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

11-AMRC-0165

JUN 29 2011

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

Dear Mr. Faulk:

TRANSMITTAL OF APPROVED WASTE SITE RECLASSIFICATION FORM AND SUPPORTING DOCUMENTATION FOR THE 600-202 HANFORD TOWNSITE FOUR BURN AND BURIAL PITS, REVISION 0

Attached for your use is the approved Waste Site Reclassification Form No. 2011-030 and supporting Remaining Sites Verification Package for the 600-202, "Hanford Townsite Four Burn and Burial Pits," Revision 0. If you have questions, please contact me or your staff may contact Jamie Zeisloft, of my staff, at (509) 372-0188.

Sincerely,

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

AMRC:JHZ

Attachment

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

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

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Date Submitted: 04/14/2011 Originator: M. L. Proctor Phone: 372-9227	**WASTE SITE RECLASSIFICATION FORM** Operable Unit(s): 100-IU-6 Waste Site Code: 600-202 Type of Reclassification Action: Closed Out ☐ Interim Closed Out ☒ No Action ☐ RCRA Postclosure ☐ Rejected ☐ Consolidated ☐	Control Number: 2011-030

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 600-202, Hanford Townsite Four Burn and Burial Pits waste site was used as an open pit municipal dump by the Hanford construction camp workers in the 1940s. The 600-202 waste site is identified as a remaining site for remediation 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), U.S. Environmental Protection Agency, Region 10, Seattle, Washington. Following confirmatory sampling, portions of the site were identified for remediation, which took place from March to May 2010. The selected remedy involved (1) excavating the site to the extent required to meet specified soil cleanup levels, (2) disposing of contaminated excavation materials at the Environmental Restoration Disposal Facility at the 200 Area of the Hanford Site, (3) demonstrating through verification sampling that cleanup goals have been achieved, and (4) proposing the site for reclassification as Interim Closed Out.

Basis for reclassification:

In accordance with this evaluation, the verification sampling results support a reclassification of the 600-202 waste site to Interim Closed Out. The current site conditions achieve the remedial action goals established by the Remaining Sites ROD. The results of verification sampling 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 analytical results and rationale presented also demonstrate that levels of residual contamination are protective of groundwater and the Columbia River. The basis for reclassification is described in detail in the *Remaining Sites Verification Package for the 600-202, Hanford Townsite Four Burn and Burial Pits* (attached). The results of verification sampling indicate that residual waste site contamination originating from Hanford Site or Manhattan Project activities is not present in the deep zone (below 4.6 m [15 ft] deep); therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep-zone soil are not required.

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)	R. Chris Smith for MSF Signature	5/17/11 Date
N/A Ecology Project Manager (printed)	Signature	Date
C. Guzzetti EPA Project Manager (printed)	Signature	5/25/11 Date

REMAINING SITES VERIFICATION PACKAGE FOR THE 600-202, HANFORD TOWNSITE FOUR BURN AND BURIAL PITS

Attachment to Waste Site Reclassification Form 2011-030

April 2011

REMAINING SITES VERIFICATION PACKAGE FOR THE 600-202, HANFORD TOWNSITE FOUR BURN AND BURIAL PITS

EXECUTIVE SUMMARY

The 600-202, Hanford Townsite Four Burn and Burial Pits waste site, located in the 100-IU-6 Operable Unit, was used as an open pit municipal dump by the Hanford construction camp workers in the 1940s. The pits were open until the 1980s, at which time they were backfilled to prevent recreational river users from coming onshore to collect artifacts.

The 600-202 waste site was identified in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP) (DOE-RL 2009) and the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD) (EPA 1999) as a candidate site for confirmatory sampling. However, it was determined that the site would be remediated because confirmatory sampling found buried waste materials and soils contaminated at concentrations above cleanup levels. Confirmatory sampling was carried out by excavation of test trenches and pits focused on six areas identified in a geophysical survey of the site (BHI 2004b). Confirmatory sampling indicated the need for remedial action at four of the six areas, which failed to meet remedial action goals (RAGs). Areas five and six required no remediation; however, a single focused verification sample was collected under the location of a battery found in area five.

Remediation occurred from March to May, 2010, and resulted in a large and small excavation, as well as a staging pile area where waste was staged prior to shipment and disposal at the Environmental Restoration Disposal Facility. Due to shallow waste at this site, no overburden material was stockpiled.

Following remediation, verification sampling was conducted in December 2010. After an exceedance of the RAGs for total petroleum hydrocarbons (TPH) in the staging pile area, further remediation was performed for that portion of the staging pile in January 2010. Replacement verification samples were collected from the staging pile area in February 2010. The verification sampling results indicate that the waste removal action achieved compliance with the remedial action objectives (RAOs) and remedial action goals (RAGs) established in the RDR/RAWP (DOE-RL 2009) and the Remaining Sites ROD (EPA 1999). These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow-zone soil (i.e., surface to 4.6 m [15 ft]), and contaminant levels remaining in the soil are protective of groundwater and the Columbia River. A summary of the cleanup evaluation for the soil results against the applicable criteria is presented in Table ES-1. The results of the verification sampling are used to make reclassification decisions for the 600-202 waste site in accordance with the TPA-MP-14 procedure (DOE-RL 2007). In accordance with this evaluation, the verification sampling results support a reclassification of this site to Interim Closed Out.

Table ES-1. Summary of Remedial Action Goals for the 600-202 Waste Site. (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.	Radionuclides were not COPCs for the 600-202 waste site.	NA
Direct Exposure – Nonradionuclides	Attain individual COPC RAGs.	All individual COPC concentrations are below the direct exposure criteria.	Yes
Risk Requirements – Nonradionuclides	Attain a hazard quotient of <1 for all individual noncarcinogens.	The hazard quotients for individual nonradionuclide COPCs are <1.	Yes
	Attain a cumulative hazard quotient of <1 for noncarcinogens.	The cumulative hazard quotient for all sampling areas (1.3×10^{-1}) is <1.	
	Attain an excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens.	The excess cancer risk values for individual nonradionuclide COPCs are all $<1 \times 10^{-6}$.	
	Attain a cumulative excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.	The cumulative excess cancer risk (7.5×10^{-7}), is $<1 \times 10^{-5}$.	
Groundwater/River Protection – Radionuclides	Attain single COPC groundwater and river RAGs.	Radionuclides were not COPCs for the 600-202 waste site.	NA
	Attain National Primary Drinking Water Regulations: 4 mrem/yr (beta/gamma) dose standard to target receptor/organ [a].		
	Meet drinking water standards for alpha emitters: the more stringent of 15 pCi/L MCL or 1/25th of the derived concentration guide for DOE Order 5400.5 [b].		
	Meet total uranium standard of 21.2 pCi/L [c].		

Table ES-1. Summary of Remedial Action Goals for the 600-202 Waste Site. (2 Pages)

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Groundwater/River Protection – Nonradionuclides	Attain individual nonradionuclide groundwater and Columbia River cleanup requirements.	Barium, cadmium, chromium, copper, lead, nickel, zinc, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, aldrin, alpha-BHC, and beta-BHC are present at concentrations slightly above soil RAGs for groundwater and/or Columbia River protection. However, an evaluation based upon RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009) shows that residual concentrations of these constituents are predicted to be protective of groundwater and the river [d, e].	Yes

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

[b] *Radiation Protection of the Public and Environment* (DOE Order 5400.5).

[c] Based on the isotopic distribution of uranium in the 100 Area, the 30 µg/L MCL corresponds to 21.2 pCi/L. Concentration-to-activity calculations are documented in *Calculation of Total Uranium Activity Corresponding to a Maximum Contaminant Level for Total Uranium of 30 Micrograms per Liter in Groundwater* (BHI 2001).

[d] Based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009), the residual concentrations of barium, cadmium, chromium, copper, lead, nickel, zinc, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and aldrin are not expected to migrate more than 3 m (10 ft) vertically in 1,000 years (based on the contaminant with the lowest distribution coefficient, copper, with a distribution coefficient value of 22 mL/g). The vadose zone underlying the soil below the site is approximately 3.1 m (10.2 ft) thick at the deepest portion of the excavation. Therefore, residual concentrations of these constituents predicted to be protective of groundwater and the Columbia River.

[e] Based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009) and an evaluation of dilution-attenuation in the saturated zone using the formulas from the EPA *Soil Screening Guidance: User's Guide* (EPA 1996), residual soil concentrations of alpha- and beta-BHC are predicted to be protective of groundwater and the Columbia River for 1,000 years (Appendix D).

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

Residual waste site contamination originating from Hanford Site or Manhattan Project activities is not present in the deep zone; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required.

Soil cleanup levels were established in the Remaining Sites ROD (EPA 1999) based in part on a limited ecological risk assessment. Although not required by the Remaining Sites ROD, 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, barium, boron, copper, lead, selenium, vanadium,

and zinc. The U.S. Environmental Protection Agency ecological soil screening levels were exceeded for antimony, cadmium, copper, lead, manganese, vanadium, and zinc. Exceedance of screening values is intended to trigger additional evaluation and does not necessarily indicate the existence of risk to ecological receptors. Because the maximum detected levels of antimony, manganese, selenium, and vanadium were below Hanford Site-wide background levels, it is believed that the presence of these constituents does not pose a risk to ecological receptors. No established background value is available for boron; a final cleanup level for boron, including consideration of background, will be established through the final remedial investigation/feasibility study process. 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 600-202, HANFORD TOWNSITE FOUR BURN AND BURIAL PITS

STATEMENT OF PROTECTIVENESS

The 600-202, Hanford Townsite Four Burn and Burial Pits waste site verification sampling data, site evaluations, and supporting documentation demonstrate that this site meets the objectives established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP) (DOE-RL 2009) and the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD) (EPA 1999). These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations originating from Hanford Site or Manhattan Project activities support unrestricted future use of shallow-zone soil (i.e., surface to 4.6 m [15 ft]) and that such contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Residual contamination from the 600-202 waste site is not present in the deep zone; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required.

GENERAL SITE INFORMATION AND BACKGROUND

The 600-202 waste site was located in the 100-IU-6 Operable Unit, southeast of the intersection of Avenue A and 9th Street within the Hanford Construction Camp (Figure 1). The approximate Washington State Plane (WSP) coordinates are N 137862, E 588481. The 600-202 waste site was used as an open pit municipal dump by the Hanford construction camp workers in the 1940s. The pits were open until the 1980s, at which time they were backfilled to prevent recreational river users from coming onshore to collect artifacts.

Geophysical Survey

A geophysical survey was performed over the 600-202 waste site in March 2004 to map surface features and identify subsurface anomalous zones (BHI 2004a, b). Two roads approaching the waste site from the west appeared to extend through the center of the pits (Figure 2). Significant debris was evident within all of the pits, but the concentrations varied within each. Surface debris was observed both visually and by the geophysical survey (Figure 3).

Figure 1. The 600-202 Waste Site Location Map.

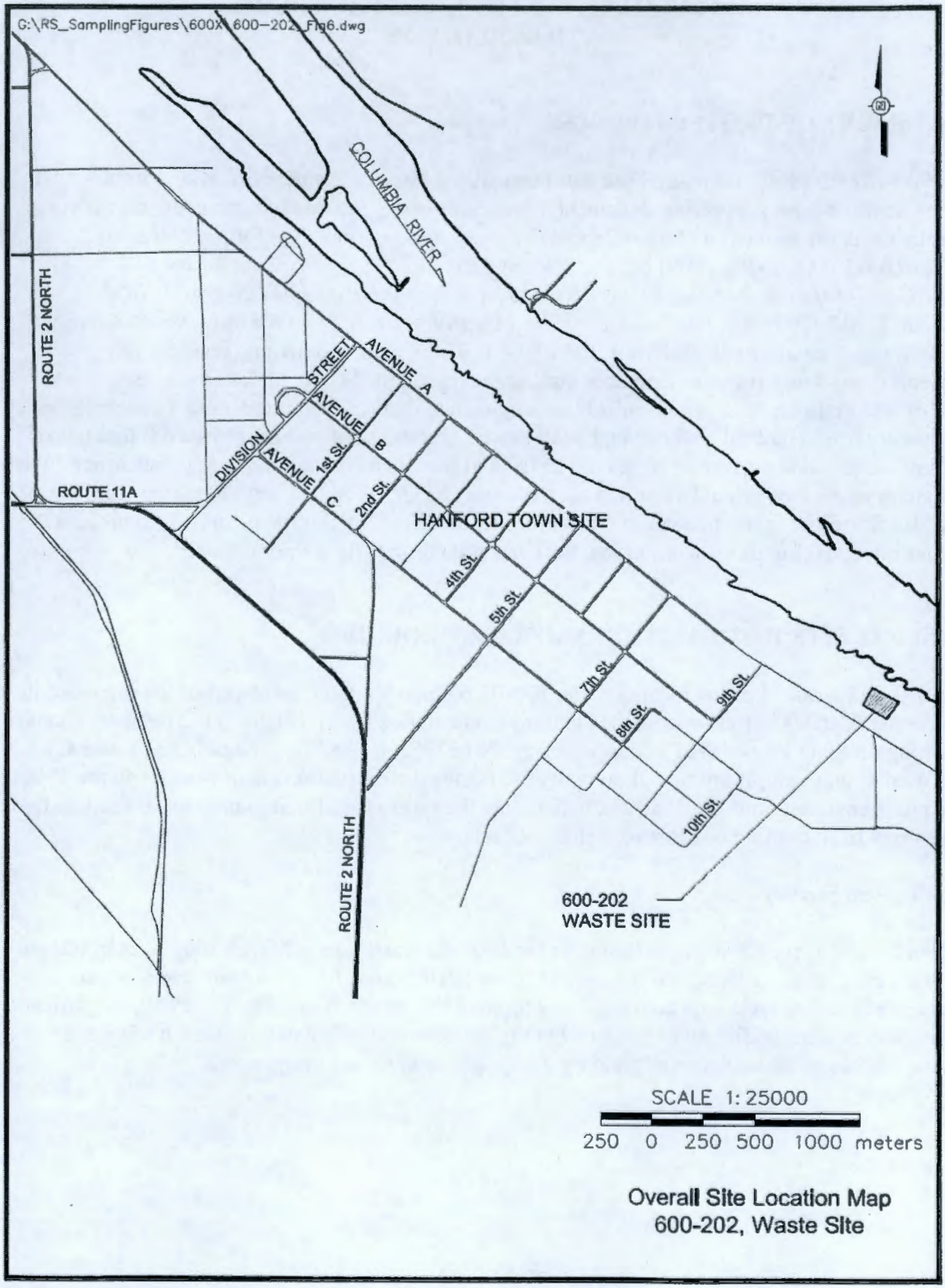


Figure 2. 600-202 Surface Feature Map.

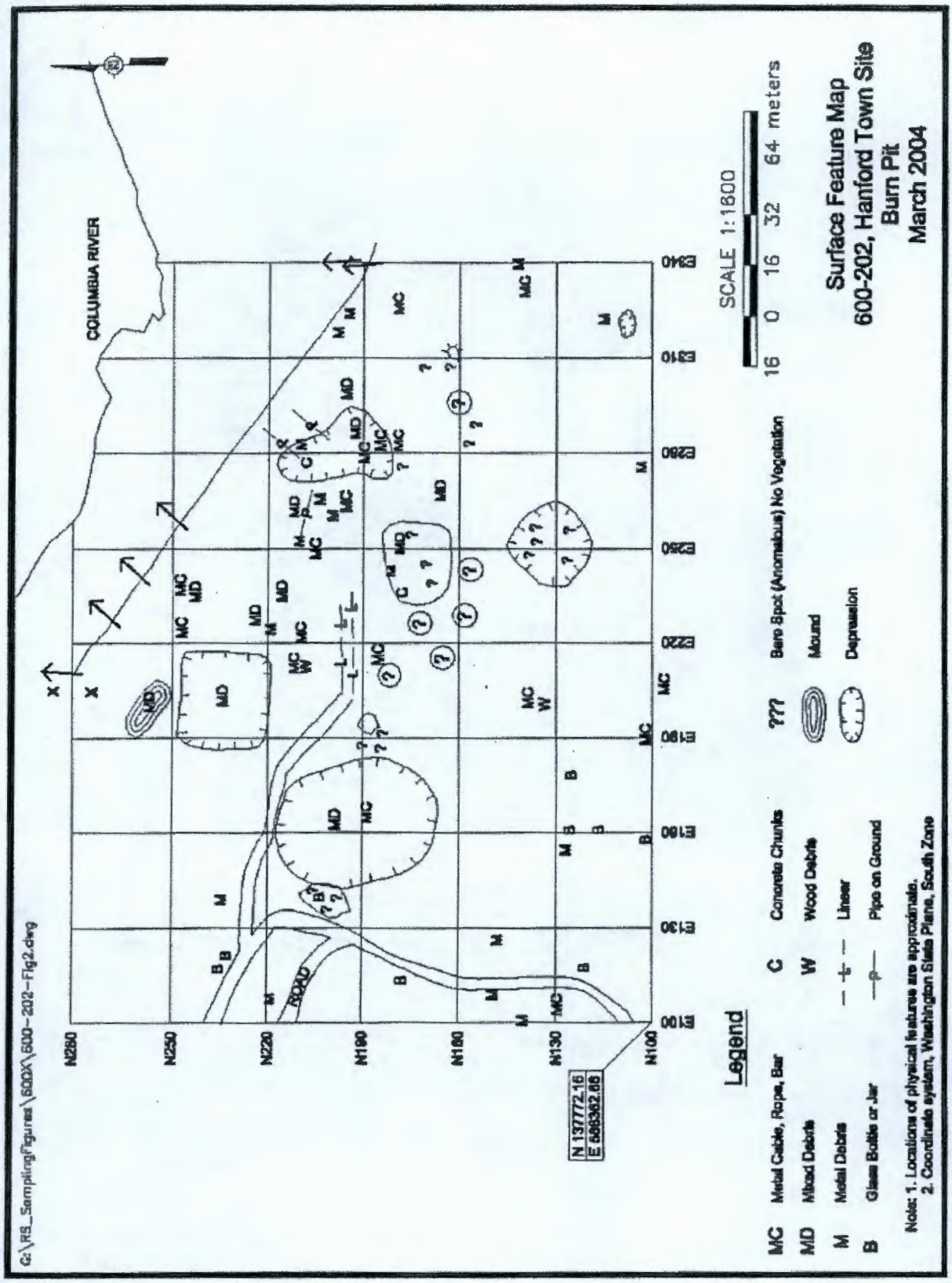
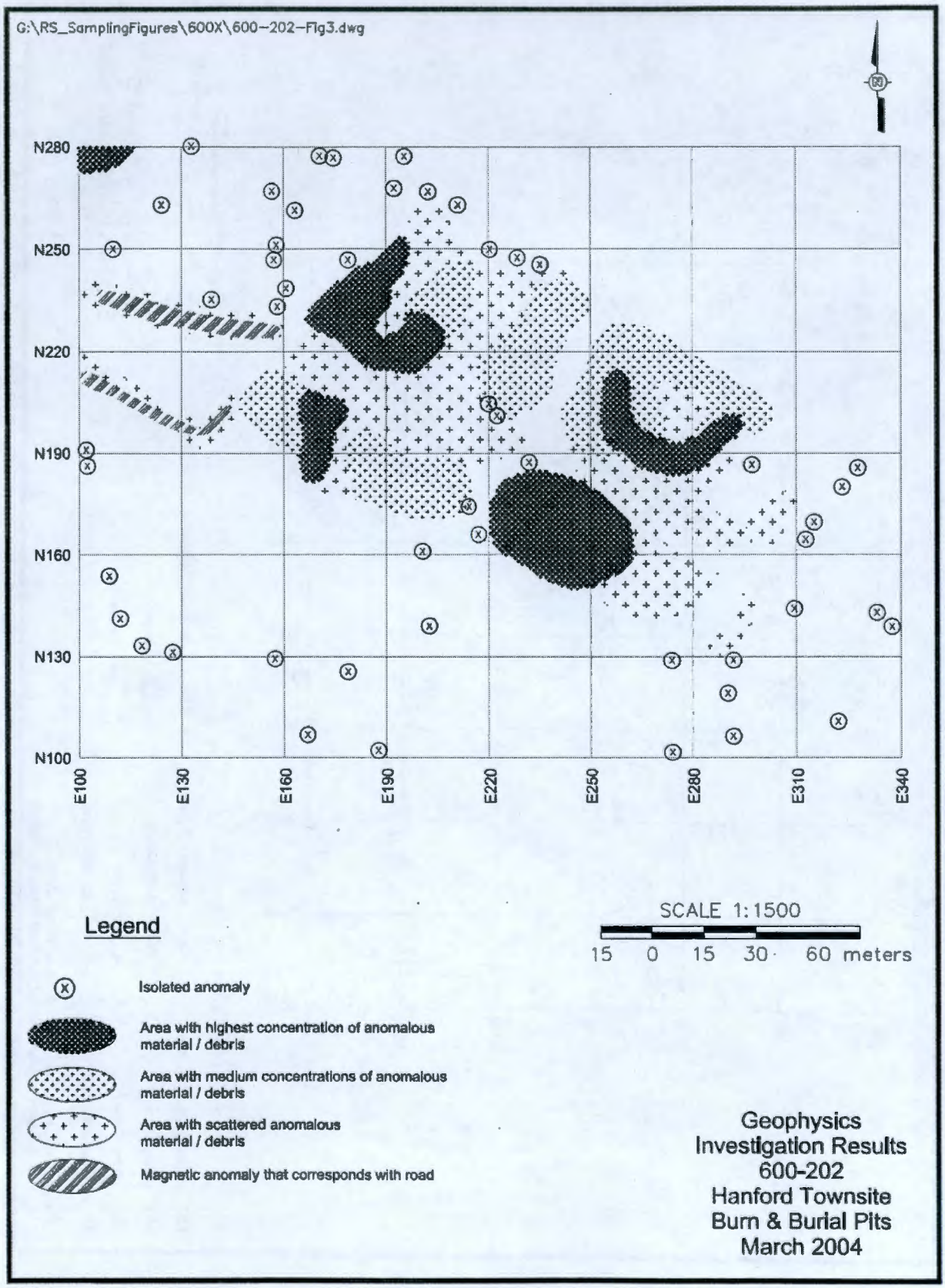


Figure 3. 600-202 Geophysical Interpretation Map.



Site Walkdown

A site walkdown was performed on June 10, 2004 to discuss a path forward for the waste site, locate the site, and evaluate field conditions. Areas of surface debris and soil discoloration were identified. Several days later, an additional walkdown was conducted to locate a nonvegetated bare spot that was identified in the geophysical survey. The spot was determined to be a natural sand dune caused by erosive wind, and no further evaluation during confirmatory sampling was necessary.

Another site walkdown was performed in June 2009. Two metal pipes approximately 5 cm (2 in.) in diameter were found on the northern side of the site, and were determined to be water pipes used for fire suppression.

CONFIRMATORY SAMPLING ACTIVITIES

Confirmatory sampling was carried out for the 600-202 waste site with test trenches and pits focused on areas identified in the geophysical survey (BHI 2004c). These trenches and pits were excavated in areas 1 through 6 shown in Figure 4. All samples were analyzed for semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), pesticides, inductively-coupled plasma (ICP) metals, sulfate, hexavalent chromium, mercury, total petroleum hydrocarbons (TPH), and polycyclic aromatic hydrocarbons (PAH). The confirmatory samples were collected on January 19 to 24, 2005. A total of 20 samples and 4 quality control (QC) samples were collected. The sample media, depth below ground surface (bgs), and analysis performed are listed in Table 1.

Excavation at area 1 uncovered asphalt shingles, sheet rock plaster board, tar paper, metallic debris, glass debris, orange stained soils, and a gray, powdery material. At area 2, glass bottles, metallic debris, and a layer of ash near the surface were found. The excavation at area 3 uncovered glass bottles, nails, battery cores and plates, orange stained soil, and material exhibiting evidence of burning. At area 4, where a pipeline and valve were observed during the site walkdown, a fine, tan layer of powder without debris or evidence of burning was encountered at approximately 0.6 m (2 ft) bgs. The layer trended southwest; however, no potential fluid source on the opposite end of the pipeline could be identified. Excavation at area 5 uncovered metallic, wood, and glass debris, tar paper, ash, and a battery at WSP coordinates N 137901, E 588495. At area 6, mixed debris was present. No volatile organic compounds (VOCs) or radiological readings above background were detected in the field.

