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

11-AMRC-0166

JUN 27 2011

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

Dear Ms. Hedges:

TRANSMITTAL OF APPROVED WASTE SITE RECLASSIFICATION FORM AND SUPPORTING DOCUMENTATION FOR THE 100-H-4, 1717-H HOT SHOP, FRENCH DRAIN, CONTAMINATED STORAGE UNIT, REVISION 0

Attached for your use is the approved Waste Site Reclassification Form No. 2011-001 and supporting "Remaining Sites Verification Package for the 100-H-4, 1717-H Hot Shop, French Drain, and Contaminated Storage Unit," Revision 0. If you have questions, please contact me or your staff may contact Joanne Chance, of my staff, at (509) 376-0811.

Sincerely,

Mark S. French, Federal Project Director
for the River Corridor Closure Project

AMRC:JCC

Attachment

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

cc w/o attach:
R. D. Cantwell, WCH
S. A. Christman, CHPRC
S. L. Feaster, WCH
T. A. Harris, WCH
M. L. Proctor, WCH

Date Submitted: 2/14/11 Originator: M. L. Proctor Phone: 372-9227	**WASTE SITE RECLASSIFICATION FORM** Operable Unit(s): 100-HR-1 Waste Site Code: 100-H-4 Type of Reclassification Action: Closed Out ☐ Interim Closed Out ☒ No Action ☐ RCRA Postclosure ☐ Rejected ☐ Consolidated ☐	Control Number: 2011-001

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

Description of current waste site condition:
The 100-H-4, 1717-H Hot Shop, French Drain, and Contaminated Storage Unit waste site is located within the 100-HR-1 Operable Unit on the Hanford Site in southeastern Washington State. The 1717-H Building provided centralized service facilities for certain 100 Area maintenance requirements. The site has been remediated and presently exists as an open excavation. Remediation, verification sampling, and comparison of residual contaminant concentrations against cleanup levels have been performed in accordance with remedial action objectives and goals established by the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD), U.S. Environmental Protection Agency, Region 10, Seattle, Washington (EPA 1999). The 100-H-4 waste site was a candidate site for confirmatory sampling in the Remaining Sites ROD (EPA 1999). The site was recommended for remediation because confirmatory sampling determined that contamination exceeded direct exposure remedial action goals (RAGs). The selected action involved: (1) evaluating the site using available process information, (2) remediating the site, (3) demonstrating through verification sampling that cleanup goals have been achieved, and (4) proposing the site for reclassification to Interim Closed Out.

Basis for reclassification:
Evaluation of verification sampling data for the 100-H-4 waste site demonstrates that this site meets the remedial action objectives and associated RAGs specified in the Remaining Sites ROD. This site will support future unrestricted land uses that can be represented (or bounded) by a rural-residential scenario. Sampling and modeling results also showed that this site will support unrestricted future use of shallow-zone soil (i.e., surface to 4.6 m [15 ft]) and is protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone. Therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. In accordance with this evaluation, the verification sampling and/or modeling results support a reclassification of this site to Interim Closed Out. The basis for reclassification is described in detail in the *Remaining Sites Verification Package for the 100-H-4, 1717-H Hot Shop, French Drain, and Contaminated Storage Unit* (attached).

Regulator Comments:
Approval of this WSRF documents regulator agreement that the 100-H-4 waste site qualifies for "Interim Closed Out" under this Interim Action ROD. In addition, Ecology has evaluated the data for this site against WAC 173-340 (2007) clean-up levels for direct contact, groundwater protection, and river protection. This evaluation is documented in the letter transmitting Ecology's approval of the site's interim reclassification to "Interim Closed Out".

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

M. S. French DOE Federal Project Director (printed)	Mark S. French Signature	5/29/11 Date
N. Menard Ecology Project Manager (printed)	Nina M. Menard Signature	6/1/11 Date
EPA Project Manager (printed)	Signature	Date

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-H-4, 1717-H HOT SHOP, FRENCH DRAIN, AND CONTAMINATED STORAGE UNIT

Attachment to Waste Site Reclassification Form 2011-001

February 2011

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-H-4, 1717-H HOT SHOP, FRENCH DRAIN, AND CONTAMINATED STORAGE UNIT

EXECUTIVE SUMMARY

The 100-H-4, 1717-H Hot Shop, French Drain, and Contaminated Storage Unit waste site is located within the 100-HR-1 Operable Unit on the Hanford Site in southeastern Washington State. The Waste Information Data System (WIDS) and the Stewardship Information System (SIS) report that the 1717-H Building provided centralized service facilities for certain 100 Area maintenance requirements. The 1717-H Building housed a machine shop, sheet metal shop, fabrication shop, hot shop, and carpenter shop. The fabrication shop was used for fabrication and repair of reactor system components (GE 1964). The 1717-H Building was removed during general decontamination and decommissioning of 100-H Area facilities in 1974 (WHC 1991).

Confirmatory sampling of the 100-H-4 waste site determined that portions of the site contained contaminated pipe sediment, a contaminated french drain, and contaminated soil that exceeded direct exposure remedial action goals (RAGs) for several constituents. Based on these results, portions of the 100-H-4 waste site were recommended for remediation (WCH 2009).

Remedial action was performed at the 100-H-4 waste site between January 4 and 18, 2010. The footprint of the 1717-H Building, including the 1717-H Hot Shop and the foundation wall, was excavated to a depth of approximately 1 m (3 ft) below ground surface. Verification sampling for the 100-H-4 waste site was performed on September 22, 2010 to collect data to determine if the site met RAGs. The contaminants of potential concern for verification sampling included inductively coupled plasma (ICP) metals, mercury, hexavalent chromium, polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCBs), pesticides, semivolatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH), volatile organic compounds (VOCs), gamma-emitting radionuclides, strontium-90, uranium 233/234, uranium-235 and uranium-238 (WCH 2010b).

Results of verification sample analysis show that the waste removal action achieved compliance with the remedial action objectives and associated RAGs for the 100-H-4 waste site. A summary of the verification sampling analytical results evaluated against the applicable criteria is presented in Table ES-1. The results of the verification sampling are used to make reclassification decisions for the 100-H-4 waste site in accordance with the TPA-MP-14 procedure in the *Tri-Party Agreement Handbook Management Procedures* (DOE-RL 2007).

Table ES-1. Summary of Remedial Action Goals for 100-H-4, 1717-H Hot Shop, French Drain, and Contaminated Storage Unit. (2 Pages)

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Direct Exposure – Radionuclides	Attain 15 mrem/yr dose rate above background over 1,000 years.	Site-specific RESRAD modeling predicts that the direct exposure dose limitation of 15 mrem/yr above background will not be exceeded within 1,000 years.	Yes
Direct Exposure – Nonradionuclides	Attain individual COPC RAGs.	All individual COPC concentrations are below the direct exposure criteria.	Yes
Direct Contact Risk Requirements – Nonradionuclides	Attain a hazard quotient of <1 for all individual noncarcinogens.	All individual hazard quotients are <1.	Yes
	Attain a cumulative hazard quotient of <1 for noncarcinogens.	The cumulative hazard quotient (6.0×10^{-2}) is <1.	
Risk Requirements – Nonradionuclides	Attain an excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens.	The excess cancer risk for individual carcinogens is $<1 \times 10^{-6}$.	Yes
	Attain a cumulative excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.	The total excess cancer risk (7.3×10^{-7}) is $<1 \times 10^{-5}$.	
Groundwater/River Protection – Radionuclides	Attain single-COPC groundwater and river protection RAGs.	Drinking water standards for beta/gamma and alpha emitting radionuclides are met for site COPCs. Site-specific RESRAD modeling predicts that uranium will not reach groundwater at concentrations exceeding the 30 µg/L uranium MCL (40 *Code of Federal Regulations* 141.66) for uranium in drinking water within 1,000 years.	Yes
	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 100-H-4, 1717-H Hot Shop, French Drain, and Contaminated Storage Unit. (2 Pages)

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Groundwater/River Protection – Nonradionuclides	Attain individual nonradionuclide groundwater and river cleanup requirements.	Residual concentrations of lead, mercury, total PCBs, and benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene and benzo(k)fluoranthene exceeded the soil RAGs for the protection of groundwater and the Columbia River. However, RESRAD modeling presented in the RDR/RAWP (DOE-RL 2009b) predicts these constituents will not reach groundwater (and, therefore, the Columbia River) within 1,000 years [d].	Yes

[a] "National Primary Drinking Water Regulations" (40 *Code of Federal Regulations* 141).
[b] *Radiation Protection of the Public and Environment* (DOE Order 5400.5).
[c] Based on the isotopic distribution of uranium in the 100 Area, the 30 µg/L MCL corresponds to 21.2 pCi/L. Concentration-to-activity calculations are documented in *Calculation of Total Uranium Activity Corresponding to a Maximum Contaminant Level for Total Uranium of 30 Micrograms per Liter in Groundwater* (BHI 2001).
[d] RESRAD modeling predicts that the residual concentrations of lead, mercury, total PCBs, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene and benzo(k)fluoranthene will not migrate more than 2 m (6.6 ft) vertically in 1,000 years (based on the constituent with the lowest distribution coefficient of lead and mercury of 30 mL/g). The vadose zone underlying the soil below the site at the deepest test pit location is approximately 9.9 m (32.5 ft) thick. Therefore, residual concentrations of these constituents are predicted to be protective of groundwater and the Columbia River.

COPC = contaminant of potential concern
MCL = maximum contaminant level (drinking water standard)
PCB = polychlorinated biphenyl
RAG = remedial action goal
RDR/RAWP = *Remedial Design Report/Remedial Action Work Plan for the 100 Area*
RESRAD = RESidual RADioactivity (dose model)

Soil cleanup levels were established in 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) based in part on a limited ecological risk assessment. Although not required by the Remaining Sites ROD, a comparison against ecological risk screening levels has been made for the site contaminants of concern, contaminants of potential concern, and other constituents. Those constituents exceeding the ecological screening level in the *Washington Administrative Code* Chapter 173-340, Table 749-3 were arsenic, boron, mercury, selenium, and vanadium. The U.S. Environmental Protection Agency ecological soil screening levels were exceeded for antimony, lead, manganese, vanadium, and zinc. Exceeding screening values is intended to trigger additional evaluation and does not necessarily indicate the existence of risk to ecological receptors. Because the maximum detected levels of antimony, manganese, selenium, vanadium, and zinc were below Hanford Site background levels, it is believed that the presence of these constituents does not pose a risk to

ecological receptors. All exceedances will be evaluated in the context of additional lines of evidence for ecological effects as a part of the final closeout decision for the Columbia River corridor portion of the Hanford Site.

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-H-4, 1717-H HOT SHOP, FRENCH DRAIN AND CONTAMINATED STORAGE UNIT

STATEMENT OF PROTECTIVENESS

This report demonstrates that the 100-H-4, 1717-H Hot Shop, French Drain, and Contaminated Storage Unit waste site meets the remedial action objectives (RAOs) and remedial action goals (RAGs) as established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP) (DOE-RL 2009b) and the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD) (EPA 1999). The results of the verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow-zone soils (i.e., surface to 4.6-m [15-ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. The site does not have a deep zone or residual contaminant concentrations that would require any institutional controls.

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

GENERAL SITE INFORMATION AND BACKGROUND

According to the Waste Information Data System (WIDS) and the Stewardship Information System (SIS), the 1717-H Building provided centralized service facilities for certain 100 Area maintenance requirements. The 1717-H Building housed a machine shop, sheet metal shop, fabrication shop, hot shop, and carpenter shop. The fabrication shop was used for fabrication and repair of reactor system components (GE 1964). The 1717-H Building was removed during general decontamination and decommissioning of 100-H Area facilities in 1974 (WHC 1991).

Confirmatory sampling of the 100-H-4 waste site determined that portions of the site contained contaminated pipe sediment, a contaminated french drain, and contaminated soil that exceeded direct exposure RAGs for several constituents. Based on these results, portions of the 100-H-4 waste site were recommended for remediation (WCH 2009).

As shown in Figure 1, the 1717-H Building was located approximately 183 m (600 ft) east of the 105-H Reactor Building. The hot shop was located inside the 1717-H Building. The contaminated storage unit was located approximately 20 m (65 ft) east of the southeastern corner of the 1717-H Building. The french drain was located approximately 26 m (85 ft) south of the northeastern corner and 4 m (13 ft) east of the former eastern wall of the 1717-H Building.

Hot Shop

Drawing SK-1-7325 (AEC 1966) provides a floor plan of the 1717-H Building as it existed in 1966 and identifies two "hot shops" separated by a hallway. The hot shops were used for work on equipment with low-level radioactive contamination. According to Drawing SK-1-7325 (AEC 1966), decontamination tanks were located in one of the hot shops, and a decontamination exhaust was present outside of the building. A 10.2-cm (4-in.) process sewer line and a 15.2-cm (6-in.) sanitary sewer line exited the north and the west sides of the building, respectively, as shown on Drawing P-1437 (GE 1949). No drains are shown coming from the decontamination tanks in the hot shop; however, there is a sink that connected to the process sewer line in the east hot shop. The 100-H-4 waste site includes the process sewer line and the sanitary sewer lines that are within the 1717-H Building footprint.

Contaminated Storage Unit

According to WIDS, a contaminated storage unit made up part of the 100-H-4 waste site. The unit was removed when the 1717-H Building was demolished at some time in the past, but the asphalt is still present at the site. The former location of the contaminated storage unit was not part of the 100-H-4 remediation and was not sampled under the verification work instruction because it was sampled in 2001 when the 100-H-21 reactor effluent pipeline was remediated.

The layback to access the 100-H-21 pipeline runs through the WIDS boundary for the 100-H-4 contaminated storage unit. The 100-H-21 shallow zone closeout sample design resulted in the collection of a variance sample from within this area (shown in Figure 2), which was submitted for gamma energy analysis (GEA). According to the topographical survey map, the sample depth was approximately 1.5 to 2 m (5 to 6 ft) below ground surface (bgs) (BHI 2001). The GEA results for this sample (Table 1), Hanford Environmental Information System (HEIS) number B0YXY2, detected cesium-137 at an estimated activity of 0.059 pCi/g, well below the Hanford Site background activity of 1.1 pCi/g. All other constituents that were analyzed for were undetected.

Figure 1. Overall Site Location of the 100-H-4, 1717-H Hot Shop, French Drain, and Contaminated Storage Unit.

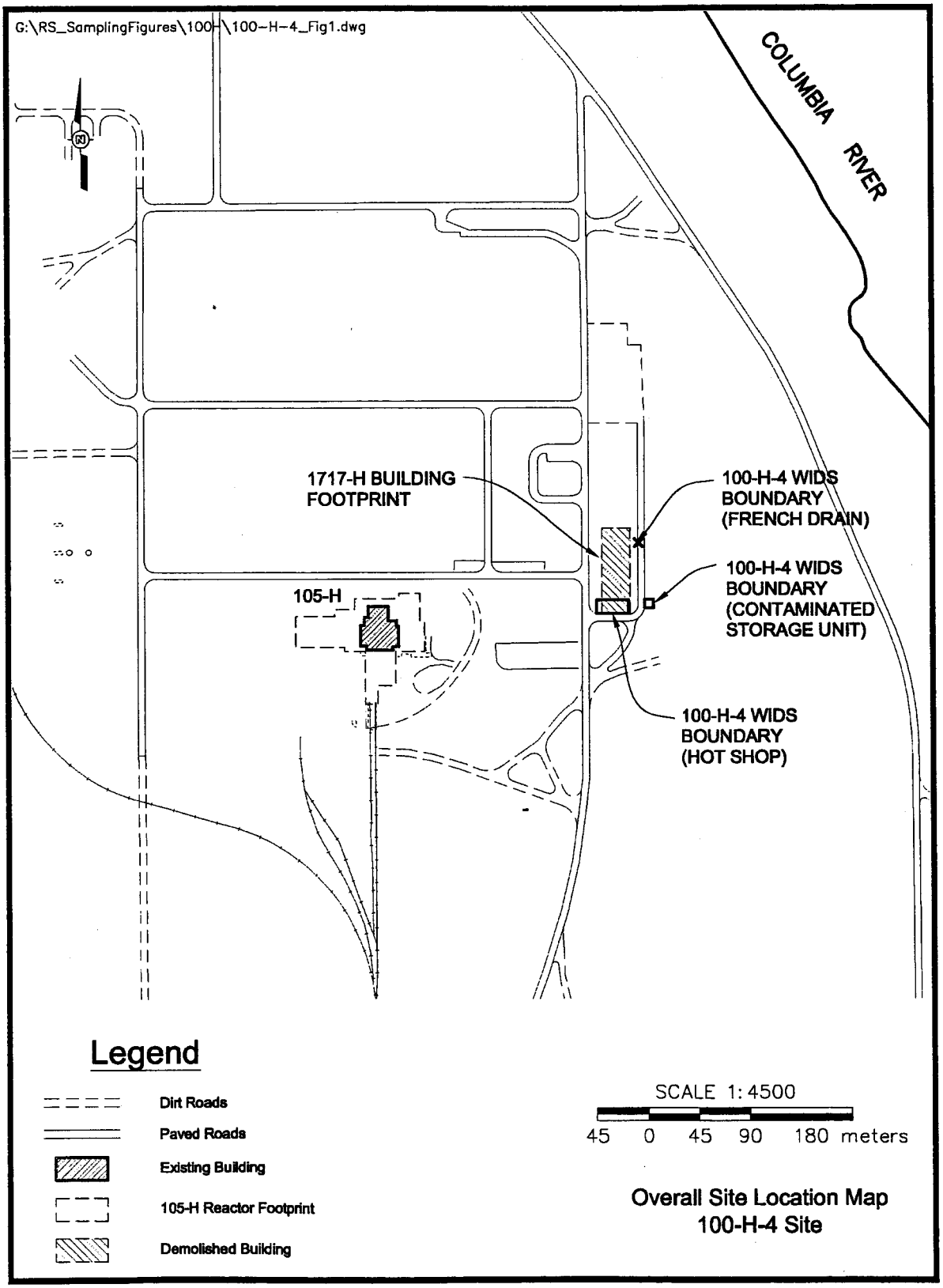


Figure 2. Geophysical Investigation Results for the 100-H-4, 1717-H Hot Shop, French Drain, and Contaminated Storage Unit.

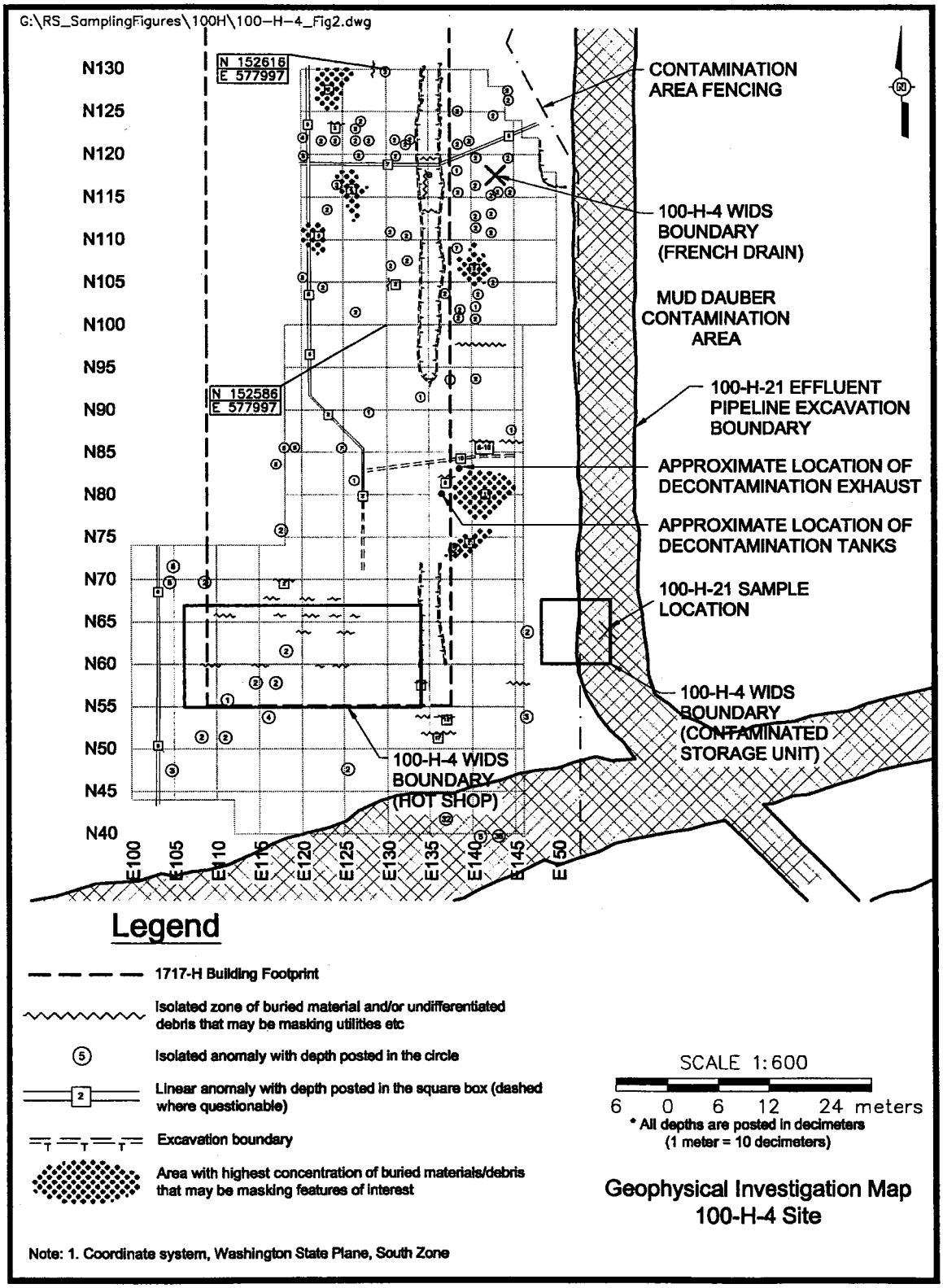


Table 1. 100-H-21 Waste Site Variance Sample Results for 100-H-4 Waste Site Contaminated Storage Unit.

Sample Number	Constituent	Method Name	Value Reported (pCi/g)	Lab Qualifier	PQL
B0YXY2	Cesium-137	Gamma GS	0.059	J	0.06
	Cobalt-60			U	0.06
	Europium-155			U	0.18
	Americium-241			U	0.45
	Europium-152			U	0.13
	Europium-154			U	0.18

J = estimated
PQL = practical quantitation limit
U = undetected

French Drain

The french drain was found to be located at Washington State Plane coordinates N 152594, E 578008. Modifications to 1717-H Building piping systems supporting an air compressor are shown on Drawing P-9343 (GE 1956). This drawing indicates that a french drain was used to dispose of condensation water vapor from the air compressor, which was housed outside the 1717-H Building. No other french drains are known to be present at the 100-H-4 waste site, although several potential locations based on early drawings (GE 1956, 1957) and information in WIDS were investigated.

Geophysical Investigation

As shown in Figure 2, geophysical survey using ground-penetrating radar and electromagnetic induction was performed at the 100-H-4 waste site in August 2004 (BHI 2004). Two small zones of concentrated metal debris were identified in the former hot shop location. The northernmost location is in the general vicinity of the decontamination exhaust, as shown on Drawing SK-1-7325 (AEC 1966). Several linear features were identified within the footprint of the 1717-H Building; one linear correlates with a process sewer pipeline found on Drawing P-1437 (GE 1949). No specific anomalies were identified that could be uniquely assigned to the 100-H-4 french drain.

In February 2006, an extension to the original geophysical survey was performed to locate and map the contaminated storage unit to the southeast of the 1717-H Building footprint (WCH 2006). This southeastern survey extension was limited to covering only the western half of the WIDS footprint of the contaminated storage unit, due to the radiological boundary established for mud dauber contamination. Interpreted results are shown in Figure 2. Two east-west linears were detected. The linear at about N46 is greater than 2 m (6.6 ft) bgs and appears to be associated with an encasement, typically used when vulnerable lines extended through asphalt/traffic areas. Remnants of an east-west asphalt road are visible in this area, supporting the encasement interpretation. An east-west linear was also detected at about N65. This linear trends into the location of the contaminated storage unit, but the linear is only about 0.3 m (0.98 ft) bgs and is likely associated with a cable or shallow electrical line. Remnants of

an asphalt road, from about E142 to E150, are visible in the vicinity of the WIDS location for the contaminated storage unit.

REMEDIATION ACTION SUMMARY

Remedial action at the 100-H-4, 1717-H Hot Shop, French Drain, and Contaminated Storage Unit waste site was performed between January 4 and 18, 2010. The excavation resulted in approximately 3,148 bank cubic meters (4,117 bank cubic yards [BCY]) of contaminated soil. All material was direct loaded for disposal at the Environmental Restoration Disposal Facility (ERDF). The area associated with the 100-H-4 remediation is shown in Figure 3.

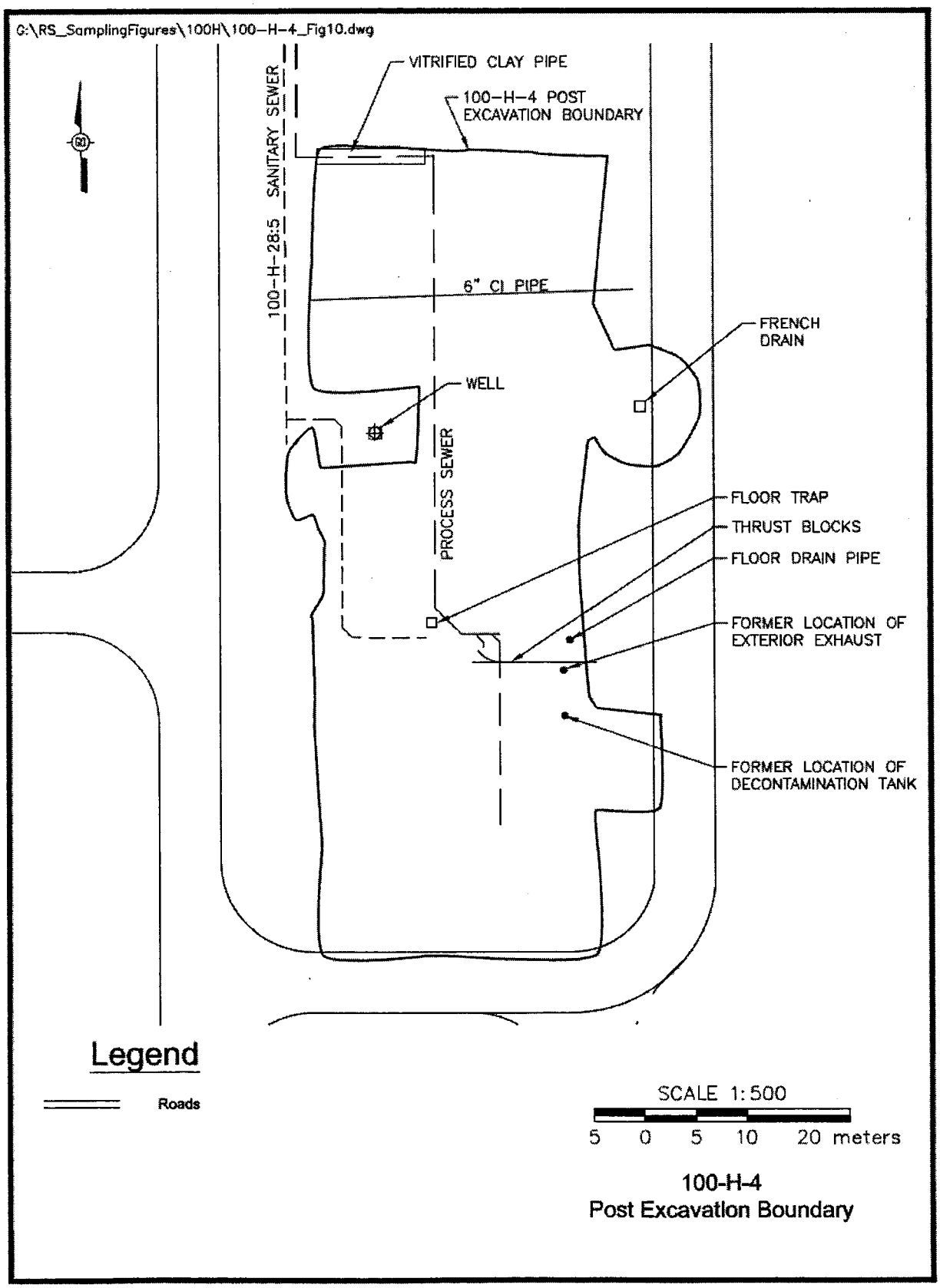
The footprint of the 1717-H Building, including the 1717-H Hot Shop and the foundation wall, was excavated to a depth of approximately 1 m (3 ft) below ground surface. The excavation activities included remediation of former locations of decontamination tanks and exterior exhaust, as per approved excavation design. The french drain located northeast of the building footprint was excavated to a depth of approximately 4 m (12 ft). A concrete floor trap with metal lid and insulation piece was uncovered and removed. All pieces including the drainpipe were excavated and loaded out in a void-space waste disposal can for grout filling at ERDF. The process sewer line and the sanitary sewer line were completely removed within the 1717-H Building footprint and excavation boundary, shown in Figure 3. Other materials and debris such as concrete and asphalt were excavated and removed from the waste site.

Due to remediation exceeding the excavation design dimensions, two additional features were uncovered: a 6-in.-diameter cast iron (CI) pipeline running in the east-west direction to the northern side of the 1717-H footprint excavation and a "Y"-shaped concrete thrust block structure. These two features were left in place. Although not confirmed by historical drawings or historical aerial photographs, it is suspected that the 6-in.-diameter CI pipeline is part of the 100-H-35, 100-H Clean Water Pipelines, 100-H Service Water Pipelines. However, due to the lack of available historical information, this pipeline will be included with 100-H-56, H-Area Miscellaneous Pipelines. The "Y"-shaped thrust blocks do not encase any pipelines. These concrete thrust blocks do not appear on any historical drawings or historical aerial photographs.

VERIFICATION SAMPLING ACTIVITIES

Verification sampling for the 100-H-4 waste site was performed on September 22, 2010 (WCH 2010a), to support a determination that residual contaminant concentrations at this site meet the cleanup criteria specified in the RDR/RAWP (DOE-RL 2009b) and the Remaining Sites ROD (EPA 1999). The verification sample results are provided in the 95% upper confidence limit (UCL) calculation in Appendix B and indicate that the remedial action achieved compliance with the RAOs for the 100-H-4 waste site. The following subsections provide additional discussion of the information used to develop the verification sampling design. A more detailed discussion of the verification sample design can be found in the verification work instruction (WCH 2010b).

Figure 3. 100-H-4 Post-Excavation Boundary.



Contaminants of Potential Concern

The contaminants of potential concern (COPCs) for the 100-H-4 waste site were identified based on existing historical information, confirmatory sampling, and in-process samples for the site. The COPC list identified in the *100 Area Remedial Action Sampling and Analysis Plan* (SAP) (DOE-RL 2009a) includes cadmium, chromium (total), lead, mercury, selenium, silver, hexavalent chromium, semivolatile organic compounds (SVOCs), cobalt-60, cesium-137, europium-152, europium-154, europium-155, and strontium-90. In-process soil samples detected pesticides, polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCBs), and total petroleum hydrocarbons (TPH); therefore, they were added to the list of COPCs. In addition, in-process samples detected uranium-238; therefore, isotopic uranium was added to the list of COPCs. Volatile organic compounds (VOCs) were detected during confirmatory sampling activities; therefore, VOCs were added to the list of COPCs. While not considered COPCs, antimony, arsenic, barium, beryllium, boron, cobalt, copper, manganese, molybdenum, nickel, vanadium, and zinc were evaluated by performing analyses for the constituents of the expanded ICP metals list.

Verification Sample Design

This section describes the basis for selection of an appropriate sample design and determination of the number of verification samples that were collected. The footprint of the entire excavation was the only decision unit for verification sampling.

Figure 4 presents the statistical verification sample design for the shallow zone within the excavation. Figure 5 presents the focused verification sample locations within the excavation. A discrete soil sample was collected at each designated sample point (0 to 0.15 m [0 to 6 in.] below the surface of the excavated waste site) and analyzed using the methods identified in Table 2. The soil sampling locations were global positional surveyed and staked prior to sample collection using the coordinate pairs provided in Table 3.

The decision rule for demonstrating compliance with the cleanup criteria requires comparison of the true population mean, as estimated by the 95% UCL on the sample mean, with the cleanup level. Therefore, a statistical sampling design is the preferred verification sampling approach for this site because the distribution of potential residual soil contamination over the site is uncertain. The Washington State Department of Ecology (Ecology) publication *Guidance on Sampling and Data Analysis Methods* (Ecology 1995) recommends that systematic sampling with sample locations distributed over the entire study area be used. This sampling approach is referred to by Ecology as "area-wide sampling." Therefore, sampling locations were distributed over the footprint of the 100-H-4 waste site using random-start systematic grids in an effort to determine the potential presence of residual contamination.

The footprint of the 100-H-4 waste site was delineated in Visual Sample Plan[1] (VSP) software and used as the basis for the location of a random-start systematic grid for verification soil sampling. Twelve soil sample locations were identified in the 100-H-4 waste site. Additional

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

Figure 4. Shallow Zone Sample Locations for the 100-H-4, 1717-H Hot Shop and French Drain.

