoglie	T. Q. Howell	R. J. Nielson	S. G. Wilkinson	11/3/14

SUMMARY OF REVISION

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

Washington Closure Hanford CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	10/29/2014	Calc. No.:	0100H-CA-V0211	Rev.:	0
Project:	100-H Area Closure Operations	Job No:	14655	Checked:	T. Q. Howell	Date:	10/29/2014
Subject:	100-H-43 Waste Site Hazard Quotient and Carcinogenic Risk Calculations for Protection of Groundwater					Sheet No. 1 of 3	

PURPOSE:

Provide documentation to support the calculation of the hazard quotient (HQ) and excess carcinogenic risk associated with soil contaminant levels compared to soil cleanup levels for protection of groundwater for the 100-H-43 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 $\leq 1 \times 10^{-6}$ for individual carcinogens
4) A cumulative excess cancer risk of $\leq 1 \times 10^{-5}$ for carcinogens.

GIVEN/REFERENCES:

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

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

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

4) WCH, 2014, *100-H-43 Waste Site Cleanup Verification 95% UCL Calculations*, Calculation Number 0100H-CA-V0209, Washington Closure Hanford, Richland, Washington.

SOLUTION:

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

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

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

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

Washington Closure Hanford CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	10/29/2014	Calc. No.:	0100H-CA-V0211	Rev.:	0
Project:	100-H Area Closure Operations	Job No:	14655	Checked:	T. Q. Howell	Date:	10/29/2014
Subject:	100-H-43 Waste Site Hazard Quotient and Carcinogenic Risk Calculations for Protection of Groundwater					Sheet No. 2 of 3	

METHODOLOGY:

The 100-H-43 waste site underwent statistical sampling at two decision units for verification sampling; the excavation area and the staging pile area. Four focused and one duplicate sample were also collected. The protection of groundwater hazard quotient and carcinogenic risk calculations for the 100-H-43 waste site were conservatively calculated for the entire waste site using the greatest of the maximum soil sample results (WCH 2014). Of the contaminants of potential concern (COPCs) for this site boron, hexavalent chromium, and acenapthene required an HQ and risk calculation because these analytes were detected and a Washington State or Hanford Site background value is not available, and the distribution coefficient is less than that necessary to show no migration to groundwater in 1,000 years using the generic site RESRAD model (BHI 2005). Selenium was included because this analyte was detected above the Washington State background value and the distribution coefficient is less than that necessary to show no migration to groundwater in 1,000 years. Based on this model and a vadose zone of approximately 10 m (35 ft) thick, a K_d of 7.2 or greater is required to show no predicted migration to groundwater in 1,000 years. Arsenic was detected above background and the distribution coefficient is less than that necessary; however, the arsenic cleanup level is not toxicity based, therefore, HQ and risk calculations for arsenic are not performed. All other site nonradionuclide COPCs were not detected, quantified below background levels, or have a K_d greater than or equal to 7.2. An example of the HQ and risk calculations for soil constituents with a potential impact to groundwater is presented below:

1) The hazard quotient is defined as the ratio of the dose of a substance obtained over a specified time (mg/kg/day) to a reference dose for the same substance derived over the same specified time (mg/kg/day). The hazard quotient can also be calculated as the ratio of the concentration in soil (maximum or statistical value) (mg/kg) to the soil RAG (mg/kg) for protection of groundwater, where the RAG is the groundwater cleanup level (mg/L) (calculated with, and related to the hazard quotient through, WAC 173-340-720(3)(a)(ii)(A), 1996) x 100 x 1 mg/1000 mg (conversion factor). This is based on the "100 times rule" of WAC 173-340-740(3)(a)(ii)(A) (1996). For example, the maximum value for boron of 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-H-43 waste site is 2.7×10^{-1}. Comparing this value to the requirement of ≤1.0, this criterion is met.

3) To calculate the excess cancer risk, the maximum value is divided by the carcinogenic RAG value and multiplied by 1×10^{-6}. For this site, there were not any constituents detected above background and/or above a Kd value of 7.2 that had a carcinogenic RAG. Therefore, the requirement of $\leq 1 \times 10^{-6}$ is met.