Areas 1 through 4 failed to meet remedial action goals (RAGs) for ICP metals, hexavalent chromium, TPH, and PAH. At areas 5 and 6, RESidual RADioactivity (RESRAD) modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009) predicted that the contaminants exceeding RAGs for protection of groundwater and/or the Columbia River would not reach groundwater within a 1,000-year time frame. Therefore, it was determined that areas 5 and 6 required no remediation. A focused sample was collected at the location of the battery found in area 5.

Figure 4. 600-202 Confirmatory Sampling Test Trench Locations.

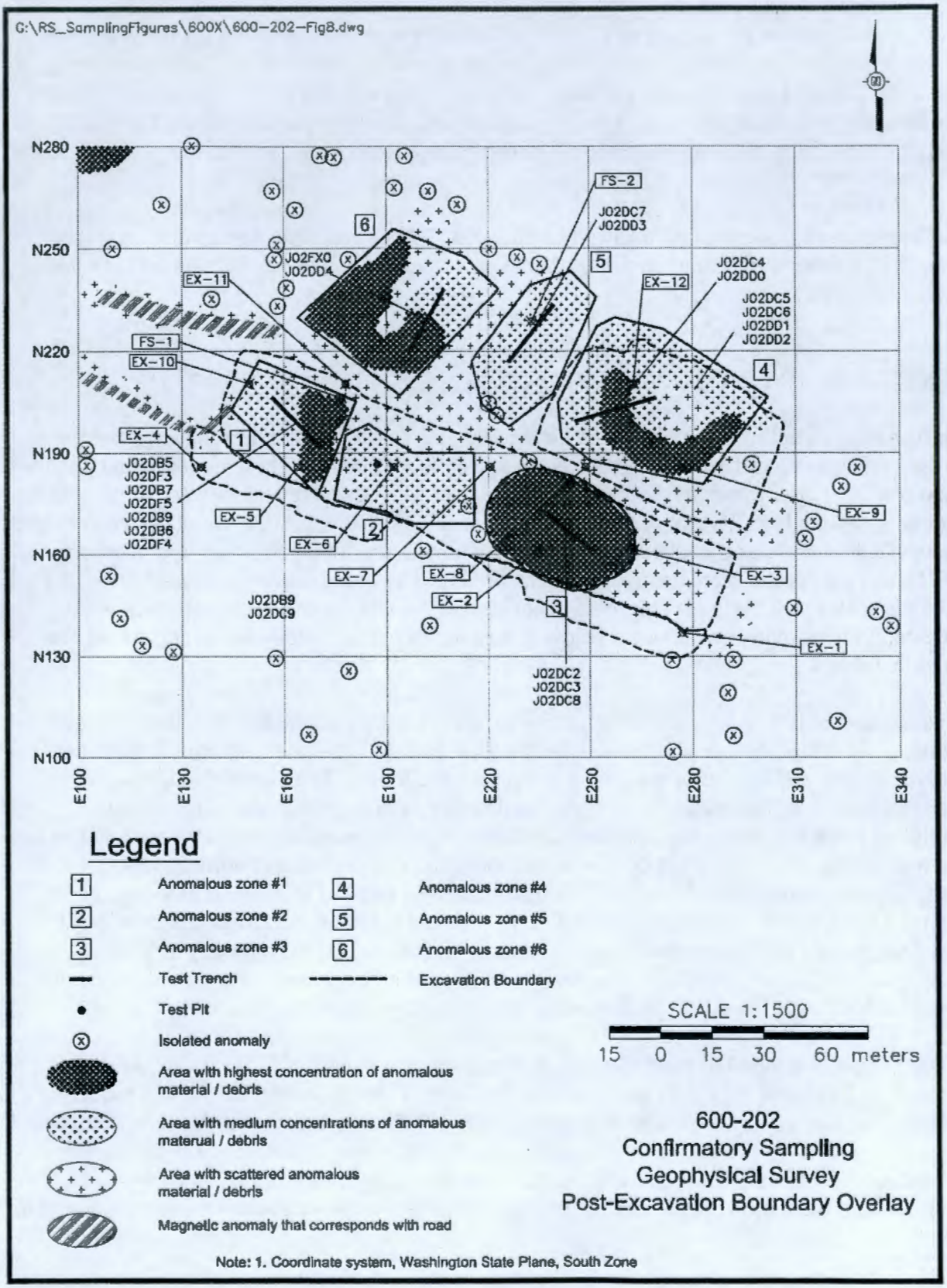


Table 1. Confirmatory Sample Summary for the 600-202 Waste Site. (2 Pages)

Sample Location	Sample Media	HEIS Number	Location[a]	Depth (m bgs)	Sample Analysis
Area 1 test trench	Gray stained soil	J02DB5	N 137872, E 588440	0.3	SVOA, PCBs, pesticides, ICP metals, sulfate, mercury, TPH, PAH
	Gray stained soil	J02DF3			Hexavalent chromium
	Orange stained soil	J02DB7		0.9	SVOA, PCBs, pesticides, ICP metals, sulfate, mercury, TPH, PAH
	Orange stained soil	J02DF5			Hexavalent chromium
	Native soil	J02D89		2.4	SVOA, PCBs, pesticides, ICP metals, sulfate, mercury, TPH, PAH
Area 2 test pit	Ash material	J02DB9	N 137859, E 588450	0.3	SVOA, PCBs, pesticides, ICP metals, sulfate, mercury, TPH, PAH
	Native soil	J02DC9		0.9	SVOA, PCBs, pesticides, ICP metals, sulfate, mercury, TPH, PAH
Area 3 test trench	Aliquots of soil and solid material	J02DC2	N 137839, E 588505	1.5	SVOA, PCBs, pesticides, ICP metals, sulfate, mercury, TPH, PAH
	Battery material	J02DC3		0.6	
	Native soil	J02DC8		2.4	SVOA, PCBs, pesticides, ICP metals, sulfate, mercury, TPH, PAH
Area 4 test trench	Fine tan powder	J02DC4	N 137875, E 588520	0.6	SVOA, PCBs, pesticides, ICP metals, sulfate, mercury, TPH, PAH
	Native soil	J02DD0		2.75	SVOA, PCBs, pesticides, ICP metals, sulfate, mercury, TPH, PAH
	West pipes/valve scale (outside of excavated area)	J02DC5	N 137906, E 588505	0.3	ICP metals, sulfate, mercury, PCBs
	East pipes/valve scale (outside of excavated area)	J02DC6			
	West soil in contact with pipe/valve	J02DD1		0.3	ICP metals, sulfate, mercury and PCBs
	East soil in contact with pipe/valve	J02DD2			
Area 5 test trench	Aliquots of soil and solid material	J02DC7	N 137899, E 588489	0.6	SVOA, PCBs, pesticides, ICP metals, sulfate, mercury, TPH, PAH
	Native soil	J02DD3		0.9	SVOA, PCBs, pesticides, ICP metals, sulfate, mercury, TPH, PAH
Area 6 test trench	Mixed debris	J02FX0	N 137864, E 588434	0.3	SVOA, PCBs, pesticides, ICP metals, sulfate, mercury, TPH, PAH
	Native soil	J02DD4			SVOA, PCBs, pesticides, ICP metals, sulfate, mercury, TPH, PAH
Equipment blank (matrixed to J02D89)	Silica sand	J02DD9	NA	NA	ICP metals, PCBs, sulfate, mercury, SVOA
Equipment blank (matrixed to J02D89)		J02DB8			Hexavalent chromium

Table 1. Confirmatory Sample Summary for the 600-202 Waste Site. (2 Pages)

Sample Location	Sample Media	HEIS Number	Location[a]	Depth (m bgs)	Sample Analysis
Duplicate of J02DB5 (area 1)	Gray powdery material	J02DB6	N 137864 E 588434	0.3	SVOA, PCBs, pesticides, ICP metals, sulfate, mercury, TPH, PAH
Duplicate of J02DF3 (area 1)		J02DF4			Hexavalent chromium

[a] Coordinates listed correspond to the Washington State Plane.

bgs = below ground surface
HEIS = Hanford Environmental Information System
ICP = inductively coupled plasma
NA = not applicable
PAH = polycyclic aromatic hydrocarbons
PCB = polychlorinated biphenyl
SVOA = semivolatile organic analysis
TPH = total petroleum hydrocarbons

REMEDIAL ACTION SUMMARY

Based on the results of confirmatory sampling of the 600-202 waste site the waste site was recommended for remove, treat, and dispose (RTD). Remediation occurred from November 2009 to May 2010.

Remedial Action

On November 19, 2009, several waste characterization samples were collected from the surface of the backfilled confirmatory test trenches 1 through 4. Random aliquots of surface soil were collected from the location of the trenches. The results of the waste characterization samples are provided in Appendix A.

Excavation of the 600-202 waste site began on March 9, 2010, and was completed on April 26, 2010. Photographs of the remedial action are provided in Appendix B. On March 16, 2010, white ash material, later determined to be mussel shells, were encountered by field remediation personnel. Cultural resources personnel were permanently staged at the waste site for the remainder of the excavation to oversee the handling of the shells.

Several batteries were found during excavation. The batteries were drummed and a sample was collected on March 31, 2010 from random aliquots of soil beneath one of the batteries at WSP coordinates N 137866, E 588493. The results of this sample, J19VY1, are provided in Appendix A.

On April 8, 2010, a 132-L (35-gal) drum filled with dirt was encountered at WSP coordinates N 137878, E 588439 and was stockpiled for disposal at the Environmental Restoration Disposal Facility (ERDF). On April 14, 2010, a 0.18-L (6-oz) bottle with a small amount of white liquid inside was also found. The contents of the bottle were characterized and are included with other sample results in Appendix A.

Several in-process samples were taken from the excavated areas on May 5, 2010. Multi-aliquot soil samples were taken from the areas as presented in Table 2. On May 17, 2010, the battery found on the surface during area 5 confirmatory sampling was removed along with surrounding soil and sent to the ERDF. The battery was located at WSP coordinates N 137901, E 588495.

Table 2. 600-202 Waste Characterization and In-Process Soil Samples.

Location	Sample
Area 1, backfilled trenches C and J	J19BY4
Area 2, backfilled trenches B and I	J19BY5
Area 2, backfilled trenches B and I (duplicate of J19BY5)	J19CT7
Area 3, backfilled trench A	J19CT5
Area 4, backfilled trenches D and H	J19CT6
Equipment blank	J19CT8
East excavation	J19Y00
	J19XY9
	J19XY8
West excavation	J19Y07
	J19Y06
	J19Y05
	J19Y04
	J19Y03
	J19Y02
	J19Y01
Small scraped areas	J19Y09
	J19Y08

At the completion of all remedial activities, the depth of both excavations was approximately 4.8 m (15.7 ft).

VERIFICATION SAMPLING ACTIVITIES

Verification sampling for the 600-202 waste site was conducted in November 2010 and January 2011 to support a determination that residual contaminant concentrations at this site meet the cleanup criteria specified in the RDR/RAWP (DOE-RL 2009) and the Remaining Sites ROD (EPA 1999). The verification sample results are provided in Appendix C and indicate that the waste removal action achieved compliance with the remedial action objectives (RAOs) for the 600-202 waste site. The following subsections provide additional discussion of the information used to develop the verification sampling design. Table 3 identifies the locations and analyses for each verification sample. A more detailed discussion of the verification sampling design can be found in the *Work Instruction for Verification Sampling of the 600-202, Hanford Townsite Four Burn and Burial Pits* (WCH 2010b).

Contaminants of Potential Concern

The contaminants of potential concern (COPCs) for the 600-202 waste site were preliminarily identified in the RDR/RAWP and were revised in consideration of field observations and the results of confirmatory, waste characterization, and in-process samples. The COPCs identified in the RDR/RAWP are PCBs, SVOCs, TPH, VOCs, asbestos, silver, cadmium, barium, chromium (total), mercury, selenium, hexavalent chromium, and sulfate.

Table 3. 600-202 Verification Sampling Summary Table. (2 Pages)

Sample Location	HEIS Number	Washington State Plane Coordinates		Sample Analysis
		Northing (m)	Easting (m)	
EXL-1	J1C3W7	137815.1	588528.8	ICP metals [a], hexavalent chromium, pesticides, PAH, TPH
EXL-2	J1C3W8	137821.8	588551.4	
EXL-3	J1C3W9	137831.4	588511.7	
EXL-4	J1C3X0	137838	588534.3	
EXL-5	J1C3X1	137841	588472.1	
EXL-6	J1C3X2	137847.6	588494.7	
EXL-7	J1C3X3	137850.6	588432.5	
EXL-8	J1C3X4	137857.2	588455.1	
EXL-9	J1C3X5	137863.8	588477.7	
EXL-10	J1C3X6	137866.8	588415.5	
EXL-11	J1C3X7	137873.4	588438	
EXL-12	J1C3X8	137889.7	588421	
Duplicate of EXL-1	J1C3X9	TBD	TBD	
EXS-1	J1C3Y0	137845.9	588548.7	ICP metals [a], pesticides, PAH, TPH
EXS-2	J1C3Y1	137856.1	588536.8	
EXS-3	J1C3Y2	137861.3	588551.6	
EXS-4	J1C3Y3	137866.5	588566.4	
EXS-5 [b]	J1C3Y4	137868.0	588512.0	
EXS-6	J1C3Y5	137866.3	588524.9	
EXS-7	J1C3Y6	137871.5	588539.7	
EXS-8	J1C3Y7	137876.7	588554.5	
EXS-9	J1C3Y8	137876.5	588513	
EXS-10	J1C3Y9	137881.7	588527.8	
EXS-11	J1C400	137886.9	588542.6	
EXS-12	J1C401	137891.9	588515.8	
Duplicate of EXS-3	J1C402	TBD	TBD	
SPA-1	J1C409	137945.5	588296.1	ICP metals [a], hexavalent chromium, pesticides, PAH, TPH
SPA-2	J1C410	137951.3	588262.6	
SPA-3	J1C411	137958.1	588281	
SPA-4	J1C412	137957.1	588229.2	
SPA-5	J1C413	137963.8	588247.6	
SPA-6	J1C414	137962.8	588195.7	
SPA-7	J1C415	137969.6	588214.1	
SPA-8	J1C416	137975.4	588180.6	
SPA-9	J1C417	137982.2	588199	
SPA-10	J1C418	137981.1	588147.2	
SPA-11	J1C419	137987.9	588165.6	
SPA-12	J1C420	137993.7	588132.1	
FS-1	J1C422	137878.4	588439.4	
FS-2	J1C423	137900.9	588495.6	
Duplicate of SPA-1	J1C421	TBD	TBD	

Table 3. 600-202 Verification Sampling Summary Table. (2 Pages)

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

[a] Analysis for the expanded list of ICP metals was performed to include antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.
[b] Sample location EXS-5 was moved slightly from the staked location identified by the verification work instruction due to the abundance of mussel shells present. The new coordinates are listed in this table.

EXL = large excavation (Decision Unit 1)
EXS = small excavation (Decision Unit 2)
HEIS = Hanford Environmental Information System
ICP = inductively coupled plasma
FS = focused sample
NA = not applicable
PAH = polycyclic aromatic hydrocarbons
SPA = staging pile area (Decision Unit 3)
TBD = to be determined
TPH = total petroleum hydrocarbons

During confirmatory sampling, PAH, TPH, and pesticides were detected above the RAGs and are included as COPCs for all decision units. Hexavalent chromium was detected above the RAGs during confirmatory sampling at areas 1, 2, and 3; therefore, it was a COPC for the large excavation (Decision Unit 1), the staging pile area (Decision Unit 3), and the focused samples (Decision Units 1 and 4). The ICP metals that exceeded RAGs during confirmatory sampling are antimony, arsenic, cadmium, chromium (total), copper, lead, manganese, nickel, silver, and zinc. Although not considered COPCs, analyses for the constituents of the expanded ICP metals list were performed to include beryllium, boron, cobalt, molybdenum, and vanadium.

All SVOCs that were not included in the PAH analysis were estimated at less than the practical quantitation limit (PQL); therefore, SVOCs were eliminated as COPCs. Polychlorinated biphenyls were undetected during confirmatory sampling and were therefore eliminated as COPCs. The sulfate detections during confirmatory sampling were less than the RAGs, and it was eliminated as a COPC. Mercury was also detected during confirmatory sampling, but at levels less than background; therefore, it was eliminated as a COPC. Because friable asbestos was not observed during remediation, it was eliminated as a COPC. Field screening did not indicate the presence of VOCs, and they were eliminated as COPCs for verification sampling. The COPCs for verification sampling and the laboratory analytical methods are identified in Table 4. Figure 5 shows each verification sampling location.

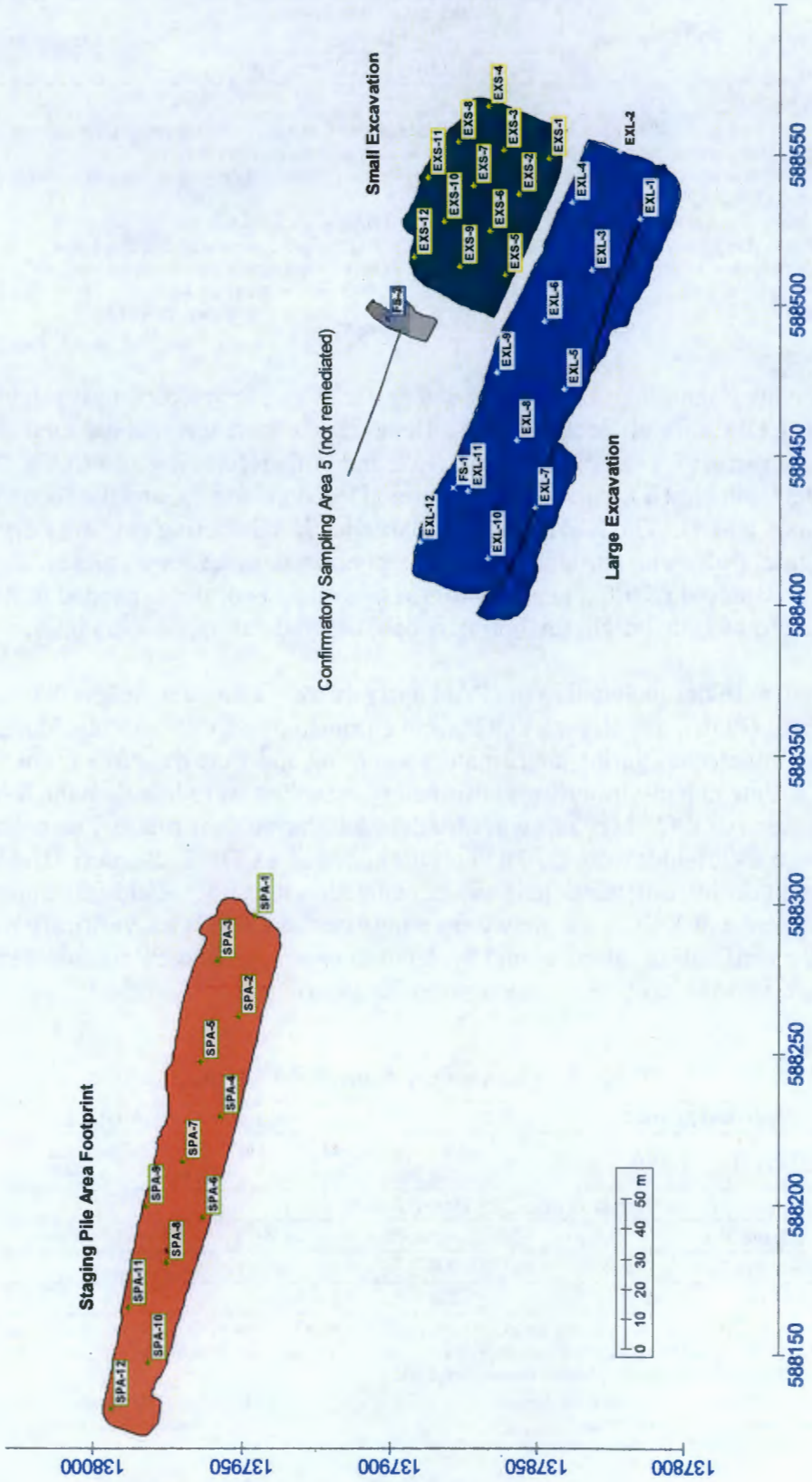
Table 4. Laboratory Analytical Methods.

Analytical Method	Contaminants of Potential Concern
ICP metals [a] – EPA Method 6010	Antimony, arsenic, barium, cadmium, chromium (total), copper, lead, manganese, nickel, selenium, silver, zinc
Hexavalent chromium – EPA Method 7196	Hexavalent chromium
Pesticides – EPA method 8081	Organochlorine pesticides
PAH – EPA method 8310	PAH
TPH – NWTPH-Dx [b]	TPH

[a] Analyses will be performed for the expanded list of ICP metals including antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.
[b] NWTPH-Dx analysis for both diesel and heavy oil range organics.

EPA = U.S. Environmental Protection Agency
ICP = inductively coupled plasma
NWTPH-Dx = Northwest total petroleum hydrocarbons – diesel range organics
PAH = polycyclic aromatic hydrocarbons
TPH = total petroleum hydrocarbons

Figure 5. Verification Sampling Locations for the 600-202 Waste Site.



Verification Sample Design

This section describes the basis for selection of an appropriate sample design to verify that residual contaminant concentrations do not exceed soil cleanup levels for the protection of human health and the environment, as identified in the Remaining Sites ROD (EPA 1999). The 600-202 waste site consists of four decision units for verification sampling. Decision Unit 1 is the large excavation (confirmatory sampling areas 1, 2, and 3), Decision Unit 2 is the small excavation (confirmatory sampling area 4), Decision Unit 3 is the staging pile area, and Decision Unit 4 is the location outside of the excavation where the battery was buried in confirmatory sample area 5.

Verification Sample Results

Verification samples were analyzed using U.S. Environmental Protection Agency-approved analytical methods. The 95% upper confidence limit (UCL) on the true population mean for residual concentrations of COPCs were calculated for each decision unit (the large and small excavations and staging pile area footprint) as specified by the RDR/RAWP (DOE-RL 2009), with calculations provided in Appendix C. When a nonradionuclide COPC was detected in fewer than 50% of the verification samples collected for the area, the maximum detected value was used for comparison to RAGs. If no detections for a given COPC were reported in the data set, then no statistical evaluation or calculations were performed for that COPC. Evaluation of the verification data from the focused samples were performed by direct comparison of the sample results against cleanup criteria.

Comparisons of the statistical results for COPCs and the site RAGs for each decision unit are presented in Tables 5 through 8. Contaminants that were not detected by laboratory analysis are excluded from these tables. Calculated cleanup levels for aluminum, calcium, iron, magnesium, potassium, silicon, and sodium are not presented in the RDR/RAWP (DOE-RL 2009). Parameters to calculate cleanup levels for these constituents are not presented in the Cleanup Levels and Risk Calculations (CLARC) Database (Ecology 2010) under WAC 173-340-740(3) or other reference databases; therefore, these constituents are not considered COPCs and are not included in the tables. The laboratory-reported data results for all constituents are stored in the Environmental Restoration (ENRE) project-specific database prior to provision to the Hanford Environmental Information System (HEIS) and are presented as an attachment to the 95% UCL calculation in Appendix C.