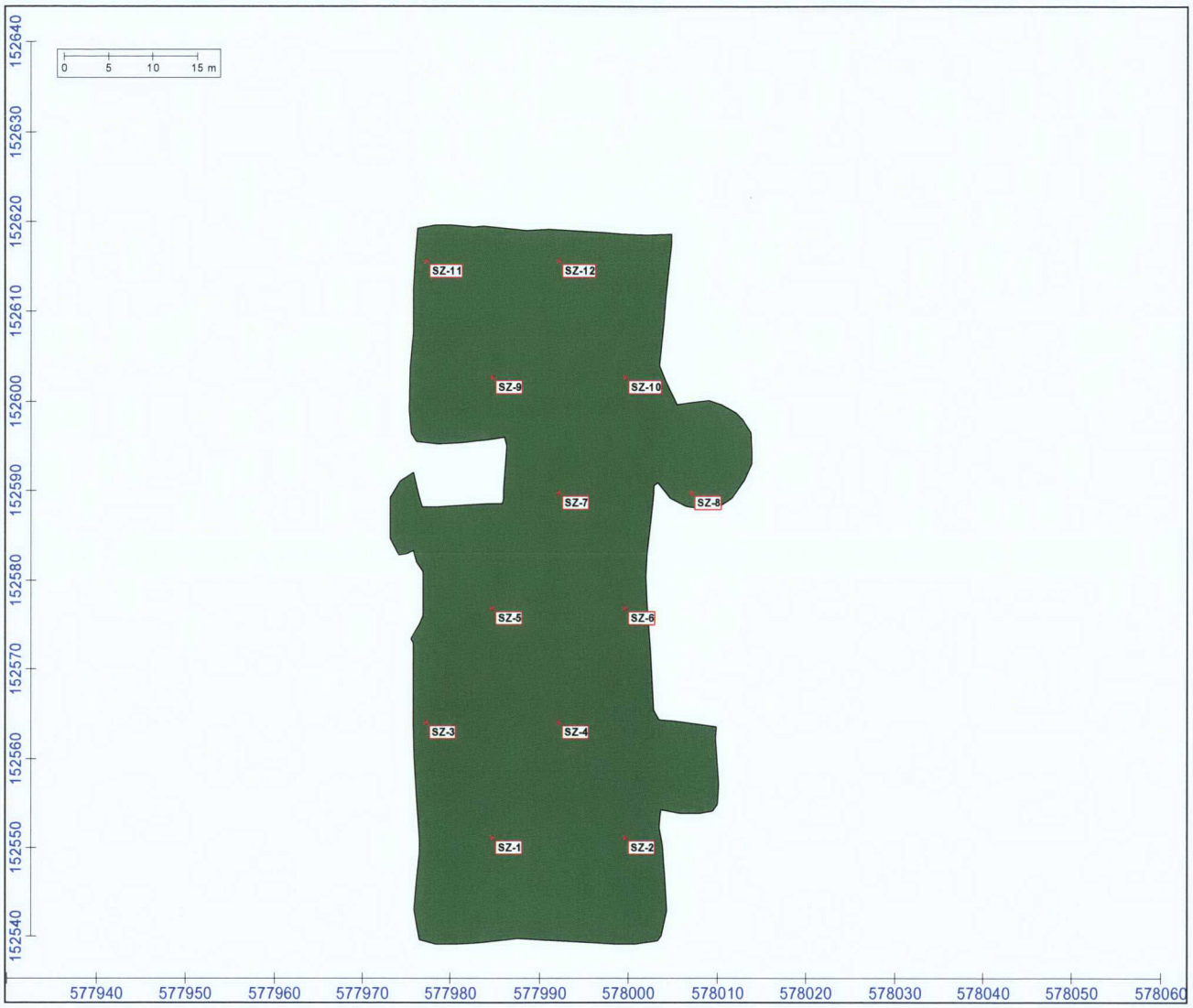


Figure 5. Focused Sample Location for 100-H-4 French Drain.

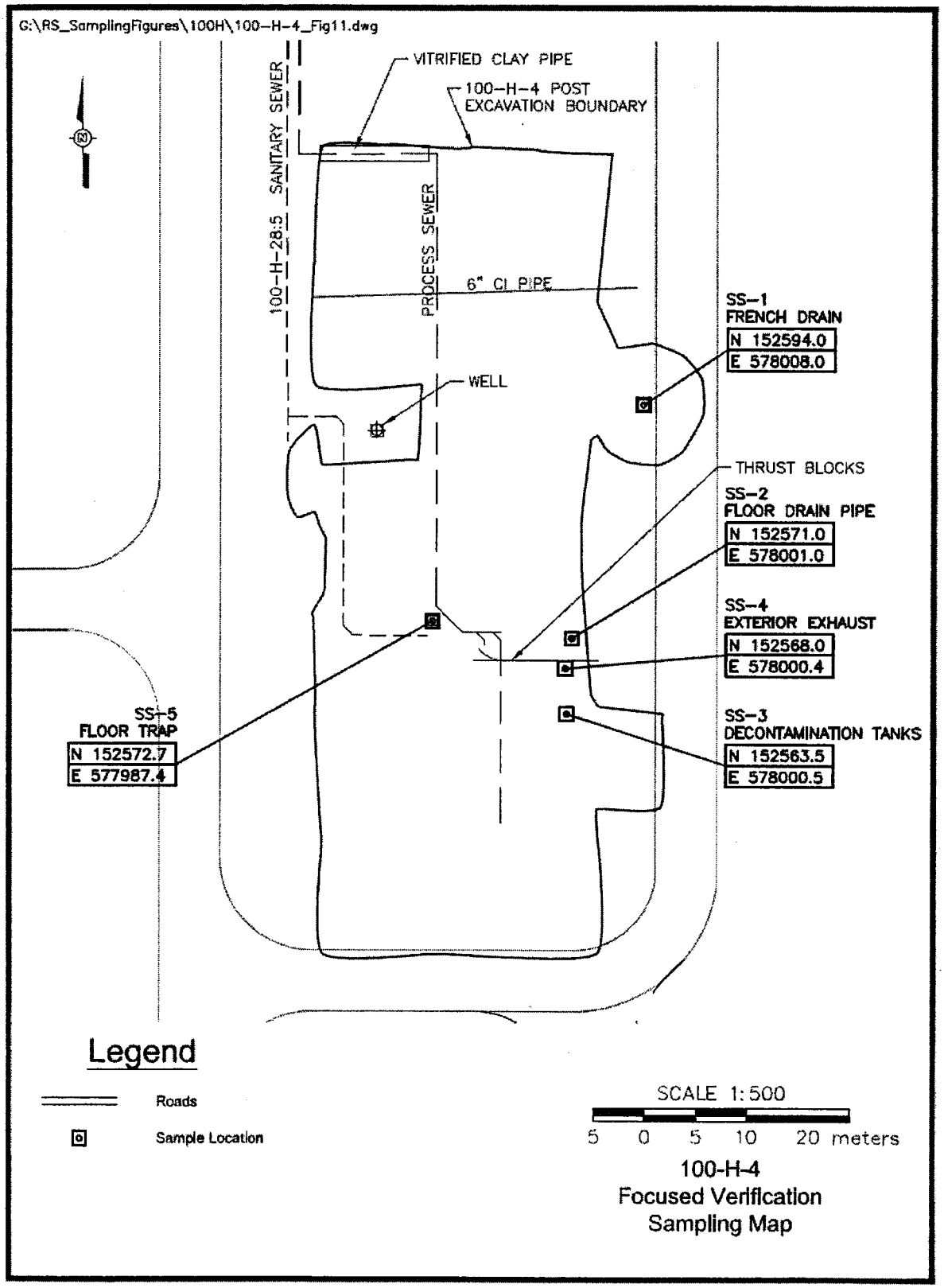


Table 2. 100-H-4 Laboratory Analytical Methods.

Analytical Method	COPCs
ICP metals [a] – EPA Method 6010	Cadmium, chromium (total), lead, mercury, selenium, silver
Mercury – EPA Method 7471	Mercury
Hexavalent chromium – EPA Method 7196	Hexavalent chromium
PAH [b] – EPA Method 8310	PAH
PCB – EPA Method 8082	PCBs
Pesticides – Method 8081	Pesticides
SVOA – EPA Method 8270	SVOCs
TPH – EPA Method NWTPH-Dx	TPH
VOA – EPA Method 8260	Volatile organic compounds
GEA – gamma spectroscopy	Gamma-emitting radionuclides
Strontium-90 – liquid scintillation	Strontium-90
Isotopic uranium	Uranium-233/234, uranium-235, uranium-238

[a] Although not considered COPCs, antimony, arsenic, barium, beryllium, boron, cobalt, copper, manganese, molybdenum, nickel, vanadium, and zinc were evaluated by performing analyses for the constituents of the expanded ICP metals list.
[b] Because method 8310 is specifically meant to analyze for PAH, data from this method was used preferentially over the 8270 data for site evaluation of the PAH analytes.

COPC = contaminant of potential concern
EPA = U.S. Environmental Protection Agency
GEA = gamma energy analysis
ICP = inductively coupled plasma
NWTPH-Dx = Northwest total petroleum hydrocarbon-diesel range organics
PAH = polycyclic aromatic hydrocarbons
PCB = polychlorinated biphenyl
SVOA = semivolatile organic analysis
SVOC = semivolatile organic compound
TPH = total petroleum hydrocarbons
VOA = volatile organic compound

Table 3. 100-H-4, 1717-H Hot Shop, French Drain, and Contaminated Storage Unit Sample Summary. (2 Pages)

Sample Location	HEIS Sample Number	WSP Coordinates		Sample Analysis
		Northing	Easting	
SZ-1	J1C393	152551.1	577984.7	ICP metals [a], mercury, hexavalent chromium, VOA, SVOA, PAH [b], TPH, PCBs, pesticides, GEA, strontium-90, isotopic uranium
SZ-2	J1C394	152551.1	577999.6	
SZ-3	J1C395	152564.0	577977.2	
SZ-4	J1C396	152564.0	577992.1	
SZ-5	J1C397	152576.9	577984.7	
SZ-6	J1C398	152576.9	577999.6	
SZ-7	J1C399	152589.8	577992.1	
SZ-8	J1C3B0	152589.8	578007.0	

Table 3. 100-H-4, 1717-H Hot Shop, French Drain, and Contaminated Storage Unit Sample Summary. (2 Pages)

Sample Location	HEIS Sample Number	WSP Coordinates		Sample Analysis
		Northing	Easting	
SZ-9	J1C3B1	152602.7	577984.7	ICP metals [a], mercury, hexavalent chromium, VOA, SVOA, PAH [b], TPH, PCBs, pesticides, GEA, strontium-90, isotopic uranium
SZ-10	J1C3B2	152602.7	577999.6	
SZ-11	J1C3B3	152615.6	577977.2	
SZ-12	J1C3B4	152615.6	577992.1	
SS-1 French drain	J1C3B6	152594.0	578008.0	
SS-2 Floor drain pipe	J1C3B7	152571.0	578001.0	
SS-3 Decontamination tanks	J1C3B8	152563.5	578000.5	
SS-4 Exterior exhaust	J1C3B9	152568.0	578000.4	
SS-5 Floor trap	J1C3C0	152572.7	577987.4	
Duplicate	J1C3B5	152589.8	578007.0	
Equipment blank	J1C3C1	NA	NA	ICP metals [a], mercury, PAH, SVOA, VOA

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

[b] Because method 8310 is specifically meant to analyze for PAH, data from this method will be used preferentially over the 8270 data for site evaluation of the PAH analytes.

GEA = gamma energy analysis
HEIS = Hanford Environmental Information System
ICP = inductively coupled plasma
NA = not applicable
PAH = polycyclic aromatic hydrocarbons
PCB = polychlorinated biphenyl
SVOA = semivolatile organic analysis
TBD = to be determined
TPH = total petroleum hydrocarbons
VOA = volatile organic analysis
WSP = Washington State Plane

details concerning the use of VSP to develop the statistical sampling design and derive the number of verification samples to collect are discussed in the verification work instruction (WCH 2010b).

Field quality control samples consisted of one equipment blank sample and one field duplicate sample. All samples were submitted for full protocol laboratory analysis. A summary of verification and focused samples collected for the 100-H-4 waste site is provided in Table 3, and maps of the sample locations are provided in Figure 4 and Figure 5.

Verification Sample Results

Verification samples were analyzed using U.S. Environmental Protection Agency (EPA)-approved analytical methods. The 95% UCLs on the true population means for residual COPCs were calculated for the excavation footprint as specified by the RDR/RAWP (DOE-RL 2009b) with calculations provided in Appendix B. When a COPC was detected in fewer than 50% of the non-radionuclide verification samples collected, the maximum detected value was used for comparison against the RAGs, therefore no statistical evaluation was done for that COPC. If no detections for a given COPC were reported in the data set, then no statistical evaluation or calculations were performed for that COPC. Calculated cleanup levels are not presented in the Cleanup Levels and Risk Calculations Database (Ecology 2009) under

Washington Administrative Code (WAC) 173-340-740(3) for aluminum, calcium, iron, magnesium, potassium, silicon, and sodium; therefore, these constituents are not considered site COPCs.

Comparisons of the statistical and maximum results for COPCs against the site RAGs are summarized in Table 4. Contaminants that were not detected by laboratory analysis are excluded from these tables. The laboratory-reported verification data results for all constituents are stored in the Environmental Restoration project-specific database prior to archival in the HEIS and are presented as Attachment 1 of the 95% UCL calculation (Appendix B).

Table 4. Comparison of Statistical Values to Action Levels for the 100-H-4 Excavation Verification Samples. (2 Pages)

COPC	Statistical Result [b] (pCi/g)	Soil Lookup Values (pCi/g) [a]			Does the Statistical Result Exceed Lookup Values?	Do the Results Pass RESRAD Modeling?
		Shallow Zone Lookup Value	Soil Lookup Value for Groundwater Protection	Soil Lookup Value for River Protection		
Nickel-63	1.61	4,013	83	166	No	--
Uranium-233/234	1.10 (=BG)	1.1 [c]	1.1 [c]	1.1 [c]	No	--
Uranium-238	0.864 (<BG)	1.1 [c]	1.1 [c]	1.1 [c]	No	--
COPC	**Statistical Result [b] (mg/kg)**	**Remedial Action Goals (mg/kg) [a]**			**Does the Statistical Result Exceed RAGs?**	**Does the Statistical Result Pass RESRAD Modeling?**
		Direct Exposure	**Soil Cleanup Level for Groundwater Protection**	**Soil Cleanup Level for River Protection**		
Arsenic	7.17	20 [d]	20 [d]	20 [d]	No	--
Barium	53.3 (<BG)	5,600	200	400	No	--
Beryllium	0.243 (<BG)	10.4 [e]	1.51 [d]	1.51 [d]	No	--
Boron [f]	1.67	7,200	320	-- [g]	No	--
Cadmium	0.123 (<BG)	13.9 [e]	0.81 [d]	0.81 [d]	No	--
Chromium	11.3 (<BG)	80,000	18.5 [d]	18.5 [d]	No	--
Cobalt	5.56 (<BG)	24	15.7 [d]	-- [g]	No	--
Copper	15.3 (<BG)	2,960	59.2	22.0 [d]	No	--
Lead	16.8	353	10.2 [d]	10.2 [d]	Yes	Yes [h]
Manganese	263 (<BG)	3,760	512 [d]	512 [d]	No	--
Mercury	0.408	24	0.33 [d]	0.33 [d]	Yes	Yes [h]
Molybdenum [f]	0.456	400	8	-- [g]	No	--
Nickel	10.2 (<BG)	1,600	19.1 [d]	27.4	No	--
Selenium	0.391 (<BG)	400	5	1	No	--
Vanadium	50.5 (<BG)	560	85.1 [d]	-- [g]	No	--
Zinc	35.7 (<BG)	24,000	480	67.8 [d]	No	--
TPH – motor oil	34.8	200	200	200	No	--
Total PCB	0.102	0.5	0.017 [i]	0.017 [i]	Yes	Yes [h]
DDE, 4,4'-	0.00295	2.94	0.0257	0.0033 [i]	No	--
DDT, 4,4'-	0.00156	2.94	0.0257	0.0033 [i]	No	--

Table 4. Comparison of Statistical Values to Action Levels for the 100-H-4 Excavation Verification Samples. (2 Pages)

COPC	Statistical Result [b] (mg/kg)	Remedial Action Goals (mg/kg) [a]			Does the Statistical Result Exceed RAGs?	Does the Statistical Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Acenapthene	0.0109	4,800	96	129	No	--
Benzo(a)anthracene	0.00324	1.37	0.015 [i]	0.015 [i]	No	--
Benzo (a)pyrene	0.00368	0.137	0.015 [i]	0.015 [i]	No	--
Benzo(b)fluoranthene	0.00332	1.37	0.015 [i]	0.015 [i]	No	--
Benzo(ghi)perylene [j]	0.00294	2,400	48	192	No	--
Benzo(k)fluoranthene	0.00212	1.37	0.015 [i]	0.015 [i]	No	--
Chrysene	0.00536	13.7	0.12	0.1 [i]	No	--
Fluoranthene	0.0116	3,200	64	18.0	No	--
Fluorene	0.00299	3,200	64	260	No	--
Phenanthrene [j]	0.00285	24,000	240	1,920	No	--
Indeno(1,2,3-cd)pyrene	0.0311	1.37	0.33 [i]	0.33 [i]	No	--
Pyrene	0.00801	2,400	48	192	No	--
Chlordane (alpha, gamma)	0.00445	2.86	0.025	0.0165 [i]	No	--

[a] Lookup values and RAGs obtained from the RDR/RAWP (DOE-RL 2009b) or calculated per WAC 173-340-720, WAC 173-340-730, and WAC 173-340-740, Method B (1996) (WAC 173-340), unless otherwise noted.

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Appendix B.

[c] The calculated lookup value is below the Hanford Site-specific soil background concentration. The value presented is Hanford Site-specific soil background concentration.

[d] Where cleanup levels are less than background, cleanup levels default to background (WAC 173-340-700[4][d], 1996).

[e] Carcinogenic cleanup level calculated based on the inhalation exposure pathway (WAC 173-340-750[3]) using 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 ambient water quality criteria values) are available from the Ecology Cleanup Levels and Risk Calculations database or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], 1996 [Method B for surface waters]).

[h] Based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b), the residual concentrations of lead, mercury, aroclor-1254 and aroclor-1260 are not expected to migrate more than 2 m (6.6 ft) vertically in 1,000 years (based on the lowest distribution coefficient of lead and mercury of 30 mL/g). The vadose zone underlying the soil below the site at the deepest test pit location is approximately 9.9 m (32.5 ft) thick. Therefore, residual concentrations of these constituents are predicted to be protective of groundwater and the Columbia River.

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

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

-- = not applicable
BG = background
COPC = contaminant of potential concern
Ecology = Washington State Department of Ecology
PCB = polychlorinated biphenyl
RAG = remedial action goal
RDL = required detection limit
RDR/RAWP = *Remedial Design Report/Remedial Action Work Plan for the 100 Area*
RESRAD = RESidual RADioactivity (dose model)
TPH = total petroleum hydrocarbons
WAC = *Washington Administrative Code*

Five focused samples were collected from the 100-H-4 waste site. Statistical analysis (e.g., calculation of a 95% UCL value) is not appropriate to use for evaluation of focused samples; therefore, the sample results for each focused sample are evaluated using the maximum detected activity for each contaminant of concern (COC)/COPC and comparing the value directly to the cleanup level. Table 5 provides a comparison of the maximum result of the focused samples against the cleanup criteria. Individual sample results are provided in Appendix B.

Table 5. Comparison of Maximum Values to Action Levels for the 100-H-4 Focused Verification Sampling. (2 Pages)

COPC	Maximum Result (pCi/g)	Soil Lookup Values (pCi/g) [a]			Does the Maximum Result Exceed Lookup Values?	Does the Maximum Result Pass RESRAD Modeling?
		Shallow Zone Lookup Value	Soil Lookup Value for Groundwater Protection	Soil Lookup Value for River Protection		
Uranium-233/234	1.46	1.1 [b]	1.1 [b]	1.1 [b]	Yes	Yes [c]
Uranium-238	1.34	1.1 [b]	1.1 [b]	1.1 [b]	Yes	Yes [c]
COPC	**Maximum Result (mg/kg)**	**Remedial Action Goals (mg/kg) [a]**			**Does the Maximum Result Exceed RAGs?**	**Does the Maximum Result Pass RESRAD Modeling?**
		Direct Exposure	**Soil Cleanup Level for Groundwater Protection**	**Soil Cleanup Level for River Protection**		
Antimony	0.397 (<BG)	32	5 [d]	5 [d]	No	--
Arsenic	8.36	20 [d]	20 [d]	20 [d]	No	--
Barium	79.0 (<BG)	5,600	200	400	No	--
Beryllium	0.307 (<BG)	10.4 [e]	1.51 [d]	1.51 [d]	No	--
Boron [f]	2.26	7,200	320	-- [g]	No	--
Cadmium	0.240 (<BG)	13.9 [e]	0.81 [d]	0.81 [d]	No	--
Chromium	16.9 (<BG)	80,000	18.5 [d]	18.5 [d]	No	--
Cobalt	6.46 (<BG)	24	15.7 [d]	-- [h]	No	--
Copper	19.3 (<BG)	2,960	59.2	22.0 [d]	No	--
Lead	18.4	353	10.2 [d]	10.2 [d]	Yes	Yes [h]
Manganese	364 (<BG)	3,760	512 [d]	512 [d]	No	--
Mercury	0.0141 (<BG)	24	0.33 [d]	0.33 [d]	No	--
Molybdenum [f]	0.478	400	8	-- [g]	No	--
Nickel	14.9 (<BG)	1,600	19.1 [d]	27.4	No	--
Selenium	0.334 (<BG)	400	5	1	No	--
Vanadium	46.4 (<BG)	560	85.1 [d]	-- [g]	No	--
Zinc	32.5 (<BG)	24,000	480	67.8 [d]	No	--
TPH – motor oil	188	200	200	200	No	--
Acenapthene	0.0511	4,800	96	129	No	--
Total PCB	0.0322	0.5	0.017 [i]	0.017 [i]	Yes	Yes [h]

Table 5. Comparison of Maximum Values to Action Levels for the 100-H-4 Focused Verification Sampling. (2 Pages)

COPC	Maximum Result (mg/kg)	Remedial Action Goals (mg/kg) [a]			Does the Maximum Result Exceed RAGs?	Does the Maximum Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Benzo(a)anthracene	0.0746	1.37	0.015 [i]	0.015 [i]	Yes	Yes [h]
Benzo (a)pyrene	0.0529	0.137	0.015 [i]	0.015 [i]	Yes	Yes [h]
Benzo(b)fluoranthene	0.0441	1.37	0.015 [i]	0.015 [i]	Yes	Yes [h]
Benzo(ghi)perylene [k]	0.0459	2,400	48	192	No	--
Benzo(k)fluoranthene	0.0272	1.37	0.015 [i]	0.015 [i]	Yes	Yes [h]
DDT, 4,4'-	0.00194	2.94	0.0257	0.0033 [i]	No	--
Fluoranthene	0.0290	3,200	64	18.0	No	--
Fluorene	0.00418	3,200	64	260	No	--
Indeno(1,2,3-cd)pyrene	0.0145	1.37	0.33 [i]	0.33 [i]	No	--
Phenanthrene [j]	0.00208	24,000	240	1,920	No	--
Pyrene	0.0157	2,400	48	192	No	--

[a] Lookup values and RAGs obtained from the RDR/RAWP (DOE-RL 2009b) or calculated per WAC 173-340-720, WAC 173-340-730, and WAC 173-340-740, Method B, 1996 (WAC 173-340), unless otherwise noted.

[b] The calculated lookup value is below the Hanford Site-specific soil background concentration. The value presented is Hanford Site-specific soil background concentration.

[c] Site-specific RESRAD modeling predicts that the direct exposure dose limitation of 15 mrem/yr above background will not be exceeded within 1,000 years and that uranium will not reach groundwater at concentrations exceeding the 30 µg/L uranium MCL (40 *Code of Federal Regulations* 141.66) for uranium in drinking water within 1,000 years. Therefore, radionuclide direct exposure dose limitations and groundwater and river protection criteria are met.

[d] Where cleanup levels are less than background, cleanup levels default to background (WAC 173-340-700[4][d], 1996).

[e] Carcinogenic cleanup level calculated based on the inhalation exposure pathway (WAC 173-340-750[3]) using 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 ambient water quality criteria values) are available from the Ecology Cleanup Levels and Risk Calculations database or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], 1996 [Method B for surface waters]).

[h] Based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b), the residual concentrations of lead, total PCBs, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene and benzo(k)fluoranthene are not expected to migrate more than 2 m (6.6 ft) vertically in 1,000 years (based on the constituent with the lowest distribution coefficient of 30 mL/g for lead). The vadose zone underlying the soil below the site at the deepest test pit location is approximately 9.9 m (32.5 ft) thick. Therefore, residual concentrations of these constituents are predicted to be protective of groundwater and the Columbia River

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

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

-- = not applicable
BG = background
COPC = contaminant of potential concern
Ecology = Washington State Department of Ecology
MCL = maximum contaminant level
PCB = polychlorinated biphenyl
RAG = remedial action goal
RDL = required detection limit
RDR/RAWP = *Remedial Design Report/Remedial Action Work Plan for the 100 Area*
RESRAD = RESidual RADioactivity (dose model)
TPH = total petroleum hydrocarbons
WAC = *Washington Administrative Code*

VERIFICATION SAMPLE DATA EVALUATION

This section demonstrates that remedial actions at the 100-H-4 waste site have achieved the applicable RAOs by meeting the RAGs and determining that groundwater and the river are protected.

Evaluation of the verification sampling results in Table 4 show that all statistical results are below rural-residential scenario direct exposure, groundwater protection, and Columbia River protection soil RAGs at the 100-H-4 waste site excavation, with the exception of lead, mercury, and total PCBs. These constituents exceed the RAGs for groundwater and river protection. Data were not collected on the vertical extent of these contaminants, but given the lowest soil-partitioning coefficient (K_d) for these constituents (30 mL/g for lead or mercury); they are not predicted to migrate more than 2 m (6.6 ft) vertically in 1,000 years, per RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b). The thickness of the vadose zone beneath the bottom of the waste site excavation is approximately 9.9 m (32.5 ft). Therefore, residual soil concentrations of these constituents are predicted to be protective of groundwater and the Columbia River. All other COPCs were either not detected or were quantified below the RAGs.

Table 5 compares the confirmatory sample results for focused verification sampling to the applicable soil RAGs for direct exposure, protection of groundwater, and protection of the Columbia River. Five focused samples were taken within the 100-H-4 waste site footprint. All focused sample analytical results are presented in Appendix B. Contaminants evaluated in the focused samples were below soil RAGs for direct exposure, groundwater protection, and Columbia River protection, with the exception of the uranium isotopes, lead, total PCBs, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene and benzo(k)fluoranthene. The cited nonradionuclides exceeded groundwater and Columbia River protection soil RAGs. However, as discussed above, RESRAD modeling predicts that residual concentrations of the nonradionuclides are not expected to migrate more than 2 m (6.6 ft) vertically in 1,000 years (based on the lowest distribution coefficient of 30 mL/g for lead). Therefore, residual soil concentrations of nonradionuclide constituents are predicted to be protective of groundwater and the Columbia River.

The uranium isotopes in Table 5 exceeded direct exposure and groundwater and river protection RAGs. However, site-specific RESRAD modeling predicts that the direct exposure dose limitation of 15 mrem/yr above background will not be exceeded within 1,000 years. Also, site-specific RESRAD modeling predicts that uranium will not reach groundwater at concentrations exceeding the 30 µg/L uranium maximum contaminant level (MCL) (40 *Code of Federal Regulations* 141.66) for uranium in drinking water within 1,000 years. Therefore, radionuclide direct exposure dose limitations and groundwater and river protection criteria are met.

Assessment of the risk requirements for the 100-H-4 waste site is determined by calculation of the direct contact hazard quotient and carcinogenic (excess cancer) risk values for nonradionuclides. These calculations are located in Appendix B. The 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 x 10^{-6}, and a cumulative excess carcinogenic risk of less than 1 x 10^{-5}. These risk values were conservatively calculated using the 95% UCL or maximum values (Appendix B) from the samples collected at the 100-H-3 waste site. Risk values are not calculated for constituents that were not detected or were detected at concentrations below Hanford Site or Washington State background values. The calculations indicate that all individual hazard quotients for noncarcinogenic constituents are less than 1.0. The cumulative hazard quotient for the 100-H-4 waste site is 6.0 x 10^{-2}. All individual cumulative carcinogenic risk values are less than 1 x 10^{-6}. The cumulative carcinogenic risk value is 7.3 x 10^{-7}. Therefore, nonradionuclide risk requirements are met.

An additional calculation of the hazard quotient and carcinogenic (excess cancer) risk values for the potential impact to groundwater was performed for nonradionuclides. This calculation is located in Appendix B. The comparisons for the groundwater pathway 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 x 10^{-6}, and a cumulative excess carcinogenic risk of less than 1 x 10^{-5}. These risk values were conservatively calculated for the entire waste site using the highest applicable values from each of the decision units. Risk values were not calculated for constituents that were not detected, were detected at concentrations below Hanford Site or Washington State background values (note that state background values are only used when Hanford Site background values are not available), or were protective of groundwater at the site based on fate and transport modeling. The calculations indicated that all individual hazard quotients for noncarcinogenic constituents are less than 1.0. The cumulative hazard quotient for the 100-H-4 waste site is 7.7 x 10^{-3}. The carcinogenic risk value for this waste site is zero; therefore, the carcinogenic risk RAG has been attained for the 100-H-4, 1717-H Hot Shop, French Drain, and Contaminated Storage Unit.

When using a statistical sampling approach, a RAG requirement for nonradionuclides is the WAC 173-340-740(7)(e) three-part test. The WAC 173-340 three-part test consists of the following criteria: (1) the cleanup verification 95% UCL value must be less than the cleanup level, (2) no single detection can 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-4 waste site is included in the statistical calculations (Appendix B). The results of this evaluation indicate that all residual COPC concentrations pass the three-part test in comparison against applicable RAGs, with the exception of lead, mercury, and total PCBs comparison against the soil RAGs for groundwater and river protection. As described previously, RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009b) predicts that these constituents will not reach groundwater (and, therefore, the river) within 1,000 years. Therefore, residual concentrations of all constituents are protective of groundwater and the river.

A three-part evaluation was also performed for focused sampling results. Table 5 presents the maximum value associated with each detected constituent. As shown in Table 5, maximum results for lead, total PCBs, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene and benzo(k)fluoranthene, exceed soil RAGs for groundwater and/or river protection. Because the data set for each focused sample consists of one sample, greater than 10% of the data for these analytes also exceed the same RAG values. Only benzo(a)anthracene, benzo(a)pyrene and

benzo(b)fluoranthene results exceed more than twice the lowest RAG value (for groundwater and river protection). However, as discussed previously, RESRAD modeling predicts that no constituents will not reach groundwater (and, therefore, the river) within 1,000 years. Therefore, residual concentrations of all constituents are protective of groundwater and the river.

DATA QUALITY ASSESSMENT

A data quality assessment (DQA) was performed to compare the verification sampling approaches 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-4 waste site establishes that the data are of the right type, quality, and quantity to support site verification decisions within specified error tolerances. The evaluation verified that the sample design and resulting data set are acceptable for decision-making purposes. The detailed DQA is presented in Appendix C.

SUMMARY FOR INTERIM CLOSURE

The 100-H-4 waste site has been evaluated in accordance with the Remaining Sites ROD (EPA 1999). Verification sampling results support an evaluation that residual contaminant concentrations at the 100-H-4 waste site 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. Therefore, the 100-H-4 waste site does not pose a risk to human health or the environment, and no institutional controls are required. A reclassification to Interim Closed Out is supported for the 100-H-4, 1717-H Hot Shop, French Drain, and Contaminated Storage Unit waste site.

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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-4 Waste Site [a].

Hazardous Substance		2001 WAC 173-340 Table 749-3			EPA Ecological Soil Screening Levels [b]				Maximum Result
		Plants	Soil Biota	Wildlife	Plants	Soil Biota	Avian [c]	Mammalian [c]	
	Background	Metals (mg/kg)							
Antimony	5	5	--	--	--	78	--	0.27	0.397 (<BG)
Arsenic III	6.5 [d]	--	--	7	18	--	43	46	7.17
Arsenic V	6.5 [d]	10	60	132					
Boron	--	0.5	--	--	--	--	--	--	1.67
Lead	10.2	50	500	118	120	1,700	11	56	16.8
Manganese	512	1,100 [e]	--	1,500	220	450	4,300	4,000	263 (<BG)
Mercury, inorganic	0.33	0.3	0.1	5.5	--	--	--	--	0.408
Selenium	0.78	1	70	0.3	0.52	4.1	1.2	0.63	0.334 (<BG)
Vanadium	85.1	2	--	--	--	--	7.8	280	50.5 (<BG)
Zinc	67.8	86 [e]	200	360	160	120	46	79	62.5 (<BG)

[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 applicable
BG = background
EPA = U.S. Environmental Protection Agency
WAC = *Washington Administrative Code*

APPENDIX B

CALCULATIONS

APPENDIX B

CALCULATION BRIEFS

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

100-H-4 Waste Site Cleanup Verification 95% UCL Calculation, 0100H-CA-V0150, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-H-4 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculations, 0100H-CA-V0157, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-H-4 Waste Site Hazard Quotient and Carcinogenic Risk Calculation for Protection of Groundwater, 0100H-CA-V0156, 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.

Acrobat 8.0

CALCULATION COVER SHEET

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

Area: 100-HR-1

Discipline: Environmental *Calculation No: 0100H-CA-V0150

Subject: 100-H-4 Waste Site Cleanup Verification 95% UCL Calculation

Computer Program: Excel Program No: Excel 2003

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

Committed Calculation ☒ Preliminary ☐ Superseded ☐ Voided ☐

Rev.	Sheet Numbers	Originator	Checker	Reviewer	Approval	Date
0	Cover = 1 Sheets = 15 Attm. 1 = 28 Total = 44	T. E. Queen	J. D. Skoglie	B. L. Vedder	D. F. Obenauer	1/13/11

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 T. E. Queen	**Date** 01/12/11	**Calc. No.** 0100H-CA-V0150	**Rev. No.** 0
Project 100-H Field Remediation	**Job No.** 14655	**Checked** J. D. Skoglie	**Date** 01/12/11
Subject 100-H-4 Waste Site Cleanup Verification 95% UCL Calculations			**Sheet No.** 1 of 15

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
Sheet 5 to 10 - Calculation Sheet Verification Data - Excavation
Sheet 11 to 13 - Ecology Software (MTCAStat) Results
Sheet 14 to 15 - Calculation Sheet Split - Duplicate Analysis
Attachment 1 - 100-H-4, Verification Sampling Results (28 sheets)

Given/References:
1) Sample Results (Attachment 1).
2) Background values and remedial action goals (RAGs) are taken from DOE-RL (2005b), DOE-RL (2001), and Ecology (1996).
3) DOE-RL, 2001, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, DOE/RL-92-24, Rev. 4, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
4) 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.
5) 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.
6) Ecology, 1992, *Statistical Guidance for Ecology Site Managers*, Publication #92-54, Washington Department of Ecology, Olympia, Washington.
7) 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.
8) Ecology, 1996, *Model Toxic Control Act Cleanup Levels and Risk Calculations (CLARC II),* Publication #94-145, Washington State Department of Ecology, Olympia, Washington.
9) Ecology, 2005, Cleanup Levels and Risk Calculations (CLARC) Database, Washington State Department of Ecology, Olympia, Washington, <https://fortress.wa.gov/ecy/clarc/CLARCHome.aspx>.
10) WAC 173-340, 1996, "Model Toxic Control Act - Cleanup," *Washington Administrative Code.*

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

Calculation Description:
The subject calculations were performed on statistical data from soil verification samples (Attachment 1) from the 100-H-4 waste site. The data were entered into an EXCEL 2003 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-4 waste site underwent statistical verification sampling in the shallow zone excavation. Five focused samples were also collected.