4) After these calculations are completed for the carcinogenic analytes, the cumulative excess cancer risk can be obtained by summing the individual values. To avoid errors due to intermediate rounding, the individual cancer risk values prior to rounding are used for this calculation. For this site, there were not any constituents detected above background and/or above a Kd value of 7.2 that had a carcinogenic RAG. Therefore, the requirement of $\leq 1 \times 10^{-5}$ is met.

Washington Closure Hanford CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	10/29/2014	Calc. No.:	0100H-CA-V0211	Rev.:	0
Project:	100-H Area Closure Operations	Job No:	14655	Checked:	T. Q. Howell	Date:	10/29/2014
Subject:	100-H-43 Waste Site Hazard Quotient and Carcinogenic Risk Calculations for Protection of Groundwater					Sheet No. 3 of 3	

5) The soil cleanup RAGs for protection of groundwater are based on the "100 times" provision in WAC 173-340-740(3)(a)(ii)(A). WAC 173-340-740(3)(a)(ii)(A) (1996) provides the "100 times rule" but also states "unless it can be demonstrated that a higher soil concentration is protective of ground water at the site." When the "100 times rule" values are exceeded, RESRAD was used to demonstrate that higher soil concentrations may be protective of groundwater.

RESULTS:

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

Table 1 shows the results of the calculations.

Table 1. Hazard Quotient and Excess Cancer Risk Results for the 100-H-43 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					
Arsenic [c]	13	20	--	0.667	--
Boron	2.0	320	6.3E-03	--	--
Chromium, hexavalent	0.321	4.8	6.7E-02	--	--
Selenium	0.98	5	2.0E-01	--	--
Polycyclic Aromatic Hydrocarbons					
Acenapthene	0.015	96	1.6E-04	--	--
Totals					
Cumulative Hazard Quotient:			**2.7E-01**		
Cumulative Excess Cancer Risk:					**0.0E+00**

Notes:

[a] = From WCH (2014).

[b] = Value obtained from the Cleanup Levels and Risk Calculations (CLARC) database using Groundwater, Method B, results and the "100 times" model.

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

-- = not applicable

RAG = remedial action goal

CONCLUSION:

This calculation demonstrates that the 100-H-43 waste site meets the requirements for the hazard quotient and excess carcinogenic risk 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.

To ensure quality data, the 100 Area SAP (DOE-RL 2009) data assurance requirements and the *Data Validation Procedure 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-H-43 waste site were provided by the laboratories in four sample delivery groups (SDGs): SDG JP0849, JP0850, JP0851, and JP0865. SDG JP0850 was submitted for third-party validation. No major deficiencies were noted. Minor deficiencies are discussed for the 100-H-43 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.

MINOR DEFICIENCIES

SDG JP0849

This SDG comprises 13 statistical soil samples (J1TXC1 through J1TXC9, J1TXD0 through J1TXD3) from the 100-H-43 staging pile area, where sample J1TXD3 is a duplicate of sample J1TXC6. All samples were analyzed for inductively coupled plasma (ICP) metals, mercury, hexavalent chromium, pesticides, extended Northwest total petroleum hydrocarbons – diesel range organics (NWTPH-D+), semivolatile organic compounds (SVOCs), polycyclic aromatic hydrocarbons (PAH), and polychlorinated biphenyls (PCBs). No major deficiencies were identified in these data. Minor deficiencies are as follows.

In the SVOC analysis, the analytes benzo(b)fluoranthene and benzo(k)fluoranthene were unresolved in sample J1TXC4 due to matrix interference. The resulting combined peak was

reported as benzo(b)fluoranthene, and benzo(k)fluoranthene was reported as undetected. The laboratory has qualified these results with "K" flags. Results for benzo(b)fluoranthene and benzo(k)fluoranthene should be considered estimated. Estimated data are usable for decision-making purposes.