Table 5. Comparison of Maximum Contaminant Concentrations to Remedial Action Goals for the 600-202 Large Excavation Verification Sampling Data. (2 Pages)

COPC	Statistical Result [b] (mg/kg)	Remedial Action Goals [a] (mg/kg)			Do The Maximum Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Antimony	0.398 (<BG)	32	5 [c]	5 [c]	No	--
Arsenic	5.12 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	86.2 (<BG)	5,600	200	400	No	--
Beryllium	0.319 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Boron [e]	1.87	7,200	320	-- [f]	No	--
Cadmium [g]	0.0852 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	17.8 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	5.47 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	13.7 (<BG)	2,960	59.2	22.0 [c]	No	--
Lead	5.44 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	310 (<BG)	3,760	512 [c]	512 [c]	No	--
Molybdenum [e]	0.396	400	8	-- [f]	No	--
Nickel	16.1 (<BG)	1,600	19.1 [c]	27.4	No	--
Vanadium	46.6 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	40.7 (<BG)	24,000	480	67.8 [c]	No	--
Acenaphthene	0.00606	4,800	96	129	No	--
Benzo(b)fluor-anthene	0.00120	1.37	0.015 [h]	0.015 [h]	No	--
Chrysene	0.00239	13.7	0.12	0.1 [h]	No	--
Fluoranthene	0.00708	3,200	64	18.0	No	--
Indeno(1,2,3-cd)pyrene	0.00428	1.37	0.33 [h]	0.33 [h]	No	--
Phenanthrene [i]	0.00407	24,000	240	1,920	No	--
Aldrin	0.00286	0.0588	0.00165 [h]	0.00165 [h]	Yes	Yes [j]

Table 5. Comparison of Maximum Contaminant Concentrations to Remedial Action Goals for the 600-202 Large Excavation Verification Sampling Data. (2 Pages)

COPC	Statistical Result [b] (mg/kg)	Remedial Action Goals [a] (mg/kg)			Do The Maximum Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Beta-BHC	0.00332	0.556	0.00486	0.00554	No	--

[a] RAGs obtained from the RDR/RAWP (DOE-RL 2009) unless otherwise noted.
[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Appendix B.
[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement Project Managers as discussed in Section 2.1.2.1 of the RDR/RAWP (DOE-RL 2009).
[d] Carcinogenic cleanup level calculated based on the inhalation exposure pathway per WAC 173-340-750(3), 1996 (Method B for air quality) and an airborne particulate mass loading rate of 0.0001 g/m3 (*Hanford Guidance for Radiological Cleanup* [WDOH 1997]).
[e] No Hanford Site-specific or Washington State background value available.
[f] No parameters (bioconcentration factors or AWQC values) are available from the Cleanup Levels and Risk Calculations Database (Ecology 2010) or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], 1996 [Method B for surface waters]).
[g] Hanford Site-specific background value is not available; it was not evaluated during background study. Value used is from *Natural Background Soil Metals Concentrations in Washington State* (Ecology 1994).
[h] Where cleanup levels are less than RDLs, cleanup levels default to RDLs per WAC 173-340-707(2) (Ecology 1996). The cited RDLs are based on EPA-approved analytical methods that may not be available for rapid turnaround analyses. Prior notification and concurrence with the laboratory may be necessary to analyze to meet this RDL. Actual detection limits may differ from any RDL.
[i] Toxicity data for this chemical are not available. Cleanup levels are based on surrogate chemicals: Contaminant: phenanthrene, surrogate: anthracene.
[j] Based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009), the residual concentrations of aldrin are not expected to migrate more than 1 m (3.3 ft) vertically in 1,000 years (based on the distribution coefficient of aldrin of 48.7 mL/g). The vadose zone soil underlying the waste site excavation is approximately 3.1 m (10.2 ft) thick. Therefore, residual concentrations of aldrin are predicted to be protective of groundwater and the Columbia River.

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

Table 6. Comparison of Statistical Contaminant Concentrations to Remedial Action Goals for the 600-202 Small Excavation Verification Sampling Data. (2 Pages)

COPC	Statistical Result [b] (mg/kg)	Remedial Action Goals [a] (mg/kg)			Does the Statistical Data Set Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	7.87	20 [c]	20 [c]	20 [c]	No	--
Barium	104 (<BG)	5,600	200	400	No	--
Beryllium	0.463 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Boron [e]	3.03	7,200	320	-- [f]	No	--
Cadmium [g]	0.159 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	22.4	80,000	18.5 [c]	18.5 [c]	Yes	Yes [h]
Cobalt	7.21 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	17.8 (<BG)	2,960	59.2	22.0 [c]	No	--
Lead	6.82 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	394 (<BG)	3,760	512 [c]	512 [c]	No	--
Molybdenum [e]	0.448	400	8	-- [f]	No	--
Nickel	19.0 (<BG)	1,600	19.1 [c]	27.4	No	--
Selenium	0.337 (<BG)	400	5	1	No	--
Vanadium	48.1 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	49.0 (<BG)	24,000	480	67.8 [c]	No	--
TPH – motor oil	8.17	200	200	200	No	--
Acenaphthene	0.0248	4,800	96	129	No	--
Acenaphthylene	0.0821	4,800	96	129	No	--
Anthracene	0.00203	24,000	240	1,920	No	--
Fluoranthene	0.00514	3,200	64	18.0	No	--
Fluorene	0.0345	3,200	64	260	No	--
Napthalene	0.0207	1,600	16.0	988	No	--
Phenanthrene [i]	0.00524	24,000	240	1,920	No	--

Table 6. Comparison of Statistical Contaminant Concentrations to Remedial Action Goals for the 600-202 Small Excavation Verification Sampling Data. (2 Pages)

COPC	Statistical Result [b] (mg/kg)	Remedial Action Goals [a] (mg/kg)			Does the Statistical Data Set Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Pyrene	0.00514	2,400	48	192	No	--

[a] RAGs obtained from the RDR/RAWP (DOE-RL 2009) unless otherwise noted.
[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Appendix B.
[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement Project Managers as discussed in Section 2.1.2.1 of the RDR/RAWP (DOE-RL 2009).
[d] Carcinogenic cleanup level calculated based on the inhalation exposure pathway per WAC 173-340-750(3), 1996 (Method B for air quality) and an airborne particulate mass loading rate of 0.0001 g/m^3 (*Hanford Guidance for Radiological Cleanup* [WDOH 1997]).
[e] No Hanford Site-specific or Washington State background value available.
[f] No parameters (bioconcentration factors or AWQC values) are available from the Cleanup Levels and Risk Calculations Database (Ecology 2010) or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], 1996 [Method B for surface waters]).
[g] Hanford Site-specific background value is not available; it was not evaluated during background study. Value used is from *Natural Background Soil Metals Concentrations in Washington State* (Ecology 1994).
[h] Based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009), the residual concentrations of chromium are not expected to migrate vertically in 1,000 years (based on the distribution coefficient of chromium of 200 mL/g). The vadose zone soil underlying the waste site excavation is approximately 3.1 m (10.2 ft) thick. Therefore, residual concentrations of chromium are predicted to be protective of groundwater and the Columbia River.
[i] Toxicity data for this chemical are not available. Cleanup levels are based on surrogate chemicals: Contaminant: phenanthrene, surrogate: anthracene.

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

Table 7. Comparison of Statistical Contaminant Concentrations to Remedial Action Goals for the 600-202 Staging Pile Area Footprint Verification Sampling Data. (3 Pages)

COPC	Statistical Result [b] (mg/kg)	Remedial Action Goals [a] (mg/kg)			Does the Statistical Data Set Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Antimony	1.74 (<BG)	32	5 [c]	5 [c]	No	--
Arsenic	4.94 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	108 (<BG)	5,600	200	400	No	--
Beryllium	0.242 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Boron [e]	5.72	7,200	320	-- [f]	No	--
Cadmium [g]	0.276 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	15.0 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--

Table 7. Comparison of Statistical Contaminant Concentrations to Remedial Action Goals for the 600-202 Staging Pile Area Footprint Verification Sampling Data. (3 Pages)

COPC	Statistical Result [b] (mg/kg)	Remedial Action Goals [a] (mg/kg)			Does the Statistical Data Set Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Cobalt	7.03 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	28.9	2,960	59.2	22.0 [c]	Yes	Yes [h]
Hexavalent chromium [e]	0.26	2.1 [d]	4.8	2	No	--
Lead	38.3	353	10.2 [c]	10.2 [c]	Yes	Yes [h]
Manganese	350 (<BG)	3,760	512 [c]	512 [c]	No	--
Molybdenum [e]	0.919	400	8	-- [f]	No	--
Nickel	12.7 (<BG)	1,600	19.1 [c]	27.4	No	--
Silver	0.275 (<BG)	400	8	0.73 [c]	No	--
Vanadium	55.6 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	122	24,000	480	67.8 [c]	Yes	Yes [h]
TPH – motor oil	119	200	200	200	No	--
TPH – diesel range	11.5	200	200	200	No	--
Acenaphthene	0.0539	4,800	96	129	No	--
Acenapthylene	0.0382	4,800	96	129	No	--
Anthracene	0.00364	24,000	240	1,920	No	--
Benzo(a)-anthracene	0.0201	1.37	0.015 [i]	0.015 [i]	Yes	Yes [h]
Benzo(a)pyrene	0.0363	0.137	0.015 [i]	0.015 [i]	Yes	Yes [h]
Benzo(b)fluor-anthene	0.0340	1.37	0.015 [i]	0.015 [i]	Yes	Yes [h]
Benzo(ghi)-perylene [j]	0.0528	2,400	48	192	No	--
Benzo(k)fluor-anthene	0.0165	1.37	0.015 [i]	0.015 [i]	Yes	Yes [h]
Chrysene	0.0481	13.7	0.12	0.1 [c]	No	--
Dibenz[a,h]-anthracene	0.0168	1.37	0.03 [i]	0.03 [i]	No	--
Fluoranthene	0.198	3,200	64	18.0	No	--
Fluorene	0.00597	3,200	64	260	No	--
Napthalene	0.0131	1,600	16.0	988	No	--
Phenanthrene [j]	0.0542	24,000	240	1,920	No	--

Table 7. Comparison of Statistical Contaminant Concentrations to Remedial Action Goals for the 600-202 Staging Pile Area Footprint Verification Sampling Data. (3 Pages)

COPC	Statistical Result [b] (mg/kg)	Remedial Action Goals [a] (mg/kg)			Does the Statistical Data Set Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Pyrene	1.88	2,400	48	192	No	--
Aldrin	0.00600	0.0588	0.00165 [i]	0.00165 [i]	Yes	Yes [h]
4,4'-DDD	0.00265	4.17	0.0365	0.0033 [i]	No	--
4,4'-DDE	0.00204	2.94	0.0257	0.0033 [i]	No	--
4,4'-DDT	0.00401	2.94	0.0257	0.0033 [i]	Yes	Yes [h]
Endrin	0.00224	24	0.2	0.039	No	--
Endrin aldehyde	0.00197	24	0.2	0.039	No	--
Endrin ketone	0.00141	24	0.2	0.039	No	--
Methoxychlor	0.00161	400	4	1.67	No	--

[a] RAGs obtained from the RDR/RAWP (DOE-RL 2009) unless otherwise noted.
[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Appendix B.
[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement Project Managers as discussed in Section 2.1.2.1 of the RDR/RAWP (DOE-RL 2009).
[d] Carcinogenic cleanup level calculated based on the inhalation exposure pathway per WAC 173-340-750(3), 1996 (Method B for air quality) and an airborne particulate mass loading rate of 0.0001 g/m^3 (*Hanford Guidance for Radiological Cleanup* [WDOH 1997]).
[e] No Hanford Site-specific or Washington State background value available.
[f] No parameters (bioconcentration factors or AWQC values) are available from the Cleanup Levels and Risk Calculations Database (Ecology 2010) or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], 1996 [Method B for surface waters]).
[g] Hanford Site-specific background value is not available; it was not evaluated during background study. Value used is from *Natural Background Soil Metals Concentrations in Washington State* (Ecology 1994).
[h] Based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009), the residual concentrations of copper, lead, zinc, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, aldrin, and 4,4'-DDT are not expected to migrate more than 3 m (10 ft) vertically in 1,000 years (based on the contaminant with the lowest distribution coefficient, copper, with a distribution coefficient value of 22 mL/g). The vadose zone soil underlying the staging pile area footprint is approximately 7.9 m (25.9 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). The cited RDLs are based on EPA-approved analytical methods that may not be available for rapid turnaround analyses. Prior notification and concurrence with the laboratory may be necessary to analyze to meet this RDL. Actual detection limits may differ from any RDL.
[j] Toxicity data for this chemical are not available. Cleanup levels are based on surrogate chemicals: Contaminant: benzo(ghi)perylene, surrogate: pyrene; phenanthrene, surrogate: anthracene.

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

Table 8. Comparison of Maximum Contaminant Concentrations to Remedial Action Goals for the 600-202 Focused Samples Verification Sampling Data. (2 Pages)

COPC	Maximum Result (mg/kg)	Remedial Action Goals [a] (mg/kg)			Does the Statistical Data Set Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Antimony	0.735 (<BG)	32	5 [b]	5 [b]	No	--
Arsenic	10.2	20 [b]	20 [b]	20 [b]	No	--
Barium	201	5,600	200	400	Yes	Yes [c]
Beryllium	0.376 (<BG)	10.4 [d]	1.51 [b]	1.51 [b]	No	--
Boron [e]	13.0	7,200	320	-- [f]	No	--
Cadmium [g]	1.29	13.9 [d]	0.81 [b]	0.81 [b]	Yes	Yes [c]
Chromium (total)	21.9	80,000	18.5 [b]	18.5 [b]	Yes	Yes [c]
Cobalt	6.62 (<BG)	24	15.7 [b]	-- [f]	No	--
Copper	87.9	2,960	59.2	22.0 [b]	Yes	Yes [c]
Lead	278	353	10.2 [b]	10.2 [b]	Yes	Yes [c]
Manganese	358 (<BG)	3,760	512 [b]	512 [b]	No	--
Molybdenum [e]	1.17	400	8	-- [f]	No	--
Nickel	20.5	1,600	19.1 [b]	27.4	Yes	Yes [c]
Vanadium	50.3 (<BG)	560	85.1 [b]	-- [f]	No	--
Zinc	403	24,000	480	67.8 [b]	Yes	Yes [c]
TPH – motor oil	104	200	200	200	No	--
Acenaphthene	0.0139	4,800	96	129	No	--
Acenapthylene	0.132	4,800	96	129	No	--
Anthracene	0.0114	24,000	240	1,920	No	--
Benzo(a)-anthracene	0.0173	1.37	0.015 [h]	0.015 [h]	Yes	Yes [c]
Benzo(a)pyrene	0.00122	0.137	0.015 [h]	0.015 [h]	No	--
Benzo(b)fluor-anthene	0.0156	1.37	0.015 [h]	0.015 [h]	Yes	Yes [c]
Benzo(ghi)-perylene [i]	0.00133	2,400	48	192	No	--
Chrysene	0.00245	13.7	0.12	0.1 [c]	No	--
Fluoranthene	0.0610	3,200	64	18.0	No	--
Fluorene	0.0147	3,200	64	260	No	--
Indeno(1,2,3-cd)pyrene	0.0825	1.37	0.33 [h]	0.33 [h]	No	--

Table 8. Comparison of Maximum Contaminant Concentrations to Remedial Action Goals for the 600-202 Focused Samples Verification Sampling Data. (2 Pages)

COPC	Maximum Result (mg/kg)	Remedial Action Goals [a] (mg/kg)			Does the Statistical Data Set Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Napthalene	0.0265	1,600	16.0	988	No	--
Phenanthrene [i]	0.0535	24,000	240	1,920	No	--
Pyrene	0.00683	2,400	48	192	No	--
Alpha-BHC	0.00202	0.159	0.00165 [h]	0.00165 [h]	Yes	Yes [j]
Beta-BHC	0.0145	0.556	0.00486	0.00554	Yes	Yes [j]
Endosulfan I	0.00299	480	9.6	0.0112	No	--

[a] RAGs obtained from the RDR/RAWP (DOE-RL 2009) unless otherwise noted.

[b] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement Project Managers as discussed in Section 2.1.2.1 of the RDR/RAWP (DOE-RL 2009).

[c] Based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009), the residual concentrations of barium, cadmium, chromium, copper, lead, nickel, zinc, benzo(a)anthracene, and benzo(b)fluoranthene are not expected to migrate more than 3 m (10 ft) vertically in 1,000 years (based on the contaminant with the lowest distribution coefficient, copper, with a distribution coefficient value of 22 mL/g). The vadose zone soil underlying the waste site excavation is approximately 3.1 m (10.2 ft) thick. Therefore, residual concentrations of these constituents are predicted to be protective of groundwater and the Columbia River.

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

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

[f] No parameters (bioconcentration factors or AWQC values) are available from the Cleanup Levels and Risk Calculations Database (Ecology 2010) or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], 1996 [Method B for surface waters]).

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

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

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

[j] Based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009) and the evaluation of dilution-attenuation in the saturated zone using the formulas from the EPA *Soil Screening Guidance: User's Guide* (EPA 1996), residual soil concentrations of alpha- and beta-BHC are predicted to be protective of groundwater and the Columbia River for 1,000 years (Appendix D).

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

DATA EVALUATION

This section demonstrates that contaminant concentrations at the 600-202 waste site achieve the applicable RAGs developed to support unrestricted land use at the 100 Area as established in the Remaining Sites ROD (EPA 1999) and documented in the RDR/RAWP (DOE-RL 2009). Tables 5 through 8 compare the cleanup verification sample values to the applicable soil RAGs for direct exposure, protection of groundwater, and protection of the Columbia River.

Nonradionuclide Direct Contact Hazard Quotient and Carcinogenic Risk RAGs Attained

Calculation of the 600-202 waste site direct contact hazard quotients and carcinogenic risk is presented in Appendix C. Nonradionuclide risk requirements include an individual hazard quotient of less than 1.0, a cumulative hazard quotient of less than 1.0, an individual contaminant carcinogenic risk of less than 1×10^{-6}, and a cumulative carcinogenic risk of less than 1×10^{-5}. For the 600-202 waste site, these risk values were not calculated for constituents that were either not detected or were detected at concentrations below Hanford Site or Washington State background levels. All individual hazard quotients for noncarcinogenic constituents were less than 1.0. The cumulative hazard quotient for those noncarcinogenic constituents above background or detected levels is 1.3×10^{-1}. The total carcinogenic risk value is 7.5×10^{-7}, which is less than the cumulative carcinogenic risk criteria of 1×10^{-5}.

Nonradionuclide Soil RAGs for Groundwater and River Protection Attained

Based on the evaluation of the nonradionuclide groundwater and river protection RAGs shown in Tables 5 through 8, the residual concentrations of the nonradionuclide contaminants are protective of groundwater and the Columbia River. All cleanup verification data values pass in direct comparison to the applicable RAGs, with the exception of barium, cadmium, chromium, copper, lead, nickel, zinc, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and aldrin. However, based on RESRAD modeling discussed in Appendix C of the RDR/RAWP (DOE-RL 2009), the residual concentrations of these constituents are not expected to migrate more than 3 m (10 ft) vertically in 1,000 years (based on the contaminant with the lowest distribution coefficient (K_d), copper, with a K_d value of 22 mL/g). The vadose zone underlying the soil below the site is approximately 3.1 m (10.2 ft) thick. Therefore, residual concentrations of these constituents are predicted to be protective of groundwater and the Columbia River.

At the 600-202 waste site, pesticides were detected in confirmatory samples collected from area 1. As a result, pesticide analysis was performed across the entire waste site during verification sampling as a conservative measure, including the focused sample location in area 5, which was not remediated. Because the sampling in area 5 was intended to verify the absence of residual contamination associated with the stored lead battery, pesticides were not a COPC for this location. As a result of the pesticide analysis in area 5, alpha- and beta-BHC were detected above the river protection criteria. Although pesticides were not a COPC for area 5, a site-specific RESRAD calculation (Appendix D) was performed to further show that alpha- and beta-BHC meet the RAGs for the 600-202 waste site.

Three-Part Test for Nonradionuclides

When using a statistical sampling approach, a RAG requirement for nonradionuclides is the *Washington Administrative Code* (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 WAC 173-340 three-part test for the 600-202 waste site statistical data is included in the 95% UCL calculation (Appendix C). The results of this evaluation indicate that all residual COPC concentrations pass the three-part test in comparison to applicable RAGs.

DATA QUALITY ASSESSMENT

A data quality assessment (DQA) was performed to compare the verification sampling approach (WCH 2010b), the field logbooks (WCH 2010a, 2011), and resulting analytical data with the sampling and data quality requirements specified by the project objectives and performance specifications.

The DQA for the 600-202 waste site established that the data are of the right type, quality, and quantity to support site verification decisions within specified error tolerances. The evaluation verified that the sample design was sufficient for the purpose of clean site verification. The cleanup verification sample analytical data are stored in the ENRE project-specific database for data evaluation prior to archival in the HEIS and are provided as an attachment to the 95% UCL calculation in Appendix C. The detailed DQA is presented in Appendix E.

SUMMARY FOR INTERIM CLOSURE

The 600-202 waste site has been evaluated in accordance with the Remaining Sites ROD (EPA 1999) and the RDR/RAWP (DOE-RL 2009). Verification sampling was performed, and the analytical results indicate that the residual concentrations of COPCs at this site meet the RAOs for direct exposure, groundwater protection, and river protection. In accordance with this evaluation, the verification sampling results support a reclassification of the 600-202 waste site to Interim Closed Out. Residual waste site contamination originating from Hanford Site or Manhattan Project activities does not extend into the deep zone; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required.