Analytical results for all sampling locations are summarized in the tables provided on sheets 3 and 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 T. E. Queen	**Date** 01/12/11	**Calc. No.** 0100H-CA-V0150	**Rev. No.** 0
Project 100-H Field Remediation	**Job No.** 14655	**Checked** J. D. Skoglie	**Date** 01/12/11
Subject 100-H-4 Waste Site Cleanup Verification 95% UCL Calculations			**Sheet No.** 2 of 15

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 (which includes primary and duplicate samples) 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 (2005) under WAC 173-340-740(3) for aluminum, calcium, iron, magnesium, potassium, silicon, and sodium; therefore, these constituents are not considered site COCs/COPCs and are also not included in these calculations. The 95% UCL values were not calculated for potassium-40, radium-226, radium-228, thorium-228, and thorium-232 based on natural occurence at the Hanford Site.

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 either the duplicate or split value for a given analyte are above detection limits and are greater than 5 times the target detection limit (TDL). The TDL is a laboratory detection limit pre-determined for each analytical method and is listed in Table 2-1 of the SAP (DOE-RL 2009a) for certain constituents. All other constituents will have their own pre-determined TDL's based on the laboratory and method used. Where direct evaluation of the attached sample data showed that a given analyte was not detected in the primary 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) 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/split 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/split result 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 T. E. Queen Date 01/12/11 Calc. No. 0100H-CA-V0150 Rev. No. 0
Project 100-H Field Remediation Job No. 14655 Checked J. D. Skoglie Date 01/12/11
Subject 100-H-4 Waste Site Cleanup Verification 95% UCL Calculations Sheet No. 3 of 15

Summary (continued)

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

Results Summary - Excavation [a]

Analyte	95% UCL Result	Maximum Result	Units
Nickel-63	1.61	–	pCi/g
Uranium-233/234	1.10	–	pCi/g
Uranium-238	0.864	–	pCi/g
Arsenic	7.17	–	mg/kg
Barium	53.3	–	mg/kg
Beryllium	0.243	–	mg/kg
Boron	1.67	–	mg/kg
Cadmium	0.123	–	mg/kg
Chromium	11.3	–	mg/kg
Cobalt	5.56	–	mg/kg
Copper	15.3	–	mg/kg
Lead	16.8	–	mg/kg
Manganese	263	–	mg/kg
Molybdenum	0.456	–	mg/kg
Nickel	10.2	–	mg/kg
Vanadium	50.5	–	mg/kg
Zinc	35.7	–	mg/kg
TPH - motor oil	34.8	–	mg/kg
Benzo(a)anthracene	3.24	–	ug/kg
Benzo(a)pyrene	3.68	–	ug/kg
Benzo(b)fluoranthene	3.32	–	ug/kg
Benzo(ghi)perylene	2.94	–	ug/kg
Benzo(k)fluoranthene	2.12	–	ug/kg
Chrysene	5.36	–	ug/kg
Fluoranthene	11.6	–	ug/kg
Phenanthrene	2.85	–	ug/kg
Pyrene	8.01	–	ug/kg
Mercury	–	0.408	mg/kg
Selenium	–	0.391	mg/kg
Acenaphthene	–	10.9	ug/kg
alpha-Chlordane	–	3.02	ug/kg
Aroclor-1254	–	66.5	ug/kg
Aroclor-1260	–	35.2	ug/kg
4,4'-DDE	–	2.95	ug/kg
4,4'-DDT	–	1.56	ug/kg
Fluorene	–	2.99	ug/kg
gamma-Chlordane	–	1.43	ug/kg
Indeno(1,2,3-cd)pyrene	–	31.1	ug/kg

3-Part Test Evaluation:

95% UCL or maximum[a] >		
Cleanup Limit?	YES	YES
> 10% above Cleanup Limit?	YES	YES
Any sample > 2x Cleanup Limit?	YES	YES

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

– = not applicable
B = blank contamination (inorganic constituents)
C = Sample was ≤5X the blank concentration
CVP = closeout verification package
D = dilution
DE = direct exposure
GW = groundwater
J = estimate
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
SAP = sampling and analysis plan
TDL = target detection limit
U = undetected
UCL = upper confidence limit
WAC = Washington Administrative Code

Washington Closure Hanford **CALCULATION SHEET**

Originator T. E. Queen	**Date** 01/12/11	**Calc. No.** 0100H-CA-V0150		**Rev. No.**	0
Project 100-H Field Remediation	**Job No.** 14655	**Checked** J. D. Skoglie		**Date**	01/12/11
Subject 100-H-4 Waste Site Cleanup Verification 95% UCL Calculations				**Sheet No.**	4 of 15

Summary (continued)

Results:

The results presented in the tables that follow include the summary of the results of the 95% UCL calculations for the shallow zone excavation, the WAC 173-340-740(7)(e) 3-part test evaluation, and the RPD calculations, and are for use in risk analysis and the RSVP for this site.

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

Analyte	Duplicate Analysis Excavation
Potassium-40	8.0%
Radium-226	5.7%
Aluminum	4.5%
Barium	17.4%
Calcium	11.3%
Chromium	9.3%
Copper	14.5%
Iron	6.5%
Lead	10.1%
Magnesium	6.3%
Manganese	6.0%
Silicon	34.4%
Vanadium	8.9%
Zinc	3.7%

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

Focused Samples

Analyte	Result	Units
Uranium-233/234	1.46	pCi/g
Uranium-238	1.34	pCi/g
Antimony	0.397	mg/kg
Arsenic	8.36	mg/kg
Barium	79.0	mg/kg
Beryllium	0.307	mg/kg
Boron	2.26	mg/kg
Cadmium	0.240	mg/kg
Chromium	16.9	mg/kg
Cobalt	6.46	mg/kg
Copper	19.3	mg/kg
Lead	18.4	mg/kg
Manganese	364	mg/kg
Mercury	0.0141	mg/kg
Molybdenum	0.478	mg/kg
Nickel	14.9	mg/kg
Selenium	0.334	mg/kg
Vanadium	46.4	mg/kg
Zinc	62.5	mg/kg
TPH - motor oil	188	mg/kg
Acenaphthene	51.1	ug/kg
Aroclor-1254	13.8	ug/kg
Aroclor-1260	18.4	ug/kg
Benzo(a)anthracene	74.6	ug/kg
Benzo(a)pyrene	52.9	ug/kg
Benzo(b)fluoranthene	44.1	ug/kg
Benzo(ghi)perylene	45.9	ug/kg
Benzo(k)fluoranthene	27.2	ug/kg
Chrysene	31.3	ug/kg
Dibenz[a,h]anthracene	6.62	ug/kg
4,4'-DDT	1.94	ug/kg
Fluoranthene	29.0	ug/kg
Fluorene	4.18	ug/kg
Indeno(1,2,3-cd)pyrene	14.5	ug/kg
Phenanthrene	2.08	ug/kg
Pyrene	15.7	ug/kg

CALCULATION SHEET

Washington Closure Hanford

Originator T. E. Queen
Project 100-H Field Remediation
Subject 100-H-4 Waste Site Cleanup Verification 95% UCL Calculations

Date 01/12/11
Job No. 14655

Calc. No. 0100H-CA-V0150
Checked J. D. Skoglie

Rev. No. 0
Date 01/12/11
Sheet No. 5 of 15

1 **100-H-4 Statistical Calculations**
2 **Verification Data -Excavation**

3	Sample	Sample	Sample	Nickel-63			Uranium-233/234			Uranium-238		
4	Area	Number	Date	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
5	SZ-8	J1C3B0	9/22/10	-1.42	U	2.7	0.556		0.327	0.427		0.327
6	Duplicate of J1C3B0	J1C3B5	9/22/10	1.11	U	2.54	0.526		0.131	0.549		0.074
7	SZ-1	J1C393	9/22/10	-0.894	U	2.67	0.991		0.292	0.572		0.292
8	SZ-2	J1C394	9/22/10	-0.672	U	2.56	0.656		0.285	0.715		0.228
9	SZ-3	J1C395	9/22/10	7.74		2.60	1.49		0.181	0.991		0.181
10	SZ-4	J1C396	9/22/10	0.871	U	2.49	1.42		0.389	0.812		0.311
11	SZ-5	J1C397	9/22/10	-0.400	U	2.50	0.790		0.263	0.927		0.263
12	SZ-6	J1C398	9/22/10	-1.10	U	2.60	0.561		0.286	0.449		0.286
13	SZ-7	J1C399	9/22/10	1.56	U	2.68	1.60		0.272	1.28		0.272
14	SZ-9	J1C3B1	9/22/10	-1.03	U	2.52	1.07		0.227	1.07		0.227
15	SZ-10	J1C3B2	9/22/10	-0.635	U	2.56	0.622		0.28	0.439		0.28
16	SZ-11	J1C3B3	9/22/10	-0.112	U	2.56	0.591		0.226	0.355		0.226
17	SZ-12	J1C3B4	9/22/10	0.256	U	2.51	0.617		0.262	0.617		0.262

18
19 **Statistical Computation Input Data**

20	Sample	Sample	Sample	Nickel-63			Uranium-233/234			Uranium-238		
21	Area	Number	Date	pCi/g			pCi/g			pCi/g		
22	SZ-8	J1C3B0/ J1C3B5	9/22/10	-0.155			0.541			0.488		
23	SZ-1	J1C393	9/22/10	-0.894			0.991			0.572		
24	SZ-2	J1C394	9/22/10	-0.672			0.656			0.715		
25	SZ-3	J1C395	9/22/10	7.74			1.49			0.991		
26	SZ-4	J1C396	9/22/10	0.871			1.42			0.812		
27	SZ-5	J1C397	9/22/10	-0.400			0.790			0.927		
28	SZ-6	J1C398	9/22/10	-1.10			0.561			0.449		
29	SZ-7	J1C399	9/22/10	1.56			1.60			1.28		
30	SZ-9	J1C3B1	9/22/10	-1.03			1.07			1.07		
31	SZ-10	J1C3B2	9/22/10	-0.635			0.622			0.439		
32	SZ-11	J1C3B3	9/22/10	-0.112			0.591			0.355		
33	SZ-12	J1C3B4	9/22/10	0.256			0.617			0.617		

34 **Statistical Computations**

35		Nickel-63			Uranium-233/234			Uranium-238		
36	95% UCL based on	Radionuclide data set. Use nonparametric z-statistic.			Radionuclide data set. Use nonparametric z-statistic.			Radionuclide data set. Use nonparametric z-statistic.		
37	N	12			12			12		
38	% < Detection limit	92%			0%			0%		
39	Mean	0.452			0.912			0.726		
40	Standard deviation	2.43			0.395			0.291		
41	Z-statistic	1.64			1.64			1.64		
42	95% UCL on mean	1.61			1.10			0.864		
43	Maximum value	7.74			1.60			1.28		

CALCULATION SHEET

Washington Closure Hanford

Originator T. E. Queen
Project 100-H Field Remediation
Subject 100-H-4 Waste Site Cleanup Verification 95% UCL Calculations

Date 01/12/11
Job No. 14655

Calc. No. 0100H-CA-V0150
Checked J. D. Skoglie

Rev. No. 0
Date 01/12/11
Sheet No. 6 of 15

1 **100-H-4 Statistical Calculations**

2 **Verification Data -Excavation**

3	Sample	Sample	Sample	Arsenic			Barium			Beryllium			Boron			Cadmium			Chromium			Cobalt			Copper		
4	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
5	SZ-8	J1C3B0	9/22/10	12.9	J	0.700	83.5	J	0.350	0.323		0.140	3.29	J	1.40	0.114	JB	0.175	13.3	J	0.700	6.23	J	2.10	16.6	J	1.40
6	Duplicate of J1C3B0	J1C3B5	9/22/10	11.9	J	0.980	99.4	J	0.490	0.357		0.196	5.64	J	1.96	0.133	JB	0.245	14.6	J	0.980	6.67	J	2.94	19.2	J	1.96
7	SZ-1	J1C393	9/22/10	2.27	J	0.655	35.1	J	0.328	0.158		0.131	0.545	JB	1.31	0.127	JB	0.164	6.06	J	0.655	4.94	J	1.97	14.8	J	1.31
8	SZ-2	J1C394	9/22/10	2.77	J	0.763	30.3	J	0.381	0.174		0.153	0.701	JB	1.53	0.0940	JB	0.191	8.88	J	0.763	5.49	J	2.29	12.1	J	1.53
9	SZ-3	J1C395	9/22/10	4.04	J	0.825	31.3	J	0.413	0.169		0.165	0.694	JB	1.65	0.0959	JB	0.206	8.88	J	0.825	4.92	J	2.48	12.3	J	1.65
10	SZ-4	J1C396	9/22/10	3.13	J	0.775	41.7	J	0.388	0.177		0.155	0.789	JB	1.55	0.103	JB	0.194	9.37	J	0.775	5.18	J	2.33	15.4	J	1.55
11	SZ-5	J1C397	9/22/10	5.92	J	0.671	35.8	J	0.336	0.203		0.134	0.610	JB	1.34	0.110	JB	0.168	6.32	J	0.671	5.16	J	2.01	14.1	J	1.34
12	SZ-6	J1C398	9/22/10	4.23	J	0.821	42.6	J	0.410	0.210		0.164	1.02	JB	1.64	0.106	JB	0.205	11.0	J	0.821	4.71	J	2.46	12.6	J	1.64
13	SZ-7	J1C399	9/22/10	2.85	J	0.772	32.7	J	0.386	0.161		0.154	0.813	JB	1.54	0.0858	JB	0.193	9.87	J	0.772	4.76	J	2.32	11.0	J	1.54
14	SZ-9	J1C3B1	9/22/10	3.50	J	0.862	32.6	J	0.431	0.202		0.172	0.813	JB	1.72	0.0902	JB	0.216	11.3	J	0.862	5.08	J	2.59	11.6	J	1.72
15	SZ-10	J1C3B2	9/22/10	6.81	J	0.810	43.8	J	0.405	0.259		0.162	1.51	JB	1.62	0.0962	JB	0.203	10.8	J	0.810	4.94	J	2.43	12.6	J	1.62
16	SZ-11	J1C3B3	9/22/10	9.02	J	0.861	76.0	J	0.431	0.320		0.172	1.11	JB	1.72	0.178	JB	0.215	11.4	J	0.861	6.49	J	2.58	18.4	J	1.72
17	SZ-12	J1C3B4	9/22/10	4.67	J	0.943	36.4	J	0.472	0.198		0.189	0.887	JB	1.89	0.119	JB	0.236	9.89	J	0.943	5.19	J	2.83	14.5	J	1.89

19 **Statistical Computation Input Data**

20	Sample	Sample	Sample	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper
21	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
22	SZ-8	J1C3B0/ J1C3B5	9/22/10	12.4	91.5	0.340	4.47	0.124	14.0	6.45	17.9
23	SZ-1	J1C393	9/22/10	2.27	35.1	0.158	0.545	0.127	6.06	4.94	14.8
24	SZ-2	J1C394	9/22/10	2.77	30.3	0.174	0.701	0.0940	8.88	5.49	12.1
25	SZ-3	J1C395	9/22/10	4.04	31.3	0.169	0.694	0.0959	8.88	4.92	12.3
26	SZ-4	J1C396	9/22/10	3.13	41.7	0.177	0.789	0.103	9.37	5.18	15.4
27	SZ-5	J1C397	9/22/10	5.92	35.8	0.203	0.610	0.110	6.32	5.16	14.1
28	SZ-6	J1C398	9/22/10	4.23	42.6	0.210	1.020	0.106	11.0	4.71	12.6
29	SZ-7	J1C399	9/22/10	2.85	32.7	0.161	0.813	0.0858	9.87	4.76	11.0
30	SZ-9	J1C3B1	9/22/10	3.50	32.6	0.202	0.813	0.0902	11.3	5.08	11.6
31	SZ-10	J1C3B2	9/22/10	6.81	43.8	0.259	1.51	0.0962	10.8	4.94	12.6
32	SZ-11	J1C3B3	9/22/10	9.02	76.0	0.320	1.11	0.178	11.4	6.49	18.4
33	SZ-12	J1C3B4	9/22/10	4.67	36.4	0.198	0.887	0.119	9.89	5.19	14.5

34 **Statistical Computations**

35		Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper
36	95% UCL based on	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), use MTCAStat lognormal distribution.
37	N	12	12	12	12	12	12	12	12
38	% < Detection limit	0%	0%	0%	0%	0%	0%	0%	0%
39	Mean	5.13	44.1	0.214	1.16	0.111	9.81	5.28	13.9
40	Standard deviation	3.00	19.3	0.0608	1.07	0.0250	2.18	0.596	2.38
41	95% UCL on mean	7.17	53.3	0.243	1.67	0.123	11.3	5.56	15.3
42	Maximum value	12.9	99.4	0.357	5.64	0.178	14.6	6.67	19.2
43	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)**	20 DE, GW & River Protection	200 GW Protection	1.51 GW & River Protection	320 GW Protection	0.81 GW & River Protection	18.5 GW & River Protection	15.7 GW Protection	22.0 River Protection
44	**WAC 173-340 3-PART TEST**								
45	95% UCL > Cleanup Limit?	NO	NA	NA	NO	NA	NA	NA	NA
46	> 10% above Cleanup Limit?	NO	NA	NA	NO	NA	NA	NA	NA
47	Any sample > 2X Cleanup Limit?	NO	NA	NA	NO	NA	NA	NA	NA
48	**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.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	Because all values are below background (0.81 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (18.5 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (15.7 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (22.0 mg/kg) the WAC 173-340 3-part test is not required.

CALCULATION SHEET

Washington Closure Hanford

Originator T. E. Queen
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1 **100-H-4 Statistical Calculations**
2 **Verification Data -Excavation**

3	Sample	Sample	Sample	Lead			Manganese			Molybdenum			Nickel			Vanadium			Zinc			TPH - motor oil			Benzo(a)anthracene		
4	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	ug/kg	Q	PQL
5	SZ-8	J1C3B0	9/22/10	29.1	J	0.700	290	J	0.700	0.655	B	0.700	11.5		1.75	44.2	J	0.700	39.6	J	2.10	16.3	J	9.43	9.50		3.36
6	Duplicate of J1C3B0	J1C3B5	9/22/10	26.3	J	0.980	308	J	0.980	0.709	B	0.980	12.4		2.45	48.3	J	0.980	41.1	J	2.94	16.2	J	10.2	5.02		3.47
7	SZ-1	J1C393	9/22/10	2.38	J	0.655	198	J	0.655	0.359	B	0.655	8.24		1.64	47.7	J	0.655	30.3	J	1.97	22.6	J	9.89	3.34	U	3.34
8	SZ-2	J1C394	9/22/10	2.42	J	0.763	227	J	0.763	0.381	B	0.763	8.73		1.91	51.0	J	0.763	30.8	J	2.29	18.9	J	12.3	3.40	U	3.40
9	SZ-3	J1C395	9/22/10	4.00	J	0.825	231	J	0.825	0.333	B	0.825	7.80		2.06	45.2	J	0.825	30.5	J	2.48	21.4	J	10.5	3.40	U	3.40
10	SZ-4	J1C396	9/22/10	3.35	J	0.775	247	J	0.775	0.350	B	0.775	8.67		1.94	49.8	J	0.775	31.0	J	2.33	8.58	J	11.3	1.52	J	4.00
11	SZ-5	J1C397	9/22/10	4.37	J	0.671	239	J	0.671	0.423	B	0.671	7.17		1.68	54.4	J	0.671	35.0	J	2.01	6.64	J	10.5	3.20	J	3.46
12	SZ-6	J1C398	9/22/10	4.82	J	0.821	236	J	0.821	0.405	B	0.821	9.93		2.05	41.2	J	0.821	30.3	J	2.46	24.6	J	9.92	2.86	J	3.78
13	SZ-7	J1C399	9/22/10	2.35	J	0.772	227	J	0.772	0.322	B	0.772	9.77		1.93	50.8	J	0.772	28.3	J	2.32	15.8	J	9.97	3.41	U	3.41
14	SZ-9	J1C3B1	9/22/10	3.00	J	0.862	245	J	0.862	0.329	B	0.862	10.2		2.16	51.6	J	0.862	30.4	J	2.59	16.0	J	9.94	3.37	U	3.37
15	SZ-10	J1C3B2	9/22/10	22.2	J	0.810	253	J	0.810	0.339	B	0.810	9.55		2.03	43.4	J	0.810	33.3	J	2.43	56.7	J	10.1	3.08	J	3.50
16	SZ-11	J1C3B3	9/22/10	42.8	J	0.861	303	J	0.861	0.541	B	0.861	11.0		2.15	50.7	J	0.861	46.0	J	2.58	24.3	J	10.3	1.25	J	3.38
17	SZ-12	J1C3B4	9/22/10	6.63	J	0.943	253	J	0.943	0.406	B	0.943	9.63		2.36	48.4	J	0.943	33.0	J	2.83	42.6	J	10.8	1.90	J	3.38

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19 **Statistical Computation Input Data**

20	Sample	Sample	Sample	Lead	Manganese	Molybdenum	Nickel	Vanadium	Zinc	TPH - motor oil	Benzo(a)anthracene
21	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	ug/kg
22	SZ-8	J1C3B0/ J1C3B5	9/22/10	27.7	299	0.682	12.0	46.3	40.4	16.3	7.26
23	SZ-1	J1C393	9/22/10	2.38	198	0.359	8.24	47.7	30.3	22.6	1.67
24	SZ-2	J1C394	9/22/10	2.42	227	0.381	8.73	51.0	30.8	18.9	1.70
25	SZ-3	J1C395	9/22/10	4.00	231	0.333	7.80	45.2	30.5	21.4	1.70
26	SZ-4	J1C396	9/22/10	3.35	247	0.350	8.67	49.8	31.0	8.58	1.52
27	SZ-5	J1C397	9/22/10	4.37	239	0.423	7.17	54.4	35.0	6.64	3.20
28	SZ-6	J1C398	9/22/10	4.82	236	0.405	9.93	41.2	30.3	24.6	2.86
29	SZ-7	J1C399	9/22/10	2.35	227	0.322	9.77	50.8	28.3	15.8	1.71
30	SZ-9	J1C3B1	9/22/10	3.00	245	0.329	10.2	51.6	30.4	16.0	1.69
31	SZ-10	J1C3B2	9/22/10	22.2	253	0.339	9.55	43.4	33.3	56.7	3.08
32	SZ-11	J1C3B3	9/22/10	42.8	303	0.541	11.0	50.7	46.0	24.3	1.25
33	SZ-12	J1C3B4	9/22/10	6.63	253	0.406	9.63	48.4	33.0	42.6	1.90

34 **Statistical Computations**

35		Lead	Manganese	Molybdenum	Nickel	Vanadium	Zinc	TPH - motor oil	Benzo(a)anthracene
36	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), 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), lognormal and normal distribution rejected, use z-statistic.
37	N	12	12	12	12	12	12	12	12
38	% < Detection limit	0%	0%	0%	0%	0%	0%	0%	42%
39	Mean	10.5	247	0.406	9.39	48.4	33.3	22.9	2.46
40	Standard deviation	13.2	29.5	0.106	1.35	3.79	5.09	14.0	1.64
41	95% UCL on mean	16.8	263	0.456	10.2	50.5	35.7	34.8	3.24
42	Maximum value	42.8	308	0.709	12.4	54.4	46.0	56.7	9.50
43	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless noted otherwise**	10.2 GW & River Protection	512 GW & River Protection	8.0 GW Protection	19.1 GW Protection	85.1 GW Protection	67.8 River Protection	200 DE, GW & River Protection	15 ug/kg GW & River Protection
44	**WAC 173-340 3-PART TEST**								
45	95% UCL > Cleanup Limit?	YES	NA	NO	NA	NA	NA	NO	NO
46	> 10% above Cleanup Limit?	YES	NA	NO	NA	NA	NA	NO	NO
47	Any sample > 2X Cleanup Limit?	YES	NA	NO	NA	NA	NA	NO	NO
48	**WAC 173-340 Compliance?**	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	Because all values are below background (512 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	Because all values are below background (19.1 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (85.1 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (67.8 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.

CALCULATION SHEET

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1 **100-H-4 Statistical Calculations**
2 **Verification Data -Excavation**

3	Sample	Sample	Sample	Benzo(a)pyrene			Benzo(b)fluoranthene			Benzo(ghi)perylene			Benzo(k)fluoranthene			Chrysene			Fluoranthene			Phenanthrene			Pyrene		
4	Area	Number	Date	ug/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
5	SZ-8	J1C3B0	9/22/10	8.86		3.36	10.1		3.36	6.41		3.36	4.73		3.36	8.26		3.36	22.0		3.36	2.69	J	3.36	3.36	U	3.36
6	Duplicate of J1C3B0	J1C3B5	9/22/10	6.71		3.47	3.03	J	3.47	5.25		3.47	3.16	J	3.47	6.97		3.47	22.3		3.47	6.08		3.47	11.0		3.47
7	SZ-1	J1C393	9/22/10	3.34	U	3.34	3.34	U	3.34	3.34	U	3.34	3.34	U	3.34	2.66	J	3.34	3.34	U	3.34	3.34	U	3.34	3.34	U	3.34
8	SZ-2	J1C394	9/22/10	3.40	U	3.40	3.40	U	3.40	3.40	U	3.40	3.40	U	3.40	2.74	J	3.40	3.40	U	3.40	3.40	U	3.40	1.02	J	3.40
9	SZ-3	J1C395	9/22/10	3.40	U	3.40	3.40	U	3.40	3.40	U	3.40	3.40	U	3.40	4.88		3.40	1.02	J	3.40	3.40	U	3.40	3.40	U	3.40
10	SZ-4	J1C396	9/22/10	2.26	J	4.00	1.60	J	4.00	1.68	J	4.00	1.08	J	4.00	5.78		4.00	2.24	J	4.00	1.38	J	4.00	2.78	J	4.00
11	SZ-5	J1C397	9/22/10	3.78		3.46	3.64		3.46	2.82	J	3.46	1.82	J	3.46	1.21	J	3.46	10.0		3.46	4.38		3.46	8.75		3.46
12	SZ-6	J1C398	9/22/10	3.82		3.78	4.26		3.78	2.63	J	3.78	1.91	J	3.78	1.69	J	3.78	5.89		3.78	1.55	J	3.78	9.03		3.78
13	SZ-7	J1C399	9/22/10	3.41	U	3.41	3.41	U	3.41	3.41	U	3.41	3.41	U	3.41	3.41	U	3.41	3.41	U	3.41	3.41	U	3.41	3.41	U	3.41
14	SZ-9	J1C3B1	9/22/10	3.37	U	3.37	3.37	U	3.37	3.37	U	3.37	3.37	U	3.37	3.07	J	3.37	3.37	U	3.37	3.37	U	3.37	3.37	U	3.37
15	SZ-10	J1C3B2	9/22/10	3.24	J	3.50	2.87	J	3.50	3.50	U	3.50	1.73	J	3.50	1.96	J	3.50	9.35		3.50	3.62		3.50	9.33		3.50
16	SZ-11	J1C3B3	9/22/10	2.44	J	3.38	1.98	J	3.38	3.46		3.38	1.08	J	3.38	2.44	J	3.38	3.18	J	3.38	2.57	J	3.38	4.39		3.38
17	SZ-12	J1C3B4	9/22/10	2.37	J	3.38	3.38	U	3.38	1.47	J	3.38	1.07	J	3.38	6.57		3.38	3.40		3.38	1.30	J	3.38	2.52	J	3.38

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19 **Statistical Computation Input Data**

20	Sample	Sample	Sample	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(ghi)perylene	Benzo(k)fluoranthene	Chrysene	Fluoranthene	Phenanthrene	Pyrene
21	Area	Number	Date	ug/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
22	SZ-8	J1C3B0/ J1C3B5	9/22/10	7.79	6.57	5.83	3.95	7.62	22.2	4.39	6.34
23	SZ-1	J1C393	9/22/10	1.67	1.67	1.67	1.67	2.66	1.67	1.67	1.67
24	SZ-2	J1C394	9/22/10	1.70	1.70	1.70	1.70	2.74	1.70	1.70	1.02
25	SZ-3	J1C395	9/22/10	1.70	1.70	1.70	1.70	4.88	1.02	1.70	1.70
26	SZ-4	J1C396	9/22/10	2.26	1.60	1.68	1.08	5.78	2.24	1.38	2.78
27	SZ-5	J1C397	9/22/10	3.78	3.64	2.82	1.82	1.21	10.0	4.38	8.75
28	SZ-6	J1C398	9/22/10	3.82	4.26	2.63	1.91	1.69	5.89	1.55	9.03
29	SZ-7	J1C399	9/22/10	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71
30	SZ-9	J1C3B1	9/22/10	1.69	1.69	1.69	1.69	3.07	1.69	1.69	1.69
31	SZ-10	J1C3B2	9/22/10	3.24	2.87	1.75	1.73	1.96	9.35	3.62	9.33
32	SZ-11	J1C3B3	9/22/10	2.44	1.98	3.46	1.08	2.44	3.18	2.57	4.39
33	SZ-12	J1C3B4	9/22/10	2.37	1.69	1.47	1.07	6.57	3.40	1.30	2.52

34 **Statistical Computations**

35		Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(ghi)perylene	Benzo(k)fluoranthene	Chrysene	Fluoranthene	Phenanthrene	Pyrene
36	95% UCL based on	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), 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.
37	N	12	12	12	12	12	12	12	12
38	% < Detection limit	42%	50%	50%	42%	8%	33%	42%	33%
39	Mean	2.85	2.59	2.34	1.76	3.53	5.33	2.30	4.24
40	Standard deviation	1.75	1.54	1.26	0.752	2.14	6.11	1.16	3.23
41	95% UCL on mean	3.68	3.32	2.94	2.12	5.36	11.6	2.85	8.01
42	Maximum value	8.86	10.1	6.41	4.73	8.26	22.3	6.08	11.0
43	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless noted otherwise**	15 ug/kg GW & River Protection	15 ug/kg GW & River Protection	48,000 ug/kg GW Protection	15 ug/kg GW & River Protection	100 ug/kg River Protection	18,000 ug/kg River Protection	240,000 ug/kg GW Protection	48,000 ug/kg GW Protection
44	**WAC 173-340 3-PART TEST**								
45	95% UCL > Cleanup Limit?	NO	NO	NO	NO	NO	NO	NO	NO
46	> 10% above Cleanup Limit?	NO	NO	NO	NO	NO	NO	NO	NO
47	Any sample > 2X Cleanup Limit?	NO	NO	NO	NO	NO	NO	NO	NO
48	**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.	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.	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 T. E. Queen
Project 100-H Field Remediation
Subject 100-H-4 Waste Site Cleanup Verification 95% UCL Calculations

Date 01/12/11
Job No. 14655

Calc. No. 0100H-CA-V0150
Checked J. D. Skoglie

Rev. No. 0
Date 01/12/11
Sheet No. 9 of 15

1 **100-H-4 Maximum Calculations**
2 **Verification Data -Excavation**

3	Sample	Sample	Sample	Mercury			Selenium			Acenaphthene			alpha-Chlordane			Aroclor-1254			Aroclor-1260			4,4'-DDE			4,4'-DDT			Fluorene		
4	Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
5	SZ-8	J1C3B0	9/22/10	0.0266	U	0.0266	0.287	J	0.210	3.36	U	3.36	1.30	UD	1.30	66.1	J	12.9	35.2		12.9	2.95	JD	1.30	1.30	UD	1.30	3.36	U	3.36
6	Duplicate of J1C3B0	J1C3B5	9/22/10	0.0258	U	0.0258	0.319	J	0.294	3.47	U	3.47	1.42	UD	1.42	66.5	J	14.2	33.4		14.2	2.91	JD	1.42	1.42	UD	1.42	2.99	J	3.47
7	SZ-1	J1C393	9/22/10	0.0236	U	0.0236	0.197	UJ	0.197	3.34	U	3.34	1.32	UD	1.32	13.2	UJ	13.2	13.2	U	13.2	1.32	UD	1.32	1.32	UD	1.32	3.34	U	3.34
8	SZ-2	J1C394	9/22/10	0.0242	U	0.0242	0.273	J	0.229	3.40	U	3.40	1.34	UD	1.34	13.4	UJ	13.4	13.4	U	13.4	1.34	UD	1.34	1.34	UD	1.34	3.40	U	3.40
9	SZ-3	J1C395	9/22/10	0.0242	U	0.0242	0.248	UJ	0.248	3.40	U	3.40	1.34	UD	1.34	13.5	UJ	13.5	13.5	UJ	13.5	1.34	UD	1.34	1.34	UD	1.34	3.40	U	3.40
10	SZ-4	J1C396	9/22/10	0.0302	U	0.0302	0.233	UJ	0.233	4.00	U	4.00	1.61	UD	1.61	16.1	UJ	16.1	16.1	U	16.1	1.61	UD	1.61	1.61	UD	1.61	4.00	U	4.00
11	SZ-5	J1C397	9/22/10	0.0236	U	0.0236	0.201	UJ	0.201	3.46	U	3.46	1.39	UD	1.39	13.9	UJ	13.9	13.9	U	13.9	1.39	UD	1.39	1.39	UD	1.39	3.46	U	3.46
12	SZ-6	J1C398	9/22/10	0.408		0.0272	0.246	UJ	0.246	3.78	U	3.78	1.49	UD	1.49	14.9	UJ	14.9	5.38	J	14.9	1.49	UD	1.49	1.49	UD	1.49	3.78	U	3.78
13	SZ-7	J1C399	9/22/10	0.0274	U	0.0274	0.232	UJ	0.232	3.41	U	3.41	1.38	UD	1.38	13.8	UJ	13.8	13.8	U	13.8	1.38	UD	1.38	1.38	UD	1.38	3.41	U	3.41
14	SZ-9	J1C3B1	9/22/10	0.0248	U	0.0248	0.259	UJ	0.259	3.37	U	3.37	1.34	UD	1.34	13.4	UJ	13.4	13.4	U	13.4	1.34	UD	1.34	1.34	UD	1.34	3.37	U	3.37
15	SZ-10	J1C3B2	9/22/10	0.0249	U	0.0249	0.243	UJ	0.243	3.50	U	3.50	1.36	UD	1.36	6.85	J	13.5	4.21	J	13.5	1.36	UD	1.36	1.36	UD	1.36	3.50	U	3.50
16	SZ-11	J1C3B3	9/22/10	0.0251	U	0.0251	0.258	UJ	0.258	10.9		3.38	3.02	JD	1.30	6.95	J	13.0	3.57	J	13.0	1.30	UD	1.30	1.56	JD	1.30	3.38	U	3.38
17	SZ-12	J1C3B4	9/22/10	0.0272	U	0.0272	0.391	J	0.283	3.38	U	3.38	1.38	UD	1.38	19.3	J	13.8	8.09	J	13.8	1.38	UD	1.38	1.38	UD	1.38	3.38	U	3.38

18
19 **Statistical Computations**

20		Mercury	Selenium	Acenaphthene	alpha-Chlordane	Aroclor-1254	Aroclor-1260	4,4'-DDE	4,4'-DDT	Fluorene
21	% < Detection limit	92%	75%	92%	92%	67%	58%	92%	92%	92%
22	Maximum value	0.408	0.391	10.9	3.02	66.5	35.2	2.95	1.56	2.99
23	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless otherwise noted**	0.33 GW & River Protection	1 River Protection	96,000 ug/kg GW Protection	16.5 ug/kg River Protection[a]	17 ug/kg GW & River Protection	17 ug/kg GW & River Protection	3.3 ug/kg River Protection	3.3 ug/kg River Protection	64,000 ug/kg GW Protection
24	**3-PART TEST**									
25	Maximum > Cleanup Limit?	YES	NA	NO	NO	YES	YES	NO	NO	NO
26	> 10% above Cleanup Limit?	NO	NA	NO	NO	YES	NO	NO	NO	NO
27	Any sample > 2X Cleanup Limit?	NO	NA	NO	NO	YES	YES	NO	NO	NO
28	**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.	Because all values are below background (0.78 mg/kg) the 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	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.

a RAG is applicable to the summation of alpha- and gamma-Chlordane.