In the gasoline range organics portion of the NWTPH-Gx analysis the laboratory control sample (LCS) exhibited an elevated percent recovery outside the quality control (QC) limits suggesting a possible high bias in the associated field data. Additionally, the relative percent difference calculated between the LCS and the laboratory control standard duplicate was outside the QC limits. The laboratory has qualified the associated data with "N" flags. Gasoline range organics were not detected in any of the field sample data so the possible high bias associated with the data is inconsequential. Nondetected and high biased data are usable for decision-making purposes.

In the pesticide analysis, the final continuing calibration verification standard results for endrin and dichlorodiphenyldichloroethylene (4,4'-DDE) each exhibited percent differences of 17%, which is greater than the QC limit of 15%. This suggests a possible high bias in the field sample data. However, all of the associated field sample results were nondetected for endrin and 4,4-DDE; therefore, there is no impact to the evaluation of the 100-H-43 waste site. The data are usable for decision-making purposes.

In the PAH analysis, the relative percent differences (RPDs) calculated between the primary and confirmatory columns exceeded the QC limit of 40%. The laboratory has reported matrix interference on both columns. The associated data was qualified by the laboratory with "X" flags due to the matrix interference. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the PAH analysis, the matrix spike (MS) and matrix spike duplicate (MSD) performed on sample J1TXC4 produced recoveries outside the QC limits. The laboratory has qualified the associated data with "N" flags. The LCS recoveries for these analytes show that the analytical system was operating within control. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, evaluation of a serial digestion indicates physical and/or chemical interference for the analyte zinc. The associated results have been qualified by the laboratory with "X" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, low levels of barium, magnesium, and calcium were detected in the method blank (MB). These detections are less than half of the associated reporting limits. There is no significant impact to the field sample data. The data are usable for decision-making purposes.

In the ICP metals analysis, the RPD calculated for sodium in the duplicate analysis of sample J1TXC1 is outside the QC limit. The laboratory has qualified the associated data with "M" flags.

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

SDG JP0850

This SDG comprises 13 statistical soil samples (J1TX87 through J1TX89, J1TX90 through J1TX99) from the 100-H-43 excavation, where sample J1TX99 is a duplicate of sample J1TX91. All samples were analyzed for ICP metals, mercury, hexavalent chromium, pesticides, NWTPH-D+, SVOCs, PAH, and PCBs. Additionally, an equipment blank sample (J1TXC0) is included in SDG JP0850, which was analyzed for ICP metals, mercury, and SVOCs. SDG JP0850 was submitted for third-party validation. No major deficiencies were identified in these data. Minor deficiencies are as follows.

In the ICP metals analysis, the MS recoveries for antimony (49%), chromium (54%), and silicon (11%) are outside QC limits. Third-party validation qualified all antimony, chromium, and silicon results in SDG JP08050 as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the LCS recovery for silicon (15%) is outside QC limits. Third-party validation qualified all silicon results in SDG JP08050 as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the RPD calculated for chromium (34%) is outside QC limits. Third-party validation qualified all chromium results in SDG JP08050 as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the pesticide analysis, no MS, MSD, or LCS analyses were performed for toxaphene. This is standard practice for laboratories performing pesticide screenings. Toxaphene is a mixture of compounds that would inhibit the analysis of other pesticides if it were included in the spiking mixture. Third-party validation qualified all toxaphene results in SDG JP08050 as estimated with "J" flags. Estimated data are usable for decision-making purposes.

SDG JP0851

This SDG comprises four focused soil samples (J1TXD4 through J1TXD7) from the 100-H-43 excavation. All samples were analyzed for ICP metals, mercury, hexavalent chromium, pesticides, NWTPH-D+, SVOCs, PAH, and PCBs. No major deficiencies were identified in these data. Minor deficiencies are as follows.

In the pesticide analysis, the RPD calculated between the primary and confirmatory column for endrin in sample J1TDX7 exceeded the QC limits. The laboratory has reported the higher of the two results and qualified that result with a "Y." This result may be considered estimated. Estimated data are usable for decision-making purposes.