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APPENDIX A

CONFIRMATORY, WASTE CHARACTERIZATION, AND IN-PROCESS SAMPLING RESULTS

Table A-1. 600-202 Confirmatory Sampling Data. (25 Pages)

Sample Location	HEIS Number	Sample Date	Aluminum			Antimony			Arsenic			Barium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Area 1, native soil	J02D89	01/19/05	7250		3.1	0.275	U	0.28	3.6		0.26	82.2	C	0.04
Area 3, native soil	J02DC8	01/20/05	8600		3.3	0.407		0.29	4		0.27	93.4	C	0.04
Area 2, native soil	J02DC9	01/20/05	6020		3	0.271	U	0.27	4.2		0.25	72.3	C	0.04
Area 4, native soil	J02DD0	01/20/05	9800		3.1	0.28	U	0.28	5.4		0.26	114	C	0.04
Area 4, west soil in contact with pipe/valve	J02DD1	01/24/05	5720		3.4	0.313	J	0.3	3		0.28	65.5	C	0.04
Area 4, east soil in contact with pipe/valve	J02DD2	01/24/05	5630		3.3	0.552	J	0.29	5.4		0.27	56.6	C	0.04
Area 5, native soil	J02DD3	01/24/05	8540		2.8	0.373	J	0.25	4.6		0.24	74.1	C	0.04
Area 6, native soil	J02DD4	01/24/05	9400		3.1	0.468	J	0.28	5.5		0.26	95	C	0.04
Area 1, gray stained soil	J02DB5	01/19/05	99300		19.2	1.72	U	1.7	4.2		1.6	132	C	0.25
Area 1, duplicate of J02DB5	J02DB6	01/19/05	109000		19.4	1.74	U	1.7	2.6		1.6	94.8	C	0.25
Area 1, orange stained soil	J02DB7	01/19/05	8440		17.8	1.6	U	1.6	5		1.5	133	C	0.23
Equipment blank	J02DB8	01/19/05	62.6		2.8	0.392		0.25	0.412		0.23	1.3	C	0.27
Area 2, suspected contaminated soil or debris	J02DB9	01/19/05	11900		20.3	1.82	U	1.8	7.7		1.7	1020	C	0.26
Area 3, suspected contaminated soil or debris	J02DC2	01/20/05	10900		18.9	10.6		1.7	14.2		1.6	696	C	0.24
Area 3, battery	J02DC3	01/20/05	99300		18.8	30.8		1.7	10.1		1.6	326	C	0.24
Area 4, suspected contaminated soil or debris	J02DC4	01/20/05	14700		71.1	6.36	U	6.4	5.9	U	5.9	172	C	0.91
Area 4, west pipes/valve scale	J02DC5	01/24/05	4380		16.6	1.49	U	1.5	14.8		1.4	53.2	C	0.21
Area 4, east pipes/valve scale	J02DC6	01/24/05	3910		17.8	1.59	U	1.6	15.3		1.5	57.9	C	0.23
Area 5, suspected contaminated soil or debris	J02DC7	01/24/05	7300		20.8	1.86	U	1.9	9.5		1.7	263	C	0.27
Equipment blank	J02DD9	01/19/05												
Area 1, gray stained soil	J02DF3	01/19/05												
Area 1, duplicate of J02DF3	J02DF4	01/19/05												
Area 1, orange stained soil	J02DF5	01/19/05												
Area 6, suspected contaminated soil or debris	J02FX0	01/24/05	14100		19.9	1.9		1.8	18.5		1.6	829	C	0.25

Table A-1. 600-202 Confirmatory Sampling Data. (25 Pages)

Sample Location	HEIS Number	Sample Date	Beryllium			Boron			Cadmium			Calcium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Area 1, native soil	J02D89	01/19/05	0.78		0.01	0.829		0.29	0.139		0.03	3380	C	2.7
Area 3, native soil	J02DC8	01/20/05	0.772		0.01	6.3		0.32	0.094		0.03	4020	C	2.9
Area 2, native soil	J02DC9	01/20/05	0.881		0.01	1.7		0.29	0.029	U	0.03	3620	C	2.7
Area 4, native soil	J02DD0	01/20/05	0.88		0.01	2.2		0.3	0.051		0.03	5300	C	2.8
Area 4, west soil in contact with pipe/valve	J02DD1	01/24/05	0.693		0.01	1.6		0.32	0.032	U	0.03	5020	C	3
Area 4, east soil in contact with pipe/valve	J02DD2	01/24/05	0.645		0.01	1.9		0.32	0.199		0.03	4800	C	2.9
Area 5, native soil	J02DD3	01/24/05	0.764		0.01	1.6		0.27	0.149		0.03	3720	C	2.5
Area 6, native soil	J02DD4	01/24/05	0.876		0.01	0.977		0.3	0.162		0.03	4310	C	2.8
Area 1, gray stained soil	J02DB5	01/19/05	0.535		0.06	25.8		1.8	1.8		0.18	6110	C	17.2
Area 1, duplicate of J02DB5	J02DB6	01/19/05	0.472		0.06	19.3		1.9	1.4		0.19	5220	C	17.3
Area 1, orange stained soil	J02DB7	01/19/05	0.519		0.06	2.3		1.7	0.336		0.17	32200	C	15.9
Equipment blank	J02DB8	01/19/05	0.014		0.01	0.475		0.27	0.027	U	0.03	21.7	C	2.5
Area 2, suspected contaminated soil or debris	J02DB9	01/19/05	0.968		0.06	141		1.9	0.585		0.19	31600	C	18.1
Area 3, suspected contaminated soil or debris	J02DC2	01/20/05	0.61		0.06	45.4		1.8	4		0.18	40100	C	16.8
Area 3, battery	J02DC3	01/20/05	0.324		0.06	23.6		1.8	9.5		0.18	14500	C	16.7
Area 4, suspected contaminated soil or debris	J02DC4	01/20/05	0.659		0.23	6.81	U	6.8	0.681	U	0.68	10700	C	63.4
Area 4, west pipes/valve scale	J02DC5	01/24/05	0.334		0.05	4		1.6	1.4		0.16	4510	C	14.8
Area 4, east pipes/valve scale	J02DC6	01/24/05	0.199		0.06	7		1.7	0.341		0.17	5430	C	15.9
Area 5, suspected contaminated soil or debris	J02DC7	01/24/05	0.446		0.07	15.6		2	0.991		0.2	41600	C	18.6
Equipment blank	J02DD9	01/19/05												
Area 1, gray stained soil	J02DF3	01/19/05												
Area 1, duplicate of J02DF3	J02DF4	01/19/05												
Area 1, orange stained soil	J02DF5	01/19/05												
Area 6, suspected contaminated soil or debris	J02FX0	01/24/05	1.2		0.06	85.1		1.9	2		0.19	33400	C	17.7

Table A-1. 600-202 Confirmatory Sampling Data. (25 Pages)

Sample Location	HEIS Number	Sample Date	Chromium			Cobalt			Copper			Hexavalent Chromium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Area 1, native soil	J02D89	01/19/05	12.4		0.08	6.5		0.07	16.3		0.14	1.78		0.22
Area 3, native soil	J02DC8	01/20/05	19.9		0.08	7.5		0.07	15.5		0.15			
Area 2, native soil	J02DC9	01/20/05	11.6		0.08	7		0.07	12.6		0.14			
Area 4, native soil	J02DD0	01/20/05	21.2		0.08	8.8		0.07	19.6		0.14			
Area 4, west soil in contact with pipe/valve	J02DD1	01/24/05	10		0.09	5.2		0.07	9.8		0.15			
Area 4, east soil in contact with pipe/valve	J02DD2	01/24/05	11.9		0.08	5.7		0.07	12.2		0.15			
Area 5, native soil	J02DD3	01/24/05	20		0.07	6.9		0.06	14.5		0.13			
Area 6, native soil	J02DD4	01/24/05	20.4		0.08	8.3		0.07	19		0.14			
Area 1, gray stained soil	J02DB5	01/19/05	69.9	C	0.49	6.2		0.43	5240		0.86			
Area 1, duplicate of J02DB5	J02DB6	01/19/05	84.4	C	0.5	6.3		0.43	6540		0.87			
Area 1, orange stained soil	J02DB7	01/19/05	18.2	C	0.46	6.6		0.4	20.6		0.8			
Equipment Blank	J02DB8	01/19/05	0.093	C	0.07	0.096		0.06	0.977		0.12			
Area 2, suspected contaminated soil or debris	J02DB9	01/19/05	11.4	C	0.52	4.6		0.45	62.3		0.91			
Area 3, suspected contaminated soil or debris	J02DC2	01/20/05	51	C	0.48	8.9		0.42	157		0.85			
Area 3, battery	J02DC3	01/20/05	36.6	C	0.49	5.8		0.42	8770		0.84			
Area 4, suspected contaminated soil or debris	J02DC4	01/20/05	16.1	C	1.8	7.9		1.6	35.2		3.2			
Area 4, west pipes/valve scale	J02DC5	01/24/05	17.3	C	0.42	7.8		0.37	299		0.74			
Area 4, east pipes/valve scale	J02DC6	01/24/05	11.6	C	0.46	5.8		0.4	203		0.8			
Area 5, suspected contaminated soil or debris	J02DC7	01/24/05	27.7	C	0.53	6.4		0.47	66.8		0.93			
Equipment Blank	J02DD9	01/19/05										0.35	U	0.35
Area 1, gray stained soil	J02DF3	01/19/05										2.7		0.35
Area 1, duplicate of J02DF3	J02DF4	01/19/05										3.49		0.35
Area 1, orange stained soil	J02DF5	01/19/05										1.43		0.35
Area 6, suspected contaminated soil or debris	J02FX0	01/24/05	45.7	C	0.51	12.5		0.44	598		0.89			

Table A-1. 600-202 Confirmatory Sampling Data. (25 Pages)

Sample Location	HEIS Number	Sample Date	Iron			Lead			Magnesium			Manganese		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Area 1, native soil	J02D89	01/19/05	20300	C	2.7	4.4		0.22	4740	C	0.68	304	C	0.03
Area 3, native soil	J02DC8	01/20/05	22900	C	2.9	8.4		0.23	5910	C	0.73	364	C	0.03
Area 2, native soil	J02DC9	01/20/05	23200	C	2.7	5.1		0.21	4550	C	0.67	332	C	0.03
Area 4, native soil	J02DD0	01/20/05	25600	C	2.8	7.4		0.22	6300	C	0.69	379	C	0.03
Area 4, west soil in contact with pipe/valve	J02DD1	01/24/05	18800	C	3	4.9		0.24	4180	C	0.74	267	C	0.03
Area 4, east soil in contact with pipe/valve	J02DD2	01/24/05	54400	C	5.9	5.5		0.23	4010	C	0.73	399	C	0.03
Area 5, native soil	J02DD3	01/24/05	19700	C	2.5	5.3		0.2	5460	C	0.63	324	C	0.03
Area 6, native soil	J02DD4	01/24/05	22100	C	2.8	5.9		0.22	5680	C	0.69	411	C	0.03
Area 1, gray stained soil	J02DB5	01/19/05	13100		17.2	200		1.4	3500	C	4.2	337		0.18
Area 1, duplicate of J02DB5	J02DB6	01/19/05	12700		11.7	257		1.4	3250	C	4.3	351		0.19
Area 1, orange stained soil	J02DB7	01/19/05	17400		10.8	64.4		1.3	4560	C	3.9	275		0.17
Equipment blank	J02DB8	01/19/05	153		1.7	0.319		0.19	8.4	C	0.61	3.3		0.03
Area 2, suspected contaminated soil or debris	J02DB9	01/19/05	20700		12.3	25.3		1.4	6900	C	4.5	428		0.19
Area 3, suspected contaminated soil or debris	J02DC2	01/20/05	35100		16.8	1230		1.3	7040	C	4.2	529		0.18
Area 3, battery	J02DC3	01/20/05	34900		16.7	1090		1.3	4510	C	4.1	463		0.18
Area 4, suspected contaminated soil or debris	J02DC4	01/20/05	21500		63.4	5.3		5	5380	C	15.7	340		0.68
Area 4, west pipes/valve scale	J02DC5	01/24/05	142000		14.8	18.2		1.2	3730	C	3.7	752		0.16
Area 4, east pipes/valve scale	J02DC6	01/24/05	178000		15.9	15.9		1.3	5030	C	3.9	837		0.17
Area 5, suspected contaminated soil or debris	J02DC7	01/24/05	34800		18.6	330		1.5	4830	C	4.6	379		0.2
Equipment blank	J02DD9	01/19/05												
Area 1, gray stained soil	J02DF3	01/19/05												
Area 1, duplicate of J02DF3	J02DF4	01/19/05												
Area 1, orange stained soil	J02DF5	01/19/05												
Area 6, suspected contaminated soil or debris	J02FX0	01/24/05	64000		17.7	245		1.4	5830	C	4.4	624		0.19

Table A-1. 600-202 Confirmatory Sampling Data. (25 Pages)

Sample Location	HEIS Number	Sample Date	Mercury			Molybdenum			Nickel			Potassium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Area 1, native soil	J02D89	01/19/05	0.017	U	0.02	0.326		0.23	13.4		0.12	1120	C	1.9
Area 3, native soil	J02DC8	01/20/05	0.015	U	0.01	0.56		0.24	18.1		0.13	1160	C	2
Area 2, native soil	J02DC9	01/20/05	0.015	U	0.02	0.438		0.22	12.4		0.12	1270	C	1.8
Area 4, native soil	J02DD0	01/20/05	0.017	U	0.02	0.585		0.23	22.9		0.12	1460	C	1.9
Area 4, west soil in contact with pipe/valve	J02DD1	01/24/05	0.017	U	0.02	0.524		0.25	10.1		0.13	1820	C	2
Area 4, east soil in contact with pipe/valve	J02DD2	01/24/05	0.019	U	0.02	0.883		0.24	11		0.13	2200	C	2
Area 5, native soil	J02DD3	01/24/05	0.017	U	0.02	0.408		0.21	20.6		0.11	970	C	1.7
Area 6, native soil	J02DD4	01/24/05	0.017	U	0.02	0.506		0.23	23.7		0.12	1240	C	1.9
Area 1, gray stained soil	J02DB5	01/19/05	0.018		0.02	1.41	U	1.4	262		0.74	1440	C	11.6
Area 1, duplicate of J02DB5	J02DB6	01/19/05	0.038		0.02	1.43	U	1.4	327		0.74	1120	C	11.7
Area 1, orange stained soil	J02DB7	01/19/05	0.014	U	0.01	1.31	U	1.3	13.7		0.68	2440	C	10.8
Equipment Blank	J02DB8	01/19/05	0.015	U	0.01	0.204		0.2	0.106	U	0.11	60.4	C	1.7
Area 2, suspected contaminated soil or debris	J02DB9	01/19/05	0.018	U	0.02	1.49	U	1.5	15.9		0.78	1250	C	12.3
Area 3, suspected contaminated soil or debris	J02DC2	01/20/05	0.09		0.02	2.7		1.4	33.7		0.72	3680	C	11.4
Area 3, battery	J02DC3	01/20/05	0.075		0.02	2.9		1.4	118		0.72	2230	C	11.3
Area 4, suspected contaminated soil or debris	J02DC4	01/20/05	0.066	U	0.07	5.22	U	5.2	18.6		2.7	3570	C	42.9
Area 4, west pipes/valve scale	J02DC5	01/24/05	0.039		0.02	2		1.2	16.8		0.64	4210	C	10
Area 4, east pipes/valve scale	J02DC6	01/24/05	0.075		0.02	1.9		1.3	13.7		0.68	6450	C	10.8
Area 5, suspected contaminated soil or debris	J02DC7	01/24/05	0.06		0.02	1.7		1.5	17.9		0.8	3210	C	12.6
Equipment Blank	J02DD9	01/19/05												
Area 1, gray stained soil	J02DF3	01/19/05												
Area 1, duplicate of J02DF3	J02DF4	01/19/05												
Area 1, orange stained soil	J02DF5	01/19/05												
Area 6, suspected contaminated soil or debris	J02FX0	01/24/05	0.11		0.02	4.7		1.5	65.5		0.76	1750	C	12

Table A-1. 600-202 Confirmatory Sampling Data. (26 Pages)

Sample Location	HEIS Number	Sample Date	Selenium			Silicon			Silver			Sodium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Area 1, native soil	J02D89	01/19/05	0.364	U	0.36	211		1.4	0.098	U	0.1	376	C	0.5
Area 3, native soil	J02DC8	01/20/05	0.593		0.39	455		1.5	0.105	U	0.11	1460	C	0.54
Area 2, native soil	J02DC9	01/20/05	0.359	U	0.36	518		1.4	0.097	U	0.1	244	C	0.49
Area 4, native soil	J02DD0	01/20/05	0.502		0.37	655		1.4	0.1	U	0.1	681	C	0.51
Area 4, west soil in contact with pipe/valve	J02DD1	01/24/05	0.396	U	0.4	414	J	1.5	0.107	U	0.11	141	C	0.55
Area 4, east soil in contact with pipe/valve	J02DD2	01/24/05	0.857		0.39	395	J	1.5	0.105	U	0.11	135	C	0.54
Area 5, native soil	J02DD3	01/24/05	0.336	U	0.34	349	J	1.3	0.091	U	0.09	476	C	0.46
Area 6, native soil	J02DD4	01/24/05	0.371	U	0.37	912	J	1.4	0.1	U	0.1	204	C	0.51
Area 1, gray stained soil	J02DB5	01/19/05	2.28	U	2.3	844		8.6	0.959		0.62	336	C	3.1
Area 1, duplicate of J02DB5	J02DB6	01/19/05	2.3	U	2.3	924		8.7	1.3		0.62	340	C	3.2
Area 1, orange stained soil	J02DB7	01/19/05	2.11	U	2.1	362		8	0.57	U	0.57	561	C	2.9
Equipment blank	J02DB8	01/19/05	0.327	U	0.33	38		1.2	0.089	U	0.09	7.9	C	0.45
Area 2, suspected contaminated soil or debris	J02DB9	01/19/05	2.4	U	2.4	930		9.1	0.65	U	0.65	557	C	3.3
Area 3, suspected contaminated soil or debris	J02DC2	01/20/05	2.23	U	2.2	758		8.5	4.9		0.6	4360	C	3.1
Area 3, battery	J02DC3	01/20/05	2.22	U	2.2	870		8.4	3.9		0.6	4560	C	3.1
Area 4, suspected contaminated soil or debris	J02DC4	01/20/05	8.4	U	8.4	1350		31.8	2.27	U	2.3	2050	C	11.6
Area 4, west pipes/valve scale	J02DC5	01/24/05	1.96	U	2	390		7.4	0.53	U	0.53	338	C	2.7
Area 4, east pipes/valve scale	J02DC6	01/24/05	2.1	U	2.1	375		8	0.569	U	0.57	383	C	2.9
Area 5, suspected contaminated soil or debris	J02DC7	01/24/05	2.46	U	2.5	580		9.3	0.665	U	0.67	1260	C	3.4
Equipment blank	J02DD9	01/19/05												
Area 1, gray stained soil	J02DF3	01/19/05												
Area 1, duplicate of J02DF3	J02DF4	01/19/05												
Area 1, orange stained soil	J02DF5	01/19/05												
Area 6, suspected contaminated soil or debris	J02FX0	01/24/05	2.35	U	2.3	681		8.9	1.2		0.63	791	C	3.2

Table A-1. 600-202 Confirmatory Sampling Data. (25 Pages)

Sample Location	HEIS Number	Sample Date	Sulfate			Vanadium			Zinc			TPH		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Area 1, native soil	J02D89	01/19/05	95.9		11	41.9		0.07	39.7		0.13	36.3	U	36
Area 3, native soil	J02DC8	01/20/05	711		55	44.9		0.07	50.9		0.14	36.8	U	37
Area 2, native soil	J02DC9	01/20/05	189		11	58.1		0.07	44.4		0.13	35.3	U	35
Area 4, native soil	J02DD0	01/20/05	568		22	53.4		0.07	58.1		0.13	36	U	36
Area 4, west soil in contact with pipe/valve	J02DD1	01/24/05				34.1		0.07	36.5		0.14			
Area 4, east soil in contact with pipe/valve	J02DD2	01/24/05				32.2		0.07	35.1		0.14			
Area 5, native soil	J02DD3	01/24/05	248		11	39.9		0.06	41.4		0.12	36.7	U	37
Area 6, native soil	J02DD4	01/24/05	307		10	45.3		0.07	45.7		0.13	34.6	U	35
Area 1, gray stained soil	J02DB5	01/19/05	122		11	29.4		0.43	454		0.8	46.8		36
Area 1, duplicate of J02DB5	J02DB6	01/19/05	140		11	28.2		0.43	526		0.81	47.4		36
Area 1, orange stained soil	J02DB7	01/19/05	6760		1000	35.1		0.4	107		0.74	34.7	U	35
Equipment blank	J02DB8	01/19/05	3.14		1	0.073		0.06	0.886		0.12			
Area 2, suspected contaminated soil or debris	J02DB9	01/19/05	659		23	24.6		0.45	312		0.84	37.5	U	38
Area 3, suspected contaminated soil or debris	J02DC2	01/20/05	10400		1200	33.1		0.42	2430		0.78	64.3		37
Area 3, battery	J02DC3	01/20/05	3340		560	23.1		0.42	4700		0.78	67		37
Area 4, suspected contaminated soil or debris	J02DC4	01/20/05	710		41	42.3		1.6	46.4		3	140	U	140
Area 4, west pipes/valve scale	J02DC5	01/24/05				26.7		0.37	332		0.69			
Area 4, east pipes/valve scale	J02DC6	01/24/05	2800		210	21.7		0.4	264		0.74	307		72
Area 5, suspected contaminated soil or debris	J02DC7	01/24/05	8100		1200	31		0.47	508		0.87	89.6		40
Equipment blank	J02DD9	01/19/05												
Area 1, gray stained soil	J02DF3	01/19/05												
Area 1, duplicate of J02DF3	J02DF4	01/19/05												
Area 1, orange stained soil	J02DF5	01/19/05												
Area 6, suspected contaminated soil or debris	J02FX0	01/24/05	6460		1200	53.7		0.44	911		0.82	38.2	U	38

Table A-1. 600-202 Confirmatory Sampling Data. (25 Pages)

Constituent	J02D89, Area 1 Native Soil 01/19/05			J02DB5, Area 1 Gray Soil 01/19/05			J02DB6, Area 1 Duplicate of J02DB5 01/19/05			J02DB7, Area 1 Orange Soil 01/19/05		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Polycyclic Aromatic Hydrocarbons												
Acenaphthene	55.1	U	55.1	54.8	U	54.8	54.8	U	54.8	52.2	U	52.2
Acenaphthylene	55.1	U	55.1	54.8	U	54.8	54.8	U	54.8	52.2	U	52.2
Anthracene	5.51	U	5.51	18.1		5.48	28.8		5.48	5.22	U	5.22
Benzo(a)anthracene	5.51	U	5.51	576		5.48	756		5.48	5.22	U	5.22
Benzo(a)pyrene	5.51	U	5.51	858		5.48	882		5.48	5.22	U	5.22
Benzo(b)fluoranthene	6.86		5.51	2079		5.48	2172		5.48	5.22	U	5.22
Benzo(ghi)perylene	5.51	U	5.51	788		5.48	758		5.48	5.22	U	5.22
Benzo(k)fluoranthene	5.51	U	5.51	516		5.48	556		5.48	5.22	U	5.22
Chrysene	5.51	U	5.51	498		5.48	1175		5.48	5.22	U	5.22
Dibenz[a,h]anthracene	5.51	U	5.51	76.5		5.48	77.6		5.48	5.22	U	5.22
Fluoranthene	11	U	11	510		11.0	686		10.96	10.4	U	10.4
Fluorene	5.51	U	5.51	636		5.48	376		5.48	5.22	U	5.22
Indeno(1,2,3-cd)pyrene	5.51	U	5.51	1184		5.48	1100		5.48	5.22	U	5.22
Naphthalene	55.1	U	55.1	54.8	U	54.8	54.8	U	54.8	52.2	U	52.2
Phenanthrene	5.51	U	5.51	230		5.48	321		5.48	5.22	U	5.22
Pyrene	11	U	11	824		10.96	1137		10.96	10.4	U	10.4
Polychlorinated Biphenyls												
Aroclor-1016	15	U	15	37	U	37	37	U	37	35	U	35
Aroclor-1221	15	U	15	37	U	37	37	U	37	35	U	35
Aroclor-1232	15	U	15	37	U	37	37	U	37	35	U	35
Aroclor-1242	15	U	15	37	U	37	37	U	37	35	U	35
Aroclor-1248	15	U	15	37	U	37	37	U	37	35	U	35
Aroclor-1254	15	U	15	37	U	37	37	U	37	35	U	35
Aroclor-1260	15	U	15	37	U	37	37	U	37	35	U	35
Pesticides												
Aldrin	1.8	U	1.8	18	U	18	3.55	J	18	1.7	U	1.7
Alpha-BHC	1.8	U	1.8	18	U	18	18	U	18	1.7	U	1.7
alpha-Chlordane	1.8	U	1.8	18	U	18	4.86	J	18	1.7	U	1.7
beta-1,2,3,4,5,6-Hexachlorocyclohexane	1.8	U	1.8	18	U	18	18	U	18	1.7	U	1.7
Delta-BHC	1.8	U	1.8	18	U	18	18	U	18	1.7	U	1.7
Dichlorodiphenyldichloroethane	3.7	U	3.7	37	U	37	13.6		37	3.5	U	3.5
Dichlorodiphenyldichloroethylene	3.7	U	3.7	167		37	149		37	3.5	U	3.5
Dichlorodiphenyltrichloroethane	3.7	U	3.7	235		37	145		37	3.5	U	3.5
Dieldrin	3.7	U	3.7	37	U	37	37	U	37	3.5	U	3.5
Endosulfan I	1.8	U	1.8	18	U	18	5.12	J	18	1.7	U	1.7
Endosulfan II	3.7	U	3.7	37	U	37	37	U	37	3.5	U	3.5
Endosulfan sulfate	3.7	U	3.7	37	U	37	8.41	J	37	3.5	U	3.5
Endrin	3.7	U	3.7	37	U	37	37	U	37	3.5	U	3.5
Endrin aldehyde	3.7	U	3.7	37	U	37	37	U	37	3.5	U	3.5

Table A-1. 600-202 Confirmatory Sampling Data. (25 Pages)