MAXIMUM VALUE 3-PART TEST CALCULATION SHEET

Washington Closure Hanford

Originator T. E. Queen
Project 100-H Field Remediation
Subject 100-H-4 Waste Site Cleanup Verification 95% UCL Calculations

Date 01/12/11
Job No. 14655

Calc. No. 0100H-CA-V0150
Checked J. D. Skoglie

Rev. No. 0
Date 01/12/11
Sheet No. 10 of 15

1 **100-H-4 Maximum Calculations**
2 **Verification Data -Excavation**

3	Sample	Sample	Sample	gamma-Chlordane			Indeno(1,2,3-cd)pyrene		
4	Area	Number	Date	ug/kg	Q	PQL	ug/kg	Q	PQL
5	SZ-8	J1C3B0	9/22/10	1.30	UD	1.30	4.17		3.36
6	Duplicate of J1C3B0	J1C3B5	9/22/10	1.42	UD	1.42	3.42	J	3.47
7	SZ-1	J1C393	9/22/10	1.32	UD	1.32	3.34	U	3.34
8	SZ-2	J1C394	9/22/10	1.34	UD	1.34	3.40	U	3.40
9	SZ-3	J1C395	9/22/10	1.34	UD	1.34	3.40	U	3.40
10	SZ-4	J1C396	9/22/10	1.61	UD	1.61	4.00	U	4.00
11	SZ-5	J1C397	9/22/10	1.39	UD	1.39	3.46	U	3.46
12	SZ-6	J1C398	9/22/10	1.49	UD	1.49	2.25	J	3.78
13	SZ-7	J1C399	9/22/10	1.38	UD	1.38	3.41	U	3.41
14	SZ-9	J1C3B1	9/22/10	1.34	UD	1.34	3.37	U	3.37
15	SZ-10	J1C3B2	9/22/10	1.36	UD	1.36	3.50	U	3.50
16	SZ-11	J1C3B3	9/22/10	1.43	JD	1.30	31.1		3.38
17	SZ-12	J1C3B4	9/22/10	1.38	UD	1.38	3.38	U	3.38

18
19 **Statistical Computations**

20		gamma-Chlordane			Indeno(1,2,3-cd)pyrene		
21	% < Detection limit	92%			75%		
22	Maximum value	1.43			31.1		
23	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless otherwise noted**	16.5 ug/kg River Protection			330 ug/kg GW & River Protection		
24	**3-PART TEST**						
25	Maximum > Cleanup Limit?	NO			NO		
26	> 10% above Cleanup Limit?	NO			NO		
27	Any sample > 2X Cleanup Limit?	NO			NO		
28	**3-Part Test Compliance?**	The data set meets the 3-part test criteria when compared to the most stringent RAG.			The data set meets the 3-part test criteria when compared to the most stringent RAG.		

CALCULATION SHEET

Washington Closure Hanford

Originator T. E. Queen
Project 100-H Field Remediation
Subject 100-H-4 Waste Site Cleanup Verification 95% UCL Calculations

Date 01/12/11
Job No. 14655

Calc. No. 0100H-CA-V0150
Checked J. D. Skoglie

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Ecology Software (MTCAStat) Results, 100-H-4 Excavation

Arsenic 95% UCL Calculation

DATA	ID
12.4	J1C3B0/ J1C3B5
2.27	J1C393
2.77	J1C394
4.04	J1C395
3.13	J1C396
5.92	J1C397
4.23	J1C398
2.85	J1C399
3.50	J1C3B1
6.81	J1C3B2
9.02	J1C3B3
4.67	J1C3B4

Number of samples		Uncensored values	
Uncensored	12	Mean	5.13
Censored		Lognormal mean	5.14
Detection limit or PQL		Std. devn.	3.00
Method detection limit		Median	4.14
TOTAL	12	Min.	2.27
		Max.	12.4

Lognormal distribution? r-squared is: 0.957
Normal distribution? r-squared is: 0.831
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 7.17

Barium 95% UCL Calculation

DATA	ID
91.5	J1C3B0/ J1C3B5
35.1	J1C393
30.3	J1C394
31.3	J1C395
41.7	J1C396
35.8	J1C397
42.6	J1C398
32.7	J1C399
32.6	J1C3B1
43.8	J1C3B2
76.0	J1C3B3
36.4	J1C3B4

Number of samples		Uncensored values	
Uncensored	12	Mean	44.1
Censored		Lognormal mean	44.0
Detection limit or PQL		Std. devn.	19.3
Method detection limit		Median	36.1
TOTAL	12	Min.	30.3
		Max.	91.5

Lognormal distribution? r-squared is: 0.778
Normal distribution? r-squared is: 0.682
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 53.3

Beryllium 95% UCL Calculation

DATA	ID
0.340	J1C3B0/ J1C3B5
0.158	J1C393
0.174	J1C394
0.169	J1C395
0.177	J1C396
0.203	J1C397
0.210	J1C398
0.161	J1C399
0.202	J1C3B1
0.259	J1C3B2
0.320	J1C3B3
0.198	J1C3B4

Number of samples		Uncensored values	
Uncensored	12	Mean	0.214
Censored		Lognormal mean	0.214
Detection limit or PQL		Std. devn.	0.0608
Method detection limit		Median	0.200
TOTAL	12	Min.	0.158
		Max.	0.340

Lognormal distribution? r-squared is: 0.879
Normal distribution? r-squared is: 0.821
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 0.243

Boron 95% UCL Calculation

DATA	ID
4.47	J1C3B0/ J1C3B5
0.545	J1C393
0.701	J1C394
0.694	J1C395
0.789	J1C396
0.610	J1C397
1.02	J1C398
0.813	J1C399
0.813	J1C3B1
1.51	J1C3B2
1.11	J1C3B3
0.887	J1C3B4

Number of samples		Uncensored values	
Uncensored	12	Mean	1.16
Censored		Lognormal mean	1.12
Detection limit or PQL		Std. devn.	1.07
Method detection limit		Median	0.813
TOTAL	12	Min.	0.545
		Max.	4.47

Lognormal distribution? r-squared is: 0.757
Normal distribution? r-squared is: 0.506
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 1.67

Cadmium 95% UCL Calculation

DATA	ID
0.124	J1C3B0/ J1C3B5
0.127	J1C393
0.094	J1C394
0.096	J1C395
0.103	J1C396
0.110	J1C397
0.106	J1C398
0.0858	J1C399
0.0902	J1C3B1
0.0962	J1C3B2
0.178	J1C3B3
0.119	J1C3B4

Number of samples		Uncensored values	
Uncensored	12	Mean	0.111
Censored		Lognormal mean	0.111
Detection limit or PQL		Std. devn.	0.0250
Method detection limit		Median	0.105
TOTAL	12	Min.	0.0858
		Max.	0.178

Lognormal distribution? r-squared is: 0.880
Normal distribution? r-squared is: 0.796
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 0.123

Chromium 95% UCL Calculation

DATA	ID
14.0	J1C3B0/ J1C3B5
6.06	J1C393
8.88	J1C394
8.88	J1C395
9.37	J1C396
6.32	J1C397
11.0	J1C398
9.87	J1C399
11.3	J1C3B1
10.8	J1C3B2
11.4	J1C3B3
9.89	J1C3B4

Number of samples		Uncensored values	
Uncensored	12	Mean	9.81
Censored		Lognormal mean	9.85
Detection limit or PQL		Std. devn.	2.18
Method detection limit		Median	9.88
TOTAL	12	Min.	6.06
		Max.	14.0

Lognormal distribution? r-squared is: 0.905
Normal distribution? r-squared is: 0.940
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 11.3

Cobalt 95% UCL Calculation

DATA	ID
6.45	J1C3B0/ J1C3B5
4.94	J1C393
5.49	J1C394
4.92	J1C395
5.18	J1C396
5.16	J1C397
4.71	J1C398
4.76	J1C399
5.08	J1C3B1
4.94	J1C3B2
6.49	J1C3B3
5.19	J1C3B4

Number of samples		Uncensored values	
Uncensored	12	Mean	5.28
Censored		Lognormal mean	5.28
Detection limit or PQL		Std. devn.	0.596
Method detection limit		Median	5.12
TOTAL	12	Min.	4.71
		Max.	6.49

Lognormal distribution? r-squared is: 0.804
Normal distribution? r-squared is: 0.774
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 5.56

Copper 95% UCL Calculation

DATA	ID
17.9	J1C3B0/ J1C3B5
14.8	J1C393
12.1	J1C394
12.3	J1C395
15.4	J1C396
14.1	J1C397
12.6	J1C398
11.0	J1C399
11.6	J1C3B1
12.6	J1C3B2
18.4	J1C3B3
14.5	J1C3B4

Number of samples		Uncensored values	
Uncensored	12	Mean	13.9
Censored		Lognormal mean	14.0
Detection limit or PQL		Std. devn.	2.38
Method detection limit		Median	13.4
TOTAL	12	Min.	11.0
		Max.	18.4

Lognormal distribution? r-squared is: 0.945
Normal distribution? r-squared is: 0.918
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 15.3

Lead 95% UCL Calculation

DATA	ID
27.7	J1C3B0/ J1C3B5
2.38	J1C393
2.42	J1C394
4.00	J1C395
3.35	J1C396
4.37	J1C397
4.82	J1C398
2.35	J1C399
3.00	J1C3B1
22.2	J1C3B2
42.8	J1C3B3
6.63	J1C3B4

Number of samples		Uncensored values	
Uncensored	12	Mean	10.5
Censored		Lognormal mean	10.1
Detection limit or PQL		Std. devn.	13.2
Method detection limit		Median	4.19
TOTAL	12	Min.	2.35
		Max.	42.8

Lognormal distribution? r-squared is: 0.835
Normal distribution? r-squared is: 0.671
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 16.8

CALCULATION SHEET

Washington Closure Hanford
Originator T. E. Queen
Project 100-H Field Remediation
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Ecology Software (MTCAStat) Results, 100-H-4 Excavation

Manganese 95% UCL Calculation

DATA	ID J1C3B0/
299	J1C3B5
198	J1C393
227	J1C394
231	J1C395
247	J1C396
239	J1C397
236	J1C398
227	J1C399
245	J1C3B1
253	J1C3B2
303	J1C3B3
253	J1C3B4

Number of samples		Uncensored values	
Uncensored	12	Mean	247
Censored		Lognormal mean	247
Detection limit or PQL		Std. devn.	29.5
Method detection limit		Median	242
TOTAL	12	Min.	198
		Max.	303

Lognormal distribution? r-squared is: 0.903
Normal distribution? r-squared is: 0.881
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 263

Molybdenum 95% UCL Calculation

DATA	ID J1C3B0/
0.682	J1C3B5
0.359	J1C393
0.381	J1C394
0.333	J1C395
0.350	J1C396
0.423	J1C397
0.405	J1C398
0.322	J1C399
0.329	J1C3B1
0.339	J1C3B2
0.541	J1C3B3
0.406	J1C3B4

Number of samples		Uncensored values	
Uncensored	12	Mean	0.406
Censored		Lognormal mean	0.406
Detection limit or PQL		Std. devn.	0.106
Method detection limit		Median	0.370
TOTAL	12	Min.	0.322
		Max.	0.682

Lognormal distribution? r-squared is: 0.818
Normal distribution? r-squared is: 0.743
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 0.456

Nickel 95% UCL Calculation

DATA	ID J1C3B0/
12.0	J1C3B5
8.24	J1C393
8.73	J1C394
7.80	J1C395
8.67	J1C396
7.17	J1C397
9.93	J1C398
9.77	J1C399
10.2	J1C3B1
9.55	J1C3B2
11.0	J1C3B3
9.63	J1C3B4

Number of samples		Uncensored values	
Uncensored	12	Mean	9.39
Censored		Lognormal mean	9.40
Detection limit or PQL		Std. devn.	1.35
Method detection limit		Median	9.59
TOTAL	12	Min.	7.17
		Max.	12.0

Lognormal distribution? r-squared is: 0.984
Normal distribution? r-squared is: 0.982
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 10.2

Vanadium 95% UCL Calculation

DATA	ID J1C3B0/
46.3	J1C3B5
47.7	J1C393
51.0	J1C394
45.2	J1C395
49.8	J1C396
54.4	J1C397
41.2	J1C398
50.8	J1C399
51.6	J1C3B1
43.4	J1C3B2
50.7	J1C3B3
48.4	J1C3B4

Number of samples		Uncensored values	
Uncensored	12	Mean	48.4
Censored		Lognormal mean	48.4
Detection limit or PQL		Std. devn.	3.79
Method detection limit		Median	49.1
TOTAL	12	Min.	41.2
		Max.	54.4

Lognormal distribution? r-squared is: 0.955
Normal distribution? r-squared is: 0.965
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 50.5

Zinc 95% UCL Calculation

DATA	ID J1C3B0/
40.4	J1C3B5
30.3	J1C393
30.8	J1C394
30.5	J1C395
31.0	J1C396
35.0	J1C397
30.3	J1C398
28.3	J1C399
30.4	J1C3B1
33.3	J1C3B2
46.0	J1C3B3
33.0	J1C3B4

Number of samples		Uncensored values	
Uncensored	12	Mean	33.3
Censored		Lognormal mean	33.3
Detection limit or PQL		Std. devn.	5.09
Method detection limit		Median	30.9
TOTAL	12	Min.	28.3
		Max.	46.0

Lognormal distribution? r-squared is: 0.802
Normal distribution? r-squared is: 0.760
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 35.7

TPH - motor oil 95% UCL Calculation

DATA	ID J1C3B0/
16.3	J1C3B5
22.6	J1C393
18.9	J1C394
21.4	J1C395
8.58	J1C396
6.64	J1C397
24.6	J1C398
15.8	J1C399
16.0	J1C3B1
56.7	J1C3B2
24.3	J1C3B3
42.6	J1C3B4

Number of samples		Uncensored values	
Uncensored	12	Mean	22.9
Censored		Lognormal mean	23.3
Detection limit or PQL		Std. devn.	14.0
Method detection limit		Median	20.2
TOTAL	12	Min.	6.64
		Max.	56.7

Lognormal distribution? r-squared is: 0.945
Normal distribution? r-squared is: 0.832
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 34.8

Benzo(a)anthracene 95% UCL Calculation

DATA	ID J1C3B0/
7.26	J1C3B5
1.67	J1C393
1.70	J1C394
1.70	J1C395
1.52	J1C396
3.20	J1C397
2.86	J1C398
1.71	J1C399
1.69	J1C3B1
3.08	J1C3B2
1.25	J1C3B3
1.90	J1C3B4

Number of samples		Uncensored values	
Uncensored	12	Mean	2.46
Censored		Lognormal mean	2.43
Detection limit or PQL		Std. devn.	1.64
Method detection limit		Median	1.70
TOTAL	12	Min.	1.25
		Max.	7.26

Lognormal distribution? r-squared is: 0.802
Normal distribution? r-squared is: 0.621
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 3.24

Benzo(a)pyrene 95% UCL Calculation

DATA	ID J1C3B0/
7.79	J1C3B5
1.67	J1C393
1.70	J1C394
1.70	J1C395
2.26	J1C396
3.78	J1C397
3.82	J1C398
1.71	J1C399
1.69	J1C3B1
3.24	J1C3B2
2.44	J1C3B3
2.37	J1C3B4

Number of samples		Uncensored values	
Uncensored	12	Mean	2.85
Censored		Lognormal mean	2.82
Detection limit or PQL		Std. devn.	1.75
Method detection limit		Median	2.32
TOTAL	12	Min.	1.67
		Max.	7.79

Lognormal distribution? r-squared is: 0.835
Normal distribution? r-squared is: 0.683
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 3.68

Benzo(b)fluoranthene 95% UCL Calculation

DATA	ID J1C3B0/
6.57	J1C3B5
1.67	J1C393
1.70	J1C394
1.70	J1C395
1.60	J1C396
3.64	J1C397
4.26	J1C398
1.71	J1C399
1.69	J1C3B1
2.87	J1C3B2
1.98	J1C3B3
1.69	J1C3B4

Number of samples		Uncensored values	
Uncensored	12	Mean	2.59
Censored		Lognormal mean	2.57
Detection limit or PQL		Std. devn.	1.54
Method detection limit		Median	1.70
TOTAL	12	Min.	1.60
		Max.	6.57

Lognormal distribution? r-squared is: 0.759
Normal distribution? r-squared is: 0.687
Recommendations:
Reject BOTH lognormal and normal distributions

UCL (based on Z-statistic) is 3.32

CALCULATION SHEET

Washington Closure Hanford

Originator T. E. Queen
Project 100-H Field Remediation
Subject 100-H-4 Waste Site Cleanup Verification 95% UCL Calculations

Date 01/12/11
Job No. 14655

Calc. No. 0100H-CA-V0150
Checked J. D. Skoglie

Rev. No. 0
Date 01/12/11
Sheet No. 13 of 15

Ecology Software (MTCAStat) Results, 100-H-4 Excavation

	DATA	ID	Benzo(ghi)perylene 95% UCL Calculation				DATA	ID	Benzo(k)fluoranthene 95% UCL Calculation				DATA	ID	Chrysene 95% UCL Calculation			
1		J1C3B0/						J1C3B0/						J1C3B0/				
2	5.83	J1C3B5					3.95	J1C3B5					7.62	J1C3B5				
3	1.67	J1C393					1.67	J1C393					2.66	J1C393				
4	1.70	J1C394	Number of samples		Uncensored values		1.70	J1C394	Number of samples		Uncensored values		2.74	J1C394	Number of samples		Uncensored values	
5	1.70	J1C395	Uncensored	12	Mean	2.34	1.70	J1C395	Uncensored	12	Mean	1.76	4.88	J1C395	Uncensored	12	Mean	3.53
6	1.68	J1C396	Censored		Lognormal mean	2.32	1.08	J1C396	Censored		Lognormal mean	1.76	5.78	J1C396	Censored		Lognormal mean	3.57
7	2.82	J1C397	Detection limit or PQL		Std. devn.	1.26	1.82	J1C397	Detection limit or PQL		Std. devn.	0.752	1.21	J1C397	Detection limit or PQL		Std. devn.	2.14
8	2.63	J1C398	Method detection limit		Median	1.70	1.91	J1C398	Method detection limit		Median	1.70	1.69	J1C398	Method detection limit		Median	2.70
9	1.71	J1C399	TOTAL	12	Min.	1.47	1.71	J1C399	TOTAL	12	Min.	1.07	1.71	J1C399	TOTAL	12	Min.	1.21
10	1.69	J1C3B1			Max.	5.83	1.69	J1C3B1			Max.	3.95	3.07	J1C3B1			Max.	7.62
11	1.75	J1C3B2					1.73	J1C3B2					1.96	J1C3B2				
12	3.46	J1C3B3					1.08	J1C3B3					2.44	J1C3B3				
13	1.47	J1C3B4					1.07	J1C3B4					6.57	J1C3B4				
14			Lognormal distribution?		Normal distribution?				Lognormal distribution?		Normal distribution?				Lognormal distribution?		Normal distribution?	
15			r-squared is: 0.750		r-squared is:	0.648			r-squared is: 0.774		r-squared is:	0.635			r-squared is: 0.958		r-squared is:	0.883
16			Recommendations:						Recommendations:						Recommendations:			
17			Reject BOTH lognormal and normal distributions						Reject BOTH lognormal and normal distributions						Use lognormal distribution.			
18																		
19			UCL (based on Z-statistic) is		2.94				UCL (based on Z-statistic) is		2.12				UCL (Land's method) is		5.36	
20																		

	DATA	ID	Fluoranthene 95% UCL Calculation				DATA	ID	Phenanthrene 95% UCL Calculation				DATA	ID	Pyrene 95% UCL Calculation			
21		J1C3B0/						J1C3B0/						J1C3B0/				
22	22.2	J1C3B5					4.39	J1C3B5					6.34	J1C3B5				
23	1.67	J1C393					1.67	J1C393					1.67	J1C393				
24	1.70	J1C394	Number of samples		Uncensored values		1.70	J1C394	Number of samples		Uncensored values		1.02	J1C394	Number of samples		Uncensored values	
25	1.02	J1C395	Uncensored	12	Mean	5.33	1.70	J1C395	Uncensored	12	Mean	2.30	1.70	J1C395	Uncensored	12	Mean	4.24
26	2.24	J1C396	Censored		Lognormal mean	5.27	1.38	J1C396	Censored		Lognormal mean	2.30	2.78	J1C396	Censored		Lognormal mean	4.38
27	10.0	J1C397	Detection limit or PQL		Std. devn.	6.11	4.38	J1C397	Detection limit or PQL		Std. devn.	1.16	8.75	J1C397	Detection limit or PQL		Std. devn.	3.23
28	5.89	J1C398	Method detection limit		Median	2.71	1.55	J1C398	Method detection limit		Median	1.70	9.03	J1C398	Method detection limit		Median	2.65
29	1.71	J1C399	TOTAL	12	Min.	1.02	1.71	J1C399	TOTAL	12	Min.	1.30	1.705	J1C399	TOTAL	12	Min.	1.02
30	1.69	J1C3B1			Max.	22.2	1.69	J1C3B1			Max.	4.39	1.685	J1C3B1			Max.	9.33
31	9.35	J1C3B2					3.62	J1C3B2					9.33	J1C3B2				
32	3.18	J1C3B3					2.57	J1C3B3					4.39	J1C3B3				
33	3.40	J1C3B4					1.30	J1C3B4					2.52	J1C3B4				
34			Lognormal distribution?		Normal distribution?				Lognormal distribution?		Normal distribution?				Lognormal distribution?		Normal distribution?	
35			r-squared is: 0.914		r-squared is:	0.687			r-squared is: 0.823		r-squared is:	0.759			r-squared is: 0.907		r-squared is:	0.831
36			Recommendations:						Recommendations:						Recommendations:			
37			Use lognormal distribution.						Reject BOTH lognormal and normal distributions						Use lognormal distribution.			
38																		
39			UCL (Land's method) is		11.6				UCL (based on Z-statistic) is		2.85				UCL (Land's method) is		8.01	
40																		

CALCULATION SHEET

Washington Closure Hanford

Originator T. E. Queen **Date** 01/12/11 **Calc. No.** 0100H-CA-V0150 **Rev. No.** 0

Project 100-H Field Remediation **Job No.** 14655 **Checked** J. D. Skoglie **Date** 01/12/11

Subject 100-H-4 Waste Site Cleanup Verification 95% UCL Calculations **Sheet No.** 14 of 15

Duplicate Analysis - 100-H-4 Waste Site Excavation

Sampling Area	Sample Number	Sample Date	Potassium-40			Radium-226			Radium-228			Thorium-228 GEA			Thorium-232 GEA			Uranium-233/234			Uranium-238			Aluminum			Arsenic		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	mg/kg	Q	PQL	mg/kg	Q	PQL
SZ-8	J1C3B0	9/22/10	12.0		0.458	0.652		0.125	0.739		0.280	0.896		0.085	0.739	J	0.280	0.556		0.327	0.427		0.327	8880		14.0	12.9	J	0.700
Duplicate of J1C3B0	J1C3B5	9/22/10	13.0		0.785	0.690		0.136	0.868		0.284	0.807		0.087	0.868	J	0.284	0.526		0.131	0.549		0.074	9290		19.6	11.9	J	0.980

Analysis:

	TDL		0.5			0.1			0.2			1			1			1			1			5			10		
Duplicate Analysis	Both > PQL?		Yes (continue)						Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)			Yes (continue)		
	Both >5xTDL?		Yes (calc RPD)			Yes (calc RPD)			No-Stop (acceptable)			No-Stop (acceptable)			No-Stop (acceptable)			No-Stop (acceptable)			No-Stop (acceptable)			Yes (calc RPD)			No-Stop (acceptable)		
	RPD		8.0%			5.7%																		4.5%					
	Difference > 2 TDL?		Not applicable			Not applicable			No - acceptable			No - acceptable			No - acceptable			No - acceptable			No - acceptable			Not applicable			No - acceptable		

Duplicate Analysis - 100-H-4 Waste Site Excavation

Sampling Area	HEIS Number	Sample Date	Barium			Beryllium			Boron			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
SZ-8	J1C3B0	9/22/10	83.5	J	0.350	0.323		0.140	3.29	J	1.40	0.114	JB	0.175	4430	J	14.0	13.3	J	0.700	6.23	J	2.10	16.6	J	1.40	19400		14.0
Duplicate of J1C3B0	J1C3B5	9/22/10	99.4	J	0.490	0.357		0.196	5.64	J	1.96	0.133	JB	0.245	4960	J	19.6	14.6	J	0.980	6.67	J	2.94	19.2	J	1.96	20700		19.6

Analysis:

	TDL		2			0.2			2			0.2			100			1			2			1			5		
Duplicate Analysis	Both > PQL?		Yes (continue)			Yes (continue)			Yes (continue)			No-Stop (acceptable)			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)			No-Stop (acceptable)			Yes (calc RPD)			Yes (calc RPD)		
	RPD		17.4%												11.3%			9.3%						14.5%			6.5%		
	Difference > 2 TDL?		Not applicable			No - acceptable			No - acceptable			No - acceptable			Not applicable			Not applicable			No - acceptable			Not applicable			Not applicable		

Duplicate Analysis - 100-H-4 Waste Site Excavation

Sampling Area	HEIS Number	Sample Date	Lead			Magnesium			Manganese			Molybdenum			Nickel			Potassium			Selenium			Silicon			Sodium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
SZ-8	J1C3B0	9/22/10	29.1	J	0.700	4300	J	3.50	290	J	0.700	0.655	B	0.700	11.5		1.75	1450		70.0	0.287	J	0.210	356	J	4.20	212		35.0
Duplicate of J1C3B0	J1C3B5	9/22/10	26.3	J	0.980	4580	J	4.90	308	J	0.980	0.709	B	0.980	12.4		2.45	1440		98.0	0.319	J	0.294	504	J	5.88	225		49.0

Analysis:

	TDL		5			75			5			2			4			400			1			2			50		
Duplicate Analysis	Both > PQL?		Yes (continue)			Yes (continue)			Yes (continue)			No-Stop (acceptable)			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)			No-Stop (acceptable)			Yes (calc RPD)			No-Stop (acceptable)		
	RPD		10.1%			6.3%			6.0%															34.4%					
	Difference > 2 TDL?		Not applicable			Not applicable			Not applicable			No - acceptable			No - acceptable			No - acceptable			No - acceptable			Not applicable			No - acceptable		

CALCULATION SHEET

Washington Closure Hanford

Originator T. E. Queen
Project 100-H Field Remediation
Subject 0100H-CA-V0150

Date 01/12/11
Job No. 14655

Calc. No. 0100H-CA-V0150
Checked J. D. Skoglie

Rev. No. 0
Date 01/12/11
Sheet No. 15 of 15

1 **Duplicate Analysis - 100-H-4 Waste Site Excavation**

2				Vanadium			Zinc			TPH - motor oil			Aroclor-1254			Aroclor-1260			Benzo(a)anthracene			Benzo(a)pyrene			Benzo(b)fluoranthene			Benzo(ghi)perylene		
3	Sampling Area	HEIS Number	Sample Date	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	ug/kg	Q	PQL	ug/kg	Q	PQL
4	SZ-8	J1C3B0	9/22/10	44.2	J	0.700	39.6	J	2.10	16.3	J	9.43	66.1	J	12.9	35.2		12.9	9.50		3.36	8.86		3.36	10.1		3.36	6.41		3.36
5	Duplicate of J1C3B0	J1C3B5	9/22/10	48.3	J	0.980	41.1	J	2.94	16.2	J	10.2	66.5	J	14.2	33.4		14.2	5.02		3.47	6.71		3.47	3.03	J	3.47	5.25		3.47

6 **Analysis:**

7											
7	TDL		2.5	1	5	20	20	15	15	15	15
8	Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)
9		Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)		No-Stop (acceptable)
10		RPD	8.9%	3.7%							
11		Difference > 2 TDL?	Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	No - acceptable

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13 **Duplicate Analysis - 100-H-4 Waste Site Excavation**

14				Benzo(k)fluoranthene			Chrysene			4,4'-DDE			Fluoranthene			Indeno(1,2,3-cd)pyrene			Phenanthrene		
15	Sampling Area	HEIS Number	Sample 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
16	SZ-8	J1C3B0	9/22/10	4.73		3.36	8.26		3.36	2.95	JD	1.30	22.0		3.36	4.17		3.36	2.69	J	3.36
17	Duplicate of J1C3B0	J1C3B5	9/22/10	3.16	J	3.47	6.97		3.47	2.91	JD	1.42	22.3		3.47	3.42	J	3.47	6.08		3.47

18 **Analysis:**

19								
19	TDL		15	15	5	15	15	15
20	Duplicate Analysis	Both > PQL?	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	No-Stop (acceptable)
21		Both >5xTDL?		No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)		
22		RPD						
23		Difference > 2 TDL?	No - acceptable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	No - acceptable

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Attachment 1. 100-H-4 Waste Site Verification Sample Results (Radionuclides).

Sample Location	HEIS Number	Sample Date	Americium-241 GEA			Barium-133			Cesium-137			Cobalt-60			Europium-152		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
SZ-8	J1C3B0	9/22/10	0.172	U	0.172	0.070	U	0.070	0.067	U	0.067	0.068	U	0.068	0.171	U	0.171
Duplicate of J1C3B0	J1C3B5	9/22/10	0.317	U	0.317	0.064	U	0.064	0.058	U	0.058	0.064	U	0.064	0.159	U	0.159
SZ-1	J1C393	9/22/10	0.293	U	0.293	0.074	U	0.074	0.063	U	0.063	0.070	U	0.070	0.178	U	0.178
SZ-2	J1C394	9/22/10	0.148	U	0.148	0.057	U	0.057	0.06	U	0.06	0.073	U	0.073	0.137	U	0.137
SZ-3	J1C395	9/22/10	0.154	U	0.154	0.068	U	0.068	0.055	U	0.055	0.056	U	0.056	0.161	U	0.161
SZ-4	J1C396	9/22/10	0.116	U	0.116	0.094	U	0.094	0.102	U	0.102	0.094	U	0.094	0.286	U	0.286
SZ-5	J1C397	9/22/10	0.126	U	0.126	0.052	U	0.052	0.043	U	0.043	0.044	U	0.044	0.142	U	0.142
SZ-6	J1C398	9/22/10	0.122	U	0.122	0.048	U	0.048	0.044	U	0.044	0.048	U	0.048	0.126	U	0.126
SZ-7	J1C399	9/22/10	0.420	U	0.420	0.102	U	0.102	0.093	U	0.093	0.106	U	0.106	0.242	U	0.242
SZ-9	J1C3B1	9/22/10	0.429	U	0.429	0.105	U	0.105	0.094	U	0.094	0.096	U	0.096	0.215	U	0.215
SZ-10	J1C3B2	9/22/10	0.130	U	0.130	0.053	U	0.053	0.048	U	0.048	0.052	U	0.052	0.144	U	0.144
SZ-11	J1C3B3	9/22/10	0.170	U	0.170	0.069	U	0.069	0.06	U	0.06	0.054	U	0.054	0.165	U	0.165
SZ-12	J1C3B4	9/22/10	0.373	U	0.373	0.098	U	0.098	0.084	U	0.084	0.095	U	0.095	0.250	U	0.250
SS-1	J1C3B6	9/22/10	0.095	U	0.095	0.081	U	0.081	0.074	U	0.074	0.063	U	0.063	0.205	U	0.205
SS-2	J1C3B7	9/22/10	0.449	U	0.449	0.102	U	0.102	0.094	U	0.094	0.114	U	0.114	0.255	U	0.255
SS-3	J1C3B8	9/22/10	0.182	U	0.182	0.073	U	0.073	0.061	U	0.061	0.064	U	0.064	0.173	U	0.173
SS-4	J1C3B9	9/22/10	0.143	U	0.143	0.059	U	0.059	0.057	U	0.057	0.059	U	0.059	0.154	U	0.154
SS-5	J1C3C0	9/22/10	0.129	U	0.129	0.049	U	0.049	0.050	U	0.050	0.056	U	0.056	0.127	U	0.127

Acronyms and notes apply to all of the tables in this attachment.
Note: Data qualified with B, C, and/or J are considered acceptable values.
B = blank contamination (inorganic constituents)
HEIS = Hanford Environmental Information System
J = estimate
L = dilution indicating physical and chemical interference are present
M = Sample duplicate precision not met
PQL = practical quantitation limit
Q = qualifier
R = rejected
U = undetected

Attachment	1	Sheet No.	1 of 28
Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
Calc. No.	0100H-CA-V0150	Rev. No.	0

Attachment 1. 100-H-4 Waste Site Verification Sample Results (Radionuclides).