In the pesticide analysis, the MS/MSD performed on sample J1TXD5 exhibited recoveries outside the QC limits. Acceptable LCS results indicate that the analytical system was operating

within control. The laboratory qualified the associated results with "N" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the pesticide analysis, the percent differences for the continuing calibration verification standard and the analyte endrin on the confirmatory column is above the QC limits. This result suggests a possible high bias on the confirmatory column for endrin. Endrin results from the primary column have been reported without qualification. The data are usable for decision-making purposes.

In the PCB analysis, surrogate recoveries in the MB were reported outside the QC limits and biased low. Surrogate recoveries associated with the field samples are all within QC limits. The laboratory concluded that the anomaly is limited to the MB. No qualifications were applied to the field sample data. The data are usable for decision-making purposes.

In the PAH analysis, the RPDs calculated between the primary and confirmatory columns exceeded the QC limit (40%) for multiple analytes. The laboratory found matrix interference to be evident on both columns. Due to the matrix interference the laboratory has reported the lower of the two values and qualified those results with "X" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, an evaluation by serial dilution indicates that physical and chemical interferences are present for the analyte zinc. The laboratory has qualified all results for zinc in SDG JP0851 with "X" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, iron was detected in the MB at a concentration greater than the reporting limit. Iron is a common laboratory contaminant. However, the iron concentrations reported for the field samples are all more than 20 times the MB result. Therefore, there is no appreciable impact on the field sample data and no qualifiers have been applied. The data are usable for decision-making purposes.

In the ICP metals analysis, barium, calcium, and magnesium were detected in the MB. The concentrations reported in the MB for these analytes are less than half of the reporting limit. There is no significant impact to the field sample data and no qualifiers have been applied. The data are usable for decision-making purposes.

In the ICP metals analysis, the MS recoveries for boron and silicon are outside the QC limits. The laboratory has qualified the associated data with "N" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

An analysis for percent moisture is also performed on the samples. The duplicate analysis of sample J1TXD6 exceeded the RPD limit. The laboratory qualified the associated result with an "M" flag. This result may be considered estimated. Estimated data are usable for decision-making purposes.

SDG JP0865

This SDG comprises three replacement statistical soil samples (J1V0F0, J1V0F1, J1V0F2) from the 100-H-43 excavation. Samples J1V0F0 and J1V0F1 were analyzed for ICP metals. Sample J1V0F2 was analyzed for PAH. No major deficiencies were identified in these data. Minor deficiencies are as follows.

In the PAH analysis, the MS/MSD recoveries for dibenzo(a,h)anthracene are outside the QC limits. Acceptable LCS recovery for dibenzo(a,h)anthracene indicates that the analytical system was operating within control. The laboratory has qualified the dibenzo(a,h)anthracene result in sample J1V0F2 as estimated with a "J" flag. This result may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, an evaluation by serial dilution has indicated physical and chemical interferences are present for the analyte copper. The laboratory has qualified the associated copper results with "X" flags. These results may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the MS recovery for magnesium is outside the QC limits. There is no indication that the analytical system is operating out of control. Method accuracy is confirmed by acceptable LCS results. The laboratory has qualified the associated magnesium data with "N" flags. These data 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	J1TX91	J1TX99
Staging Pile Area	J1TXC6	J1TXD3

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.

Only the RPD calculated for lead (41.3%) in the field duplicate pair (J1TX91, J1TX99) from the excavation area was above the acceptance criteria of 30%. Elevated RPDs in environmental samples are generally attributed to natural heterogeneities in the sample matrix. 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 (TDL), including undetected analytes. In these cases, a control limit of ±2 times the TDL is used (Appendix C) to indicate that a visual check of the data is required by the reviewer. The total petroleum hydrocarbons, diesel range extended results in the excavation area field duplicate pair (J1TX91, J1TX99) were greater than ±2 times the TDL. However, the values are less than five times the TDL. These results may be attributed to heterogeneities in the sample matrix. There is no indication that the analytical system was operating out of control.

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-H-43 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-H-43 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.

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