Constituent	J02D89, Area 1 Native Soil 01/19/05			J02DB5, Area 1 Gray Soil 01/19/05			J02DB6, Area 1 Duplicate of J02DB5 01/19/05			J02DB7, Area 1 Orange Soil 01/19/05		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Pesticides												
Endrin ketone	3.7	U	3.7	37	U	37	37	U	37	3.5	U	3.5
Gamma-BHC (Lindane)	1.8	U	1.8	18	U	18	18	U	18	1.7	U	1.7
gamma-Chlordane	1.8	U	1.8	18	U	18	18	U	18	1.7	U	1.7
Heptachlor	1.8	U	1.8	18	U	18	18	U	18	1.7	U	1.7
Heptachlor epoxide	1.8	U	1.8	18	U	18	18	U	18	1.7	U	1.7
Methoxychlor	18	U	18	180	U	180	180	U	180	17	U	17
Toxaphene	180	U	180	1800	U	1800	1800	U	1800	170	U	170
Semivolatile Organic Compounds												
1,2,4-Trichlorobenzene	370	U	370	370	U	370	370	U	370	350	U	350
1,2-Dichlorobenzene	370	U	370	370	U	370	370	U	370	350	U	350
1,3-Dichlorobenzene	370	U	370	370	U	370	370	U	370	350	U	350
1,4-Dichlorobenzene	370	U	370	370	U	370	370	U	370	350	U	350
2,4,5-Trichlorophenol	920	U	920	920	U	920	920	U	920	870	U	870
2,4,6-Trichlorophenol	370	U	370	370	U	370	370	U	370	350	U	350
2,4-Dichlorophenol	370	U	370	370	U	370	370	U	370	350	U	350
2,4-Dimethylphenol	370	U	370	370	U	370	370	U	370	350	U	350
2,4-Dinitrophenol	920	U	920	920	U	920	920	U	920	870	U	870
2,4-Dinitrotoluene	370	U	370	370	U	370	370	U	370	350	U	350
2,6-Dinitrotoluene	370	U	370	370	U	370	370	U	370	350	U	350
2-Chloronaphthalene	370	U	370	370	U	370	370	U	370	350	U	350
2-Chlorophenol	370	U	370	370	U	370	370	U	370	350	U	350
2-Methylnaphthalene	370	U	370	47.5	J	370	46.1	J	370	350	U	350
2-Methylphenol (cresol, o-)	370	U	370	370	U	370	370	U	370	350	U	350
2-Nitroaniline	920	U	920	920	U	920	920	U	920	870	U	870
2-Nitrophenol	370	U	370	370	U	370	370	U	370	350	U	350
3+4 Methylphenol (cresol, m+p)	370	U	370	370	U	370	370	U	370	350	U	350
3,3'-Dichlorobenzidine	370	U	370	370	U	370	370	U	370	350	U	350
3-Nitroaniline	920	U	920	920	U	920	920	U	920	870	U	870
4,6-Dinitro-2-methylphenol	920	U	920	920	U	920	920	U	920	870	U	870
4-Bromophenylphenyl ether	370	U	370	370	U	370	370	U	370	350	U	350
4-Chloro-3-methylphenol	370	U	370	370	U	370	370	U	370	350	U	350
4-Chloroaniline	370	U	370	370	U	370	370	U	370	350	U	350
4-Chlorophenylphenyl ether	370	U	370	370	U	370	370	U	370	350	U	350
4-Nitroaniline	920	U	920	336	J	370	128	J	370	870	U	870
4-Nitrophenol	920	U	920	920	U	920	920	U	920	870	U	870
Acenaphthene	370	U	370	370	U	370	370	U	370	350	U	350
Acenaphthylene	370	U	370	370	U	370	370	U	370	350	U	350
Anthracene	370	U	370	43.5	J	370	62.6	J	370	350	U	350
Benzo(a)anthracene	370	U	370	560		370	613		370	350	U	350

Table A-1. 600-202 Confirmatory Sampling Data. (25 Pages)

Constituent	J02D89, Area 1 Native Soil 01/19/05			J02DB5, Area 1 Gray Soil 01/19/05			J02DB6, Area 1 Duplicate of J02DB5 01/19/05			J02DB7, Area 1 Orange Soil 01/19/05		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Semivolatile Organic Compounds												
Benzo(a)pyrene	370	U	370	653		370	608		370	350	U	350
Benzo(b)fluoranthene	370	U	370	808		370	721		370	350	U	350
Benzo(ghi)perylene	370	U	370	438		370	376		370	350	U	350
Benzo(k)fluoranthene	370	U	370	936		370	904		370	350	U	350
Bis(2-chloro-1-methylethyl)ether	370	U	370	370	U	370	370	U	370	350	U	350
Bis(2-Chloroethoxy)methane	370	U	370	370	U	370	370	U	370	350	U	350
Bis(2-chloroethyl) ether	370	U	370	370	U	370	370	U	370	350	U	350
Bis(2-ethylhexyl) phthalate	47.748	JB	370	51.4	JB	370	55.7	JB	370	83.711	JB	350
Butylbenzylphthalate	370	U	370	21.9	J	370	370	U	370	52.792	J	350
Carbazole	370	U	370	33.4	J	370	41.5	J	370	350	U	350
Chrysene	370	U	370	703		370	727		370	350	U	350
Di-n-butylphthalate	23.681	J	370	61.3	J	370	37.6	J	370	54.34	J	350
Di-n-octylphthalate	370	U	370	370	U	370	370	U	370	350	U	350
Dibenz[a,h]anthracene	370	U	370	164	J	370	143	J	370	350	U	350
Dibenzofuran	370	U	370	370	U	370	370	U	370	350	U	350
Diethylphthalate	370	U	370	370	U	370	370	U	370	350	U	350
Dimethyl phthalate	370	U	370	370	U	370	370	U	370	350	U	350
Fluoranthene	370	U	370	473		370	637		370	350	U	350
Fluorene	370	U	370	370	U	370	370	U	370	350	U	350
Hexachlorobenzene	370	U	370	370	U	370	370	U	370	350	U	350
Hexachlorobutadiene	370	U	370	370	U	370	370	U	370	350	U	350
Hexachlorocyclopentadiene	370	U	370	370	U	370	370	U	370	350	U	350
Hexachloroethane	370	U	370	370	U	370	370	U	370	350	U	350
Indeno(1,2,3-cd)pyrene	370	U	370	463		370	406		370	350	U	350
Isophorone	370	U	370	370	U	370	370	U	370	350	U	350
N-Nitroso-di-n-dipropylamine	370	U	370	370	U	370	370	U	370	350	U	350
N-Nitrosodiphenylamine	370	U	370	370	U	370	370	U	370	350	U	350
Naphthalene	370	U	370	88.0	J	370	57.6	J	370	350	U	350
Nitrobenzene	370	U	370	370	U	370	370	U	370	350	U	350
Pentachlorophenol	920	U	920	920	U	920	920	U	920	870	U	870
Phenanthrene	370	U	370	147	J	370	270	J	270	350	U	350
Phenol	370	U	370	370	U	370	370	U	370	350	U	350
Pyrene	370	U	370	472		370	627		370	350	U	350

Table A-1. 600-202 Confirmatory Sampling Data. (25 Pages)

Constituent	J02DB8, Area 1 Equipment blank 01/19/05			J02DB9, Area 2 Suspected Contaminated Soil or Debris 01/19/05			J02DC2, Area 3 Suspected Contaminated Soil or Debris 01/20/05			J02DC3, Area 3 Battery 01/20/05		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Polycyclic Aromatic Hydrocarbons												
Acenaphthene				1655.81		56.3	57.9	U	57.9	55.5	U	55.5
Acenaphthylene				56.3	U	56.3	57.9	U	57.9	55.5	U	55.5
Anthracene				13.0		5.63	5.79	U	5.79	5.55	U	5.55
Benzo(a)anthracene				35.8		5.63	11.3		5.79	6.94		5.55
Benzo(a)pyrene				14.6		5.63	31.5		5.79	5.55	U	5.55
Benzo(b)fluoranthene				103		5.63	66.0		5.79	27.2		5.55
Benzo(ghi)perylene				5.63	U	5.63	58.2		5.79	5.55	U	5.55
Benzo(k)fluoranthene				19.712		5.63	11.0		5.79	5.55	U	5.55
Chrysene				72.1		5.63	10.1		5.79	11.9		5.55
Dibenz[a,h]anthracene				5.63	U		5.79	U	5.79	5.55	U	5.55
Fluoranthene				67.3		11.3	46.0		11.6	27.5		11.1
Fluorene				5.63	U	5.63	5.79	U	5.79	5.55	U	5.55
Indeno(1,2,3-cd)pyrene				3381		5.63	85.4		5.79	35.8		5.55
Naphthalene				185		5.63	49.5		57.9	28.6		55.5
Phenanthrene				22.9		5.63	40.8		5.79	31.6		5.55
Pyrene				111		11.3	13.3		11.6	18.0		11.1
Polychlorinated Biphenyls												
Aroclor-1016	33	U	33	38	U	38	39	U	39	37	U	37
Aroclor-1221	33	U	33	38	U	38	39	U	39	37	U	37
Aroclor-1232	33	U	33	38	U	38	39	U	39	37	U	37
Aroclor-1242	33	U	33	38	U	38	39	U	39	37	U	37
Aroclor-1248	33	U	33	38	U	38	39	U	39	37	U	37
Aroclor-1254	33	U	33	38	U	38	39	U	39	37	U	37
Aroclor-1260	33	U	33	38	U	38	39	U	39	37	U	37
Pesticides												
Aldrin	1.7	U	1.7	19	U	19	19	U	19	19	U	19
Alpha-BHC	1.7	U	1.7	19	U	19	19	U	19	19	U	19
alpha-Chlordane	1.7	U	1.7	19	U	19	19	U	19	19	U	19
beta-1,2,3,4,5,6-Hexachlorocyclohexane	1.7	U	1.7	19	U	19	19	U	19	19	U	19
Delta-BHC	1.7	U	1.7	19	U	19	19	U	19	19	U	19
Dichlorodiphenyldichloroethane	3.3	U	3.3	38	U	38	6.25	J	39	37	U	37
Dichlorodiphenyldichloroethylene	3.3	U	3.3	38	U	38	39	U	39	37	U	37
Dichlorodiphenyltrichloroethane	3.3	U	3.3	38	U	38	39	U	39	37	U	37
Dieldrin	3.3	U	3.3	38	U	38	4.05		39	37	U	37
Endosulfan I	1.7	U	1.7	9.69	J	19	19	U	19	19	U	19
Endosulfan II	3.3	U	3.3	5.37	J	38	39	U	39	37	U	37
Endosulfan sulfate	3.3	U	3.3	38	U	38	5.48	J	39	37	U	37
Endrin	3.3	U	3.3	38	U	38	39	U	39	37	U	37

Table A-1. 600-202 Confirmatory Sampling Data. (25 Pages)

Constituent	J02DB8, Area 1 Equipment blank 01/19/05			J02DB9, Area 2 Suspected Contaminated Soil or Debris 01/19/05			J02DC2, Area 3 Suspected Contaminated Soil or Debris 01/20/05			J02DC3, Area 3 Battery 01/20/05		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Endrin aldehyde	3.3	U	3.3	38	U	38	39	U	39	37	U	37
Endrin ketone	3.3	U	3.3	38	U	38	39	U	39	37	U	37
Gamma-BHC (Lindane)	1.7	U	1.7	19	U	19	19	U	19	19	U	19
gamma-Chlordane	1.7	U	1.7	2.97	J	19	19	U	19	19	U	19
Heptachlor	1.7	U	1.7	19	U	19	19	U	19	19	U	19
Heptachlor epoxide	1.7	U	1.7	19	U	19	19	U	19	19	U	19
Methoxychlor	17	U	17	190	U	190	190	U	190	190	U	190
Toxaphene	170	U	170	1900	U	1900	1900	U	1900	1900	U	1900
Semivolatile Organic Compounds												
1,2,4-Trichlorobenzene				380	U	380	390	U	390	370	U	370
1,2-Dichlorobenzene				380	U	380	390	U	390	370	U	370
1,3-Dichlorobenzene				380	U	380	390	U	390	370	U	370
1,4-Dichlorobenzene				380	U	380	244	J	390	45.4	J	370
2,4,5-Trichlorophenol				940	U	940	960	U	960	920	U	920
2,4,6-Trichlorophenol				380	U	380	390	U	390	370	U	370
2,4-Dichlorophenol				380	U	380	390	U	390	370	U	370
2,4-Dimethylphenol				380	U	380	390	U	390	370	U	370
2,4-Dinitrophenol				940	U	940	960	U	960	920	U	920
2,4-Dinitrotoluene				380	U	380	390	U	390	370	U	370
2,6-Dinitrotoluene				380	U	380	390	U	390	370	U	370
2-Chloronaphthalene				380	U	380	390	U	390	370	U	370
2-Chlorophenol				380	U	380	390	U	390	370	U	370
2-Methylnaphthalene				49.1	J	380	390	U	390	370	U	370
2-Methylphenol (cresol, o-)				380	U	380	390	U	390	370	U	370
2-Nitroaniline				940	U	940	960	U	960	920	U	920
2-Nitrophenol				380	U	380	390	U	390	370	U	370
3+4 Methylphenol (cresol, m+p)				380	U	380	390	U	390	370	U	370
3,3'-Dichlorobenzidine				380	U	380	390	U	390	370	U	370
3-Nitroaniline				940	U	940	960	U	960	920	U	920
4,6-Dinitro-2-methylphenol				940	U	940	960	U	960	920	U	920
4-Bromophenylphenyl ether				380	U	380	390	U	390	370	U	370
4-Chloro-3-methylphenol				380	U	380	390	U	390	370	U	370
4-Chloroaniline				380	U	380	390	U	390	370	U	370
4-Chlorophenylphenyl ether				380	U	380	390	U	390	370	U	370
4-Nitroaniline				940	U	940	960	U	960	920	U	920
4-Nitrophenol				940	U	940	960	U	960	920	U	920
Acenaphthene				380	U	380	390	U	390	370	U	370
Acenaphthylene				380	U	380	390	U	390	370	U	370
Anthracene				380	U	380	390	U	390	370	U	370
Benzo(a)anthracene				77.6	J	380	19.9	J	390	370	U	370

Table A-1. 600-202 Confirmatory Sampling Data. (25 Pages)

Constituent	J02DB8, Area 1 Equipment blank 01/19/05			J02DB9, Area 2 Suspected Contaminated Soil or Debris 01/19/05			J02DC2, Area 3 Suspected Contaminated Soil or Debris 01/20/05			J02DC3, Area 3 Battery 01/20/05		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Benzo(a)pyrene				101	J	380	37.0	J	390	370	U	370
Benzo(b)fluoranthene				152	J	380	38.9	J	390	370	U	370
Benzo(ghi)perylene				196	J	380	35.9	J	390	370	U	370
Benzo(k)fluoranthene				98.1	J	380	24.7	J	390	370	U	370
Bis(2-chloro-1-methylethyl)ether				380	U	380	390	U	390	370	U	370
Bis(2-Chloroethoxy)methane				380	U	380	390	U	390	370	U	370
Bis(2-chloroethyl) ether				380	U	380	390	U	390	370	U	370
Bis(2-ethylhexyl) phthalate				55.3	JB	380	45.1	JB	390	61.5	JB	370
Butylbenzylphthalate				380	U	380	390	U	390	370	U	370
Carbazole				380	U	380	390	U	390	370	U	370
Chrysene				121	J	380	34.1	J	390	370	U	370
Di-n-butylphthalate				28.35	J	380	57.0	J	390	73.6	J	370
Di-n-octylphthalate				380	U	380	390	U	390	370	U	370
Dibenz[a,h]anthracene				32.4	J	380	390	U	390	370	U	370
Dibenzofuran				49.4	J	380	390	U	390	370	U	370
Diethylphthalate				380	U	380	390	U	390	370	U	370
Dimethyl phthalate				380	U	380	390	U	390	370	U	370
Fluoranthene				194	J	380	27.8	J	390	370	U	370
Fluorene				380	U	380	390	U	390	370	U	370
Hexachlorobenzene				380	U	380	390	U	390	370	U	370
Hexachlorobutadiene				380	U	380	390	U	390	370	U	370
Hexachlorocyclopentadiene				380	U	380	390	U	390	370	U	370
Hexachloroethane				380	U	380	390	U	390	370	U	370
Indeno(1,2,3-cd)pyrene				129	J	380	24.4	J	390	370	U	370
Isophorone				380	U	380	390	U	390	370	U	370
N-Nitroso-di-n-dipropylamine				380	U	380	390	U	390	370	U	370
N-Nitrosodiphenylamine				380	U	380	390	U	390	370	U	370
Naphthalene				98.7	J	380	30.9	J	390	25.2	J	370
Nitrobenzene				380	U	380	390	U	390	370	U	370
Pentachlorophenol				940	U	940	960	U	960	920	U	920
Phenanthrene				167	J	380	44.1	J	390	21.7	J	370
Phenol				380	U	380	390	U	390	370	U	370
Pyrene				119	J	380	22.5	J	390	370	U	370

Table A-1. 600-202 Confirmatory Sampling Data. (25 Pages)

Constituent	J02DC4, Area 4 Suspected Contaminated Soil or Debris 01/20/05			J02DC5, Area 4 West Pipes/Valve Scale 01/24/05			J02DC6, Area 4 East Pipes/Valve Scale 01/24/05			J02DC7, Area 5 Suspected Contaminated Soil or Debris 01/24/05		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Polycyclic Aromatic Hydrocarbons												
Acenaphthene	210	U	210				54.1	U	54.1	59.9	U	59.9
Acenaphthylene	210	U	210				169		54.1	59.9	U	59.9
Anthracene	21	U	21				14.6		5.41	12.0		5.99
Benzo(a)anthracene	21	U	21				5.41	U	5.41	36.8		5.99
Benzo(a)pyrene	21	U	21				5.41	U	5.41	104		5.99
Benzo(b)fluoranthene	21	U	21				5.41	U	5.41	131		5.99
Benzo(ghi)perylene	21	U	21				5.41	U	5.41	129		5.99
Benzo(k)fluoranthene	21	U	21				5.41	U	5.41	22.2		5.99
Chrysene	21	U	21				18.1		5.41	23.1		5.99
Dibenz[a,h]anthracene	21	U	21				5.41	U	5.41	13.2		5.99
Fluoranthene	42	U	42				146		10.8	45.8		11.98
Fluorene	21	U	21				1395		5.41	16.5		5.99
Indeno(1,2,3-cd)pyrene	21	U	21				58.9		5.41	23.7		5.99
Naphthalene	210	U	210				227		54.1	59.9	U	59.9
Phenanthrene	21	U	21				5.41	U	5.41	91.0		5.99
Pyrene	42	U	42				10.8	U	10.8	59.6		12.0
Polychlorinated Biphenyls												
Aroclor-1016	140	U	140	34	U	34	36	U	36	40	U	40
Aroclor-1221	140	U	140	34	U	34	36	U	36	40	U	40
Aroclor-1232	140	U	140	34	U	34	36	U	36	40	U	40
Aroclor-1242	140	U	140	34	U	34	36	U	36	40	U	40
Aroclor-1248	140	U	140	34	U	34	36	U	36	40	U	40
Aroclor-1254	140	U	140	34	U	34	36	U	36	40	U	40
Aroclor-1260	140	U	140	34	U	34	36	U	36	40	U	40

Table A-1. 600-202 Confirmatory Sampling Data. (25 Pages)

Constituent	J02DC4, Area 4 Suspected Contaminated Soil or Debris 01/20/05			J02DC5, Area 4 West Pipes/Valve Scale 01/24/05			J02DC6, Area 4 East Pipes/Valve Scale 01/24/05			J02DC7, Area 5 Suspected Contaminated Soil or Debris 01/24/05		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Pesticides												
Aldrin	7	U	7	34	U	34	90	U	90	40	U	40
Alpha-BHC	7	U	7	34	U	34	90	U	90	40	U	40
alpha-Chlordane	7	U	7	34	U	34	90	U	90	40	U	40
beta-1,2,3,4,5,6-Hexachlorocyclohexane	7	U	7	34	U	34	90	U	90	40	U	40
Delta-BHC	7	U	7	34	U	34	90	U	90	40	U	40
Dichlorodiphenyldichloroethane	14	U	14	68	U	68	180	U	180	80	U	80
Dichlorodiphenyldichloroethylene	14	U	14	4.717		68	5.335		180	80	U	80
Dichlorodiphenyltrichloroethane	14	U	14	68	U	68	180	U	180	80	U	80
Dieldrin	14	U	14	68	U	68	180	U	180	80	U	80
Endosulfan I	7	U	7	34	U	34	90	U	90	4.83	J	40
Endosulfan II	14	U	14	4.922		68	180	U	180	80	U	80
Endosulfan sulfate	14	U	14	68	U	68	180	U	180	80	U	80
Endrin	14	U	14	68	U	68	180	U	180	80	U	80
Endrin aldehyde	14	U	14	68	U	68	180	U	180	80	U	80
Endrin ketone	14	U	14	68	U	68	180	U	180	80	U	80
Gamma-BHC (Lindane)	7	U	7	34	U	34	90	U	90	40	U	40
gamma-Chlordane	7	U	7	34	U	34	90	U	90	40	U	40
Heptachlor	7	U	7	34	U	34	90	U	90	40	U	40
Heptachlor epoxide	7	U	7	34	U	34	90	U	90	40	U	40
Methoxychlor	70	U	70	340	U	340	900	U	900	400	U	400
Toxaphene	700	U	700	3400	U	3400	9000	U	9000	4000	U	4000

Table A-1. 600-202 Confirmatory Sampling Data. (25 Pages)

Constituent	J02DC4, Area 4 Suspected Contaminated Soil or Debris 01/20/05			J02DC5, Area 4 West Pipes/Valve Scale 01/24/05			J02DC6, Area 4 East Pipes/Valve Scale 01/24/05			J02DC7, Area 5 Suspected Contaminated Soil or Debris 01/24/05		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Semivolatile Organic Compounds												
1,2,4-Trichlorobenzene	1400	U	1400				1400	U	1400	400	U	400
1,2-Dichlorobenzene	1400	U	1400				1400	U	1400	400	U	400
1,3-Dichlorobenzene	1400	U	1400				1400	U	1400	400	U	400
1,4-Dichlorobenzene	1400	U	1400				1400	U	1400	400	U	400
2,4,5-Trichlorophenol	3500	U	3500				3600	U	3600	1000	U	1000
2,4,6-Trichlorophenol	1400	U	1400				1400	U	1400	400	U	400
2,4-Dichlorophenol	1400	U	1400				1400	U	1400	400	U	400
2,4-Dimethylphenol	1400	U	1400				1400	U	1400	400	U	400
2,4-Dinitrophenol	3500	U	3500				3600	U	3600	1000	U	1000
2,4-Dinitrotoluene	1400	U	1400				1400	U	1400	400	U	400
2,6-Dinitrotoluene	1400	U	1400				1400	U	1400	400	U	400
2-Chloronaphthalene	1400	U	1400				1400	U	1400	400	U	400
2-Chlorophenol	1400	U	1400				1400	U	1400	400	U	400
2-Methylnaphthalene	1400	U	1400				1400	U	1400	54.36	J	400
2-Methylphenol (cresol, o-)	1400	U	1400				76.8	J	1400	400	U	400
2-Nitroaniline	3500	U	3500				3600	U	3600	1000	U	1000
2-Nitrophenol	1400	U	1400				1400	U	1400	400	U	400
3+4 Methylphenol (cresol, m+p)	1400	U	1400				2304		1400	400	U	400
3,3'-Dichlorobenzidine	1400	U	1400				1400	U	1400	400	U	400
3-Nitroaniline	3500	U	3500				3600	U	3600	1000	U	1000
4,6-Dinitro-2-methylphenol	3500	U	3500				3600	U	3600	1000	U	1000
4-Bromophenylphenyl ether	1400	U	1400				1400	U	1400	400	U	400
4-Chloro-3-methylphenol	1400	U	1400				1400	U	1400	400	U	400
4-Chloroaniline	1400	U	1400				1400	U	1400	400	U	400
4-Chlorophenylphenyl ether	1400	U	1400				1400	U	1400	400	U	400
4-Nitroaniline	3500	U	3500				3600	U	3600	1000	U	1000
4-Nitrophenol	3500	U	3500				3600	U	3600	1000	U	1000
Acenaphthene	1400	U	1400				1400	U	1400	400	U	400
Acenaphthylene	1400	U	1400				1400	U	1400	400	U	400
Anthracene	1400	U	1400				1400	U	1400	400	U	400
Benzo(a)anthracene	1400	U	1400				1400	U	1400	56.5	J	400
Benzo(a)pyrene	1400	U	1400				1400	U	1400	85.8	J	400
Benzo(b)fluoranthene	1400	U	1400				1400	U	1400	96.8	J	400
Benzo(ghi)perylene	1400	U	1400				1400	U	1400	50.7	J	400
Benzo(k)fluoranthene	1400	U	1400				1400	U	1400	85.6	J	400
Bis(2-chloro-1-methylethyl)ether	1400	U	1400				1400	U	1400	400	U	400
Bis(2-Chloroethoxy)methane	1400	U	1400				1400	U	1400	400	U	400
Bis(2-chloroethyl) ether	1400	U	1400				1400	U	1400	400	U	400
Bis(2-ethylhexyl) phthalate	194	JB	1400				147	JB	1400	161	JB	400