Sample Location	HEIS Number	Sample Date	Europium-154			Europium-155			Nickel-63			Potassium-40			Radium-226		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
SZ-8	J1C3B0	9/22/10	0.213	U	0.213	0.152	U	0.152	-1.42	U	2.70	12.0		0.458	0.652		0.125
Duplicate of J1C3B0	J1C3B5	9/22/10	0.173	U	0.173	0.185	U	0.185	1.11	U	2.54	13.0		0.785	0.690		0.136
SZ-1	J1C393	9/22/10	0.244	U	0.244	0.150	U	0.150	-0.894	U	2.67	9.80		0.607	0.427		0.131
SZ-2	J1C394	9/22/10	0.187	U	0.187	0.134	U	0.134	-0.672	U	2.56	11.7		0.490	0.309		0.107
SZ-3	J1C395	9/22/10	0.161	U	0.161	0.194	U	0.194	7.74		2.60	12.0		0.560	0.499		0.112
SZ-4	J1C396	9/22/10	0.304	U	0.304	0.220	U	0.220	0.871	U	2.49	11.9		0.979	0.398		0.206
SZ-5	J1C397	9/22/10	0.110	U	0.110	0.144	U	0.144	-0.400	U	2.50	11.0		0.412	0.418		0.079
SZ-6	J1C398	9/22/10	0.168	U	0.168	0.108	U	0.108	-1.10	U	2.60	12.2		0.502	0.434		0.082
SZ-7	J1C399	9/22/10	0.325	U	0.325	0.210	U	0.210	1.56	U	2.68	12.9		1.02	0.594		0.174
SZ-9	J1C3B1	9/22/10	0.316	U	0.316	0.204	U	0.204	-1.03	U	2.52	10.2		1.18	0.454		0.176
SZ-10	J1C3B2	9/22/10	0.188	U	0.188	0.114	U	0.114	-0.635	U	2.56	12.6		0.582	0.435		0.107
SZ-11	J1C3B3	9/22/10	0.174	U	0.174	0.187	U	0.187	-0.112	U	2.56	12.3		0.422	0.538		0.143
SZ-12	J1C3B4	9/22/10	0.325	U	0.325	0.196	U	0.196	0.256	U	2.51	12.1		0.774	0.509		0.170
SS-1	J1C3B6	9/22/10	0.216	U	0.216	0.154	U	0.154	0.037	U	2.52	13.3		0.927	0.448		0.158
SS-2	J1C3B7	9/22/10	0.297	U	0.297	0.209	U	0.209	0.272	U	2.67	15.1		0.882	0.658		0.200
SS-3	J1C3B8	9/22/10	0.191	U	0.191	0.189	U	0.189	-0.424	U	2.65	13.3		0.484	0.614		0.120
SS-4	J1C3B9	9/22/10	0.203	U	0.203	0.132	U	0.132	0.432	U	2.69	12.8		0.470	0.438		0.102
SS-5	J1C3C0	9/22/10	0.176	U	0.176	0.121	U	0.121	0.300	U	2.58	9.29		0.620	0.272		0.094

Attachment	1	Sheet No.	2 of 28
Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
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Attachment 1. 100-H-4 Waste Site Verification Sample Results (Radionuclides).

Sample Location	HEIS Number	Sample Date	Radium-228			Silver-108 metastable			Thorium-228 GEA			Thorium-232 GEA			Total beta radiostrontium		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
SZ-8	J1C3B0	9/22/10	0.739		0.280	0.046	U	0.046	0.896		0.085	0.739	J	0.280	0.028	U	0.245
Duplicate of J1C3B0	J1C3B5	9/22/10	0.868		0.284	0.044	U	0.044	0.807		0.087	0.868	J	0.284	-0.008	U	0.228
SZ-1	J1C393	9/22/10	0.673		0.322	0.051	U	0.051	0.426		0.128	0.673	J	0.322	-0.055	U	0.263
SZ-2	J1C394	9/22/10	0.563		0.230	0.044	U	0.044	0.580		0.108	0.563	J	0.230	0.057	U	0.244
SZ-3	J1C395	9/22/10	0.482		0.242	0.048	U	0.048	0.498		0.085	0.482	J	0.242	-0.051	U	0.226
SZ-4	J1C396	9/22/10	0.593		0.370	0.071	U	0.071	0.651		0.133	0.593	J	0.370	0.095	U	0.237
SZ-5	J1C397	9/22/10	0.490		0.187	0.037	U	0.037	0.470		0.062	0.490	J	0.187	-0.113	U	0.277
SZ-6	J1C398	9/22/10	0.585		0.191	0.036	U	0.036	0.524		0.053	0.585	J	0.191	0.065	U	0.274
SZ-7	J1C399	9/22/10	0.614		0.453	0.065	U	0.065	0.650		0.174	0.614	J	0.453	0.097	U	0.285
SZ-9	J1C3B1	9/22/10	0.587		0.384	0.059	U	0.059	0.535		0.110	0.587	J	0.384	-0.027	U	0.295
SZ-10	J1C3B2	9/22/10	0.633		0.183	0.035	U	0.035	0.717		0.102	0.633	J	0.183	-0.036	U	0.246
SZ-11	J1C3B3	9/22/10	0.901		0.193	0.050	U	0.050	0.716		0.094	0.901	J	0.193	-0.035	U	0.246
SZ-12	J1C3B4	9/22/10	0.678		0.337	0.060	U	0.060	0.492		0.108	0.678	J	0.337	0.076	U	0.234
SS-1	J1C3B6	9/22/10	0.586		0.309	0.057	U	0.057	0.702		0.096	0.586	J	0.309	0.001	U	0.320
SS-2	J1C3B7	9/22/10	0.856		0.330	0.070	U	0.070	0.750		0.116	0.856	J	0.330	-0.044	U	0.261
SS-3	J1C3B8	9/22/10	0.836		0.274	0.051	U	0.051	0.757		0.095	0.836	J	0.274	-0.033	U	0.253
SS-4	J1C3B9	9/22/10	0.638		0.260	0.044	U	0.044	0.668		0.113	0.638	J	0.260	-0.082	U	0.275
SS-5	J1C3C0	9/22/10	0.410		0.193	0.036	U	0.036	0.451		0.059	0.410	J	0.193	-0.012	U	0.255

Attachment	1	Sheet No.	3 of 28
Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
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Attachment 1. 100-H-4 Waste Site Verification Sample Results (Radionuclides).

Sample Location	HEIS Number	Sample Date	Uranium-233/234			Uranium-235			Uranium-235 GEA			Uranium-238			Uranium-238 GEA		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
SZ-8	J1C3B0	9/22/10	0.556		0.327	0	U	0.396	0.345	U	0.345	0.427		0.327	7.12	U	7.12
Duplicate of J1C3B0	J1C3B5	9/22/10	0.526		0.131	0	U	0.104	0.392	U	0.392	0.549		0.074	6.55	U	6.55
SZ-1	J1C393	9/22/10	0.991		0.292	0	U	0.353	0.316	U	0.316	0.572		0.292	8.72	U	8.72
SZ-2	J1C394	9/22/10	0.656		0.285	0	U	0.276	0.295	U	0.295	0.715		0.228	7.44	U	7.44
SZ-3	J1C395	9/22/10	1.49		0.181	0.057	U	0.219	0.363	U	0.363	0.991		0.181	6.80	U	6.80
SZ-4	J1C396	9/22/10	1.42		0.389	0	U	0.376	0.546	U	0.546	0.812		0.311	10.8	U	10.8
SZ-5	J1C397	9/22/10	0.79		0.263	0.042	U	0.318	0.278	U	0.278	0.927		0.263	5.17	U	5.17
SZ-6	J1C398	9/22/10	0.561		0.286	0.045	U	0.346	0.254	U	0.254	0.449		0.286	6.71	U	6.71
SZ-7	J1C399	9/22/10	1.60		0.272	0.086	U	0.330	0.473	U	0.473	1.28		0.272	12.9	U	12.9
SZ-9	J1C3B1	9/22/10	1.07		0.227	0.036	U	0.274	0.457	U	0.457	1.07		0.227	11.0	U	11.0
SZ-10	J1C3B2	9/22/10	0.622		0.280	0	U	0.339	0.283	U	0.283	0.439		0.280	6.51	U	6.51
SZ-11	J1C3B3	9/22/10	0.591		0.226	0	U	0.274	0.370	U	0.370	0.355		0.226	7.10	U	7.10
SZ-12	J1C3B4	9/22/10	0.617		0.262	0.083	U	0.317	0.440	U	0.440	0.617		0.262	10.8	U	10.8
SS-1	J1C3B6	9/22/10	0.757		0.362	0	U	0.350	0.401	U	0.401	0.681		0.290	8.79	U	8.79
SS-2	J1C3B7	9/22/10	0.466		0.297	0	U	0.359	0.469	U	0.469	0.776		0.297	10.2	U	10.2
SS-3	J1C3B8	9/22/10	0.680		0.372	0	U	0.450	0.393	U	0.393	1.12		0.372	7.24	U	7.24
SS-4	J1C3B9	9/22/10	0.701		0.335	0	U	0.406	0.312	U	0.312	0.964		0.335	7.38	U	7.38
SS-5	J1C3C0	9/22/10	1.46		0.294	0.186	U	0.356	0.243	U	0.243	1.34		0.294	6.79	U	6.79

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Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
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Attachment 1. 100-H-4 Waste Site Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Aluminum			Antimony			Arsenic			Barium			Beryllium			Boron		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
SZ-8	J1C3B0	9/22/10	8880		14.0	0.700	UJ	0.700	12.9	J	0.700	83.5	J	0.350	0.323		0.140	3.29	J	1.40
Duplicate of J1C3B0	J1C3B5	9/22/10	9290		19.6	0.980	UJ	0.980	11.9	J	0.980	99.4	J	0.490	0.357		0.196	5.64	J	1.96
SZ-1	J1C393	9/22/10	4310		13.1	0.655	UJ	0.655	2.27	J	0.655	35.1	J	0.328	0.158		0.131	0.545	JB	1.31
SZ-2	J1C394	9/22/10	5790		15.3	0.763	UJ	0.763	2.77	J	0.763	30.3	J	0.381	0.174		0.153	0.701	JB	1.53
SZ-3	J1C395	9/22/10	5140		16.5	0.825	UJ	0.825	4.04	J	0.825	31.3	J	0.413	0.169		0.165	0.694	JB	1.65
SZ-4	J1C396	9/22/10	5710		15.5	0.775	UJ	0.775	3.13	J	0.775	41.7	J	0.388	0.177		0.155	0.789	JB	1.55
SZ-5	J1C397	9/22/10	5310		13.4	0.671	UJ	0.671	5.92	J	0.671	35.8	J	0.336	0.203		0.134	0.610	JB	1.34
SZ-6	J1C398	9/22/10	6090		16.4	0.821	UJ	0.821	4.23	J	0.821	42.6	J	0.410	0.210		0.164	1.02	JB	1.64
SZ-7	J1C399	9/22/10	4970		15.4	0.772	UJ	0.772	2.85	J	0.772	32.7	J	0.386	0.161		0.154	0.813	JB	1.54
SZ-9	J1C3B1	9/22/10	6080		17.2	0.862	UJ	0.862	3.50	J	0.862	32.6	J	0.431	0.202		0.172	0.813	JB	1.72
SZ-10	J1C3B2	9/22/10	6550		16.2	0.810	UJ	0.810	6.81	J	0.810	43.8	J	0.405	0.259		0.162	1.51	JB	1.62
SZ-11	J1C3B3	9/22/10	8580		17.2	0.861	UJ	0.861	9.02	J	0.861	76.0	J	0.431	0.320		0.172	1.11	JB	1.72
SZ-12	J1C3B4	9/22/10	6180		18.9	0.943	UJ	0.943	4.67	J	0.943	36.4	J	0.472	0.198		0.189	0.887	JB	1.89
SS-1	J1C3B6	9/22/10	6900		16.8	0.839	UJ	0.839	8.36	J	0.839	54.9	J	0.419	0.230		0.168	2.26	J	1.68
SS-2	J1C3B7	9/22/10	8780		21.0	0.397	JB	1.05	6.30	J	1.05	79.0	J	0.526	0.307		0.210	2.22	J	2.10
SS-3	J1C3B8	9/22/10	7910		15.7	0.786	UJ	0.786	5.40	J	0.786	71.1	J	0.393	0.286		0.157	1.03	JB	1.57
SS-4	J1C3B9	9/22/10	5850		15.0	0.749	UJ	0.749	2.96	J	0.749	34.9	J	0.374	0.189		0.150	0.830	JB	1.50
SS-5	J1C3C0	9/22/10	5520		14.9	0.745	UJ	0.745	5.21	J	0.745	60.6	J	0.372	0.173		0.149	0.616	JB	1.49
Equipment blank	J1C3C1	9/22/10	193		12.8	0.193	JB	0.641	0.212	JB	0.641	1.96	J	0.321	0.128	U	0.128	1.28	UJ	1.28
Trip blank	J1C3C2	9/22/10																		

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Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
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Attachment 1. 100-H-4 Waste Site Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Cadmium			Calcium			Chromium			Cobalt			Copper			Hexavalent Chromium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
SZ-8	J1C3B0	9/22/10	0.114	JB	0.175	4430	J	14.0	13.3	J	0.700	6.23	J	2.10	16.6	J	1.40	0.52	U	0.52
Duplicate of J1C3B0	J1C3B5	9/22/10	0.133	JB	0.245	4960	J	19.6	14.6	J	0.980	6.67	J	2.94	19.2	J	1.96	0.55	U	0.55
SZ-1	J1C393	9/22/10	0.127	JB	0.164	6120	J	13.1	6.06	J	0.655	4.94	J	1.97	14.8	J	1.31	0.51	U	0.51
SZ-2	J1C394	9/22/10	0.0940	JB	0.191	7810	J	15.3	8.88	J	0.763	5.49	J	2.29	12.1	J	1.53	0.51	U	0.51
SZ-3	J1C395	9/22/10	0.0959	JB	0.206	4990	J	16.5	8.88	J	0.825	4.92	J	2.48	12.3	J	1.65	0.51	U	0.51
SZ-4	J1C396	9/22/10	0.103	JB	0.194	5310	J	15.5	9.37	J	0.775	5.18	J	2.33	15.4	J	1.55	0.62	U	0.62
SZ-5	J1C397	9/22/10	0.110	JB	0.168	5350	J	13.4	6.32	J	0.671	5.16	J	2.01	14.1	J	1.34	0.52	U	0.52
SZ-6	J1C398	9/22/10	0.106	JB	0.205	5220	J	16.4	11.0	J	0.821	4.71	J	2.46	12.6	J	1.64	0.57	U	0.57
SZ-7	J1C399	9/22/10	0.0858	JB	0.193	5700	J	15.4	9.87	J	0.772	4.76	J	2.32	11.0	J	1.54	0.53	U	0.53
SZ-9	J1C3B1	9/22/10	0.0902	JB	0.216	4710	J	17.2	11.3	J	0.862	5.08	J	2.59	11.6	J	1.72	0.51	U	0.51
SZ-10	J1C3B2	9/22/10	0.0962	JB	0.203	5290	J	16.2	10.8	J	0.810	4.94	J	2.43	12.6	J	1.62	0.53	U	0.53
SZ-11	J1C3B3	9/22/10	0.178	JB	0.215	4310	J	17.2	11.4	J	0.861	6.49	J	2.58	18.4	J	1.72	0.52	U	0.52
SZ-12	J1C3B4	9/22/10	0.119	JB	0.236	6300	J	18.9	9.89	J	0.943	5.19	J	2.83	14.5	J	1.89	0.53	U	0.53
SS-1	J1C3B6	9/22/10	0.102	JB	0.210	5970	J	16.8	12.3	J	0.839	5.25	J	2.52	13.9	J	1.68	0.55	U	0.55
SS-2	J1C3B7	9/22/10	0.240	JB	0.263	6940	J	21.0	16.9	J	1.05	5.87	J	3.16	19.3	J	2.10	0.55	U	0.55
SS-3	J1C3B8	9/22/10	0.140	JB	0.196	5510	J	15.7	16.5	J	0.786	5.75	J	2.36	14.0	J	1.57	0.52	U	0.52
SS-4	J1C3B9	9/22/10	0.101	JB	0.187	5140	J	15.0	10.7	J	0.749	4.64	J	2.25	10.9	J	1.50	0.51	U	0.51
SS-5	J1C3C0	9/22/10	0.0977	JB	0.186	5410	J	14.9	4.71	J	0.745	6.46	J	2.23	15.7	J	1.49	0.51	U	0.51
Equipment blank	J1C3C1	9/22/10	0.160	UJ	0.160	36.6	J	12.8	0.641	UJ	0.641	1.92	UJ	1.92	1.28	UJ	1.28			
Trip blank	J1C3C2	9/22/10																		

Attachment	1	Sheet No.	6 of 28
Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
Calc. No.	0100H-CA-V0150	Rev. No.	0

Attachment 1. 100-H-4 Waste Site Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Iron			Lead			Magnesium			Manganese			Mercury			Molybdenum		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
SZ-8	J1C3B0	9/22/10	19400		14.0	29.1	J	0.700	4300	J	3.50	290	J	0.700	0.0266	U	0.0266	0.655	B	0.700
Duplicate of J1C3B0	J1C3B5	9/22/10	20700		19.6	26.3	J	0.980	4580	J	4.90	308	J	0.980	0.0258	U	0.0258	0.709	B	0.980
SZ-1	J1C393	9/22/10	16600		13.1	2.38	J	0.655	2930	J	3.28	198	J	0.655	0.0236	U	0.0236	0.359	B	0.655
SZ-2	J1C394	9/22/10	18300		15.3	2.42	J	0.763	4260	J	3.81	227	J	0.763	0.0242	U	0.0242	0.381	B	0.763
SZ-3	J1C395	9/22/10	16800		16.5	4.00	J	0.825	3720	J	4.13	231	J	0.825	0.0242	U	0.0242	0.333	B	0.825
SZ-4	J1C396	9/22/10	18300		15.5	3.35	J	0.775	3850	J	3.88	247	J	0.775	0.0302	U	0.0302	0.350	B	0.775
SZ-5	J1C397	9/22/10	19400		13.4	4.37	J	0.671	3330	J	3.36	239	J	0.671	0.0236	U	0.0236	0.423	B	0.671
SZ-6	J1C398	9/22/10	15700		16.4	4.82	J	0.821	4160	J	4.10	236	J	0.821	0.408		0.0272	0.405	B	0.821
SZ-7	J1C399	9/22/10	17700		15.4	2.35	J	0.772	3690	J	3.86	227	J	0.772	0.0274	U	0.0274	0.322	B	0.772
SZ-9	J1C3B1	9/22/10	18400		17.2	3.00	J	0.862	4210	J	4.31	245	J	0.862	0.0248	U	0.0248	0.329	B	0.862
SZ-10	J1C3B2	9/22/10	16700		16.2	22.2	J	0.810	4260	J	4.05	253	J	0.810	0.0249	U	0.0249	0.339	B	0.810
SZ-11	J1C3B3	9/22/10	21300		17.2	42.8	J	0.861	4540	J	4.31	303	J	0.861	0.0251	U	0.0251	0.541	B	0.861
SZ-12	J1C3B4	9/22/10	17300		18.9	6.63	J	0.943	4180	J	4.72	253	J	0.943	0.0272	U	0.0272	0.406	B	0.943
SS-1	J1C3B6	9/22/10	16800		16.8	18.4	J	0.839	4210	J	4.19	264	J	0.839	0.0260	U	0.0260	0.451	B	0.839
SS-2	J1C3B7	9/22/10	18300		21.0	15.9	J	1.05	5190	J	5.26	280	J	1.05	0.0141	B	0.0298	0.478	B	1.05
SS-3	J1C3B8	9/22/10	18800		15.7	8.56	J	0.786	4790	J	3.93	265	J	0.786	0.0275	U	0.0275	0.379	B	0.786
SS-4	J1C3B9	9/22/10	14900		15.0	3.15	J	0.749	3980	J	3.74	229	J	0.749	0.0248	U	0.0248	0.297	B	0.749
SS-5	J1C3C0	9/22/10	18300		14.9	2.68	J	0.745	3260	J	3.72	364	J	0.745	0.0231	U	0.0231	0.361	B	0.745
Equipment blank	J1C3C1	9/22/10	273		12.8	0.405	JB	0.641	21.4	J	3.21	5.91	J	0.641	0.0273	U	0.0273	0.641	U	0.641
Trip blank	J1C3C2	9/22/10																		

Attachment	1	Sheet No.	7 of 28
Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
Calc. No.	0100H-CA-V0150	Rev. No.	0

Attachment 1. 100-H-4 Waste Site Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Nickel			Potassium			Selenium			Silicon			Silver			Sodium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
SZ-8	J1C3B0	9/22/10	11.5		1.75	1450		70.0	0.287	J	0.210	356	J	4.20	0.700	UJ	0.700	212		35.0
Duplicate of J1C3B0	J1C3B5	9/22/10	12.4		2.45	1440		98.0	0.319	J	0.294	504	J	5.88	0.980	UJ	0.980	225		49.0
SZ-1	J1C393	9/22/10	8.24		1.64	422		65.5	0.197	UJ	0.197	182	J	3.93	0.655	UJ	0.655	271		32.8
SZ-2	J1C394	9/22/10	8.73		1.91	743		76.3	0.273	J	0.229	270	J	4.58	0.763	UJ	0.763	276		38.1
SZ-3	J1C395	9/22/10	7.80		2.06	628		82.5	0.248	UJ	0.248	272	J	4.95	0.825	UJ	0.825	208		41.3
SZ-4	J1C396	9/22/10	8.67		1.94	650		77.5	0.233	UJ	0.233	337	J	4.65	0.775	UJ	0.775	228		38.8
SZ-5	J1C397	9/22/10	7.17		1.68	580		67.1	0.201	UJ	0.201	307	J	4.03	0.671	UJ	0.671	246		33.6
SZ-6	J1C398	9/22/10	9.93		2.05	791		82.1	0.246	UJ	0.246	507	J	4.93	0.821	UJ	0.821	181		41.0
SZ-7	J1C399	9/22/10	9.77		1.93	522		77.2	0.232	UJ	0.232	219	J	4.63	0.772	UJ	0.772	179		38.6
SZ-9	J1C3B1	9/22/10	10.2		2.16	609		86.2	0.259	UJ	0.259	334	J	5.17	0.862	UJ	0.862	158		43.1
SZ-10	J1C3B2	9/22/10	9.55		2.03	855		81.0	0.243	UJ	0.243	448	J	4.86	0.810	UJ	0.810	193		40.5
SZ-11	J1C3B3	9/22/10	11.0		2.15	1160		86.1	0.258	UJ	0.258	447	J	5.17	0.861	UJ	0.861	222		43.1
SZ-12	J1C3B4	9/22/10	9.63		2.36	730		94.3	0.391	J	0.283	429	J	5.66	0.943	UJ	0.943	187		47.2
SS-1	J1C3B6	9/22/10	11.1		2.10	866		83.9	0.252	UJ	0.252	480	J	5.03	0.839	UJ	0.839	183		41.9
SS-2	J1C3B7	9/22/10	14.9		2.63	1430		105	0.334	J	0.316	590	J	6.31	1.05	UJ	1.05	248		52.6
SS-3	J1C3B8	9/22/10	13.5		1.96	974		78.6	0.236	UJ	0.236	471	J	4.72	0.786	UJ	0.786	219		39.3
SS-4	J1C3B9	9/22/10	9.86		1.87	695		74.9	0.225	UJ	0.225	259	J	4.49	0.749	UJ	0.749	182		37.4
SS-5	J1C3C0	9/22/10	5.96		1.86	467		74.5	0.223	UJ	0.223	239	J	4.47	0.745	UJ	0.745	303		37.2
Equipment blank	J1C3C1	9/22/10	1.60	U	1.60	40.6	B	64.1	0.192	UJ	0.192	143	J	3.85	0.641	UJ	0.641	32.1	U	32.1
Trip blank	J1C3C2	9/22/10																		

Attachment	1	Sheet No.	8 of 28
Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
Calc. No.	0100H-CA-V0150	Rev. No.	0

Attachment 1. 100-H-4 Waste Site Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Vanadium			Zinc			TPH - diesel range			TPH - motor oil			% Solids
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	
SZ-8	J1C3B0	9/22/10	44.2	J	0.700	39.6	J	2.10	3.14	U	3.14	16.3	J	9.43	97.8
Duplicate of J1C3B0	J1C3B5	9/22/10	48.3	J	0.980	41.1	J	2.94	3.40	U	3.40	16.2	J	10.2	97.8
SZ-1	J1C393	9/22/10	47.7	J	0.655	30.3	J	1.97	3.29	U	3.29	22.6	J	9.89	97.7
SZ-2	J1C394	9/22/10	51.0	J	0.763	30.8	J	2.29	4.08	U	4.08	18.9	J	12.3	80.6
SZ-3	J1C395	9/22/10	45.2	J	0.825	30.5	J	2.48	3.49	U	3.49	21.4	J	10.5	95.5
SZ-4	J1C396	9/22/10	49.8	J	0.775	31.0	J	2.33	3.77	U	3.77	8.58	J	11.3	87.0
SZ-5	J1C397	9/22/10	54.4	J	0.671	35.0	J	2.01	3.50	U	3.50	6.64	J	10.5	93.9
SZ-6	J1C398	9/22/10	41.2	J	0.821	30.3	J	2.46	3.31	U	3.31	24.6	J	9.92	96.5
SZ-7	J1C399	9/22/10	50.8	J	0.772	28.3	J	2.32	3.32	U	3.32	15.8	J	9.97	98.3
SZ-9	J1C3B1	9/22/10	51.6	J	0.862	30.4	J	2.59	3.31	U	3.31	16.0	J	9.94	95.0
SZ-10	J1C3B2	9/22/10	43.4	J	0.810	33.3	J	2.43	3.37	U	3.37	56.7	J	10.1	96.8
SZ-11	J1C3B3	9/22/10	50.7	J	0.861	46.0	J	2.58	3.45	U	3.45	24.3	J	10.3	94.7
SZ-12	J1C3B4	9/22/10	48.4	J	0.943	33.0	J	2.83	3.58	U	3.58	42.6	J	10.8	91.1
SS-1	J1C3B6	9/22/10	43.5	J	0.839	32.0	J	2.52	3.52	U	3.52	11.8	J	10.6	91.7
SS-2	J1C3B7	9/22/10	40.8	J	1.05	62.5	J	3.16	7.14	U	7.14	188	DJ	21.4	91.4
SS-3	J1C3B8	9/22/10	44.7	J	0.786	38.1	J	2.36	3.27	U	3.27	7.90	J	9.82	96.4
SS-4	J1C3B9	9/22/10	38.8	J	0.749	28.8	J	2.25	3.38	U	3.38	6.77	J	10.2	98.2
SS-5	J1C3C0	9/22/10	46.4	J	0.745	36.1	J	2.23	3.42	U	3.42	10.3	UJ	10.3	97.3
Equipment blank	J1C3C1	9/22/10	0.295	JB	0.641	0.971	JB	1.92							100
Trip blank	J1C3C2	9/22/10													99.9

Attachment	1	Sheet No.	9 of 28
Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
Calc. No.	0100H-CA-V0150	Rev. No.	0

Attachment 1. 100-H-4 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1C3B0, SZ-8			J1C3B5, Duplicate of			J1C393, SZ-1			J1C394, SZ-2		
		9/22/2010			9/22/2010			9/22/2010			9/22/2010		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	3.36	U	3.36	3.47	U	3.47	3.34	U	3.34	3.40	U	3.40
Acenaphthylene	PAH	3.36	U	3.36	3.47	U	3.47	3.34	U	3.34	3.40	U	3.40
Anthracene	PAH	3.36	U	3.36	3.47	U	3.47	3.34	U	3.34	3.40	U	3.40
Benzo(a)anthracene	PAH	9.50		3.36	5.02		3.47	3.34	U	3.34	3.40	U	3.40
Benzo(a)pyrene	PAH	8.86		3.36	6.71		3.47	3.34	U	3.34	3.40	U	3.40
Benzo(b)fluoranthene	PAH	10.1		3.36	3.03	J	3.47	3.34	U	3.34	3.40	U	3.40
Benzo(ghi)perylene	PAH	6.41		3.36	5.25		3.47	3.34	U	3.34	3.40	U	3.40
Benzo(k)fluoranthene	PAH	4.73		3.36	3.16	J	3.47	3.34	U	3.34	3.40	U	3.40
Chrysene	PAH	8.26		3.36	6.97		3.47	2.66	J	3.34	2.74	J	3.40
Dibenz[a,h]anthracene	PAH	3.36	U	3.36	3.47	U	3.47	3.34	U	3.34	3.40	U	3.40
Fluoranthene	PAH	22.0		3.36	22.3		3.47	3.34	U	3.34	3.40	U	3.40
Fluorene	PAH	3.36	U	3.36	2.99	J	3.47	3.34	U	3.34	3.40	U	3.40
Indeno(1,2,3-cd)pyrene	PAH	4.17		3.36	3.42	J	3.47	3.34	U	3.34	3.40	U	3.40
Naphthalene	PAH	3.36	U	3.36	3.47	U	3.47	3.34	U	3.34	3.40	U	3.40
Phenanthrene	PAH	2.69	J	3.36	6.08		3.47	3.34	U	3.34	3.40	U	3.40
Pyrene	PAH	3.36	U	3.36	11.0		3.47	3.34	U	3.34	1.02	J	1.02
Aroclor-1016	PCB	12.9	U	12.9	14.2	U	14.2	13.2	U	13.2	13.4	U	13.4
Aroclor-1221	PCB	12.9	UJ	12.9	14.2	UJ	14.2	13.2	UJ	13.2	13.4	UJ	13.4
Aroclor-1232	PCB	12.9	UJ	12.9	14.2	UJ	14.2	13.2	UJ	13.2	13.4	UJ	13.4
Aroclor-1242	PCB	12.9	UJ	12.9	14.2	UJ	14.2	13.2	UJ	13.2	13.4	UJ	13.4
Aroclor-1248	PCB	12.9	UJ	12.9	14.2	UJ	14.2	13.2	UJ	13.2	13.4	UJ	13.4
Aroclor-1254	PCB	66.1	J	12.9	66.5	J	14.2	13.2	UJ	13.2	13.4	UJ	13.4
Aroclor-1260	PCB	35.2		12.9	33.4		14.2	13.2	U	13.2	13.4	U	13.4
Aldrin	PEST	1.30	UD	1.30	1.42	UD	1.42	1.32	UD	1.32	1.34	UD	1.34
Alpha-BHC	PEST	1.30	UD	1.30	1.42	UD	1.42	1.32	UD	1.32	1.34	UD	1.34
alpha-Chlordane	PEST	1.30	UD	1.30	1.42	UD	1.42	1.32	UD	1.32	1.34	UD	1.34
beta-BHC	PEST	1.30	UD	1.30	1.42	UD	1.42	1.32	UD	1.32	1.34	UD	1.34
Delta-BHC	PEST	1.30	UD	1.30	1.42	UD	1.42	1.32	UD	1.32	1.34	UD	1.34
4,4'-DDD	PEST	1.30	UD	1.30	1.42	UD	1.42	1.32	UD	1.32	1.34	UD	1.34
4,4'-DDE	PEST	2.95	JD	2.95	2.91	JD	2.91	1.32	UD	1.32	1.34	UD	1.34
4,4'-DDT	PEST	1.30	UD	1.30	1.42	UD	1.42	1.32	UD	1.32	1.34	UD	1.34
Dieldrin	PEST	1.30	UD	1.30	1.42	UD	1.42	1.32	UD	1.32	1.34	UD	1.34
Endosulfan I	PEST	1.30	UD	1.30	1.42	UD	1.42	1.32	UD	1.32	1.34	UD	1.34
Endosulfan II	PEST	1.30	UD	1.30	1.42	UD	1.42	1.32	UD	1.32	1.34	UD	1.34
Endosulfan sulfate	PEST	1.30	UD	1.30	1.42	UD	1.42	1.32	UD	1.32	1.34	UD	1.34
Endrin	PEST	1.30	UD	1.30	1.42	UD	1.42	1.32	UD	1.32	1.34	UD	1.34
Endrin aldehyde	PEST	1.30	UD	1.30	1.42	UD	1.42	1.32	UD	1.32	1.34	UD	1.34
Endrin ketone	PEST	1.30	UD	1.30	1.42	UD	1.42	1.32	UD	1.32	1.34	UD	1.34
Gamma-BHC (Lindane)	PEST	1.30	UD	1.30	1.42	UD	1.42	1.32	UD	1.32	1.34	UD	1.34
gamma-Chlordane	PEST	1.30	UD	1.30	1.42	UD	1.42	1.32	UD	1.32	1.34	UD	1.34
Heptachlor	PEST	1.30	UD	1.30	1.42	UD	1.42	1.32	UD	1.32	1.34	UD	1.34
Heptachlor epoxide	PEST	1.30	UD	1.30	1.42	UD	1.42	1.32	UD	1.32	1.34	UD	1.34
Methoxychlor	PEST	1.30	UD	1.30	1.42	UD	1.42	1.32	UD	1.32	1.34	UD	1.34
Toxaphene	PEST	19.5	UDJ	19.5	21.3	UDJ	21.3	19.9	UDJ	19.9	20.1	UDJ	20.1

Attachment	1	Sheet No.	10 of 28
Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
Calc. No.	0100H-CA-V0150	Rev. No.	0