Table A-1. 600-202 Confirmatory Sampling Data. (25 Pages)

Constituent	J02DC4, Area 4 Suspected Contaminated Soil or Debris 01/20/05			J02DC5, Area 4 West Pipes/Valve Scale 01/24/05			J02DC6, Area 4 East Pipes/Valve Scale 01/24/05			J02DC7, Area 5 Suspected Contaminated Soil or Debris 01/24/05		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Semivolatile Organic Compounds												
Butylbenzylphthalate	1400	U	1400				1400	U	1400	400	U	400
Carbazole	1400	U	1400				1400	U	1400	400	U	400
Chrysene	1400	U	1400				1400	U	1400	85.9	J	400
Di-n-butylphthalate	191	J	1400				1400	U	1400	55.6	J	400
Di-n-octylphthalate	1400	U	1400				1400	U	1400	400	U	400
Dibenz[a,h]anthracene	1400	U	1400				1400	U	1400	400	U	400
Dibenzofuran	1400	U	1400				1400	U	1400	25.0	J	400
Diethylphthalate	1400	U	1400				1400	U	1400	400	U	400
Dimethyl phthalate	1400	U	1400				1400	U	1400	400	U	400
Fluoranthene	1400	U	1400				1400	U	1400	61.2	J	400
Fluorene	1400	U	1400				1400	U	1400	400	U	400
Hexachlorobenzene	1400	U	1400				1400	U	1400	400	U	400
Hexachlorobutadiene	1400	U	1400				1400	U	1400	400	U	400
Hexachlorocyclopentadiene	1400	U	1400				1400	U	1400	400	U	400
Hexachloroethane	1400	U	1400				1400	U	1400	400	U	400
Indeno(1,2,3-cd)pyrene	1400	U	1400				1400	U	1400	43.2	J	400
Isophorone	1400	U	1400				1400	U	1400	400	U	400
N-Nitroso-di-n-dipropylamine	1400	U	1400				1400	U	1400	400	U	400
N-Nitrosodiphenylamine	1400	U	1400				1400	U	1400	400	U	400
Naphthalene	1400	U	1400				1400	U	1400	57.9	J	400
Nitrobenzene	1400	U	1400				1400	U	1400	400	U	400
Pentachlorophenol	3500	U	3500				3600	U	3600	1000	U	1000
Phenanthrene	1400	U	1400				1400	U	1400	73.36	J	400
Phenol	1400	U	1400				1528		1400	400	U	400
Pyrene	1400	U	1400				1400	U	1400	74.3	J	400

Table A-1. 600-202 Confirmatory Sampling Data. (25 Pages)

Constituent	J02DC8, Area 3 Native Soil 01/20/05			J02DC9, Area 2 Native Soil 01/20/05			J02DD0, Area 4 Native Soil 01/20/05			J02DD1, Area 4 West Soil in Contact with Pipe/Valve 01/24/05		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Polycyclic Aromatic Hydrocarbons												
Acenaphthene	55.2	U	55.2	55.3	U	55.3	55.4	U	55.4			
Acenaphthylene	55.2	U	55.2	55.3	U	55.3	55.4	U	55.4			
Anthracene	5.52	U	5.52	5.53	U	5.53	5.54	U	5.54			
Benzo(a)anthracene	5.52	U	5.52	5.53	U	5.53	5.54	U	5.54			
Benzo(a)pyrene	5.52	U	5.52	5.53	U	5.53	5.54	U	5.54			
Benzo(b)fluoranthene	5.52	U	5.52	5.53	U	5.53	5.54	U	5.54			
Benzo(ghi)perylene	5.52	U	5.52	5.53	U	5.53	5.54	U	5.54			
Benzo(k)fluoranthene	5.52	U	5.52	5.53	U	5.53	5.54	U	5.54			
Chrysene	5.52	U	5.52	5.53	U	5.53	5.54	U	5.54			
Dibenz[a,h]anthracene	5.52	U	5.52	5.53	U	5.53	5.54	U	5.54			
Fluoranthene	11	U	11	10.7	U	10.7	10.8	U	10.8			
Fluorene	5.52	U	5.52	5.53	U	5.53	5.54	U	5.54			
Indeno(1,2,3-cd)pyrene	5.52	U	5.52	5.53	U	5.53	5.54	U	5.54			
Naphthalene	55.2	U	55.2	55.3	U	55.3	55.4	U	55.4			
Phenanthrene	5.52	U	5.52	5.53	U	5.53	5.54	U	5.54			
Pyrene	11	U	11	10.7	U	10.7	10.8	U	10.8			
Polychlorinated Biphenyls												
Aroclor-1016	15	U	15	14	U	14	14	U	14	15	U	15
Aroclor-1221	15	U	15	14	U	14	14	U	14	15	U	15
Aroclor-1232	15	U	15	14	U	14	14	U	14	15	U	15
Aroclor-1242	15	U	15	14	U	14	14	U	14	15	U	15
Aroclor-1248	15	U	15	14	U	14	14	U	14	15	U	15
Aroclor-1254	15	U	15	14	U	14	14	U	14	15	U	15
Aroclor-1260	15	U	15	14	U	14	14	U	14	15	U	15

Table A-1. 600-202 Confirmatory Sampling Data. (25 Pages)

Constituent	J02DC8, Area 3 Native Soil 01/20/05			J02DC9, Area 2 Native Soil 01/20/05			J02DD0, Area 4 Native Soil 01/20/05			J02DD1, Area 4 West Soil in Contact with Pipe/Valve 01/24/05		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Pesticides												
Aldrin	1.8	U	1.8	1.8	U	1.8	1.8	U	1.8	1.8	U	1.8
Alpha-BHC	1.8	U	1.8	1.8	U	1.8	1.8	U	1.8	1.8	U	1.8
alpha-Chlordane	1.8	U	1.8	1.8	U	1.8	1.8	U	1.8	1.8	U	1.8
beta-1,2,3,4,5,6-Hexachlorocyclohexane	1.8	U	1.8	1.8	U	1.8	1.8	U	1.8	1.8	U	1.8
Delta-BHC	1.8	U	1.8	1.8	U	1.8	1.8	U	1.8	1.8	U	1.8
Dichlorodiphenyldichloroethane	3.7	U	3.7	3.6	U	3.6	3.6	U	3.6	3.6	U	3.6
Dichlorodiphenyldichloroethylene	3.7	U	3.7	3.6	U	3.6	3.6	U	3.6	3.6	U	3.6
Dichlorodiphenyltrichloroethane	3.7	U	3.7	3.6	U	3.6	3.6	U	3.6	3.6	U	3.6
Dieldrin	3.7	U	3.7	3.6	U	3.6	3.6	U	3.6	3.6	U	3.6
Endosulfan I	1.8	U	1.8	1.8	U	1.8	1.8	U	1.8	1.8	U	1.8
Endosulfan II	3.7	U	3.7	3.6	U	3.6	3.6	U	3.6	3.6	U	3.6
Endosulfan sulfate	3.7	U	3.7	3.6	U	3.6	3.6	U	3.6	3.6	U	3.6
Endrin	3.7	U	3.7	3.6	U	3.6	3.6	U	3.6	3.6	U	3.6
Endrin aldehyde	3.7	U	3.7	3.6	U	3.6	3.6	U	3.6	3.6	U	3.6
Endrin ketone	3.7	U	3.7	3.6	U	3.6	3.6	U	3.6	3.6	U	3.6
Gamma-BHC (Lindane)	1.8	U	1.8	1.8	U	1.8	1.8	U	1.8	1.8	U	1.8
gamma-Chlordane	1.8	U	1.8	1.8	U	1.8	1.8	U	1.8	1.8	U	1.8
Heptachlor	1.8	U	1.8	1.8	U	1.8	1.8	U	1.8	1.8	U	1.8
Heptachlor epoxide	1.8	U	1.8	1.8	U	1.8	1.8	U	1.8	1.8	U	1.8
Methoxychlor	18	U	18	18	U	18	18	U	18	18	U	18
Toxaphene	180	U	180	180	U	180	180	U	180	180	UJ	180

Table A-1. 600-202 Confirmatory Sampling Data. (25 Pages)

Constituent	J02DC8, Area 3 Native Soil 01/20/05			J02DC9, Area 2 Native Soil 01/20/05			J02DD0, Area 4 Native Soil 01/20/05			J02DD1, Area 4 West Soil in Contact with Pipe/Valve 01/24/05		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Semivolatile Organic Compounds												
1,2,4-Trichlorobenzene	370	U	370	360	U	360	360	U	360			
1,2-Dichlorobenzene	370	U	370	360	U	360	360	U	360			
1,3-Dichlorobenzene	370	U	370	360	U	360	360	U	360			
1,4-Dichlorobenzene	370	U	370	360	U	360	360	U	360			
2,4,5-Trichlorophenol	920	U	920	890	U	890	900	U	900			
2,4,6-Trichlorophenol	370	U	370	360	U	360	360	U	360			
2,4-Dichlorophenol	370	U	370	360	U	360	360	U	360			
2,4-Dimethylphenol	370	U	370	360	U	360	360	U	360			
2,4-Dinitrophenol	920	U	920	890	U	890	900	U	900			
2,4-Dinitrotoluene	370	U	370	360	U	360	360	U	360			
2,6-Dinitrotoluene	370	U	370	360	U	360	360	U	360			
2-Chloronaphthalene	370	U	370	360	U	360	360	U	360			
2-Chlorophenol	370	U	370	360	U	360	360	U	360			
2-Methylnaphthalene	370	U	370	360	U	360	360	U	360			
2-Methylphenol (cresol, o-)	370	U	370	360	U	360	360	U	360			
2-Nitroaniline	920	U	920	890	U	890	900	U	900			
2-Nitrophenol	370	U	370	360	U	360	360	U	360			
3+4 Methylphenol (cresol, m+p)	370	U	370	360	U	360	360	U	360			
3,3'-Dichlorobenzidine	370	U	370	360	U	360	360	U	360			
3-Nitroaniline	920	U	920	890	U	890	900	U	900			
4,6-Dinitro-2-methylphenol	920	U	920	890	U	890	900	U	900			
4-Bromophenylphenyl ether	370	U	370	360	U	360	360	U	360			
4-Chloro-3-methylphenol	370	U	370	360	U	360	360	U	360			
4-Chloroaniline	370	U	370	360	U	360	360	U	360			
4-Chlorophenylphenyl ether	370	U	370	360	U	360	360	U	360			
4-Nitroaniline	920	U	920	890	U	890	900	U	900			
4-Nitrophenol	920	U	920	890	U	890	900	U	900			
Acenaphthene	370	U	370	360	U	360	360	U	360			
Acenaphthylene	370	U	370	360	U	360	360	U	360			
Anthracene	370	U	370	360	U	360	360	U	360			
Benzo(a)anthracene	370	U	370	360	U	360	360	U	360			
Benzo(a)pyrene	370	U	370	360	U	360	360	U	360			
Benzo(b)fluoranthene	370	U	370	360	U	360	360	U	360			
Benzo(ghi)perylene	370	U	370	360	U	360	360	U	360			
Benzo(k)fluoranthene	370	U	370	360	U	360	360	U	360			
Bis(2-chloro-1-methylethyl)ether	370	U	370	360	U	360	360	U	360			
Bis(2-Chloroethoxy)methane	370	U	370	360	U	360	360	U	360			
Bis(2-chloroethyl) ether	370	U	370	360	U	360	360	U	360			
Bis(2-ethylhexyl) phthalate	55.4	JB	370	63.1	JB	360	77.5	JB	360			
Butylbenzylphthalate	370	U	370	360	U	360	360	U	360			
Carbazole	370	U	370	360	U	360	360	U	360			
Chrysene	370	U	370	360	U	360	360	U	360			
Di-n-butylphthalate	51.5	J	370	29.0	J	360	24.3	J	360			

Table A-1. 600-202 Confirmatory Sampling Data. (25 Pages)

Constituent	J02DC8, Area 3 Native Soil 01/20/05			J02DC9, Area 2 Native Soil 01/20/05			J02DD0, Area 4 Native Soil 01/20/05			J02DD1, Area 4 West Soil in Contact with Pipe/Valve 01/24/05		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Semivolatile Organic Compounds												
Di-n-octylphthalate	370	U	370	360	U	360	360	U	360			
Dibenz[a,h]anthracene	370	U	370	360	U	360	360	U	360			
Dibenzofuran	370	U	370	360	U	360	360	U	360			
Diethylphthalate	370	U	370	360	U	360	360	U	360			
Dimethyl phthalate	370	U	370	360	U	360	360	U	360			
Fluoranthene	370	U	370	360	U	360	360	U	360			
Fluorene	370	U	370	360	U	360	360	U	360			
Hexachlorobenzene	370	U	370	360	U	360	360	U	360			
Hexachlorobutadiene	370	U	370	360	U	360	360	U	360			
Hexachlorocyclopentadiene	370	U	370	360	U	360	360	U	360			
Hexachloroethane	370	U	370	360	U	360	360	U	360			
Indeno(1,2,3-cd)pyrene	370	U	370	360	U	360	360	U	360			
Isophorone	370	U	370	360	U	360	360	U	360			
N-Nitroso-di-n-dipropylamine	370	U	370	360	U	360	360	U	360			
N-Nitrosodiphenylamine	370	U	370	360	U	360	360	U	360			
Naphthalene	370	U	370	360	U	360	360	U	360			
Nitrobenzene	370	U	370	360	U	360	360	U	360			
Pentachlorophenol	920	U	920	890	U	890	900	U	900			
Phenanthrene	370	U	370	360	U	360	360	U	360			
Phenol	370	U	370	360	U	360	360	U	360			
Pyrene	370	U	370	360	U	360	360	U	360			

Table A-1. 600-202 Confirmatory Sampling Data. (25 Pages)

Constituent	J02DD2, Area 4 East Soil in Contact with Pipe/Valve 01/24/05			J02DD3, Area 5 Native Soil 01/24/05			J02DD4, Area 6 Native Soil 01/24/05			J02FX0, Area 6 Suspected Contaminated Soil or Debris 01/24/05		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Polycyclic Aromatic Hydrocarbons												
Acenaphthene				55.4	U	55.4	52.2	U	52.2	57.6	U	57.6
Acenaphthylene				55.4	U	55.4	52.2	U	52.2	57.6	U	57.6
Anthracene				5.54	U	5.54	5.22	U	5.22	5.76	U	5.76
Benzo(a)anthracene				5.54	U	5.54	5.22	U	5.22	24.8		5.76
Benzo(a)pyrene				5.54	U	5.54	5.22	U	5.22	28.0		5.76
Benzo(b)fluoranthene				5.54	U	5.54	5.22	U	5.22	58.2		5.76
Benzo(ghi)perylene				5.54	U	5.54	5.22	U	5.22	22.8		5.76
Benzo(k)fluoranthene				5.54	U	5.54	5.22	U	5.22	13.5		5.76
Chrysene				6.09		5.54	5.22	U	5.22	30.3		5.76
Dibenz[a,h]anthracene				5.54	U	5.54	5.22	U	5.22	5.76	U	5.76
Fluoranthene				11.1	U	11.1	10.4	U	10.4	29.7		11.5
Fluorene				5.54	U	5.54	13.0		5.22	11.24		5.76
Indeno(1,2,3-cd)pyrene				5.54	U	5.54	5.22	U	5.22	29.7		5.76
Naphthalene				55.4	U	55.4	52.2	U	52.2	57.6	U	57.6
Phenanthrene				5.54	U	5.54	45.1		5.22	38.9		5.76
Pyrene				11.1	U	11.1	10.4	U	10.4	27.7		11.5
Polychlorinated Biphenyls												
Aroclor-1016	15	U	15	15	U	15	14	U	14	38	U	38
Aroclor-1221	15	U	15	15	U	15	14	U	14	38	U	38
Aroclor-1232	15	U	15	15	U	15	14	U	14	38	U	38
Aroclor-1242	15	U	15	15	U	15	14	U	14	38	U	38
Aroclor-1248	15	U	15	15	U	15	14	U	14	38	U	38
Aroclor-1254	15	U	15	15	U	15	14	U	14	38	U	38
Aroclor-1260	15	U	15	15	U	15	14	U	14	38	U	38

Table A-1. 600-202 Confirmatory Sampling Data. (25 Pages)

Constituent	J02DD2, Area 4 East Soil in Contact with Pipe/Valve 01/24/05			J02DD3, Area 5 Native Soil 01/24/05			J02DD4, Area 6 Native Soil 01/24/05			J02FX0, Area 6 Suspected Contaminated Soil or Debris 01/24/05		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Pesticides												
Aldrin	1.9	U	1.9	1.8	U	1.8	1.7	U	1.7	19	U	19
Alpha-BHC	1.9	U	1.9	1.8	U	1.8	1.7	U	1.7	19	U	19
alpha-Chlordane	1.9	U	1.9	1.8	U	1.8	1.7	U	1.7	19	U	19
beta-1,2,3,4,5,6-Hexachlorocyclohexane	1.9	U	1.9	1.8	U	1.8	1.7	U	1.7	19	U	19
Delta-BHC	1.9	U	1.9	1.8	U	1.8	1.7	U	1.7	19	U	19
Dichlorodiphenyldichloroethane	3.8	U	3.8	3.7	U	3.7	3.5	U	3.5	38	U	38
Dichlorodiphenyldichloroethylene	3.8	U	3.8	3.7	U	3.7	3.5	U	3.5	38	U	38
Dichlorodiphenyltrichloroethane	3.8	U	3.8	3.7	U	3.7	3.5	U	3.5	38	U	38
Dieldrin	3.8	U	3.8	3.7	U	3.7	3.5	U	3.5	38	U	38
Endosulfan I	1.9	U	1.9	1.8	U	1.8	1.7	U	1.7	19	U	19
Endosulfan II	3.8	U	3.8	3.7	U	3.7	3.5	U	3.5	38	U	38
Endosulfan sulfate	3.8	U	3.8	3.7	U	3.7	3.5	U	3.5	38	U	38
Endrin	3.8	U	3.8	3.7	U	3.7	3.5	U	3.5	38	U	38
Endrin aldehyde	3.8	U	3.8	3.7	U	3.7	3.5	U	3.5	38	U	38
Endrin ketone	3.8	U	3.8	3.7	U	3.7	3.5	U	3.5	38	U	38
Gamma-BHC (Lindane)	1.9	U	1.9	1.8	U	1.8	1.7	U	1.7	19	U	19
gamma-Chlordane	1.9	U	1.9	1.8	U	1.8	1.7	U	1.7	19	U	19
Heptachlor	1.9	U	1.9	1.8	U	1.8	1.7	U	1.7	19	U	19
Heptachlor epoxide	1.9	U	1.9	1.8	U	1.8	1.7	U	1.7	19	U	19
Methoxychlor	19	U	19	18	U	18	17	U	17	190	U	190
Toxaphene	190	UJ	190	180	UJ	180	170	UJ	170	1900	U	1900

Table A-1. 600-202 Confirmatory Sampling Data. (25 Pages)

Constituent	J02DD2, Area 4 East Soil in Contact with Pipe/Valve 01/24/05			J02DD3, Area 5 Native Soil 01/24/05			J02DD4, Area 6 Native Soil 01/24/05			J02FX0, Area 6 Suspected Contaminated Soil or Debris 01/24/05		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Semivolatile Organic Compounds												
1,2,4-Trichlorobenzene				370	U	370	350	U	350	380	U	380
1,2-Dichlorobenzene				370	U	370	350	U	350	380	U	380
1,3-Dichlorobenzene				370	U	370	350	U	350	380	U	380
1,4-Dichlorobenzene				370	U	370	350	U	350	34.1	J	380
2,4,5-Trichlorophenol				920	U	920	870	U	870	960	U	960
2,4,6-Trichlorophenol				370	U	370	350	U	350	380	U	380
2,4-Dichlorophenol				370	U	370	350	U	350	380	U	380
2,4-Dimethylphenol				370	U	370	350	U	350	380	U	380
2,4-Dinitrophenol				920	U	920	870	U	870	960	U	960
2,4-Dinitrotoluene				370	U	370	350	U	350	380	U	380
2,6-Dinitrotoluene				370	U	370	350	U	350	380	U	380
2-Chloronaphthalene				370	U	370	350	U	350	380	U	380
2-Chlorophenol				370	U	370	350	U	350	380	U	380
2-Methylnaphthalene				370	U	370	350	U	350	380	U	380
2-Methylphenol (cresol, o-)				370	U	370	350	U	350	380	U	380
2-Nitroaniline				920	U	920	870	U	870	960	U	960
2-Nitrophenol				370	U	370	350	U	350	380	U	380
3+4 Methylphenol (cresol, m+p)				370	U	370	350	U	350	380	U	380
3,3'-Dichlorobenzidine				370	U	370	350	U	350	380	U	380
3-Nitroaniline				920	U	920	870	U	870	960	U	960
4,6-Dinitro-2-methylphenol				920	U	920	870	U	870	960	U	960
4-Bromophenylphenyl ether				370	U	370	350	U	350	380	U	380
4-Chloro-3-methylphenol				370	U	370	350	U	350	380	U	380
4-Chloroaniline				370	U	370	350	U	350	380	U	380
4-Chlorophenylphenyl ether				370	U	370	350	U	350	380	U	380
4-Nitroaniline				920	U	920	870	U	870	960	U	960
4-Nitrophenol				920	U	920	870	U	870	960	U	960
Acenaphthene				370	U	370	350	U	350	380	U	380
Acenaphthylene				370	U	370	350	U	350	380	U	380
Anthracene				370	U	370	350	U	350	380	U	380
Benzo(a)anthracene				370	U	370	350	U	350	24.0	J	380
Benzo(a)pyrene				370	U	370	350	U	350	23.8	J	380
Benzo(b)fluoranthene				370	U	370	350	U	350	24.9	J	380
Benzo(ghi)perylene				370	U	370	350	U	350	380	U	380
Benzo(k)fluoranthene				370	U	370	350	U	350	23.4	J	380
Bis(2-chloro-1-methylethyl)ether				370	U	370	350	U	350	380	U	380
Bis(2-Chloroethoxy)methane				370	U	370	350	U	350	380	U	380
Bis(2-chloroethyl) ether				370	U	370	350	U	350	380	U	380
Bis(2-ethylhexyl) phthalate				660	U	660	660	U	660	61.0	JB	380

Table A-1. 600-202 Confirmatory Sampling Data. (25 Pages)

Constituent	J02DD2, Area 4 East Soil in Contact with Pipe/Valve 01/24/05			J02DD3, Area 5 Native Soil 01/24/05			J02DD4, Area 6 Native Soil 01/24/05			J02FX0, Area 6 Suspected Contaminated Soil or Debris 01/24/05		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Semivolatile Organic Compounds												
Butylbenzylphthalate				370	U	370	350	U	350	380	U	380
Carbazole				370	U	370	350	U	350	380	U	380
Chrysene				370	U	370	350	U	350	28.0	J	380
Di-n-butylphthalate				36.4	J	370	34.2	J	350	30.3	J	380
Di-n-octylphthalate				370	U	370	350	U	350	380	U	380
Dibenz[a,h]anthracene				370	U	370	350	U	350	380	U	380
Dibenzofuran				370	U	370	350	U	350	380	U	380
Diethylphthalate				370	U	370	350	U	350	380	U	380
Dimethyl phthalate				370	U	370	350	U	350	380	U	380
Fluoranthene				370	U	370	350	U	350	59.1	J	380
Fluorene				370	U	370	350	U	350	380	U	380
Hexachlorobenzene				370	U	370	350	U	350	380	U	380
Hexachlorobutadiene				370	U	370	350	U	350	380	U	380
Hexachlorocyclopentadiene				370	U	370	350	U	350	380	U	380
Hexachloroethane				370	U	370	350	U	350	380	U	380
Indeno(1,2,3-cd)pyrene				370	U	370	350	U	350	380	U	380
Isophorone				370	U	370	350	U	350	380	U	380
N-Nitroso-di-n-dipropylamine				370	U	370	350	U	350	380	U	380
N-Nitrosodiphenylamine				370	U	370	350	U	350	380	U	380
Naphthalene				370	U	370	350	U	350	380	U	380
Nitrobenzene				370	U	370	350	U	350	380	U	380
Pentachlorophenol				920	U	920	870	U	870	960	U	960
Phenanthrene				370	U	370	350	U	350	36.0	J	380
Phenol				370	U	370	350	U	350	380	U	380
Pyrene				370	U	370	350	U	350	36.7	J	380

NOTES: Data qualified with B, C, and/or J, is considered acceptable values.
Grayed cells indicate not applicable.

B = blank contamination (organic constituents)
C = blank contamination (inorganic constituents)
HEIS = Hanford Environmental Information System
J = estimate
PQL = practical quantitation limit
Q = qualifier
U = undetected

Table A-2. 600-202 Waste Characterization Sampling Data.

Constituent	J19BY4 11/19/2009 Area 1, Backfilled Trenches C and J			J19BY5 11/19/2009 Area 2, Backfilled Trenches B and I			J19CT5 11/19/2009 Area 3, Backfilled Trench A			J19CT6 11/19/2009 Area 4, Backfilled Trenches D and H			J19CT7 11/19/2009 Duplicate of J19BY5			J19CT8 11/19/2009 Equipment blank		
	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Metals																		
Aluminum	9130		4.71	10000		5.21	11000		4.21	7210		4.23	9100		4.69	122		3.48
Antimony	1.48		0.57	0.87		0.63	3.64		0.51	0.686		0.51	1.33		0.56	0.417	U	0.42
Arsenic	6.04		0.94	5.54		1.04	5.27		0.84	4.31		0.85	33.1		0.94	0.695	U	0.7
Barium	219		0.47	442		0.52	479		0.42	235		0.42	357		0.47	1.62		0.35
Beryllium	0.318		0.19	0.422		0.21	0.547		0.17	0.269		0.17	0.403		0.19	0.139	U	0.14
Boron	10.7		1.88	43.2		2.09	48		1.68	17.8		1.69	32.8		1.88	1.39	U	1.39
Cadmium	0.675		0.19	0.761		0.21	0.638		0.17	0.595		0.17	0.876		0.19	0.139	U	0.14
Calcium	12500		94.2	16100		104	18200		84.2	10000		84.6	12200		93.8	28	B	69.5
Chromium	22.4		0.19	20.3		0.21	18.5		0.17	13.3		0.17	20.2		0.19	0.139	U	0.14
Cobalt	6.28		1.88	5.86		2.09	5.93		1.68	4.92		1.69	6.94		1.88	1.39	U	1.39
Copper	35.3		0.94	40.3		1.04	32.1		0.84	712		0.85	3840		0.94	0.695	U	0.7
Hexavalent chromium																		
Iron	32200		18.8	21100		20.9	21500		16.8	20300		16.9	43300		18.8	507		13.9
Lead	83.8		0.47	76.7		0.52	517		0.42	88		0.42	86.8		0.47	0.805		0.35
Magnesium	5320		70.6	5680		78.2	6380		63.2	3920		63.5	4900		70.3	16.9	B	52.1
Manganese	376		4.71	351		5.21	389		4.21	282		4.23	359		4.69	25.3		3.48
Mercury	0.063		0.03	0.035		0.03	0.111		0.03	0.53		0.03	0.025	B	0.03	0.03	U	0.03
Molybdenum	0.973	B	1.88	1.46	B	2.09	1.44	B	1.68	0.767	B	1.69	2.05		1.88	1.39	U	1.39
Nickel	19.3		3.77	15.3		4.17	15.4		3.37	13.5		3.39	16.9		3.75	2.78	U	2.78
Potassium	1860		377	2090		417	2220		337	1820		339	2080		375	32.5	B	278
Selenium	0.392	B	0.94	0.76	B	1.04	0.718	B	0.84	0.484	B	0.85	0.717	B	0.94	0.695	U	0.7
Silicon	658		1.88	865		2.09	771		1.68	577		1.69	709		1.88	126		1.39
Silver	0.535		0.19	0.813		0.21	0.578		0.17	0.417		0.17	1.29		0.19	0.139	U	0.14
Sodium	513		47.1	819		52.1	671		42.1	826		42.3	771		46.9	34.8	U	34.8
Vanadium	42.9		2.35	40.6		2.61	41.8		2.11	30.9		2.12	37.1		2.34	0.5	B	1.74
Zinc	229		9.42	201		10.4	314		8.42	284		8.46	260		9.38	1.11	B	6.95

B = blank contamination (organic constituents)
PQL = practical quantitation limit
Q = qualifier
U = undetected

Table A-3. 600-202 In-Process Sampling Data. (14 Pages)

HEIS Number	Sample Date	Sample Location	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
Metals																				
J19VY1	3/31/2010	Soil under batteries	8230		5.29	1.41		0.63	5.08		1.06	145		0.53	0.255		0.21	9.41		2.11
J19XY8	5/5/2010	East excavation	8400		4.76	0.571	U	0.57	3.73		0.95	78.3		0.48	0.232		0.19	2.69		1.9
J19XY9	5/5/2010	East excavation	8630		3.32	0.398	U	0.4	5.01		0.66	76.3		0.33	0.292		0.13	1.64		1.33
J19Y00	5/5/2010	East excavation	7330		3.8	0.456	U	0.46	3.91		0.76	67		0.38	0.237		0.15	2.11		1.52
J19Y01	5/5/2010	West excavation	6610		4.19	0.503	U	0.5	4.08		0.84	63.3		0.42	0.208		0.17	1.78		1.68
J19Y02	5/5/2010	West excavation	7730		3.42	0.41	U	0.41	4.74		0.68	74.6		0.34	0.261		0.14	2.12		1.37
J19Y03	5/5/2010	West excavation	7930		3.89	0.467	U	0.47	4.13		0.78	70.8		0.39	0.266		0.16	4.42		1.56
J19Y04	5/5/2010	West excavation	7820		3.82	0.458	U	0.46	4.31		0.76	75.8		0.38	0.261		0.15	2.84		1.53
J19Y05	5/5/2010	West excavation	8020		4.59	0.551	U	0.55	4.16		0.92	78.2		0.46	0.254		0.18	2.61		1.84
J19Y06	5/5/2010	West excavation	8920		3.56	0.427	U	0.43	5.17		0.71	84.6		0.36	0.294		0.14	2.12		1.42
J19Y07	5/5/2010	West excavation	9510		3.62	0.435	U	0.44	4.85		0.72	93.2		0.36	0.314		0.15	1.37	B	1.45
J19Y08	5/5/2010	Small scraped area	7210		4.38	0.526	U	0.53	2.82		0.88	68.4		0.44	0.212		0.18	1.56	B	1.75
J19Y09	5/5/2010	Small scraped area	8130		4.59	0.551	U	0.55	3.29		0.92	80.9		0.46	0.245		0.18	1.52	B	1.84
J19Y12	5/5/2010	Equipment blank	139		4.03	0.484	U	0.48	0.807	U	0.81	1.41		0.4	0.161	U	0.16	1.61	U	1.61

Table A-3. 600-202 In-Process Sampling Data. (14 Pages)

HEIS Number	Sample Date	Sample Location	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
Metals																				
J19VY1	3/31/2010	Soil under batteries	0.554		0.21	8800		106	19.9		0.21	6.29		2.11	26.3		1.06	NA	NA	NA
J19XY8	5/5/2010	East excavation	0.078	B	0.19	6390		95.1	13		0.19	4.98		1.9	11.3		0.95	0.21	U	0.21
J19XY9	5/5/2010	East excavation	0.064	B	0.13	4210		66.3	17.6		0.13	5.97		1.33	12.6		0.66	0.21	U	0.21
J19Y00	5/5/2010	East excavation	0.071	B	0.15	4970		76	15.4		0.15	5.47		1.52	14.4		0.76	0.21	U	0.21
J19Y01	5/5/2010	West excavation	0.069	B	0.17	7280		83.8	13.3		0.17	5.51		1.68	10.4		0.84	0.21	U	0.21
J19Y02	5/5/2010	West excavation	0.088	B	0.14	4270		68.4	14		0.14	5.38		1.37	11.4		0.68	0.21	U	0.21
J19Y03	5/5/2010	West excavation	0.07	B	0.16	3920		77.8	15.5		0.16	5.58		1.56	11.4		0.78	0.21	U	0.21
J19Y04	5/5/2010	West excavation	0.074	B	0.15	5420		76.4	15.1		0.15	5.93		1.53	11.4		0.76	0.21	U	0.21
J19Y05	5/5/2010	West excavation	0.083	B	0.18	8290		91.9	15.9		0.18	6.26		1.84	12.1		0.92	0.21	U	0.21
J19Y06	5/5/2010	West excavation	0.072	B	0.14	4260		71.1	18.8		0.14	6.16		1.42	13.4		0.71	0.21	U	0.21
J19Y07	5/5/2010	West excavation	0.073	B	0.15	4610		72.4	17.9		0.15	6.61		1.45	14.9		0.72	0.21	U	0.21
J19Y08	5/5/2010	Small scraped area	0.06	B	0.18	4990		87.7	12		0.18	5.16		1.75	9.19		0.88	0.21	U	0.21
J19Y09	5/5/2010	Small scraped area	0.064	B	0.18	8000		91.8	13.5		0.18	5.57		1.84	10.3		0.92	0.21	U	0.21
J19Y12	5/5/2010	Equipment blank	0.161	U	0.16	34	B	80.7	0.186		0.16	1.61	U	1.61	0.807	U	0.81	NA	NA	NA

Table A-3. 600-202 In-Process Sampling Data. (14 Pages)

HEIS Number	Sample Date	Sample Location	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
Metals																				
J19VY1	3/31/2010	Soil under batteries	25300		21.1	260		0.53	4840		79.3	333		5.29	0.046		0.03	2.64		2.11
J19XY8	5/5/2010	East excavation	16400		19	4.41		0.48	4380		71.4	263		4.76	0.027	U	0.03	0.244	B	1.9
J19XY9	5/5/2010	East excavation	17700		13.3	4.37		0.33	5160		49.7	290		3.32	0.025	U	0.03	0.278	B	1.33
J19Y00	5/5/2010	East excavation	16600		15.2	4.65		0.38	4680		57	255		3.8	0.028	U	0.03	0.247	B	1.52
J19Y01	5/5/2010	West excavation	15800		16.8	7.91		0.42	4830		62.9	238		4.19	0.025	U	0.02	0.211	B	1.68
J19Y02	5/5/2010	West excavation	19200		13.7	5.75		0.34	4970		51.3	285		3.42	0.025	U	0.03	0.241	B	1.37
J19Y03	5/5/2010	West excavation	19200		15.6	3.67		0.39	5030		58.4	298		3.89	0.027	U	0.03	0.418	B	1.56
J19Y04	5/5/2010	West excavation	19200		15.3	5.14		0.38	5270		57.3	294		3.82	0.026	U	0.03	0.349	B	1.53
J19Y05	5/5/2010	West excavation	17800		18.4	4.27		0.46	5790		68.9	280		4.59	0.029	U	0.03	0.253	B	1.84
J19Y06	5/5/2010	West excavation	19300		14.2	4.3		0.36	5330		53.4	321		3.56	0.03	U	0.03	0.245	B	1.42
J19Y07	5/5/2010	West excavation	21300		14.5	4.47		0.36	5610		54.3	340		3.62	0.027	U	0.03	0.239	B	1.45
J19Y08	5/5/2010	Small scraped area	16400		17.5	3.76		0.44	4520		65.8	245		4.38	0.024	U	0.02	0.193	B	1.75
J19Y09	5/5/2010	Small scraped area	18000		18.4	3.59		0.46	5590		68.9	276		4.59	0.029	U	0.03	0.194	B	1.84
J19Y12	5/5/2010	Equipment blank	184		16.1	0.273	B	0.4	22	B	60.5	3.24	B	4.03	0.023	U	0.02	1.61	U	1.61

Table A-3. 600-202 In-Process Sampling Data. (14 Pages)

HEIS Number	Sample Date	Sample Location	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
Metals																				
J19VY1	3/31/2010	Soil under batteries	25300		21.1	260		0.53	4840		79.3	333		5.29	0.046		0.03	2.64		2.11
J19XY8	5/5/2010	East excavation	16400		19	4.41		0.48	4380		71.4	263		4.76	0.027	U	0.03	0.244	B	1.9
J19XY9	5/5/2010	East excavation	17700		13.3	4.37		0.33	5160		49.7	290		3.32	0.025	U	0.03	0.278	B	1.33
J19Y00	5/5/2010	East excavation	16600		15.2	4.65		0.38	4680		57	255		3.8	0.028	U	0.03	0.247	B	1.52
J19Y01	5/5/2010	West excavation	15800		16.8	7.91		0.42	4830		62.9	238		4.19	0.025	U	0.02	0.211	B	1.68
J19Y02	5/5/2010	West excavation	19200		13.7	5.75		0.34	4970		51.3	285		3.42	0.025	U	0.03	0.241	B	1.37
J19Y03	5/5/2010	West excavation	19200		15.6	3.67		0.39	5030		58.4	298		3.89	0.027	U	0.03	0.418	B	1.56
J19Y04	5/5/2010	West excavation	19200		15.3	5.14		0.38	5270		57.3	294		3.82	0.026	U	0.03	0.349	B	1.53
J19Y05	5/5/2010	West excavation	17800		18.4	4.27		0.46	5790		68.9	280		4.59	0.029	U	0.03	0.253	B	1.84
J19Y06	5/5/2010	West excavation	19300		14.2	4.3		0.36	5330		53.4	321		3.56	0.03	U	0.03	0.245	B	1.42
J19Y07	5/5/2010	West excavation	21300		14.5	4.47		0.36	5610		54.3	340		3.62	0.027	U	0.03	0.239	B	1.45
J19Y08	5/5/2010	Small scraped area	16400		17.5	3.76		0.44	4520		65.8	245		4.38	0.024	U	0.02	0.193	B	1.75
J19Y09	5/5/2010	Small scraped area	18000		18.4	3.59		0.46	5590		68.9	276		4.59	0.029	U	0.03	0.194	B	1.84
J19Y12	5/5/2010	Equipment blank	184		16.1	0.273	B	0.4	22	B	60.5	3.24	B	4.03	0.023	U	0.02	1.61	U	1.61

Table A-3. 600-202 In-Process Sampling Data. (14 Pages)

HEIS Number	Sample Date	Sample Location	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
Metals																				
J19VY1	3/31/2010	Soil under batteries	16.8		4.23	1900		423	0.317	U	0.32	636		2.11	0.467		0.21	558		52.9
J19XY8	5/5/2010	East excavation	11.8		3.81	1060		381	0.285	U	0.29	347		1.9	0.19	U	0.19	724		47.6
J19XY9	5/5/2010	East excavation	15.5		2.65	791		265	0.199	U	0.2	289		1.33	0.133	U	0.13	853		33.2
J19Y00	5/5/2010	East excavation	13.4		3.04	1030		304	0.228	U	0.23	339		1.52	0.152	U	0.15	814		38
J19Y01	5/5/2010	West excavation	11.7		3.35	1240		335	0.251	U	0.25	358		1.68	0.168	U	0.17	360		41.9
J19Y02	5/5/2010	West excavation	11.8		2.74	1070		274	0.205	U	0.21	342		1.37	0.137	U	0.14	483		34.2
J19Y03	5/5/2010	West excavation	12.6		3.11	1410		311	0.233	U	0.23	410		1.56	0.156	U	0.16	1270		38.9
J19Y04	5/5/2010	West excavation	13.2		3.05	1260		305	0.229	U	0.23	419		1.53	0.153	U	0.15	870		38.2
J19Y05	5/5/2010	West excavation	13.7		3.68	1440		368	0.276	U	0.28	587		1.84	0.184	U	0.18	702		45.9
J19Y06	5/5/2010	West excavation	16.2		2.85	1460		285	0.213	U	0.21	439		1.42	0.142	U	0.14	547		35.6
J19Y07	5/5/2010	West excavation	15		2.9	1230		290	0.217	U	0.22	419		1.45	0.145	U	0.15	596		36.2
J19Y08	5/5/2010	Small scraped area	10.4		3.51	1600		351	0.263	U	0.26	466		1.75	0.175	U	0.18	234		43.8
J19Y09	5/5/2010	Small scraped area	11.4		3.67	1780		367	0.276	U	0.28	631		1.84	0.184	U	0.18	232		45.9
J19Y12	5/5/2010	Equipment blank	3.23	U	3.23	38.2	B	323	0.242	U	0.24	145		1.61	0.161	U	0.16	40.3	U	40.3

Table A-3. 600-202 In-Process Sampling Data. (14 Pages)

HEIS Number	Sample Date	Sample Location	Vanadium			Zinc		
			mg/kg	Q	PQL	mg/kg	Q	PQL
Metals								
J19VY1	3/31/2010	Soil under batteries	44.9		2.64	178		10.6
J19XY8	5/5/2010	East excavation	35.6		2.38	34.9		9.51
J19XY9	5/5/2010	East excavation	38.4		1.66	38.8		6.63
J19Y00	5/5/2010	East excavation	37.2		1.9	37.5		7.6
J19Y01	5/5/2010	West excavation	36.7		2.1	39.6		8.38
J19Y02	5/5/2010	West excavation	44.7		1.71	42		6.84
J19Y03	5/5/2010	West excavation	46.1		1.95	37.3		7.78
J19Y04	5/5/2010	West excavation	46.6		1.91	41.2		7.64
J19Y05	5/5/2010	West excavation	40.5		2.3	40.3		9.19
J19Y06	5/5/2010	West excavation	46.3		1.78	41.1		7.11
J19Y07	5/5/2010	West excavation	51.6		1.81	50.3		7.24
J19Y08	5/5/2010	Small scraped area	36.7		2.19	35.1		8.77
J19Y09	5/5/2010	Small scraped area	40.6		2.3	36.6		9.18
J19Y12	5/5/2010	Equipment blank	0.284	B	2.02	1.13	B	8.07

Table A-3. 600-202 In-Process Sampling Data. (14 Pages)

Constituent	J19XY8 5/5/10 East excavation			J19XY9 5/5/10 East excavation			J19Y00 5/5/10 East excavation			J19Y01 5/5/10 West excavation			J19Y02 5/5/10 West excavation			J19Y03 5/5/10 West excavation		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Polycyclic Aromatic Hydrocarbons																		
Acenaphthene	3.42	U	3.42	3.44	U	3.44	3.44	U	3.44	1.02	J	3.46	3.46	U	3.46	3.46	U	3.46
Acenaphthylene	3.42	U	3.42	3.44	U	3.44	3.44	U	3.44	3.46	U	3.46	3.46	U	3.46	3.46	U	3.46
Anthracene	3.42	U	3.42	3.44	U	3.44	3.44	U	3.44	3.46	U	3.46	3.46	U	3.46	3.46	U	3.46
Benzo(a)anthracene	3.42	U	3.42	3.44	U	3.44	3.44	U	3.44	3.46	U	3.46	3.46	U	3.46	3.46	U	3.46
Benzo(a)pyrene	3.42	U	3.42	3.44	U	3.44	3.44	U	3.44	3.46	U	3.46	3.46	U	3.46	3.46	U	3.46
Benzo(b)fluoranthene	1.54	J	3.42	3.44	U	3.44	4.18		3.44	3.46	U	3.46	3.46	U	3.46	3.46	U	3.46
Benzo(ghi)perylene	3.42	U	3.42	3.44	U	3.44	1.43	J	3.44	3.46	U	3.46	3.46	U	3.46	3.46	U	3.46
Benzo(k)fluoranthene	3.42	U	3.42	3.44	U	3.44	3.44	U	3.44	3.46	U	3.46	3.46	U	3.46	3.46	U	3.46
Chrysene	3.43		3.42	3.44	U	3.44	25.4		3.44	3.46	U	3.46	3.46	U	3.46	3.46	U	3.46
Dibenz[a,h]anthracene	3.42	U	3.42	3.44	U	3.44	3.44	U	3.44	3.46	U	3.46	3.46	U	3.46	3.46	U	3.46
Fluoranthene	3.6		3.42	1.07	J	3.44	7.69		3.44	1.82	J	3.46	3.71		3.46	3.46	U	3.46
Fluorene	3.42	U	3.42	3.44	U	3.44	3.44	U	3.44	3.46	U	3.46	3.46	U	3.46	3.46	U	3.46
Indeno(1,2,3-cd)pyrene	3.42	U	3.42	3.44	U	3.44	3.44	U	3.44	3.46	U	3.46	3.46	U	3.46	3.46	U	3.46
Naphthalene	3.42	U	3.42	3.44	U	3.44	3.44	U	3.44	3.46	U	3.46	3.46	U	3.46	3.46	U	3.46
Phenanthrene	3.1	J	3.42	139		3.44	7.67		3.44	1.32	J	3.46	1.77	J	3.46	3.46	U	3.46
Pyrene	2.74	J	3.42	1.7	J	3.44	3.2	J	3.44	1.18	J	3.46	3.46	U	3.46	3.46	U	3.46

Table A-3. 600-202 In-Process Sampling Data. (14 Pages)

Constituent	J19Y04 5/5/10 West excavation			J19Y05 5/5/10 West excavation			J19Y06 5/5/10 West excavation			J19Y07 5/5/10 West excavation			J19Y08 5/5/10 Small scraped area			J19Y09 5/5/10 Small scraped area		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Polycyclic Aromatic Hydrocarbons																		
Acenaphthene	3.46	U	3.46	3.94		3.94	3.47	U	3.47	2.22	J	3.52	18.1		3.45	3.48	U	3.48
Acenaphthylene	3.46	U	3.46	3.49	U	3.49	3.47	U	3.47	3.52	U	3.52	3.45	U	3.45	3.48	U	3.48
Anthracene	3.46	U	3.46	3.49	U	3.49	3.47	U	3.47	3.52	U	3.52	3.45	U	3.45	3.48	U	3.48
Benzo(a)anthracene	3.46	U	3.46	3.49	U	3.49	3.47	U	3.47	3.52	U	3.52	11.2		3.45	3.48	U	3.48
Benzo(a)pyrene	3.46	U	3.46	3.49	U	3.49	3.47	U	3.47	3.52	U	3.52	17.7		3.45	3.48	U	3.48
Benzo(b)fluoranthene	3.46	U	3.46	3.49	U	3.49	3.47	U	3.47	3.52	U	3.52	18.2		3.45	3.48	U	3.48
Benzo(ghi)perylene	3.46	U	3.46	3.49	U	3.49	3.47	U	3.47	3.52	U	3.52	17.4		3.45	3.48	U	3.48
Benzo(k)fluoranthene	3.46	U	3.46	3.49	U	3.49	3.47	U	3.47	3.52	U	3.52	9.73		3.45	3.48	U	3.48
Chrysene	3.46	U	3.46	3.49	U	3.49	3.47	U	3.47	3.52	U	3.52	10.5		3.45	0.905	J	3.48
Dibenz[a,h]anthracene	3.46	U	3.46	3.49	U	3.49	3.47	U	3.47	3.52	U	3.52	1.69	J	3.45	3.48	U	3.48
Fluoranthene	3.46	U	3.46	3.49	U	3.49	3.47	U	3.47	1.06	J	3.52	41.7		3.45	9.14		3.48
Fluorene	3.46	U	3.46	3.49	U	3.49	3.47	U	3.47	3.52	U	3.52	3.45	U	3.45	3.48	U	3.48
Indeno(1,2,3-cd)pyrene	3.46	U	3.46	3.49	U	3.49	3.47	U	3.47	3.52	U	3.52	17.6		3.45	3.48	U	3.48
Naphthalene	3.46	U	3.46	3.49	U	3.49	3.47	U	3.47	3.52	U	3.52	3.45	U	3.45	3.48	U	3.48
Phenanthrene	0.9	J	3.46	3.49	U	3.49	3.47	U	3.47	3.8		3.52	13.2		3.45	0.905	J	3.48
Pyrene	3.46	U	3.46	3.49	U	3.49	3.47	U	3.47	3.52	U	3.52	46.9		3.45	1.72	J	3.48