Attachment 1. 100-H-4 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1C395, SZ-3			J1C396, SZ-4			J1C397, SZ-5			J1C398, SZ-6		
		9/22/2010			9/22/2010			9/22/2010			9/22/2010		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	3.40	U	3.40	4.00	U	4.00	3.46	U	3.46	3.78	U	3.78
Acenaphthylene	PAH	3.40	U	3.40	4.00	U	4.00	3.46	U	3.46	3.78	U	3.78
Anthracene	PAH	3.40	U	3.40	4.00	U	4.00	3.46	U	3.46	3.78	U	3.78
Benzo(a)anthracene	PAH	3.40	U	3.40	1.52	J	4.00	3.20	J	3.46	2.86	J	3.78
Benzo(a)pyrene	PAH	3.40	U	3.40	2.26	J	4.00	3.78		3.46	3.82		3.78
Benzo(b)fluoranthene	PAH	3.40	U	3.40	1.60	J	4.00	3.64		3.46	4.26		3.78
Benzo(ghi)perylene	PAH	3.40	U	3.40	1.68	J	4.00	2.82	J	3.46	2.63	J	3.78
Benzo(k)fluoranthene	PAH	3.40	U	3.40	1.08	J	4.00	1.82	J	3.46	1.91	J	3.78
Chrysene	PAH	4.88		3.40	5.78		4.00	1.21	J	3.46	1.69	J	3.78
Dibenz[a,h]anthracene	PAH	3.40	U	3.40	4.00	U	4.00	3.46	U	3.46	3.78	U	3.78
Fluoranthene	PAH	1.02	J	3.40	2.24	J	4.00	10.0		3.46	5.89		3.78
Fluorene	PAH	3.40	U	3.40	4.00	U	4.00	3.46	U	3.46	3.78	U	3.78
Indeno(1,2,3-cd)pyrene	PAH	3.40	U	3.40	4.00	U	4.00	3.46	U	3.46	2.25	J	3.78
Naphthalene	PAH	3.40	U	3.40	4.00	U	4.00	3.46	U	3.46	3.78	U	3.78
Phenanthrene	PAH	3.40	U	3.40	1.38	J	4.00	4.38		3.46	1.55	J	3.78
Pyrene	PAH	3.40	U	3.40	2.78	J	4.00	8.75		3.46	9.03		3.78
Aroclor-1016	PCB	13.5	UJ	13.5	16.1	U	16.1	13.9	U	13.9	14.9	U	14.9
Aroclor-1221	PCB	13.5	UJ	13.5	16.1	UJ	16.1	13.9	UJ	13.9	14.9	UJ	14.9
Aroclor-1232	PCB	13.5	UJ	13.5	16.1	UJ	16.1	13.9	UJ	13.9	14.9	UJ	14.9
Aroclor-1242	PCB	13.5	UJ	13.5	16.1	UJ	16.1	13.9	UJ	13.9	14.9	UJ	14.9
Aroclor-1248	PCB	13.5	UJ	13.5	16.1	UJ	16.1	13.9	UJ	13.9	14.9	UJ	14.9
Aroclor-1254	PCB	13.5	UJ	13.5	16.1	UJ	16.1	13.9	UJ	13.9	14.9	UJ	14.9
Aroclor-1260	PCB	13.5	UJ	13.5	16.1	U	16.1	13.9	U	13.9	5.38	J	14.9
Aldrin	PEST	1.34	UD	1.34	1.61	UD	1.61	1.39	UD	1.39	1.49	UD	1.49
Alpha-BHC	PEST	1.34	UD	1.34	1.61	UD	1.61	1.39	UD	1.39	1.49	UD	1.49
alpha-Chlordane	PEST	1.34	UD	1.34	1.61	UD	1.61	1.39	UD	1.39	1.49	UD	1.49
beta-BHC	PEST	1.34	UD	1.34	1.61	UD	1.61	1.39	UD	1.39	1.49	UD	1.49
Delta-BHC	PEST	1.34	UD	1.34	1.61	UD	1.61	1.39	UD	1.39	1.49	UD	1.49
4,4'-DDD	PEST	1.34	UD	1.34	1.61	UD	1.61	1.39	UD	1.39	1.49	UD	1.49
4,4'-DDE	PEST	1.34	UD	1.34	1.61	UD	1.61	1.39	UD	1.39	1.49	UD	1.49
4,4'-DDT	PEST	1.34	UD	1.34	1.61	UD	1.61	1.39	UD	1.39	1.49	UD	1.49
Dieldrin	PEST	1.34	UD	1.34	1.61	UD	1.61	1.39	UD	1.39	1.49	UD	1.49
Endosulfan I	PEST	1.34	UD	1.34	1.61	UD	1.61	1.39	UD	1.39	1.49	UD	1.49
Endosulfan II	PEST	1.34	UD	1.34	1.61	UD	1.61	1.39	UD	1.39	1.49	UD	1.49
Endosulfan sulfate	PEST	1.34	UD	1.34	1.61	UD	1.61	1.39	UD	1.39	1.49	UD	1.49
Endrin	PEST	1.34	UD	1.34	1.61	UD	1.61	1.39	UD	1.39	1.49	UD	1.49
Endrin aldehyde	PEST	1.34	UD	1.34	1.61	UD	1.61	1.39	UD	1.39	1.49	UD	1.49
Endrin ketone	PEST	1.34	UD	1.34	1.61	UD	1.61	1.39	UD	1.39	1.49	UD	1.49
Gamma-BHC (Lindane)	PEST	1.34	UD	1.34	1.61	UD	1.61	1.39	UD	1.39	1.49	UD	1.49
gamma-Chlordane	PEST	1.34	UD	1.34	1.61	UD	1.61	1.39	UD	1.39	1.49	UD	1.49
Heptachlor	PEST	1.34	UD	1.34	1.61	UD	1.61	1.39	UD	1.39	1.49	UD	1.49
Heptachlor epoxide	PEST	1.34	UD	1.34	1.61	UD	1.61	1.39	UD	1.39	1.49	UD	1.49
Methoxychlor	PEST	1.34	UD	1.34	1.61	UD	1.61	1.39	UD	1.39	1.49	UD	1.49
Toxaphene	PEST	20.1	UDJ	20.1	24.2	UDJ	24.2	20.9	UDJ	20.9	22.4	UDJ	22.4

Attachment	1	Sheet No.	11 of 28
Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
Calc. No.	0100H-CA-V0150	Rev. No.	0

Attachment 1. 100-H-4 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1C399, SZ-7			J1C3B1, SZ-9			J1C3B2, SZ-10			J1C3B3, SZ-11		
		9/22/2010			9/22/2010			9/22/2010			9/22/2010		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	3.41	U	3.41	3.37	U	3.37	3.50	U	3.50	10.9		10.9
Acenaphthylene	PAH	3.41	U	3.41	3.37	U	3.37	3.50	U	3.50	3.38	U	10.9
Anthracene	PAH	3.41	U	3.41	3.37	U	3.37	3.50	U	3.50	3.38	U	10.9
Benzo(a)anthracene	PAH	3.41	U	3.41	3.37	U	3.37	3.08	J	3.50	1.25	J	10.9
Benzo(a)pyrene	PAH	3.41	U	3.41	3.37	U	3.37	3.24	J	3.50	2.44	J	10.9
Benzo(b)fluoranthene	PAH	3.41	U	3.41	3.37	U	3.37	2.87	J	3.50	1.98	J	10.9
Benzo(ghi)perylene	PAH	3.41	U	3.41	3.37	U	3.37	3.50	U	3.50	3.46		10.9
Benzo(k)fluoranthene	PAH	3.41	U	3.41	3.37	U	3.37	1.73	J	3.50	1.08	J	10.9
Chrysene	PAH	3.41	U	3.41	3.07	J	3.07	1.96	J	3.50	2.44	J	10.9
Dibenz[a,h]anthracene	PAH	3.41	U	3.41	3.37	U	3.37	3.50	U	3.50	3.38	U	10.9
Fluoranthene	PAH	3.41	U	3.41	3.37	U	3.37	9.35		3.50	3.18	J	10.9
Fluorene	PAH	3.41	U	3.41	3.37	U	3.37	3.50	U	3.50	3.38	U	10.9
Indeno(1,2,3-cd)pyrene	PAH	3.41	U	3.41	3.37	U	3.37	3.50	U	3.50	31.1		10.9
Naphthalene	PAH	3.41	U	3.41	3.37	U	3.37	3.50	U	3.50	3.38	U	10.9
Phenanthrene	PAH	3.41	U	3.41	3.37	U	3.37	3.62		3.50	2.57	J	10.9
Pyrene	PAH	3.41	U	3.41	3.37	U	3.37	9.33		3.50	4.39		10.9
Aroclor-1016	PCB	13.8	U	13.8	13.4	U	13.4	13.5	U	13.5	13.0	U	13.0
Aroclor-1221	PCB	13.8	UJ	13.8	13.4	UJ	13.4	13.5	UJ	13.5	13.0	UJ	13.0
Aroclor-1232	PCB	13.8	UJ	13.8	13.4	UJ	13.4	13.5	UJ	13.5	13.0	UJ	13.0
Aroclor-1242	PCB	13.8	UJ	13.8	13.4	UJ	13.4	13.5	UJ	13.5	13.0	UJ	13.0
Aroclor-1248	PCB	13.8	UJ	13.8	13.4	UJ	13.4	13.5	UJ	13.5	13.0	UJ	13.0
Aroclor-1254	PCB	13.8	UJ	13.8	13.4	UJ	13.4	6.85	J	13.5	6.95	J	13.0
Aroclor-1260	PCB	13.8	U	13.8	13.4	U	13.4	4.21	J	13.5	3.57	J	13.0
Aldrin	PEST	1.38	UD	1.38	1.34	UD	1.34	1.36	UD	1.36	1.30	UD	1.30
Alpha-BHC	PEST	1.38	UD	1.38	1.34	UD	1.34	1.36	UD	1.36	1.30	UD	1.30
alpha-Chlordane	PEST	1.38	UD	1.38	1.34	UD	1.34	1.36	UD	1.36	3.02	JD	3.02
beta-BHC	PEST	1.38	UD	1.38	1.34	UD	1.34	1.36	UD	1.36	1.30	UD	1.30
Delta-BHC	PEST	1.38	UD	1.38	1.34	UD	1.34	1.36	UD	1.36	1.30	UD	1.30
4,4'-DDD	PEST	1.38	UD	1.38	1.34	UD	1.34	1.36	UD	1.36	1.30	UD	1.30
4,4'-DDE	PEST	1.38	UD	1.38	1.34	UD	1.34	1.36	UD	1.36	1.30	UD	1.30
4,4'-DDT	PEST	1.38	UD	1.38	1.34	UD	1.34	1.36	UD	1.36	1.56	JD	1.56
Dieldrin	PEST	1.38	UD	1.38	1.34	UD	1.34	1.36	UD	1.36	1.30	UD	1.30
Endosulfan I	PEST	1.38	UD	1.38	1.34	UD	1.34	1.36	UD	1.36	1.30	UD	1.30
Endosulfan II	PEST	1.38	UD	1.38	1.34	UD	1.34	1.36	UD	1.36	1.30	UD	1.30
Endosulfan sulfate	PEST	1.38	UD	1.38	1.34	UD	1.34	1.36	UD	1.36	1.30	UD	1.30
Endrin	PEST	1.38	UD	1.38	1.34	UD	1.34	1.36	UD	1.36	1.30	UD	1.30
Endrin aldehyde	PEST	1.38	UD	1.38	1.34	UD	1.34	1.36	UD	1.36	1.30	UD	1.30
Endrin ketone	PEST	1.38	UD	1.38	1.34	UD	1.34	1.36	UD	1.36	1.30	UD	1.30
Gamma-BHC (Lindane)	PEST	1.38	UD	1.38	1.34	UD	1.34	1.36	UD	1.36	1.30	UD	1.30
gamma-Chlordane	PEST	1.38	UD	1.38	1.34	UD	1.34	1.36	UD	1.36	1.43	JD	1.43
Heptachlor	PEST	1.38	UD	1.38	1.34	UD	1.34	1.36	UD	1.36	1.30	UD	1.30
Heptachlor epoxide	PEST	1.38	UD	1.38	1.34	UD	1.34	1.36	UD	1.36	1.30	UD	1.30
Methoxychlor	PEST	1.38	UD	1.38	1.34	UD	1.34	1.36	UD	1.36	1.30	UD	1.30
Toxaphene	PEST	20.7	UDJ	20.7	20.1	UDJ	20.1	20.4	UDJ	20.4	19.5	UDJ	19.5

Attachment	1	Sheet No.	12 of 28
Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
Calc. No.	0100H-CA-V0150	Rev. No.	0

Attachment 1. 100-H-4 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1C3B4, SZ-12			J1C3B6, SS-1			J1C3B7, SS-2			J1C3B8, SS-3		
		9/22/2010			9/22/2010			9/22/2010			9/22/2010		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	3.38	U	3.38	3.55	U	3.55	51.1	D	51.1	3.32	U	3.32
Acenaphthylene	PAH	3.38	U	3.38	3.55	U	3.55	7.17	U	51.1	3.32	U	3.32
Anthracene	PAH	3.38	U	3.38	3.55	U	3.55	7.17	U	51.1	3.32	U	3.32
Benzo(a)anthracene	PAH	1.90	J	3.38	3.64		3.55	74.6	D	51.1	1.50	J	3.32
Benzo(a)pyrene	PAH	2.37	J	3.38	3.87		3.55	52.9	D	51.1	1.91	J	3.32
Benzo(b)fluoranthene	PAH	3.38	U	3.38	2.45	J	3.55	44.1	D	51.1	3.32	U	3.32
Benzo(ghi)perylene	PAH	1.47	J	3.38	2.15	J	3.55	45.9	D	51.1	1.05	J	3.32
Benzo(k)fluoranthene	PAH	1.07	J	3.38	1.79	J	3.55	27.2	D	51.1	3.32	U	3.32
Chrysene	PAH	6.57		3.38	4.44		3.55	31.3	D	51.1	4.22		3.32
Dibenz[a,h]anthracene	PAH	3.38	U	3.38	3.55	U	3.55	6.62	JD	51.1	3.32	U	3.32
Fluoranthene	PAH	3.40		3.38	7.76		3.55	29.0	D	51.1	5.73		3.32
Fluorene	PAH	3.38	U	3.38	3.55	U	3.55	4.18	JD	51.1	3.32	U	3.32
Indeno(1,2,3-cd)pyrene	PAH	3.38	U	3.38	3.55	U	3.55	14.5	D	51.1	3.32	U	3.32
Naphthalene	PAH	3.38	U	3.38	3.55	U	3.55	7.17	U	51.1	3.32	U	3.32
Phenanthrene	PAH	1.30	J	3.38	2.08	J	3.55	7.17	U	51.1	1.58	J	3.32
Pyrene	PAH	2.52	J	3.38	6.81		3.55	15.7	D	51.1	4.39		3.32
Aroclor-1016	PCB	13.8	U	13.8	14.0	U	14.0	14.1	U	14.1	13.4	U	13.4
Aroclor-1221	PCB	13.8	UJ	13.8	14.0	UJ	14.0	14.1	UJ	14.1	13.4	UJ	13.4
Aroclor-1232	PCB	13.8	UJ	13.8	14.0	UJ	14.0	14.1	UJ	14.1	13.4	UJ	13.4
Aroclor-1242	PCB	13.8	UJ	13.8	14.0	UJ	14.0	14.1	UJ	14.1	13.4	UJ	13.4
Aroclor-1248	PCB	13.8	UJ	13.8	14.0	UJ	14.0	14.1	UJ	14.1	13.4	UJ	13.4
Aroclor-1254	PCB	19.3	J	13.8	13.8	J	14.0	11.0	J	14.1	13.4	UJ	13.4
Aroclor-1260	PCB	8.09	J	13.8	7.15	J	14.0	18.4		14.1	13.4	U	13.4
Aldrin	PEST	1.38	UD	1.38	1.40	UD	1.40	1.41	UD	1.41	1.34	UD	1.34
Alpha-BHC	PEST	1.38	UD	1.38	1.40	UD	1.40	1.41	UD	1.41	1.34	UD	1.34
alpha-Chlordane	PEST	1.38	UD	1.38	1.40	UD	1.40	1.41	UD	1.41	1.34	UD	1.34
beta-BHC	PEST	1.38	UD	1.38	1.40	UD	1.40	1.41	UD	1.41	1.34	UD	1.34
Delta-BHC	PEST	1.38	UD	1.38	1.40	UD	1.40	1.41	UD	1.41	1.34	UD	1.34
4,4'-DDD	PEST	1.38	UD	1.38	1.40	UD	1.40	1.41	UD	1.41	1.34	UD	1.34
4,4'-DDE	PEST	1.38	UD	1.38	1.40	UD	1.40	1.41	UD	1.41	1.34	UD	1.34
4,4'-DDT	PEST	1.38	UD	1.38	1.40	UD	1.40	1.94	JD	1.94	1.34	UD	1.34
Dieldrin	PEST	1.38	UD	1.38	1.40	UD	1.40	1.41	UD	1.41	1.34	UD	1.34
Endosulfan I	PEST	1.38	UD	1.38	1.40	UD	1.40	1.41	UD	1.41	1.34	UD	1.34
Endosulfan II	PEST	1.38	UD	1.38	1.40	UD	1.40	1.41	UD	1.41	1.34	UD	1.34
Endosulfan sulfate	PEST	1.38	UD	1.38	1.40	UD	1.40	1.41	UD	1.41	1.34	UD	1.34
Endrin	PEST	1.38	UD	1.38	1.40	UD	1.40	1.41	UD	1.41	1.34	UD	1.34
Endrin aldehyde	PEST	1.38	UD	1.38	1.40	UD	1.40	1.41	UD	1.41	1.34	UD	1.34
Endrin ketone	PEST	1.38	UD	1.38	1.40	UD	1.40	1.41	UD	1.41	1.34	UD	1.34
Gamma-BHC (Lindane)	PEST	1.38	UD	1.38	1.40	UD	1.40	1.41	UD	1.41	1.34	UD	1.34
gamma-Chlordane	PEST	1.38	UD	1.38	1.40	UD	1.40	1.41	UD	1.41	1.34	UD	1.34
Heptachlor	PEST	1.38	UD	1.38	1.40	UD	1.40	1.41	UD	1.41	1.34	UD	1.34
Heptachlor epoxide	PEST	1.38	UD	1.38	1.40	UD	1.40	1.41	UD	1.41	1.34	UD	1.34
Methoxychlor	PEST	1.38	UD	1.38	1.40	UD	1.40	1.41	UD	1.41	1.34	UD	1.34
Toxaphene	PEST	20.7	UDJ	20.7	21.0	UDJ	21.0	21.2	UDJ	21.2	20.2	UDJ	20.2

Attachment	1	Sheet No.	13 of 28
Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
Calc. No.	0100H-CA-V0150	Rev. No.	0

Attachment 1. 100-H-4 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1C3B9, SS-4			J1C3C0, SS-5			J1C3C1, Equipment blank			J1C3C2, Trip blank		
		9/22/2010			9/22/2010			9/22/2010			9/22/2010		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	3.20	U	3.20	3.25	U	3.25	3.29	U	3.29			
Acenaphthylene	PAH	3.20	U	3.20	3.25	U	3.25	3.29	U	3.29			
Anthracene	PAH	3.20	U	3.20	3.25	U	3.25	3.29	U	3.29			
Benzo(a)anthracene	PAH	3.20	U	3.20	3.25	U	3.25	3.29	U	3.29			
Benzo(a)pyrene	PAH	3.20	U	3.20	3.25	U	3.25	3.29	U	3.29			
Benzo(b)fluoranthene	PAH	3.20	U	3.20	3.25	U	3.25	3.29	U	3.29			
Benzo(ghi)perylene	PAH	3.20	U	3.20	3.25	U	3.25	3.29	U	3.29			
Benzo(k)fluoranthene	PAH	3.20	U	3.20	3.25	U	3.25	3.29	U	3.29			
Chrysene	PAH	0.816	J	3.20	3.25	U	3.25	3.29	U	3.29			
Dibenz[a,h]anthracene	PAH	3.20	U	3.20	3.25	U	3.25	3.29	U	3.29			
Fluoranthene	PAH	3.20	U	3.20	3.25	U	3.25	3.08	J	3.08			
Fluorene	PAH	3.20	U	3.20	3.25	U	3.25	3.29	U	3.29			
Indeno(1,2,3-cd)pyrene	PAH	1.42	J	3.20	3.25	U	3.25	3.29	U	3.29			
Naphthalene	PAH	3.20	U	3.20	3.25	U	3.25	3.29	U	3.29			
Phenanthrene	PAH	0.848	J	3.20	3.25	U	3.25	3.29	U	3.29			
Pyrene	PAH	3.20	U	3.20	3.25	U	3.25	3.29	U	3.29			
Aroclor-1016	PCB	13.4	U	13.4	13.6	U	13.6						
Aroclor-1221	PCB	13.4	UJ	13.4	13.6	UJ	13.6						
Aroclor-1232	PCB	13.4	UJ	13.4	13.6	UJ	13.6						
Aroclor-1242	PCB	13.4	UJ	13.4	13.6	UJ	13.6						
Aroclor-1248	PCB	13.4	UJ	13.4	13.6	UJ	13.6						
Aroclor-1254	PCB	13.4	UJ	13.4	13.6	UJ	13.6						
Aroclor-1260	PCB	13.4	U	13.4	13.6	U	13.6						
Aldrin	PEST	1.34	UD	1.34	1.36	UD	1.36						
Alpha-BHC	PEST	1.34	UD	1.34	1.36	UD	1.36						
alpha-Chlordane	PEST	1.34	UD	1.34	1.36	UD	1.36						
beta-BHC	PEST	1.34	UD	1.34	1.36	UD	1.36						
Delta-BHC	PEST	1.34	UD	1.34	1.36	UD	1.36						
4,4'-DDD	PEST	1.34	UD	1.34	1.36	UD	1.36						
4,4'-DDE	PEST	1.34	UD	1.34	1.36	UD	1.36						
4,4'-DDT	PEST	1.34	UD	1.34	1.36	UD	1.36						
Dieldrin	PEST	1.34	UD	1.34	1.36	UD	1.36						
Endosulfan I	PEST	1.34	UD	1.34	1.36	UD	1.36						
Endosulfan II	PEST	1.34	UD	1.34	1.36	UD	1.36						
Endosulfan sulfate	PEST	1.34	UD	1.34	1.36	UD	1.36						
Endrin	PEST	1.34	UD	1.34	1.36	UD	1.36						
Endrin aldehyde	PEST	1.34	UD	1.34	1.36	UD	1.36						
Endrin ketone	PEST	1.34	UD	1.34	1.36	UD	1.36						
Gamma-BHC (Lindane)	PEST	1.34	UD	1.34	1.36	UD	1.36						
gamma-Chlordane	PEST	1.34	UD	1.34	1.36	UD	1.36						
Heptachlor	PEST	1.34	UD	1.34	1.36	UD	1.36						
Heptachlor epoxide	PEST	1.34	UD	1.34	1.36	UD	1.36						
Methoxychlor	PEST	1.34	UD	1.34	1.36	UD	1.36						
Toxaphene	PEST	20.1	UDJ	20.1	20.5	UDJ	20.5						

Attachment	1	Sheet No.	14 of 28
Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
Calc. No.	0100H-CA-V0150	Rev. No.	0

Attachment 1. 100-H-4 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1C3B0, SZ-8			J1C3B5, Duplicate of			J1C393, SZ-1			J1C394, SZ-2		
		9/22/2010			9/22/2010			9/22/2010			9/22/2010		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
1,2-Dichlorobenzene	SVOA	328	UJ	328	358	UJ	358	330	UJ	330	333	UJ	333
1,3-Dichlorobenzene	SVOA	328	UJ	328	358	UJ	358	330	UJ	330	333	UJ	333
1,4-Dichlorobenzene	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
2,4,5-Trichlorophenol	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
2,4,6-Trichlorophenol	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
2,4-Dichlorophenol	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
2,4-Dimethylphenol	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
2,4-Dinitrophenol	SVOA	1640	U	1640	1790	U	1790	1650	U	1650	1660	U	1660
2,4-Dinitrotoluene	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
2,6-Dinitrotoluene	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
2-Chloronaphthalene	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
2-Chlorophenol	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
2-Methylnaphthalene	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
2-Methylphenol (cresol, o-)	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
2-Nitroaniline	SVOA	1640	U	1640	1790	U	1790	1650	U	1650	1660	U	1660
2-Nitrophenol	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
3+4 Methylphenol (cresol, m+p)	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
3,3'-Dichlorobenzidine	SVOA	655	U	655	717	U	717	661	U	661	665	U	665
3-Nitroaniline	SVOA	1640	U	1640	1790	U	1790	1650	U	1650	1660	U	1660
4,6-Dinitro-2-methylphenol	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
4-Bromophenylphenyl ether	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
4-Chloro-3-methylphenol	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
4-Chloroaniline	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
4-Chlorophenylphenyl ether	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
4-Nitroaniline	SVOA	1640	U	1640	1790	U	1790	1650	U	1650	1660	U	1660
4-Nitrophenol	SVOA	1640	U	1640	1790	U	1790	1650	U	1650	1660	U	1660
Acenaphthene	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
Acenaphthylene	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
Anthracene	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
Benzo(a)anthracene	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
Benzo(a)pyrene	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
Benzo(b)fluoranthene	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
Benzo(ghi)perylene	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
Benzo(k)fluoranthene	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
Bis(2-chloro-1-methylethyl)ether	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
Bis(2-Chloroethoxy)methane	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
Bis(2-chloroethyl) ether	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
Bis(2-ethylhexyl) phthalate	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
Butylbenzylphthalate	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
Carbazole	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
Chrysene	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
Di-n-butylphthalate	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
Di-n-octylphthalate	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
Dibenz[a,h]anthracene	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
Dibenzofuran	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
Diethyl phthalate	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
Dimethyl phthalate	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
Fluoranthene	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
Fluorene	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
Hexachlorobenzene	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
Hexachlorobutadiene	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
Hexachlorocyclopentadiene	SVOA	328	UJ	328	358	UJ	358	330	UJ	330	333	UJ	333
Hexachloroethane	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
Indeno(1,2,3-cd)pyrene	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
Isophorone	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
N-Nitroso-di-n-dipropylamine	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
N-Nitrosodiphenylamine	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
Naphthalene	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
Nitrobenzene	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
Pentachlorophenol	SVOA	1640	U	1640	1790	U	1790	1650	U	1650	1660	U	1660
Phenanthrene	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
Phenol	SVOA	328	U	328	358	U	358	330	U	330	333	U	333
Pyrene	SVOA	328	U	328	358	U	358	330	U	330	333	U	333

Attachment 1 Sheet No. 15 of 28
Originator T. E. Queen Date 1/12/11
Checked J. D. Skoglie Date 1/12/11

Attachment 1. 100-H-4 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1C395, SZ-3			J1C396, SZ-4			J1C397, SZ-5			J1C398, SZ-6		
		9/22/2010			9/22/2010			9/22/2010			9/22/2010		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
1,2-Dichlorobenzene	SVOA	335	UJ	335	408	UJ	408	342	UJ	342	366	UJ	366
1,3-Dichlorobenzene	SVOA	335	UJ	335	408	UJ	408	342	UJ	342	366	UJ	366
1,4-Dichlorobenzene	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
2,4,5-Trichlorophenol	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
2,4,6-Trichlorophenol	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
2,4-Dichlorophenol	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
2,4-Dimethylphenol	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
2,4-Dinitrophenol	SVOA	1680	U	1680	2040	U	2040	1710	U	1710	1830	U	1830
2,4-Dinitrotoluene	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
2,6-Dinitrotoluene	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
2-Chloronaphthalene	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
2-Chlorophenol	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
2-Methylnaphthalene	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
2-Methylphenol (cresol, o-)	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
2-Nitroaniline	SVOA	1680	U	1680	2040	U	2040	1710	U	1710	1830	U	1830
2-Nitrophenol	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
3+4 Methylphenol (cresol, m+p)	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
3,3'-Dichlorobenzidine	SVOA	671	U	671	817.0	U	817	685	U	685	733	U	733
3-Nitroaniline	SVOA	1680	U	1680	2040	U	2040	1710	U	1710	1830	U	1830
4,6-Dinitro-2-methylphenol	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
4-Bromophenylphenyl ether	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
4-Chloro-3-methylphenol	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
4-Chloroaniline	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
4-Chlorophenylphenyl ether	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
4-Nitroaniline	SVOA	1680	U	1680	2040	U	2040	1710	U	1710	1830	U	1830
4-Nitrophenol	SVOA	1680	U	1680	2040	U	2040	1710	U	1710	1830	U	1830
Acenaphthene	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
Acenaphthylene	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
Anthracene	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
Benzo(a)anthracene	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
Benzo(a)pyrene	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
Benzo(b)fluoranthene	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
Benzo(ghi)perylene	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
Benzo(k)fluoranthene	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
Bis(2-chloro-1-methylethyl)ether	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
Bis(2-Chloroethoxy)methane	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
Bis(2-chloroethyl) ether	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
Bis(2-ethylhexyl) phthalate	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
Butylbenzylphthalate	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
Carbazole	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
Chrysene	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
Di-n-butylphthalate	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
Di-n-octylphthalate	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
Dibenz[a,h]anthracene	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
Dibenzofuran	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
Diethyl phthalate	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
Dimethyl phthalate	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
Fluoranthene	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
Fluorene	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
Hexachlorobenzene	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
Hexachlorobutadiene	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
Hexachlorocyclopentadiene	SVOA	335	UJ	335	408	UJ	408	342	UJ	342	366	UJ	366
Hexachloroethane	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
Indeno(1,2,3-cd)pyrene	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
Isophorone	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
N-Nitroso-di-n-dipropylamine	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
N-Nitrosodiphenylamine	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
Naphthalene	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
Nitrobenzene	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
Pentachlorophenol	SVOA	1680	U	1680	2040	U	2040	1710	U	1710	1830	U	1830
Phenanthrene	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
Phenol	SVOA	335	U	335	408	U	408	342	U	342	366	U	366
Pyrene	SVOA	335	U	335	408	U	408	342	U	342	366	U	366

Attachment	1	Sheet No.	16 of 28
Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
Calc. No.	0100H-CA-V0150	Rev. No.	0

Attachment 1. 100-H-4 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1C399, SZ-7			J1C3B1, SZ-9			J1C3B2, SZ-10			J1C3B3, SZ-11		
		9/22/2010			9/22/2010			9/22/2010			9/22/2010		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
1,2-Dichlorobenzene	SVOA	339	UJ	339	331	UJ	331	338	UJ	338	338	UJ	338
1,3-Dichlorobenzene	SVOA	339	UJ	339	331	UJ	331	338	UJ	338	338	UJ	338
1,4-Dichlorobenzene	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
2,4,5-Trichlorophenol	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
2,4,6-Trichlorophenol	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
2,4-Dichlorophenol	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
2,4-Dimethylphenol	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
2,4-Dinitrophenol	SVOA	1690	U	1690	1650	U	1650	1690	U	1690	1690	U	1690
2,4-Dinitrotoluene	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
2,6-Dinitrotoluene	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
2-Chloronaphthalene	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
2-Chlorophenol	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
2-Methylnaphthalene	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
2-Methylphenol (cresol, o-)	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
2-Nitroaniline	SVOA	1690	U	1690	1650	U	1650	1690	U	1690	1690	U	1690
2-Nitrophenol	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
3+4 Methylphenol (cresol, m+p)	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
3,3'-Dichlorobenzidine	SVOA	677	U	677	661.0	U	661	676	U	676	676	U	676
3-Nitroaniline	SVOA	1690	U	1690	1650	U	1650	1690	U	1690	1690	U	1690
4,6-Dinitro-2-methylphenol	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
4-Bromophenylphenyl ether	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
4-Chloro-3-methylphenol	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
4-Chloroaniline	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
4-Chlorophenylphenyl ether	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
4-Nitroaniline	SVOA	1690	U	1690	1650	U	1650	1690	U	1690	1690	U	1690
4-Nitrophenol	SVOA	1690	U	1690	1650	U	1650	1690	U	1690	1690	U	1690
Acenaphthene	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
Acenaphthylene	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
Anthracene	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
Benzo(a)anthracene	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
Benzo(a)pyrene	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
Benzo(b)fluoranthene	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
Benzo(ghi)perylene	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
Benzo(k)fluoranthene	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
Bis(2-chloro-1-methylethyl)ether	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
Bis(2-Chloroethoxy)methane	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
Bis(2-chloroethyl) ether	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
Bis(2-ethylhexyl) phthalate	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
Butylbenzylphthalate	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
Carbazole	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
Chrysene	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
Di-n-butylphthalate	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
Di-n-octylphthalate	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
Dibenz[a,h]anthracene	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
Dibenzofuran	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
Diethyl phthalate	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
Dimethyl phthalate	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
Fluoranthene	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
Fluorene	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
Hexachlorobenzene	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
Hexachlorobutadiene	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
Hexachlorocyclopentadiene	SVOA	339	UJ	339	331	UJ	331	338	UJ	338	338	UJ	338
Hexachloroethane	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
Indeno(1,2,3-cd)pyrene	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
Isophorone	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
N-Nitroso-di-n-dipropylamine	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
N-Nitrosodiphenylamine	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
Naphthalene	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
Nitrobenzene	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
Pentachlorophenol	SVOA	1690	U	1690	1650	U	1650	1690	U	1690	1690	U	1690
Phenanthrene	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
Phenol	SVOA	339	U	339	331	U	331	338	U	338	338	U	338
Pyrene	SVOA	339	U	339	331	U	331	338	U	338	338	U	338

Attachment	1	Sheet No.	17 of 28
Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
Calc. No.	0100H-CA-V0150	Rev. No.	0

Attachment 1. 100-H-4 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1C3B4, SZ-12			J1C3B6, SS-1			J1C3B7, SS-2			J1C3B8, SS-3		
		9/22/2010			9/22/2010			9/22/2010			9/22/2010		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
1,2-Dichlorobenzene	SVOA	343	UJ	343	351	UJ	351	360	UJ	360	330	UJ	330
1,3-Dichlorobenzene	SVOA	343	UJ	343	351	UJ	351	360	UJ	360	330	UJ	330
1,4-Dichlorobenzene	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
2,4,5-Trichlorophenol	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
2,4,6-Trichlorophenol	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
2,4-Dichlorophenol	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
2,4-Dimethylphenol	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
2,4-Dinitrophenol	SVOA	1710	U	1710	1760	U	1760	1800	U	1800	1650	U	1650
2,4-Dinitrotoluene	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
2,6-Dinitrotoluene	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
2-Chloronaphthalene	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
2-Chlorophenol	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
2-Methylnaphthalene	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
2-Methylphenol (cresol, o-)	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
2-Nitroaniline	SVOA	1710	U	1710	1760	U	1760	1800	U	1800	1650	U	1650
2-Nitrophenol	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
3+4 Methylphenol (cresol, m+p)	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
3,3'-Dichlorobenzidine	SVOA	686	U	686	703.0	U	703	720	U	720	660	U	660
3-Nitroaniline	SVOA	1710	U	1710	1760	U	1760	1800	U	1800	1650	U	1650
4,6-Dinitro-2-methylphenol	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
4-Bromophenylphenyl ether	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
4-Chloro-3-methylphenol	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
4-Chloroaniline	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
4-Chlorophenylphenyl ether	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
4-Nitroaniline	SVOA	1710	U	1710	1760	U	1760	1800	U	1800	1650	U	1650
4-Nitrophenol	SVOA	1710	U	1710	1760	U	1760	1800	U	1800	1650	U	1650
Acenaphthene	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
Acenaphthylene	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
Anthracene	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
Benzo(a)anthracene	SVOA	343	U	343	351	U	351	170	J	360	330	U	330
Benzo(a)pyrene	SVOA	343	U	343	351	U	351	115	J	360	330	U	330
Benzo(b)fluoranthene	SVOA	343	U	343	351	U	351	136	J	360	330	U	330
Benzo(ghi)perylene	SVOA	343	U	343	351	U	351	75.2	J	360	330	U	330
Benzo(k)fluoranthene	SVOA	343	U	343	351	U	351	115	J	360	330	U	330
Bis(2-chloro-1-methylethyl)ether	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
Bis(2-Chloroethoxy)methane	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
Bis(2-chloroethyl) ether	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
Bis(2-ethylhexyl) phthalate	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
Butylbenzylphthalate	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
Carbazole	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
Chrysene	SVOA	343	U	343	351	U	351	194	J	360	330	U	330
Di-n-butylphthalate	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
Di-n-octylphthalate	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
Dibenz[a,h]anthracene	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
Dibenzofuran	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
Diethyl phthalate	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
Dimethyl phthalate	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
Fluoranthene	SVOA	343	U	343	351	U	351	292	J	292	330	U	330
Fluorene	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
Hexachlorobenzene	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
Hexachlorobutadiene	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
Hexachlorocyclopentadiene	SVOA	343	UJ	343	351	UJ	351	360	UJ	360	330	UJ	330
Hexachloroethane	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
Indeno(1,2,3-cd)pyrene	SVOA	343	U	343	351	U	351	66.2	J	360	330	U	330
Isophorone	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
N-Nitroso-di-n-dipropylamine	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
N-Nitrosodiphenylamine	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
Naphthalene	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
Nitrobenzene	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
Pentachlorophenol	SVOA	1710	U	1710	1760	U	1760	1800	U	1800	1650	U	1650
Phenanthrene	SVOA	343	U	343	351	U	351	81.5	J	81.5	330	U	330
Phenol	SVOA	343	U	343	351	U	351	360	U	360	330	U	330
Pyrene	SVOA	343	U	343	351	U	351	283	J	283	330	U	330

Attachment	1	Sheet No.	18 of 28
Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
Calc. No.	0100H-CA-V0150	Rev. No.	0

Attachment 1. 100-H-4 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1C3B9, SS-4			J1C3C0, SS-5			J1C3C1, Equipment blank			J1C3C2, Trip blank		
		9/22/2010			9/22/2010			9/22/2010			9/22/2010		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,2,4-Trichlorobenzene	SVOA	322	U	322	333	U	333	317	U	317			
1,2-Dichlorobenzene	SVOA	322	UJ	322	333	UJ	333	317	UJ	317			
1,3-Dichlorobenzene	SVOA	322	UJ	322	333	UJ	333	317	UJ	317			
1,4-Dichlorobenzene	SVOA	322	U	322	333	U	333	317	U	317			
2,4,5-Trichlorophenol	SVOA	322	U	322	333	U	333	317	U	317			
2,4,6-Trichlorophenol	SVOA	322	U	322	333	U	333	317	U	317			
2,4-Dichlorophenol	SVOA	322	U	322	333	U	333	317	U	317			
2,4-Dimethylphenol	SVOA	322	U	322	333	U	333	317	U	317			
2,4-Dinitrophenol	SVOA	1610	U	1610	1670	U	1670	1580	U	1580			
2,4-Dinitrotoluene	SVOA	322	U	322	333	U	333	317	U	317			
2,6-Dinitrotoluene	SVOA	322	U	322	333	U	333	317	U	317			
2-Chloronaphthalene	SVOA	322	U	322	333	U	333	317	U	317			
2-Chlorophenol	SVOA	322	U	322	333	U	333	317	U	317			
2-Methylnaphthalene	SVOA	322	U	322	333	U	333	317	U	317			
2-Methylphenol (cresol, o-)	SVOA	322	U	322	333	U	333	317	U	317			
2-Nitroaniline	SVOA	1610	U	1610	1670	U	1670	1580	U	1580			
2-Nitrophenol	SVOA	322	U	322	333	U	333	317	U	317			
3+4 Methylphenol (cresol, m+p)	SVOA	322	U	322	333	U	333	317	U	317			
3,3'-Dichlorobenzidine	SVOA	643	U	643	666.0	U	666	634	U	634			
3-Nitroaniline	SVOA	1610	U	1610	1670	U	1670	1580	U	1580			
4,6-Dinitro-2-methylphenol	SVOA	322	U	322	333	U	333	317	U	317			
4-Bromophenylphenyl ether	SVOA	322	U	322	333	U	333	317	U	317			
4-Chloro-3-methylphenol	SVOA	322	U	322	333	U	333	317	U	317			
4-Chloroaniline	SVOA	322	U	322	333	U	333	317	U	317			
4-Chlorophenylphenyl ether	SVOA	322	U	322	333	U	333	317	U	317			
4-Nitroaniline	SVOA	1610	U	1610	1670	U	1670	1580	U	1580			
4-Nitrophenol	SVOA	1610	U	1610	1670	U	1670	1580	U	1580			
Acenaphthene	SVOA	322	U	322	333	U	333	317	U	317			
Acenaphthylene	SVOA	322	U	322	333	U	333	317	U	317			
Anthracene	SVOA	322	U	322	333	U	333	317	U	317			
Benzo(a)anthracene	SVOA	322	U	322	333	U	333	317	U	317			
Benzo(a)pyrene	SVOA	322	U	322	333	U	333	317	U	317			
Benzo(b)fluoranthene	SVOA	322	U	322	333	U	333	317	U	317			
Benzo(ghi)perylene	SVOA	322	U	322	333	U	333	317	U	317			
Benzo(k)fluoranthene	SVOA	322	U	322	333	U	333	317	U	317			
Bis(2-chloro-1-methylethyl)ether	SVOA	322	U	322	333	U	333	317	U	317			
Bis(2-Chloroethoxy)methane	SVOA	322	U	322	333	U	333	317	U	317			
Bis(2-chloroethyl) ether	SVOA	322	U	322	333	U	333	317	U	317			
Bis(2-ethylhexyl) phthalate	SVOA	322	U	322	333	U	333	317	U	317			
Butylbenzylphthalate	SVOA	322	U	322	333	U	333	317	U	317			
Carbazole	SVOA	322	U	322	333	U	333	317	U	317			
Chrysene	SVOA	322	U	322	333	U	333	317	U	317			
Di-n-butylphthalate	SVOA	322	U	322	333	U	333	317	U	317			
Di-n-octylphthalate	SVOA	322	U	322	333	U	333	317	U	317			
Dibenz[a,h]anthracene	SVOA	322	U	322	333	U	333	317	U	317			
Dibenzofuran	SVOA	322	U	322	333	U	333	317	U	317			
Diethyl phthalate	SVOA	322	U	322	333	U	333	317	U	317			
Dimethyl phthalate	SVOA	322	U	322	333	U	333	317	U	317			
Fluoranthene	SVOA	322	U	322	333	U	333	317	U	317			
Fluorene	SVOA	322	U	322	333	U	333	317	U	317			
Hexachlorobenzene	SVOA	322	U	322	333	U	333	317	U	317			
Hexachlorobutadiene	SVOA	322	U	322	333	U	333	317	U	317			
Hexachlorocyclopentadiene	SVOA	322	UJ	322	333	UJ	333	317	UJ	317			
Hexachloroethane	SVOA	322	U	322	333	U	333	317	U	317			
Indeno(1,2,3-cd)pyrene	SVOA	322	U	322	333	U	333	317	U	317			
Isophorone	SVOA	322	U	322	333	U	333	317	U	317			
N-Nitroso-di-n-dipropylamine	SVOA	322	U	322	333	U	333	317	U	317			
N-Nitrosodiphenylamine	SVOA	322	U	322	333	U	333	317	U	317			
Naphthalene	SVOA	322	U	322	333	U	333	317	U	317			
Nitrobenzene	SVOA	322	U	322	333	U	333	317	U	317			
Pentachlorophenol	SVOA	1610	U	1610	1670	U	1670	1580	U	1580			
Phenanthrene	SVOA	322	U	322	333	U	333	317	U	317			
Phenol	SVOA	322	U	322	333	U	333	317	U	317			
Pyrene	SVOA	322	U	322	333	U	333	317	U	317			

Attachment	1	Sheet No.	19 of 28
Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
Calc. No.	0100H-CA-V0150	Rev. No.	0

Attachment 1. 100-H-4 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1C3B0, SZ-8			J1C3B5, Duplicate of			J1C393, SZ-1			J1C394, SZ-2		
		9/22/2010			9/22/2010			9/22/2010			9/22/2010		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,1,1-Trichloroethane	VOA	5.18	U	5.18	5.08	U	5.08	3.93	U	3.93	4.48	U	4.48
1,1,2,2-Tetrachloroethane	VOA	5.18	U	5.18	5.08	U	5.08	3.93	U	3.93	4.48	U	4.48
1,1,2-Trichloroethane	VOA	5.18	U	5.18	5.08	U	5.08	3.93	U	3.93	4.48	U	4.48
1,1-Dichloroethane	VOA	5.18	U	5.18	5.08	U	5.08	3.93	U	3.93	4.48	U	4.48
1,1-Dichloroethene	VOA	5.18	U	5.18	5.08	U	5.08	3.93	U	3.93	4.48	U	4.48
1,2-Dichloroethane	VOA	6.22	U	6.22	6.10	U	6.10	4.72	U	4.72	5.38	U	5.38
1,2-Dichloroethene(Total)	VOA	5.18	U	5.18	5.08	U	5.08	3.93	U	3.93	4.48	U	4.48
1,2-Dichloropropane	VOA	5.18	U	5.18	5.08	U	5.08	3.93	U	3.93	4.48	U	4.48
2-Butanone	VOA	12.4	U	12.4	12.2	U	12.2	9.43	U	9.43	10.8	U	10.8
2-Hexanone	VOA	12.4	U	12.4	12.2	U	12.2	9.43	U	9.43	10.8	U	10.8
4-Methyl-2-Pentanone	VOA	12.4	U	12.4	12.2	U	12.2	9.43	U	9.43	10.8	U	10.8
Acetone	VOA	12.4	UJ	12.4	12.2	U	12.2	9.43	UJ	9.43	10.8	UJ	10.8
Benzene	VOA	5.18	U	5.18	5.08	U	5.08	3.93	U	3.93	4.48	U	4.48
Bromodichloromethane	VOA	6.22	U	6.22	6.10	U	6.10	4.72	U	4.72	5.38	U	5.38
Bromoform	VOA	5.18	U	5.18	5.08	U	5.08	3.93	U	3.93	4.48	U	4.48
Bromomethane	VOA	10.4	U	10.4	10.2	U	10.2	7.86	U	7.86	8.97	U	8.97
Carbon disulfide	VOA	5.18	U	5.18	5.08	U	5.08	3.93	U	3.93	4.48	U	4.48
Carbon tetrachloride	VOA	5.18	U	5.18	5.08	U	5.08	3.93	U	3.93	4.48	U	4.48
Chlorobenzene	VOA	5.18	U	5.18	5.08	U	5.08	3.93	U	3.93	4.48	U	4.48
Chloroethane	VOA	10.4	U	10.4	10.2	U	10.2	7.86	U	7.86	8.97	U	8.97
Chloroform	VOA	5.18	U	5.18	5.08	U	5.08	3.93	U	3.93	4.48	U	4.48
Chloromethane	VOA	10.4	U	10.4	10.2	U	10.2	7.86	U	7.86	8.97	U	8.97
cis-1,2-Dichloroethylene	VOA	5.18	U	5.18	5.08	U	5.08	3.93	U	3.93	4.48	U	4.48
cis-1,3-Dichloropropene	VOA	5.18	U	5.18	5.08	U	5.08	3.93	U	3.93	4.48	U	4.48
Dibromochloromethane	VOA	5.18	U	5.18	5.08	U	5.08	3.93	U	3.93	4.48	U	4.48
Ethylbenzene	VOA	5.18	U	5.18	5.08	U	5.08	3.93	U	3.93	4.48	U	4.48
Methylenechloride	VOA	5.04	UBJ	5.18	4.59	UBJ	5.08	5.51	UBJ	3.93	5.80	UBJ	4.48
Styrene	VOA	5.18	U	5.18	5.08	U	5.08	3.93	U	3.93	4.48	U	4.48
Tetrachloroethene	VOA	5.18	U	5.18	5.08	U	5.08	3.93	U	3.93	4.48	U	4.48
Toluene	VOA	5.18	U	5.18	5.08	U	5.08	3.93	U	3.93	4.48	U	4.48
trans-1,2-Dichloroethylene	VOA	5.18	U	5.18	5.08	U	5.08	3.93	U	3.93	4.48	U	4.48
trans-1,3-Dichloropropene	VOA	5.18	U	5.18	5.08	U	5.08	3.93	U	3.93	4.48	U	4.48
Trichloroethene	VOA	5.18	U	5.18	5.08	U	5.08	3.93	U	3.93	4.48	U	4.48
Vinyl chloride	VOA	10.4	U	10.4	10.2	U	10.2	7.86	U	7.86	8.97	U	8.97
Xylenes (total)	VOA	5.18	U	5.18	5.08	U	5.08	3.93	U	3.93	4.48	U	4.48

Attachment	1	Sheet No.	20 of 28
Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
Calc. No.	0100H-CA-V0150	Rev. No.	0

Attachment 1. 100-H-4 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1C395, SZ-3			J1C396, SZ-4			J1C397, SZ-5			J1C398, SZ-6		
		9/22/2010			9/22/2010			9/22/2010			9/22/2010		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,1,1-Trichloroethane	VOA	4.74	U	4.74	5.64	U	5.64	5.13	U	5.13	5.04	U	5.04
1,1,2,2-Tetrachloroethane	VOA	4.74	U	4.74	5.64	U	5.64	5.13	U	5.13	5.04	U	5.04
1,1,2-Trichloroethane	VOA	4.74	U	4.74	5.64	U	5.64	5.13	U	5.13	5.04	U	5.04
1,1-Dichloroethane	VOA	4.74	U	4.74	5.64	U	5.64	5.13	U	5.13	5.04	U	5.04
1,1-Dichloroethene	VOA	4.74	U	4.74	5.64	U	5.64	5.13	U	5.13	5.04	U	5.04
1,2-Dichloroethane	VOA	5.68	U	5.68	6.77	U	6.77	6.16	U	6.16	6.05	U	6.05
1,2-Dichloroethene(Total)	VOA	4.74	U	4.74	5.64	U	5.64	5.13	U	5.13	5.04	U	5.04
1,2-Dichloropropane	VOA	4.74	U	4.74	5.64	U	5.64	5.13	U	5.13	5.04	U	5.04
2-Butanone	VOA	11.4	U	11.4	13.5	U	13.5	12.3	U	12.3	12.1	U	12.1
2-Hexanone	VOA	11.4	U	11.4	13.5	U	13.5	12.3	U	12.3	12.1	U	12.1
4-Methyl-2-Pentanone	VOA	11.4	U	11.4	13.5	U	13.5	12.3	U	12.3	12.1	U	12.1
Acetone	VOA	11.4	UJ	11.4	13.5	UJ	13.5	12.3	UJ	12.3	12.1	UJ	12.1
Benzene	VOA	4.74	U	4.74	5.64	U	5.64	5.13	U	5.13	5.04	U	5.04
Bromodichloromethane	VOA	5.68	U	5.68	6.77	U	6.77	6.16	U	6.16	6.05	U	6.05
Bromoform	VOA	4.74	U	4.74	5.64	U	5.64	5.13	U	5.13	5.04	U	5.04
Bromomethane	VOA	9.47	U	9.47	11.3	U	11.3	10.3	U	10.3	10.1	U	10.1
Carbon disulfide	VOA	4.74	U	4.74	5.64	U	5.64	5.13	U	5.13	5.04	U	5.04
Carbon tetrachloride	VOA	4.74	U	4.74	5.64	U	5.64	5.13	U	5.13	5.04	U	5.04
Chlorobenzene	VOA	4.74	U	4.74	5.64	U	5.64	5.13	U	5.13	5.04	U	5.04
Chloroethane	VOA	9.47	U	9.47	11.3	U	11.3	10.3	U	10.3	10.1	U	10.1
Chloroform	VOA	4.74	U	4.74	5.64	U	5.64	5.13	U	5.13	5.04	U	5.04
Chloromethane	VOA	9.47	U	9.47	11.3	U	11.3	10.3	U	10.3	10.1	U	10.1
cis-1,2-Dichloroethylene	VOA	4.74	U	4.74	5.64	U	5.64	5.13	U	5.13	5.04	U	5.04
cis-1,3-Dichloropropene	VOA	4.74	U	4.74	5.64	U	5.64	5.13	U	5.13	5.04	U	5.04
Dibromochloromethane	VOA	4.74	U	4.74	5.64	U	5.64	5.13	U	5.13	5.04	U	5.04
Ethylbenzene	VOA	4.74	U	4.74	5.64	U	5.64	5.13	U	5.13	5.04	U	5.04
Methylenechloride	VOA	5.62	UBJ	4.74	6.65	UBJ	5.64	6.49	UBJ	5.13	5.31	UBJ	5.04
Styrene	VOA	4.74	U	4.74	5.64	U	5.64	5.13	U	5.13	5.04	U	5.04
Tetrachloroethene	VOA	4.74	U	4.74	5.64	U	5.64	5.13	U	5.13	5.04	U	5.04
Toluene	VOA	4.74	U	4.74	5.64	U	5.64	5.13	U	5.13	5.04	U	5.04
trans-1,2-Dichloroethylene	VOA	4.74	U	4.74	5.64	U	5.64	5.13	U	5.13	5.04	U	5.04
trans-1,3-Dichloropropene	VOA	4.74	U	4.74	5.64	U	5.64	5.13	U	5.13	5.04	U	5.04
Trichloroethene	VOA	4.74	U	4.74	5.64	U	5.64	5.13	U	5.13	5.04	U	5.04
Vinyl chloride	VOA	9.47	U	9.47	11.3	U	11.3	10.3	U	10.3	10.1	U	10.1
Xylenes (total)	VOA	4.74	U	4.74	5.64	U	5.64	5.13	U	5.13	5.04	U	5.04

Attachment	1	Sheet No.	21 of 28
Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
Calc. No.	0100H-CA-V0150	Rev. No.	0

Attachment 1. 100-H-4 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1C399, SZ-7			J1C3B1, SZ-9			J1C3B2, SZ-10			J1C3B3, SZ-11		
		9/22/2010			9/22/2010			9/22/2010			9/22/2010		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,1,1-Trichloroethane	VOA	5.12	U	5.12	4.54	U	4.54	4.46	U	4.46	4.97	U	4.97
1,1,2,2-Tetrachloroethane	VOA	5.12	U	5.12	4.54	U	4.54	4.46	U	4.46	4.97	U	4.97
1,1,2-Trichloroethane	VOA	5.12	U	5.12	4.54	U	4.54	4.46	U	4.46	4.97	U	4.97
1,1-Dichloroethane	VOA	5.12	U	5.12	4.54	U	4.54	4.46	U	4.46	4.97	U	4.97
1,1-Dichloroethene	VOA	5.12	U	5.12	4.54	U	4.54	4.46	U	4.46	4.97	U	4.97
1,2-Dichloroethane	VOA	6.15	U	6.15	5.45	U	5.45	5.35	U	5.35	5.96	U	5.96
1,2-Dichloroethene(Total)	VOA	5.12	U	5.12	4.54	U	4.54	4.46	U	4.46	4.97	U	4.97
1,2-Dichloropropane	VOA	5.12	U	5.12	4.54	U	4.54	4.46	U	4.46	4.97	U	4.97
2-Butanone	VOA	12.3	U	12.3	10.9	U	10.9	10.7	U	10.7	11.9	U	11.9
2-Hexanone	VOA	12.3	U	12.3	10.9	U	10.9	10.7	U	10.7	11.9	U	11.9
4-Methyl-2-Pentanone	VOA	12.3	U	12.3	10.9	U	10.9	10.7	U	10.7	11.9	U	11.9
Acetone	VOA	12.3	UJ	12.3	10.9	UJ	10.9	10.7	UJ	10.7	11.9	UJ	11.9
Benzene	VOA	5.12	U	5.12	4.54	U	4.54	4.46	U	4.46	4.97	U	4.97
Bromodichloromethane	VOA	6.15	U	6.15	5.45	U	5.45	5.35	U	5.35	5.96	U	5.96
Bromoform	VOA	5.12	U	5.12	4.54	U	4.54	4.46	U	4.46	4.97	U	4.97
Bromomethane	VOA	10.2	U	10.2	9.09	U	9.09	8.92	U	8.92	9.94	U	9.94
Carbon disulfide	VOA	5.12	U	5.12	4.54	U	4.54	4.46	U	4.46	4.97	U	4.97
Carbon tetrachloride	VOA	5.12	U	5.12	4.54	U	4.54	4.46	U	4.46	4.97	U	4.97
Chlorobenzene	VOA	5.12	U	5.12	4.54	U	4.54	4.46	U	4.46	4.97	U	4.97
Chloroethane	VOA	10.2	U	10.2	9.09	U	9.09	8.92	U	8.92	9.94	U	9.94
Chloroform	VOA	5.12	U	5.12	4.54	U	4.54	4.46	U	4.46	4.97	U	4.97
Chloromethane	VOA	10.2	U	10.2	9.09	U	9.09	8.92	U	8.92	9.94	U	9.94
cis-1,2-Dichloroethylene	VOA	5.12	U	5.12	4.54	U	4.54	4.46	U	4.46	4.97	U	4.97
cis-1,3-Dichloropropene	VOA	5.12	U	5.12	4.54	U	4.54	4.46	U	4.46	4.97	U	4.97
Dibromochloromethane	VOA	5.12	U	5.12	4.54	U	4.54	4.46	U	4.46	4.97	U	4.97
Ethylbenzene	VOA	5.12	U	5.12	4.54	U	4.54	4.46	U	4.46	4.97	U	4.97
Methylenechloride	VOA	4.99	UBJ	5.12	4.70	UBJ	4.54	4.57	UBJ	4.46	5.24	UBJ	4.97
Styrene	VOA	5.12	U	5.12	4.54	U	4.54	4.46	U	4.46	4.97	U	4.97
Tetrachloroethene	VOA	5.12	U	5.12	4.54	U	4.54	4.46	U	4.46	4.97	U	4.97
Toluene	VOA	5.12	U	5.12	4.54	U	4.54	4.46	U	4.46	4.97	U	4.97
trans-1,2-Dichloroethylene	VOA	5.12	U	5.12	4.54	U	4.54	4.46	U	4.46	4.97	U	4.97
trans-1,3-Dichloropropene	VOA	5.12	U	5.12	4.54	U	4.54	4.46	U	4.46	4.97	U	4.97
Trichloroethene	VOA	5.12	U	5.12	4.54	U	4.54	4.46	U	4.46	4.97	U	4.97
Vinyl chloride	VOA	10.2	U	10.2	9.09	U	9.09	8.92	U	8.92	9.94	U	9.94
Xylenes (total)	VOA	5.12	U	5.12	4.54	U	4.54	4.46	U	4.46	4.97	U	4.97

Attachment	1	Sheet No.	22 of 28
Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
Calc. No.	0100H-CA-V0150	Rev. No.	0

Attachment 1. 100-H-4 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1C3B4, SZ-12			J1C3B6, SS-1			J1C3B7, SS-2			J1C3B8, SS-3		
		9/22/2010			9/22/2010			9/22/2010			9/22/2010		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,1,1-Trichloroethane	VOA	4.98	U	4.98	5.24	U	5.24	5.07	U	5.07	4.80	U	4.80
1,1,2,2-Tetrachloroethane	VOA	4.98	U	4.98	5.24	U	5.24	5.07	U	5.07	4.80	U	4.80
1,1,2-Trichloroethane	VOA	4.98	U	4.98	5.24	U	5.24	5.07	U	5.07	4.80	U	4.80
1,1-Dichloroethane	VOA	4.98	U	4.98	5.24	U	5.24	5.07	U	5.07	4.80	U	4.80
1,1-Dichloroethene	VOA	4.98	U	4.98	5.24	U	5.24	5.07	U	5.07	4.80	U	4.80
1,2-Dichloroethane	VOA	5.98	U	5.98	6.29	U	6.29	6.08	U	6.08	5.76	U	5.76
1,2-Dichloroethene(Total)	VOA	4.98	U	4.98	5.24	U	5.24	5.07	U	5.07	4.80	U	4.80
1,2-Dichloropropane	VOA	4.98	U	4.98	5.24	U	5.24	5.07	U	5.07	4.80	U	4.80
2-Butanone	VOA	12.0	U	12.0	12.6	U	12.6	12.2	U	12.2	11.5	U	11.5
2-Hexanone	VOA	12.0	U	12.0	12.6	U	12.6	12.2	U	12.2	11.5	U	11.5
4-Methyl-2-Pentanone	VOA	12.0	U	12.0	12.6	U	12.6	12.2	U	12.2	11.5	U	11.5
Acetone	VOA	12.0	UJ	12.0	12.6	U	12.6	12.2	U	12.2	11.5	U	11.5
Benzene	VOA	4.98	U	4.98	5.24	U	5.24	5.07	U	5.07	4.80	U	4.80
Bromodichloromethane	VOA	5.98	U	5.98	6.29	U	6.29	6.08	U	6.08	5.76	U	5.76
Bromoform	VOA	4.98	U	4.98	5.24	U	5.24	5.07	U	5.07	4.80	U	4.80
Bromomethane	VOA	9.97	U	9.97	10.5	U	10.5	10.1	U	10.1	9.60	U	9.60
Carbon disulfide	VOA	4.98	U	4.98	5.24	U	5.24	5.07	U	5.07	4.80	U	4.80
Carbon tetrachloride	VOA	4.98	U	4.98	5.24	U	5.24	5.07	U	5.07	4.80	U	4.80
Chlorobenzene	VOA	4.98	U	4.98	5.2	U	5.24	5.07	U	5.07	4.80	U	4.80
Chloroethane	VOA	9.97	U	9.97	10.5	U	10.5	10.1	U	10.1	9.60	U	9.60
Chloroform	VOA	4.98	U	4.98	5.24	U	5.24	5.07	U	5.07	4.80	U	4.80
Chloromethane	VOA	9.97	U	9.97	10.5	U	10.5	10.1	U	10.1	9.60	U	9.60
cis-1,2-Dichloroethylene	VOA	4.98	U	4.98	5.24	U	5.24	5.07	U	5.07	4.80	U	4.80
cis-1,3-Dichloropropene	VOA	4.98	U	4.98	5.24	U	5.24	5.07	U	5.07	4.80	U	4.80
Dibromochloromethane	VOA	4.98	U	4.98	5.24	U	5.24	5.07	U	5.07	4.80	U	4.80
Ethylbenzene	VOA	4.98	U	4.98	5.24	U	5.24	5.07	U	5.07	4.80	U	4.80
Methylenechloride	VOA	4.82	UBJ	4.98	6.79	UB	5.24	5.02	UBJ	5.07	5.46	UBJ	4.80
Styrene	VOA	4.98	U	4.98	5.24	U	5.24	5.07	U	5.07	4.80	U	4.80
Tetrachloroethene	VOA	4.98	U	4.98	5.24	U	5.24	5.07	U	5.07	4.80	U	4.80
Toluene	VOA	4.98	U	4.98	5.24	U	5.24	5.07	U	5.07	4.80	U	4.80
trans-1,2-Dichloroethylene	VOA	4.98	U	4.98	5.24	U	5.24	5.07	U	5.07	4.80	U	4.80
trans-1,3-Dichloropropene	VOA	4.98	U	4.98	5.24	U	5.24	5.07	U	5.07	4.80	U	4.80
Trichloroethene	VOA	4.98	U	4.98	5.24	U	5.24	5.07	U	5.07	4.80	U	4.80
Vinyl chloride	VOA	9.97	U	9.97	10.5	U	10.5	10.1	U	10.1	9.60	U	9.60
Xylenes (total)	VOA	4.98	U	4.98	5.24	U	5.24	5.07	U	5.07	4.80	U	4.80

Attachment	1	Sheet No.	23 of 28
Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
Calc. No.	0100H-CA-V0150	Rev. No.	0

Attachment 1. 100-H-4 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	J1C3B9, SS-4			J1C3C0, SS-5			J1C3C1, Equipment blank			J1C3C2, Trip blank		
		9/22/2010			9/22/2010			9/22/2010			9/22/2010		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
1,1,1-Trichloroethane	VOA	5.09	U	5.09	4.94	U	4.94	5.00	U	5.00	5.10	U	5.10
1,1,2,2-Tetrachloroethane	VOA	5.09	U	5.09	4.94	U	4.94	5.00	U	5.00	5.10	U	5.10
1,1,2-Trichloroethane	VOA	5.09	U	5.09	4.94	U	4.94	5.00	U	5.00	5.10	U	5.10
1,1-Dichloroethane	VOA	5.09	U	5.09	4.94	U	4.94	5.00	U	5.00	5.10	U	5.10
1,1-Dichloroethene	VOA	5.09	U	5.09	4.94	U	4.94	5.00	U	5.00	5.10	U	5.10
1,2-Dichloroethane	VOA	6.11	U	6.11	5.93	U	5.93	6.00	U	6.00	6.13	U	6.13
1,2-Dichloroethene(Total)	VOA	5.09	U	5.09	4.94	U	4.94	5.00	U	5.00	5.10	U	5.10
1,2-Dichloropropane	VOA	5.09	U	5.09	4.94	U	4.94	5.00	U	5.00	5.10	U	5.10
2-Butanone	VOA	12.2	U	12.2	11.9	U	11.9	12.0	U	12.0	12.3	U	12.3
2-Hexanone	VOA	12.2	U	12.2	11.9	U	11.9	12.0	U	12.0	12.3	U	12.3
4-Methyl-2-Pentanone	VOA	12.2	U	12.2	11.9	U	11.9	12.0	U	12.0	12.3	U	12.3
Acetone	VOA	12.2	U	12.2	11.9	U	11.9	12.0	U	12.0	12.3	U	12.3
Benzene	VOA	5.09	U	5.09	4.94	U	4.94	5.00	U	5.00	5.10	U	5.10
Bromodichloromethane	VOA	6.11	U	6.11	5.93	U	5.93	6.00	U	6.00	6.13	U	6.13
Bromoform	VOA	5.09	U	5.09	4.94	U	4.94	5.00	U	5.00	5.10	U	5.10
Bromomethane	VOA	10.2	U	10.2	9.88	U	9.88	10.0	U	10.0	10.2	U	10.2
Carbon disulfide	VOA	5.09	U	5.09	4.94	U	4.94	5.00	U	5.00	5.10	U	5.10
Carbon tetrachloride	VOA	5.09	U	5.09	4.94	U	4.94	5.00	U	5.00	5.10	U	5.10
Chlorobenzene	VOA	5.09	U	5.09	4.9	U	4.94	5.00	U	5.00	5.10	U	5.10
Chloroethane	VOA	10.2	U	10.2	9.88	U	9.88	10.0	U	10.0	10.2	U	10.2
Chloroform	VOA	5.09	U	5.09	4.94	U	4.94	5.00	U	5.00	5.10	U	5.10
Chloromethane	VOA	10.2	U	10.2	9.88	U	9.88	10.0	U	10.0	10.2	U	10.2
cis-1,2-Dichloroethylene	VOA	5.09	U	5.09	4.94	U	4.94	5.00	U	5.00	5.10	U	5.10
cis-1,3-Dichloropropene	VOA	5.09	U	5.09	4.94	U	4.94	5.00	U	5.00	5.10	U	5.10
Dibromochloromethane	VOA	5.09	U	5.09	4.94	U	4.94	5.00	U	5.00	5.10	U	5.10
Ethylbenzene	VOA	5.09	U	5.09	4.94	U	4.94	5.00	U	5.00	5.10	U	5.10
Methylenechloride	VOA	5.31	UBJ	5.09	4.7	UBJ	4.94	5.68	UBJ	5.00	5.83	UBJ	6.13
Styrene	VOA	5.09	U	5.09	4.94	U	4.94	5.00	U	5.00	5.10	U	5.10
Tetrachloroethene	VOA	5.09	U	5.09	4.94	U	4.94	5.00	U	5.00	5.10	U	5.10
Toluene	VOA	5.09	U	5.09	4.94	U	4.94	5.00	U	5.00	5.10	U	5.10
trans-1,2-Dichloroethylene	VOA	5.09	U	5.09	4.94	U	4.94	5.00	U	5.00	5.10	U	5.10
trans-1,3-Dichloropropene	VOA	5.09	U	5.09	4.94	U	4.94	5.00	U	5.00	5.10	U	5.10
Trichloroethene	VOA	5.09	U	5.09	4.94	U	4.94	5.00	U	5.00	5.10	U	5.10
Vinyl chloride	VOA	10.2	U	10.2	9.88	U	9.88	10.0	U	10.0	10.2	U	10.2
Xylenes (total)	VOA	5.09	U	5.09	4.94	U	4.94	5.00	U	5.00	5.10	U	5.10

Attachment	1	Sheet No.	24 of 28
Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
Calc. No.	0100H-CA-V0150	Rev. No.	0

Attachment 1. 100-H-4 Waste Site Verification Sample Results (Organic Detects).

Sample Location	HEIS Number	Sample Date	Acenaphthene			alpha-Chlordane			Aroclor-1254			Aroclor-1260			Benzo(a)anthracene			Benzo(a)pyrene		
			ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
SZ-8	J1C3B0	9/22/10	3.36	U	3.36	1.30	UD	1.30	66.1	J	12.9	35.2		12.9	9.50		3.36	8.86		3.36
Duplicate of J1C3B0	J1C3B5	9/22/10	3.47	U	3.47	1.42	UD	1.42	66.5	J	14.2	33.4		14.2	5.02		3.47	6.71		3.47
SZ-1	J1C393	9/22/10	3.34	U	3.34	1.32	UD	1.32	13.2	UJ	13.2	13.2	U	13.2	3.34	U	3.34	3.34	U	3.34
SZ-2	J1C394	9/22/10	3.40	U	3.40	1.34	UD	1.34	13.4	UJ	13.4	13.4	U	13.4	3.40	U	3.40	3.40	U	3.40
SZ-3	J1C395	9/22/10	3.40	U	3.40	1.34	UD	1.34	13.5	UJ	13.5	13.5	UJ	13.5	3.40	U	3.40	3.40	U	3.40
SZ-4	J1C396	9/22/10	4.00	U	4.00	1.61	UD	1.61	16.1	UJ	16.1	16.1	U	16.1	1.52	J	4.00	2.26	J	4.00
SZ-5	J1C397	9/22/10	3.46	U	3.46	1.39	UD	1.39	13.9	UJ	13.9	13.9	U	13.9	3.20	J	3.46	3.78		3.46
SZ-6	J1C398	9/22/10	3.78	U	3.78	1.49	UD	1.49	14.9	UJ	14.9	5.38	J	14.9	2.86	J	3.78	3.82		3.78
SZ-7	J1C399	9/22/10	3.41	U	3.41	1.38	UD	1.38	13.8	UJ	13.8	13.8	U	13.8	3.41	U	3.41	3.41	U	3.41
SZ-9	J1C3B1	9/22/10	3.37	U	3.37	1.34	UD	1.34	13.4	UJ	13.4	13.4	U	13.4	3.37	U	3.37	3.37	U	3.37
SZ-10	J1C3B2	9/22/10	3.50	U	3.50	1.36	UD	1.36	6.85	J	13.5	4.21	J	13.5	3.08	J	3.50	3.24	J	3.50
SZ-11	J1C3B3	9/22/10	10.9		3.38	3.02	JD	1.30	6.95	J	13.0	3.57	J	13.0	1.25	J	3.38	2.44	J	3.38
SZ-12	J1C3B4	9/22/10	3.38	U	3.38	1.38	UD	1.38	19.3	J	13.8	8.09	J	13.8	1.90	J	3.38	2.37	J	3.38
SS-1	J1C3B6	9/22/10	3.55	U	3.55	1.40	UD	1.40	13.8	J	14.0	7.15	J	14.0	3.64		3.55	3.87		3.55
SS-2	J1C3B7	9/22/10	51.1	D	7.17	1.41	UD	1.41	11.0	J	14.1	18.4		14.1	74.6	D	7.17	52.9	D	7.17
SS-3	J1C3B8	9/22/10	3.32	U	3.32	1.34	UD	1.34	13.4	UJ	13.4	13.4	U	13.4	1.50	J	3.32	1.91	J	3.32
SS-4	J1C3B9	9/22/10	3.20	U	3.20	1.34	UD	1.34	13.4	UJ	13.4	13.4	U	13.4	3.20	U	3.20	3.20	U	3.20
SS-5	J1C3C0	9/22/10	3.25	U	3.25	1.36	UD	1.36	13.6	UJ	13.6	13.6	U	13.6	3.25	U	3.25	3.25	U	3.25
Equipment blank	J1C3C1	9/22/10	3.29	U	3.29										3.29	U	3.29	3.29	U	3.29
Trip blank	J1C3C2	9/22/10																		

Attachment	1	Sheet No.	25 of 28
Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
Calc. No.	0100H-CA-V0150	Rev. No.	0

Attachment 1. 100-H-4 Waste Site Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Benzo(b)fluoranthene			Benzo(ghi)perylene			Benzo(k)fluoranthene			Chrysene			Dibenz(a,h)anthracene			4,4'-DDE		
			ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
SZ-8	J1C3B0	9/22/10	10.1		3.36	6.41		3.36	4.73		3.36	8.26		3.36	3.36	U	3.36	2.95	JD	1.30
Duplicate of J1C3B0	J1C3B5	9/22/10	3.03	J	3.47	5.25		3.47	3.16	J	3.47	6.97		3.47	3.47	U	3.47	2.91	JD	1.42
SZ-1	J1C393	9/22/10	3.34	U	3.34	3.34	U	3.34	3.34	U	3.34	2.66	J	3.34	3.34	U	3.34	1.32	UD	1.32
SZ-2	J1C394	9/22/10	3.40	U	3.40	3.40	U	3.40	3.40	U	3.40	2.74	J	3.40	3.40	U	3.40	1.34	UD	1.34
SZ-3	J1C395	9/22/10	3.40	U	3.40	3.40	U	3.40	3.40	U	3.40	4.88		3.40	3.40	U	3.40	1.34	UD	1.34
SZ-4	J1C396	9/22/10	1.60	J	4.00	1.68	J	4.00	1.08	J	4.00	5.78		4.00	4.00	U	4.00	1.61	UD	1.61
SZ-5	J1C397	9/22/10	3.64		3.46	2.82	J	3.46	1.82	J	3.46	1.21	J	3.46	3.46	U	3.46	1.39	UD	1.39
SZ-6	J1C398	9/22/10	4.26		3.78	2.63	J	3.78	1.91	J	3.78	1.69	J	3.78	3.78	U	3.78	1.49	UD	1.49
SZ-7	J1C399	9/22/10	3.41	U	3.41	3.41	U	3.41	3.41	U	3.41	3.41	U	3.41	3.41	U	3.41	1.38	UD	1.38
SZ-9	J1C3B1	9/22/10	3.37	U	3.37	3.37	U	3.37	3.37	U	3.37	3.07	J	3.37	3.37	U	3.37	1.34	UD	1.34
SZ-10	J1C3B2	9/22/10	2.87	J	3.50	3.50	U	3.50	1.73	J	3.50	1.96	J	3.50	3.50	U	3.50	1.36	UD	1.36
SZ-11	J1C3B3	9/22/10	1.98	J	3.38	3.46		3.38	1.08	J	3.38	2.44	J	3.38	3.38	U	3.38	1.30	UD	1.30
SZ-12	J1C3B4	9/22/10	3.38	U	3.38	1.47	J	3.38	1.07	J	3.38	6.57		3.38	3.38	U	3.38	1.38	UD	1.38
SS-1	J1C3B6	9/22/10	2.45	J	3.55	2.15	J	3.55	1.79	J	3.55	4.44		3.55	3.55	U	3.55	1.40	UD	1.40
SS-2	J1C3B7	9/22/10	44.1	D	7.17	45.9	D	7.17	27.2	D	7.17	31.3	D	7.17	6.62	JD	7.17	1.41	UD	1.41
SS-3	J1C3B8	9/22/10	3.32	U	3.32	1.05	J	3.32	3.32	U	3.32	4.22		3.32	3.32	U	3.32	1.34	UD	1.34
SS-4	J1C3B9	9/22/10	3.20	U	3.20	3.20	U	3.20	3.20	U	3.20	0.816	J	3.20	3.20	U	3.20	1.34	UD	1.34
SS-5	J1C3C0	9/22/10	3.25	U	3.25	3.25	U	3.25	3.25	U	3.25	3.25	U	3.25	3.25	U	3.25	1.36	UD	1.36
Equipment blank	J1C3C1	9/22/10	3.29	U	3.29	3.29	U	3.29	3.29	U	3.29	3.29	U	3.29	3.29	U	3.29			
Trip blank	J1C3C2	9/22/10																		

Attachment	1	Sheet No.	26 of 28
Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
Calc. No.	0100H-CA-V0150	Rev. No.	0

Attachment 1. 100-H-4 Waste Site Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	4,4'-DDT			Fluoranthene			Fluorene			gamma-Chlordane			Indeno(1,2,3-cd)pyrene			Phenanthrene		
			ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
SZ-8	J1C3B0	9/22/10	1.30	UD	1.30	22.0		3.36	3.36	U	3.36	1.30	UD	1.30	4.17		3.36	2.69	J	3.36
Duplicate of J1C3B0	J1C3B5	9/22/10	1.42	UD	1.42	22.3		3.47	2.99	J	3.47	1.42	UD	1.42	3.42	J	3.47	6.08		3.47
SZ-1	J1C393	9/22/10	1.32	UD	1.32	3.34	U	3.34	3.34	U	3.34	1.32	UD	1.32	3.34	U	3.34	3.34	U	3.34
SZ-2	J1C394	9/22/10	1.34	UD	1.34	3.40	U	3.40	3.40	U	3.40	1.34	UD	1.34	3.40	U	3.40	3.40	U	3.40
SZ-3	J1C395	9/22/10	1.34	UD	1.34	1.02	J	3.40	3.40	U	3.40	1.34	UD	1.34	3.40	U	3.40	3.40	U	3.40
SZ-4	J1C396	9/22/10	1.61	UD	1.61	2.24	J	4.00	4.00	U	4.00	1.61	UD	1.61	4.00	U	4.00	1.38	J	4.00
SZ-5	J1C397	9/22/10	1.39	UD	1.39	10.0		3.46	3.46	U	3.46	1.39	UD	1.39	3.46	U	3.46	4.38		3.46
SZ-6	J1C398	9/22/10	1.49	UD	1.49	5.89		3.78	3.78	U	3.78	1.49	UD	1.49	2.25	J	3.78	1.55	J	3.78
SZ-7	J1C399	9/22/10	1.38	UD	1.38	3.41	U	3.41	3.41	U	3.41	1.38	UD	1.38	3.41	U	3.41	3.41	U	3.41
SZ-9	J1C3B1	9/22/10	1.34	UD	1.34	3.37	U	3.37	3.37	U	3.37	1.34	UD	1.34	3.37	U	3.37	3.37	U	3.37
SZ-10	J1C3B2	9/22/10	1.36	UD	1.36	9.35		3.50	3.50	U	3.50	1.36	UD	1.36	3.50	U	3.50	3.62		3.50
SZ-11	J1C3B3	9/22/10	1.56	JD	1.30	3.18	J	3.38	3.38	U	3.38	1.43	JD	1.30	31.1		3.38	2.57	J	3.38
SZ-12	J1C3B4	9/22/10	1.38	UD	1.38	3.40		3.38	3.38	U	3.38	1.38	UD	1.38	3.38	U	3.38	1.30	J	3.38
SS-1	J1C3B6	9/22/10	1.40	UD	1.40	7.76		3.55	3.55	U	3.55	1.40	UD	1.40	3.55	U	3.55	2.08	J	3.55
SS-2	J1C3B7	9/22/10	1.94	JD	1.41	29.0	D	7.17	4.18	JD	7.17	1.41	UD	1.41	14.5	D	7.17	7.17	U	7.17
SS-3	J1C3B8	9/22/10	1.34	UD	1.34	5.73		3.32	3.32	U	3.32	1.34	UD	1.34	3.32	U	3.32	1.58	J	3.32
SS-4	J1C3B9	9/22/10	1.34	UD	1.34	3.20	U	3.20	3.20	U	3.20	1.34	UD	1.34	1.42	J	3.20	0.848	J	3.20
SS-5	J1C3C0	9/22/10	1.36	UD	1.36	3.25	U	3.25	3.25	U	3.25	1.36	UD	1.36	3.25	U	3.25	3.25	U	3.25
Equipment blank	J1C3C1	9/22/10				3.08	J	3.29	3.29	U	3.29				3.29	U	3.29	3.29	U	3.29
Trip blank	J1C3C2	9/22/10																		

Attachment	1	Sheet No.	27 of 28
Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
Calc. No.	0100H-CA-V0150	Rev. No.	0

Attachment 1. 100-H-4 Waste Site Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Pyrene		
			ug/kg	Q	PQL
SZ-8	J1C3B0	9/22/10	3.36	U	3.36
Duplicate of J1C3B0	J1C3B5	9/22/10	11.0		3.47
SZ-1	J1C393	9/22/10	3.34	U	3.34
SZ-2	J1C394	9/22/10	1.02	J	3.40
SZ-3	J1C395	9/22/10	3.40	U	3.40
SZ-4	J1C396	9/22/10	2.78	J	4.00
SZ-5	J1C397	9/22/10	8.75		3.46
SZ-6	J1C398	9/22/10	9.03		3.78
SZ-7	J1C399	9/22/10	3.41	U	3.41
SZ-9	J1C3B1	9/22/10	3.37	U	3.37
SZ-10	J1C3B2	9/22/10	9.33		3.50
SZ-11	J1C3B3	9/22/10	4.39		3.38
SZ-12	J1C3B4	9/22/10	2.52	J	3.38
SS-1	J1C3B6	9/22/10	6.81		3.55
SS-2	J1C3B7	9/22/10	15.7	D	7.17
SS-3	J1C3B8	9/22/10	4.39		3.32
SS-4	J1C3B9	9/22/10	3.20	U	3.20
SS-5	J1C3C0	9/22/10	3.25	U	3.25
Equipment blank	J1C3C1	9/22/10	3.29	U	3.29
Trip blank	J1C3C2	9/22/10			

Attachment	1	Sheet No.	28 of 28
Originator	T. E. Queen	Date	1/12/11
Checked	J. D. Skoglie	Date	1/12/11
Calc. No.	0100H-CA-V0150	Rev. No.	0

Acrobat 8.0

CALCULATION COVER SHEET

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

Area: 100-H

Discipline: Environmental Calculation No: 0100H-CA-V0150~~0~~7 1/19/11

Subject: 100-H-4 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculations

Computer Program: Excel Program No: Excel 2003

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

Committed Calculation ☒ Preliminary ☐ Superseded ☐ Voided ☐

Rev.	Sheet Numbers	Originator	Checker	Reviewer	Approval	Date
0	Cover = 1 Summary = 4 Total = 5	T. E. Queen	J. D. Skoglie	I. B. Berezovskiy	D. F. Obenauer	1/18/11

SUMMARY OF REVISION

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

DE01-437.03

Washington Closure Hanford, Inc. CALCULATION SHEET 157 MA 1/19/11

Originator:	T. E. Queen	Date:	1/18/2011	Calc. No.:	0100H-CA-V0~~150~~	Rev.:	0
Project:	100-H Field Remediation	Job No:	14655	Checked:	J. D. Skoglie	Date:	1/18/2011
Subject:	100-H-4 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-4 waste site. In accordance with the remedial action goals (RAGs) in the remedial design report/remedial action work plan (RDR/RAWP) (DOE-RL 2009a), the following criteria must be met:

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

GIVEN/REFERENCES:

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

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

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

4) WCH, 2011, *Remaining Sites Verification Package for the 100-H-4 1717-H Hot Shop, French Drain, and Contaminated Storage Unit*, Attachment to Waste Site Reclassification Form 2011-001, Washington Closure Hanford, Inc., Richland, Washington.

SOLUTION:

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

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

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

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

Washington Closure Hanford, Inc. CALCULATION SHEET 157 7/19/11

Originator:	T. E. Queen	Date:	1/18/2011	Calc. No.:	0100H-CA-V0150	Rev.:	0
Project:	100-H Field Remediation	Job No:	14655	Checked:	J. D. Skoglie	Date:	1/18/2011
Subject:	100-H-4 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 2 of 4	

METHODOLOGY:

The 100-H-4 waste site is comprised of one decision units for verification sampling which underwent statistical sampling. Five focused samples were also collected. The direct contact hazard quotient and carcinogenic risk calculations for the 100-H-4 waste site were conservatively calculated for the entire waste site using the greater of the statistical and focused verification soil sample results (WCH 2011). Of the contaminants of potential concern (COPCs) for this site, boron, molybdenum, the detected polycyclic aromatic hydrocarbons, pesticides, and polychlorinated biphenyls require HQ and risk calculations because these analytes were detected and a Washington State or Hanford Site background value is not available. Mercury requires HQ and risk calculations because this analyte was detected above background. Arsenic was detected above background; however, the arsenic standard is not toxicity based. 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 (motor oil) were detected and no background value is available, the risk associated with total petroleum hydrocarbons do not contribute to the cumulative toxicity calculation. All other site nonradionuclide COPCs were not detected or were quantified below background levels. An example of the HQ and risk calculations is presented below:

1) For example, the maximum value for boron is 2.26 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 3.1×10^{-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 6.0×10^{-2}. Comparing this value to the requirement of <1.0, this criterion is met.

3) To calculate the excess cancer risk, the maximum or statistical value is divided by the carcinogenic RAG value, then multiplied by 1.0×10^{-6}. For example, the maximum value for benzo(a)pyrene is 0.0529 mg/kg, divided by 0.137 mg/kg, and multiplied as indicated, is 3.9×10^{-7}. Comparing this value, and all other individual values, to the requirement of $<1 \times 10^{-6}$, this criterion is met.

4) After these calculations are completed for the carcinogenic analytes, the cumulative excess cancer risk can be obtained by summing the individual values. To avoid errors due to intermediate rounding, the individual cancer risk values prior to rounding are used for this calculation. The sum of the excess cancer risk values is 7.3×10^{-7}. Comparing this value to the requirement of $<1 \times 10^{-5}$, this criterion is met.

RESULTS:

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

Table 1 shows the results of the hazard quotient and excess cancer risk calculations.

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	T. E. Queen	Date:	1/18/2011	Calc. No.:	0100H-CA-V0~~150~~ 157	Rev.:	0
Project:	100-H Field Remediation	Job No:	14655	Checked:	J. D. Skoglie	Date:	1/18/2011
Subject:	100-H-4 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 3 of 4	

Table 1. Direct Contact Hazard Quotient and Excess Cancer Risk Results for the 100-H-4 Waste Site.

Contaminants of Potential Concern	Statistical or Maximum Value[a] (mg/kg)	Noncarcinogen RAG[b] (mg/kg)	Hazard Quotient	Carcinogen RAG[b] (mg/kg)	Carcinogen Risk
Metals					
Arsenic[c]	8.36	20	--	0.667	--
Boron	2.26	7,200	3.1E-04	--	--
Lead[d]	18.4	353	--	--	--
Mercury	0.408	24	1.7E-02	--	--
Molybdenum	0.478	400	1.2E-03	--	--
Polycyclic Aromatic Hydrocarbons					
Acenaphthene	0.0511	4,800	1.1E-05	--	--
Benzo(a)anthracene	0.0746	--	--	1.37	5.4E-08
Benzo(a)pyrene	0.0529	--	--	0.137	3.9E-07
Benzo(b)fluoranthene	0.0441	--	--	1.37	3.2E-08
Benzo(ghi)perylene[e]	0.0459	2,400	1.9E-05	--	--
Benzo(k)fluoranthene	0.0272	--	--	1.37	2.0E-08
Chrysene	0.0313	--	--	13.7	2.3E-09
Dibenz(a,h)anthracene	0.00662	--	--	1.37	4.8E-09
Fluoranthene	0.0290	3,200	9.1E-06	--	--
Fluorene	0.00418	3,200	1.3E-06	--	--
Indeno(1,2,3-cd)pyrene	0.0311	--	--	1.37	2.3E-08
Phenanthrene[e]	0.00285	24,000	1.2E-07	--	--
Pyrene	0.0157	2,400	6.5E-06	--	--
Pesticides					
Chlordane (alpha, gamma)	0.00445	40	1.1E-04	2.86	1.6E-09
DDE, 4,4'-	0.00295	--	--	2.94	1.0E-09
DDT, 4,4'-	0.00194	40	4.9E-05	2.94	6.6E-10
Polychlorinated Biphenyls					
Aroclor-1254	0.0665	1.6	4.2E-02	0.5	1.3E-07
Aroclor-1260	0.0352	--	--	0.5	7.0E-08
Total Petroleum Hydrocarbons					
Diesel range and motor oil[f]	188	200	--	--	--
Totals					
Cumulative Hazard Quotient:			**6.0E-02**		
Cumulative Excess Cancer Risk:					**7.3E-07**

[a] = From WCH (2011).

[b] = Value obtained from the RDR/RAWP (DOE-RL 2009a) 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). The arsenic standard is not toxicity based, therefore, the hazard quotient will not be calculated.

[d] = 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.

[e] = Toxicity data for these chemicals are not available. RAGs fare based on surrogate chemicals.

Contaminant: benzo(ghi)perylene, surrogate: pyrene

Contaminant: phenanthrene; surrogate: anthracene

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

-- = not applicable RAG = remedial action goal

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	T. E. Queen	Date:	1/18/2011	Calc. No.:	0100H-CA-V0~~150~~ 157	Rev.:	0
Project:	100-H Field Remediation	Job No:	14655	Checked:	J. D. Skoglie 1/19/11	Date:	1/18/2011
Subject:	100-H-4 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 4 of 4	

CONCLUSION:

The calculations in Table 1 demonstrates that the 100-H-4 waste site meets the requirements for the direct contact hazard quotients and carcinogenic (excess cancer) risk, respectively, as identified in the RDR/RAWP (DOE-RL 2009a) and SAP (DOE-RL 2009b). The direct contact hazard quotients 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 Field Remediation **Job No. 14655**

Area: 100-H

Discipline: Environmental *Calculation No: 0100H-CA-V0156

Subject: 100-H-4 Waste Site Hazard Quotient and Carcinogenic Risk Calculation for Protection of Groundwater

Computer Program: Excel Program No: Excel 2003

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

Committed Calculation ☒ Preliminary ☐ Superseded ☐ Voided ☐

Rev.	Sheet Numbers	Originator	Checker	Reviewer	Approval	Date
0	Cover = 1 Sheets = 3 Total = 4	T. E. Queen	I. B. Berezovskiy	J. D. Sroglie	D. F. Obenauer	1/18/11

SUMMARY OF REVISION

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

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	T. E. Queen	Date:	1/18/2011	Calc. No.:	0100H-CA-V0156	Rev.:	0
Project:	100-H Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	1/18/2011
Subject:	100-H-4 Waste Site Hazard Quotient and Carcinogenic Risk Calculation for Protection of Groundwater					Sheet No. 1 of 3	

PURPOSE:

Provide documentation to support the calculation of the hazard quotient (HQ) and excess carcinogenic risk associated with soil contaminant levels compared to soil cleanup levels for protection of groundwater for the 100-H-4 waste site. In accordance with the remedial action goals (RAGs) in the remedial design report/remedial action work plan (RDR/RAWP) (DOE-RL 2009), the following criteria must be met:

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

GIVEN/REFERENCES:

1) 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.

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

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

4) WAC 173-340-740(3)(a)(ii)(A), "Groundwater Protection."

5) WCH, 2011, *Remaining Sites Verification Package for the 100-H-4, 1717-H Hot Shop, French Drain, and Contaminated Storage Unit*, Attachment to Waste Site Reclassification Form 2011-001, Washington Closure Hanford, Inc., Richland, Washington.

SOLUTION:

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

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

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

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

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	T. E. Queen	Date:	1/18/2011	Calc. No.:	0100H-CA-V0156	Rev.:	0
Project:	100-H Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	1/18/2011
Subject:	100-H-4 Waste Site Hazard Quotient and Carcinogenic Risk Calculation for Protection of Groundwater					Sheet No. 2 of 3	

METHODOLOGY:

The 100-H-4 waste site is comprised of a single decision unit for verification sampling. Hazard quotient and carcinogenic risk calculations for potential impact to groundwater at the 100-H-4 waste site were conservatively calculated for the entire waste site using the maximum value for each analyte (WCH 2011). Of the contaminants of potential concern (COPCs) for this site, boron, acenaphthene, and fluorene are included because they do not have a Hanford Site-specific or Washington State background value available and their respective distribution coefficients are less than that necessary to show no migration to groundwater in 1,000 years using the generic site RESRAD model (DOE-RL 2009). Based on this model and a vadose zone of approximately 9.9 m (32.4 ft) thickness, a K_d of 7.9 or greater is required to show no predicted migration to groundwater in 1,000 years using the generic site model. Additionally, arsenic was detected above background; however, the arsenic standard is not toxicity based, therefore a groundwater HQ is not calculated. All other site nonradionuclide COPCs were not detected, quantified below background levels, or have a K_d greater than 7.9. 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 (µg/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 µg (conversion factor). This is based on the "100 times rule" of WAC 173-340-740(3)(a)(ii)(A) (1996). For example, the maximum soil value for boron is 2.26 mg/kg, divided by the noncarcinogenic RAG value of 320 mg/kg, is 1.7×10^{-3}. Comparing this value, and all other individual values, to the requirement of <1.0, this criterion is met.

2) After the HQ calculation is completed for the appropriate analytes, the cumulative HQ can be obtained by summing the individual values. (To avoid errors due to intermediate rounding, the individual HQ values prior to rounding are used for this calculation.) The sum of the HQ values is 7.7×10^{-3}. Comparing this value to the requirement of <1.0, this criterion is met.

3) No carcinogenic constituents met the criteria for evaluation in groundwater at the 100-H-4 waste site; therefore, no calculations of excess carcinogenic risk were performed.

4) 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 $>1 \times 10^{-6}$: None
4) List the cumulative excess cancer risk for carcinogens $>1 \times 10^{-5}$: None.

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	T. E. Queen	Date:	1/18/2011	Calc. No.:	0100H-CA-V0156	Rev.:	0
Project:	100-H Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	1/18/2011
Subject:	100-H-4 Waste Site Hazard Quotient and Carcinogenic Risk Calculation for Protection of Groundwater					Sheet No.	3 of 3

Table 1 shows the results of the calculations.

Table 1. Hazard Quotient and Excess Cancer Risk for Protection of Groundwater Results for the 100-H-4 Waste Site.

Contaminants of Potential Concern	Statistical or Maximum Value[a] (mg/kg)	Noncarcinogen RAG[b] (mg/kg)	Hazard Quotient	Carcinogen RAG[b] (mg/kg)	Carcinogen Risk
Metals					
Arsenic [c]	8.36	20	--	--	--
Boron	2.26	320	7.1E-03	--	--
Polyaromatic Hydrocarbons					
Acenaphthene	0.0511	96	5.3E-04	--	--
Fluorene	0.00418	64	6.5E-05	--	--
Totals					
Cumulative Hazard Quotient:			**7.7E-03**		
Cumulative Excess Cancer Risk:					**0.0E+00**

Notes:

[a] = From WCH (2011).

[b] = Value obtained from the Cleanup Levels and Risk Calculations (CLARC) database using Groundwater, Method B, results and "100 times" model 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). 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-4 waste site meets the requirements for the hazard quotients and excess carcinogenic risk for protection of groundwater as identified in the RDR/RAWP (DOE-RL 2009).

APPENDIX C

DATA QUALITY ASSESSMENT

APPENDIX C

DATA QUALITY ASSESSMENT

VERIFICATION SAMPLING

A data quality assessment (DQA) was performed to compare the verification sampling approach and resulting analytical data with the sampling and data requirements specified in the site-specific sample design (WCH 2010b). This DQA was performed in accordance with site specific data quality objectives found in the *100 Area Remedial Action Sampling and Analysis Plan* (SAP) (DOE-RL 2009).

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

Verification sample data collected at the 100-H-4 waste site were provided by the laboratories in sample delivery group (SDG) K2383. SDG K2383 was submitted for third-party validation. No major deficiencies were identified in the analytical data set. Minor deficiencies are discussed as follows below. If no comments are made about a specific analysis, it should be assumed that no deficiencies affecting the quality of the data were found.

SDG K2383

This SDG comprises 13 statistical samples (J1C393 through J1C399, J1C3B0 through J1C3B5) from the 100-H-4 shallow-zone excavation, and 5 focused samples (J1C3B6 through J1C3B9, J1C3C0). A field duplicate pair (J1C3B0/J1C3B5) is included in this SDG. These samples were analyzed for inductively couples plasma (ICP) metals, mercury, hexavalent chromium, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polycyclic aromatic hydrocarbons (PAH), total petroleum hydrocarbons (TPH), polychlorinated biphenyls (PCBs), pesticides, strontium-90, isotopic uranium, and by gamma energy analysis (GEA). In addition, one equipment blank (J1C3C1) was collected and analyzed for ICP metals, mercury, SVOCs, VOCs, and PAH, and one trip blank (J1C3C2) was collected and analyzed for VOs. SDG K2383 was submitted for third-party validation. Minor deficiencies are as follows:

In the radionuclide analysis, all thorium-232 results were qualified as estimates and flagged "J" by third-party validation, due to a laboratory duplicate relative percent difference (RPD) above quality control (QC) limits at 38%. Estimated data are useable for decision-making purposes.

In the TPH analysis, all of the motor oil data in SDG K2383 were qualified by third-party validation as estimated with "J" flags, due to lack of a matrix spike (MS), matrix spike duplicate (MSD), and laboratory control sample (LCS) analysis. Estimated, or "J"-flagged, data are acceptable for decision-making purposes.

In the SVOC analysis, all hexachlorocyclopentadiene results were qualified as estimates and flagged "J" by third-party validation, due to an LCS below QC limits at 32%. Estimated data are useable for decision-making purposes.

In the SVOC analysis, the MS/MSD RPDs for 1,2-dichlorobenzene (45%), 1,3-dichlorobenzene (63%), and hexachlorocyclopentadiene (40%), were above the QC criteria of 30%. The results for these SVOCs were qualified as estimated and flagged "J" by third-party validation. The data are useable for decision-making purposes.

In the VOC analysis, the detected methylene chloride results are of similar magnitude as the method blank results, and may be considered estimated due to method blank contamination. All detected methylene chloride sample results were raised to the required quantitation limit (RQL), qualified as undetected estimates, and flagged "U" by third-party validation. The data are useable for decision-making purposes.

In the VOC analysis, the MSD recovery for methylene chloride, 49%, was below the QC criteria. The methylene chloride results for sample J1C393 through J1C399 and J1C3B0 through J1C3B4 were qualified as estimated and flagged "J" by third-party validation. The data are useable for decision-making purposes.

In the VOC analysis, the MS/MSD RPD for acetone, 37%, was above the QC criteria of 30%. The acetone results for sample J1C393 through J1C399 and J1C3B0 through J1C3B4 were qualified as estimated and flagged "J" by third-party validation. The data are useable for decision-making purposes.

In the PCB analysis, all of the aroclor-1221, aroclor-1232, aroclor-1242, aroclor-1248, and aroclor-1254 results for all samples in SDG 2383 (except J1C395, which was reanalyzed in a separate analytical batch due to low LSC recoveries in the original sample) were qualified by third-party validation as estimated with "J" flags, due to lack of a method blank analysis. Estimated, or "J"-flagged, data are acceptable for decision-making purposes.

In the PCB analysis, all of the PCB results for sample J1C395 were qualified by third-party validation as estimated with "J" flags, due to lack of an MS and MSD analysis. Estimated, or "J"-flagged, data are acceptable for decision-making purposes.

In the PCB analysis, the surrogate recoveries for aroclor-1254 and aroclor-1260 in sample J1C3B4 (150% and 158%) are above the QC criteria. Third-party validation qualified all aroclor-1254 and aroclor-1260 results for sample J1C3B4 as estimated and flagged "J." Estimated, or "J"-flagged, data are acceptable for decision-making purposes.

In the pesticides analysis, all of the toxaphene data in SDG K2383 were qualified by third-party validation as estimated with "J" flags, due to lack of an MS, MSD, and LCS analysis. Estimated, or "J"-flagged, data are acceptable for decision-making purposes.

In the ICP metals analysis, the MS recoveries were out of project acceptance criteria for antimony (44%), arsenic (69%), barium (69%), boron (67%), cadmium (69%), calcium (7%), cobalt (69%), copper (42%), lead (66%), manganese (136%), selenium (67%), silicon (150%), silver (67%), vanadium (66%), and zinc (64%). These analytes did not have mismatched spike and native concentrations in the original MS. All antimony, arsenic, barium, boron, cadmium, calcium, cobalt, copper, lead, manganese, selenium, silicon, silver, vanadium, and zinc data for SDG K2383 were considered estimated and flagged "J" by third-party validation due to the MS recoveries outside the QC limits. Estimated data are useable for decision-making purposes.

In the ICP metals analysis, all silicon results were qualified as estimates and flagged "J" by third-party validation, due to an LCS below QC limits at 59%. Estimated data are useable for decision-making purposes.

In the ICP metals analysis, all chromium and magnesium results were qualified as estimates and flagged "J" by third-party validation, due to a laboratory duplicate RPD above QC limits at 65% and 40%, respectively. Estimated data are useable 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/quality control (QA/QC) measures are used to assess potential sources of error and cross contamination of samples that could bias results. Field QA/QC samples, listed in the field logbook (WCH 2010a), are the 100-H-4 primary and duplicate samples (J1C3B0/J1C3B5). The main and QA/QC sample results are presented in Appendix B.

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 (COPC). RPDs 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 difference of analytes detected at low concentrations (less than 5 times the detection limit) are not considered to be indicative of the analytical system performance. The RPD calculation brief in Appendix B provides details on duplicate pair evaluation and RPD calculation.

The RPD calculated for silicon (34.4%) in the field duplicate sample is above the acceptance criteria (30%). A secondary check of the data variability is used when one or both of the samples being evaluated (main and duplicate) is less than five times the target detection limit

(TDL), including undetected analytes. In these cases, a control limit of ±2 times the TDL is used (Appendix B) to indicate that a visual check of the data is required by the reviewer. No data required this check. A visual inspection of all of the data is also performed. No additional major or minor deficiencies are noted. The data are useable for decision-making purposes.

SUMMARY

Limited, random, or sample matrix-specific influenced batch QC issues such as those discussed above, are a potential for any analysis. The number and types seen in these data sets are within expectations for the matrix types and analyses performed. The DQA review of the 100-H-4 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-4 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 Environmental Restoration (ENRE) project-specific database prior to being submitted for inclusion in the Hanford Environmental Information System (HEIS) database. The verification sample analytical data are also summarized in Appendix B.

REFERENCES

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

BHI, 2000b, *Data Validation Procedure for Radiochemical Analysis*, BHI-01433, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

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

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

WCH, 2010a, *100H Field Remediation and Sampling*, Logbook EL-1627-04, pp. 72-73, Washington Closure Hanford, Richland, Washington.

WCH, 2010b, *Work Instruction for Verification Sampling of the 100-H-4, 1717-H Hot Shop, French Drain, and Contaminated Storage Unit,* Work Instruction No. 0100H-WI-G0051, Rev. 0, Washington Closure Hanford, Richland, Washington.