Table A-3. 600-202 In-Process Sampling Data. (14 Pages)

Constituent	J19XY8			J19XY9			J19Y00			J19Y01			J19Y02			J19Y03		
	5/5/10			5/5/10			5/5/10			5/5/10			5/5/10			5/5/10		
	East excavation			East excavation			East excavation			West excavation			West excavation			West excavation		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Polycyclic Aromatic Hydrocarbons																		
1,2,4-Trichlorobenzene	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
1,2-Dichlorobenzene	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
1,3-Dichlorobenzene	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
1,4-Dichlorobenzene	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
2,4,5-Trichlorophenol	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
2,4,6-Trichlorophenol	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
2,4-Dichlorophenol	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
2,4-Dimethylphenol	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
2,4-Dinitrophenol	1700	U	1700	1700	U	1700	1700	U	1700	1710	U	1710	1710	U	1710	1720	U	1720
2,4-Dinitrotoluene	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
2,6-Dinitrotoluene	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
2-Chloronaphthalene	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
2-Chlorophenol	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
2-Methylnaphthalene	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
2-Methylphenol (cresol, o-)	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
2-Nitroaniline	1700	U	1700	1700	U	1700	1700	U	1700	1710	U	1710	1710	U	1710	1720	U	1720
2-Nitrophenol	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
3+4 Methylphenol (cresol, m+p)	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
3,3'-Dichlorobenzidine	678	U	678	682	U	682	682	U	682	685	U	685	686	U	686	687	U	687
3-Nitroaniline	1700	U	1700	1700	U	1700	1700	U	1700	1710	U	1710	1710	U	1710	1720	U	1720
4,6-Dinitro-2-methylphenol	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
4-Bromophenylphenyl ether	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
4-Chloro-3-methylphenol	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
4-Chloroaniline	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
4-Chlorophenylphenyl ether	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
4-Nitroaniline	1700	U	1700	1700	U	1700	1700	U	1700	1710	U	1710	1710	U	1710	1720	U	1720
4-Nitrophenol	1700	U	1700	1700	U	1700	1700	U	1700	1710	U	1710	1710	U	1710	1720	U	1720

Table A-3. 600-202 In-Process Sampling Data. (14 Pages)

Constituent	J19XY8			J19XY9			J19Y00			J19Y01			J19Y02			J19Y03		
	5/5/10			5/5/10			5/5/10			5/5/10			5/5/10			5/5/10		
	East excavation			East excavation			East excavation			West excavation			West excavation			West excavation		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Polycyclic Aromatic Hydrocarbons																		
Acenaphthene	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
Acenaphthylene	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
Anthracene	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
Benzo(a)anthracene	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
Benzo(a)pyrene	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
Benzo(b)fluoranthene	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
Benzo(ghi)perylene	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
Benzo(k)fluoranthene	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
Bis(2-chloro-1-methylethyl)ether	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
Bis(2-Chloroethoxy) methane	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
Bis(2-chloroethyl) ether	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
Bis(2-ethylhexyl) phthalate	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
Butylbenzylphthalate	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
Carbazole	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
Chrysene	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
Di-n-butylphthalate	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
Di-n-octylphthalate	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
Dibenz[a,h]anthracene	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
Dibenzofuran	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
Diethyl phthalate	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
Dimethyl phthalate	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
Fluoranthene	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
Fluorene	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
Hexachlorobenzene	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
Hexachlorobutadiene	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
Hexachloro-cyclopentadiene	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
Hexachloroethane	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344

Table A-3. 600-202 In-Process Sampling Data. (14 Pages)

Constituent	J19XY8			J19XY9			J19Y00			J19Y01			J19Y02			J19Y03		
	5/5/10			5/5/10			5/5/10			5/5/10			5/5/10			5/5/10		
	East excavation			East excavation			East excavation			West excavation			West excavation			West excavation		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Polycyclic Aromatic Hydrocarbons																		
Indeno(1,2,3-cd) pyrene	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
Isophorone	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
N-Nitroso-di-n-dipropylamine	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
N-Nitrosodiphenylamine	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
Naphthalene	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
Nitrobenzene	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
Pentachlorophenol	1700	U	1700	1700	U	1700	1700	U	1700	1710	U	1710	1710	U	1710	1720	U	1720
Phenanthrene	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
Phenol	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344
Pyrene	339	U	339	341	U	341	341	U	341	343	U	343	343	U	343	344	U	344

Table A-3. 600-202 In-Process Sampling Data. (14 Pages)

Constituent	J19Y04			J19Y05			J19Y06			J19Y07			J19Y08			J19Y09		
	5/5/10			5/5/10			5/5/10			5/5/10			5/5/10			5/5/10		
	West excavation			West excavation			West excavation			West excavation			Small scraped area			Small scraped area		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Polycyclic Aromatic Hydrocarbons																		
1,2,4-Trichlorobenzene	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
1,2-Dichlorobenzene	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
1,3-Dichlorobenzene	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
1,4-Dichlorobenzene	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
2,4,5-Trichlorophenol	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
2,4,6-Trichlorophenol	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
2,4-Dichlorophenol	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
2,4-Dimethylphenol	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
2,4-Dinitrophenol	1710	U	1710	1730	U	1730	1710	U	1710	1740	U	1740	1700	U	1700	1730	U	1730
2,4-Dinitrotoluene	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
2,6-Dinitrotoluene	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
2-Chloronaphthalene	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
2-Chlorophenol	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
2-Methylnaphthalene	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
2-Methylphenol (cresol, o-)	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
2-Nitroaniline	1710	U	1710	1730	U	1730	1710	U	1710	1740	U	1740	1700	U	1700	1730	U	1730
2-Nitrophenol	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
3+4 Methylphenol (cresol, m+p)	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
3,3'-Dichlorobenzidine	684	U	684	691	U	691	685	U	685	697	U	697	682	U	682	692	U	692
3-Nitroaniline	1710	U	1710	1730	U	1730	1710	U	1710	1740	U	1740	1700	U	1700	1730	U	1730
4,6-Dinitro-2-methylphenol	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
4-Bromophenylphenyl ether	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
4-Chloro-3-methylphenol	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
4-Chloroaniline	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
4-Chlorophenylphenyl ether	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
4-Nitroaniline	1710	U	1710	1730	U	1730	1710	U	1710	1740	U	1740	1700	U	1700	1730	U	1730
4-Nitrophenol	1710	U	1710	1730	U	1730	1710	U	1710	1740	U	1740	1700	U	1700	1730	U	1730
Acenaphthene	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346

Table A-3. 600-202 In-Process Sampling Data. (14 Pages)

Constituent	J19Y04			J19Y05			J19Y06			J19Y07			J19Y08			J19Y09		
	5/5/10			5/5/10			5/5/10			5/5/10			5/5/10			5/5/10		
	West excavation			West excavation			West excavation			West excavation			Small scraped area			Small scraped area		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Polycyclic Aromatic Hydrocarbons																		
Acenaphthylene	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
Anthracene	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
Benzo(a)anthracene	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
Benzo(a)pyrene	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
Benzo(b)fluoranthene	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
Benzo(ghi)perylene	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
Benzo(k)fluoranthene	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
Bis(2-chloro-1-methylethyl)ether	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
Bis(2-Chloroethoxy)methane	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
Bis(2-chloroethyl) ether	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
Bis(2-ethylhexyl) phthalate	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
Butylbenzylphthalate	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
Carbazole	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
Chrysene	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
Di-n-butylphthalate	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
Di-n-octylphthalate	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
Dibenz[a,h]anthracene	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
Dibenzofuran	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
Diethyl phthalate	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
Dimethyl phthalate	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
Fluoranthene	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
Fluorene	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
Hexachlorobenzene	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
Hexachlorobutadiene	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
Hexachlorocyclopentadiene	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
Hexachloroethane	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
Indeno(1,2,3-cd)pyrene	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
Isophorone	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
N-Nitroso-di-n-dipropylamine	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346

Table A-3. 600-202 In-Process Sampling Data. (14 Pages)

Constituent	J19Y04			J19Y05			J19Y06			J19Y07			J19Y08			J19Y09		
	5/5/10			5/5/10			5/5/10			5/5/10			5/5/10			5/5/10		
	West excavation			West excavation			West excavation			West excavation			Small scraped area			Small scraped area		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Polycyclic Aromatic Hydrocarbons																		
N-Nitrosodiphenylamine	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
Naphthalene	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
Nitrobenzene	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
Pentachlorophenol	1710	U	1710	1730	U	1730	1710	U	1710	1740	U	1740	1700	U	1700	1730	U	1730
Phenanthrene	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
Phenol	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346
Pyrene	342	U	342	346	U	346	342	U	342	348	U	348	341	U	341	346	U	346

B = blank contamination (organic constituents)
HEIS = Hanford Environmental Information System
J = estimate
NA = not applicable
PQL = practical quantitation limit
Q = qualifier
U = undetected

APPENDIX B

PHOTOGRAPHS

Figure B-1. The 600-202 Waste Site Prior to Remediation (March 10, 2004).

Figure B-2. Circular Bare Spot at the 600-202 Waste Site (March 10, 2004).

Figure B-3. Valve and Water Line Found at 600-202 (March 22, 2004).

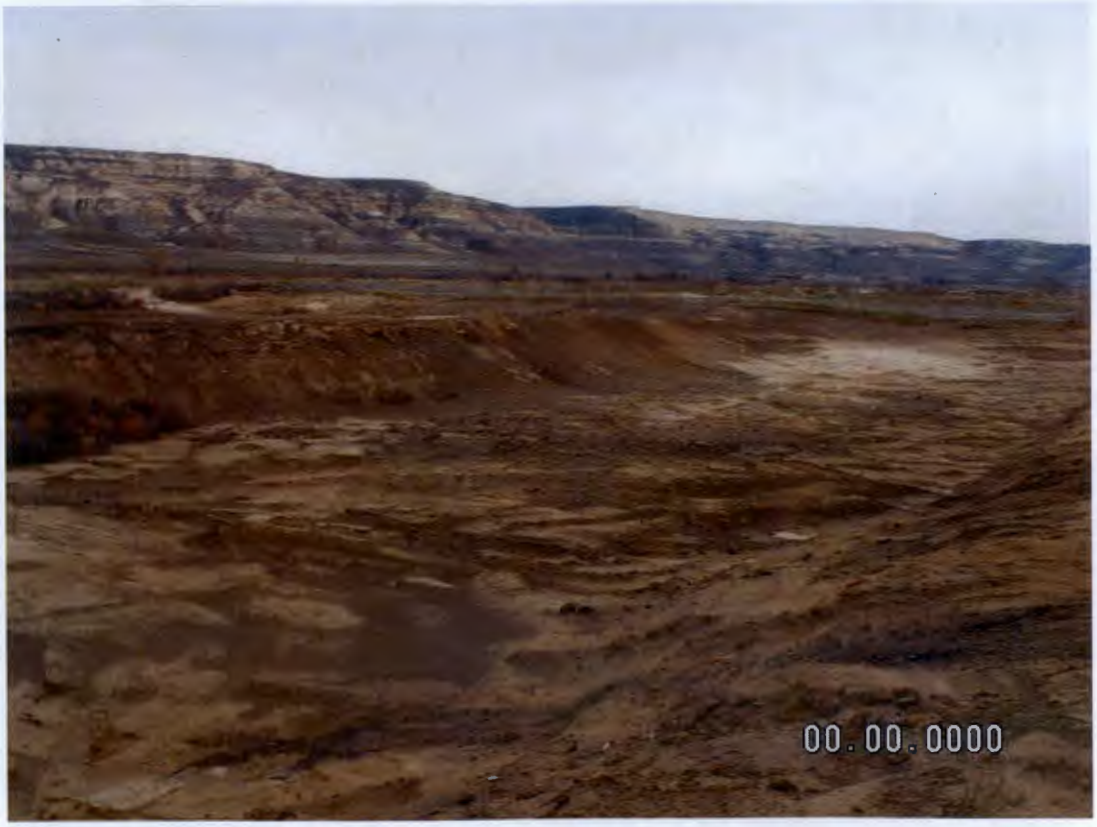
Figure B-4. Uncovered Debris During Confirmatory Sampling at 600-202 (January 19, 2005).

Figure B-5. Waste Staging Pile at 600-202 (March 16, 2010).

Figure B-6. Bottles and Other Miscellaneous Debris Found at 600-202 (March 24, 2010).

Figure B-7. Drum Found at 600-202 (April 8, 2010).

Figure B-8. 600-202 Waste Site After Remediation (May 2010).



APPENDIX C

95% UPPER CONFIDENCE LIMIT CALCULATION

AND

DIRECT CONTACT HAZARD QUOTIENT CALCULATION

Acrobat 8.0

CALCULATION COVER SHEET

Project Title: 100-IU-2/6 Field Remediation **Job No. 14655**

Area: 100-IU-6

Discipline: Environmental *Calculation No: 0600X-CA-V0115

Subject: 600-202 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 = 22 Attm. 1 = 13 Total = 36	J. D. Shoglie	T. E. Queen	I. B. Berezovskiy	D. F. Obenauer	4/4/11

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 J. D. Skoglie	**Date** 03/28/11	**Calc. No.** 0600X-CA-V0115	**Rev. No.** 0
Project 100-IU-2/6 Field Remediation	**Job No.** 14655	**Checked** T. E. Queen	**Date** 03/28/11
Subject 600-202 Waste Site Cleanup Verification 95% UCL Calculations			**Sheet No.** 1 of 22

Summary

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

Table of Contents:
Sheets 1 to 5 - Calculation Sheet Summary
Sheet 6 to 7 - Calculation Sheet Verification Data - Large Excavation
Sheet 8 to 9 - Calculation Sheet Verification Data - Small Excavation
Sheet 10 to 12 - Calculation Sheet Verification Data - Staging Pile Area
Sheet 13 to 19 - Ecology Software (MTCAStat) Results
Sheet 20 to 22 - Calculation Sheet Duplicate Analysis
Attachment 1 - 600-202, Verification Sampling Results (13 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 2005b). 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 direct contact 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 600-202 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 600-202 waste site consisted of 3 decision units for verification sampling: the large excavation area, small excavation area, and the staging pile area. Also included were 2 focused samples.

Analytical results for all sampling locations are summarized in the tables provided on sheets 3, 4 & 5. Further information of the sample data quality is presented in the data quality assessment section of the associated RSVP.

Washington Closure Hanford CALCULATION SHEET

Originator J. D. Skoglie Date 03/28/11 Calc. No. 0600X-CA-V0115 Rev. No. 0
Project 100-IU-2/6 Field Remediation Job No. 14655 Checked T. E. Queen Date 03/28/11
Subject 600-202 Waste Site Cleanup Verification 95% UCL Calculations Sheet No. 2 of 22

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.

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 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 WAC 173-340-740(7)(e) 3-part test is not performed for COPCs where the statistical value defaults to the maximum value in the data set. Instead, direct comparison of the maximum value against site remedial action goals (RAGs) (within the RSVP) is used as the compliance basis.

The RPD is calculated when both the primary value and the duplicate value for a given analyte are above detection limits and are greater than 5 times the target detection limit (TDL). The TDL is a laboratory detection limit pre-determined for each analytical method and is listed in Table II-1 of the SAP (DOE-RL 2009a) for certain constituents with cleanup levels. All other constituents will have their own pre-determined TDL's based on 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 sample, but was quantified at less than 5 times the TDL in one or both samples, an additional parameter is evaluated. In this case, if the difference between the primary and duplicate results exceeds a control limit of 2 times the TDL, further assessment regarding the usability of the data is performed. Additional discussion as necessary is provided in the data quality assessment section of the applicable RSVP.

Washington Closure Hanford **CALCULATION SHEET**

Originator J. D. Skoglie **Date** 03/28/11 **Calc. No.** 0600X-CA-V0115 **Rev. No.** 0
Project 100-IU-2/6 Field Remediation **Job No.** 14655 **Checked** T. E. Queen **Date** 03/28/11
Subject 600-202 Waste Site Cleanup Verification 95% UCL Calculations **Sheet No.** 3 of 22

Summary (continued)

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

Results Summary - Excavation Large[a]

Analyte	95% UCL Result	Maximum Result	Units
Antimony	0.398	–	mg/kg
Arsenic	5.12	–	mg/kg
Barium	86.2	–	mg/kg
Beryllium	0.319	–	mg/kg
Boron	1.87	–	mg/kg
Cadmium	0.0852	–	mg/kg
Chromium	17.8	–	mg/kg
Cobalt	5.47	–	mg/kg
Copper	13.7	–	mg/kg
Lead	5.44	–	mg/kg
Manganese	310	–	mg/kg
Molybdenum	0.396	–	mg/kg
Nickel	16.1	–	mg/kg
Vanadium	46.6	–	mg/kg
Zinc	40.7	–	mg/kg
Acenaphthene	6.06	–	ug/kg
Benzo(b)fluoranthene	–	1.20	ug/kg
Chrysene	–	2.39	ug/kg
Fluoranthene	–	7.08	ug/kg
Indeno(1,2,3-cd)pyrene	–	4.28	ug/kg
Phenanthrene	–	4.07	ug/kg
Aldrin	–	2.86	ug/kg
BHC-beta	–	3.32	ug/kg

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

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

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

Results Summary - Excavation Small[a]

Analyte	95% UCL Result	Maximum Result	Units
Arsenic	7.87	–	mg/kg
Barium	104	–	mg/kg
Beryllium	0.463	–	mg/kg
Boron	3.03	–	mg/kg
Cadmium	0.159	–	mg/kg
Chromium	22.4	–	mg/kg
Cobalt	7.21	–	mg/kg
Copper	17.8	–	mg/kg
Lead	6.82	–	mg/kg
Manganese	394	–	mg/kg
Molybdenum	0.448	–	mg/kg
Nickel	19.0	–	mg/kg
Vanadium	48.1	–	mg/kg
Zinc	49.0	–	mg/kg
Selenium	–	0.337	mg/kg
TPH-motor oil (high boiling)	–	8170	ug/kg
Acenaphthene	–	24.8	ug/kg
Acenaphthylene	–	82.1	ug/kg
Anthracene	–	2.03	ug/kg
Fluoranthene	–	5.14	ug/kg
Fluorene	–	34.5	ug/kg
Naphthalene	–	20.7	ug/kg
Phenanthrene	–	5.24	ug/kg
Pyrene	–	5.14	ug/kg

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

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

[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)
D = analyte reported from a 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
RSVP = remaining sites verification package

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 J. D. Skoglie **Date** 03/28/11 **Calc. No.** 0600X-CA-V0115 **Rev. No.** 0
Project 100-IU-2/6 Field Remediation **Job No.** 14655 **Checked** T. E. Queen **Date** 03/28/11
Subject 600-202 Waste Site Cleanup Verification 95% UCL Calculations **Sheet No.** 4 of 22

Summary (continued)

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

Results Summary - Staging Pile Area*

Analyte	95% UCL Result	Maximum Result	Units
Arsenic	4.94	-	mg/kg
Barium	108	-	mg/kg
Beryllium	0.242	-	mg/kg
Boron	5.72	-	mg/kg
Cadmium	0.276	-	mg/kg
Chromium	15.0	-	mg/kg
Cobalt	7.03	-	mg/kg
Copper	28.9	-	mg/kg
Lead	38.3	-	mg/kg
Manganese	350	-	mg/kg
Molybdenum	0.919	-	mg/kg
Nickel	12.7	-	mg/kg
Vanadium	55.6	-	mg/kg
Zinc	122	-	mg/kg
TPH-motor oil (high boiling)	119123	-	ug/kg
Acenaphthylene	38.2	-	ug/kg
Anthracene	3.64	-	ug/kg
Benzo(a)anthracene	20.1	-	ug/kg
Benzo(b)fluoranthene	34.0	-	ug/kg
Chrysene	48.1	-	ug/kg
Fluoranthene	198	-	ug/kg
Fluorene	5.97	-	ug/kg
Phenanthrene	54.2	-	ug/kg
Pyrene	1882	-	ug/kg
Antimony	-	1.74	mg/kg
Hexavalent chromium	-	0.26	mg/kg
Silver	-	0.275	mg/kg
TPH - diesel range	-	11500	ug/kg
Acenaphthene	-	53.9	ug/kg
Benzo(a)pyrene	-	36.3	ug/kg
Benzo(ghi)perylene	-	52.8	ug/kg
Benzo(k)fluoranthene	-	16.5	ug/kg
Dibenz[a,h]anthracene	-	16.8	ug/kg
Naphthalene	-	13.1	ug/kg
Aldrin	-	6.00	ug/kg
4,4'-DDD	-	2.65	ug/kg
4,4'-DDE	-	2.04	ug/kg
4,4'-DDT	-	4.01	ug/kg
Endrin	-	2.24	ug/kg
Endrin aldehyde	-	1.97	ug/kg
Endrin ketone	-	1.41	ug/kg
Methoxychlor	-	1.61	ug/kg

WAC 173-340-740(7)(e) Evaluation:
WAC 173-340 3-Part Test for most stringent RAG:

95% UCL > Cleanup Limit?	YES
> 10% above Cleanup Limit?	YES
Any sample > 2x Cleanup Limit?	YES

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

Washington Closure Hanford

CALCULATION SHEET

Originator J. D. Skoglie Date 03/28/11 Calc. No. 0600X-CA-V0115 Rev. No. 0
Project 100-IU-2/6 Field Remediation Job No. 14655 Checked T. E. Queen Date 03/28/11
Subject 600-202 Waste Site Cleanup Verification 95% UCL Calculations Sheet No. 5 of 22

Summary (continued)

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

Focused Samples Maximum Results

Analyte	Maximum Result	Units
Antimony	0.735	mg/kg
Arsenic	10.2	mg/kg
Barium	201	mg/kg
Beryllium	0.376	mg/kg
Boron	13.0	mg/kg
Cadmium	1.29	mg/kg
Chromium	21.9	mg/kg
Cobalt	6.62	mg/kg
Copper	87.9	mg/kg
Lead	278	mg/kg
Manganese	358	mg/kg
Molybdenum	1.17	mg/kg
Nickel	20.5	mg/kg
Silver	1.54	mg/kg
Vanadium	50.3	mg/kg
Zinc	403	mg/kg
TPH-motor oil (high boiling)	104000	ug/kg
Acenaphthene	13.9	ug/kg
Acenaphthylene	132	ug/kg
Anthracene	11.4	ug/kg
Benzo(a)anthracene	17.3	ug/kg
Benzo(a)pyrene	1.22	ug/kg
Benzo(b)fluoranthene	15.6	ug/kg
Benzo(ghi)perylene	1.33	ug/kg
Chrysene	2.45	ug/kg
Fluoranthene	61.0	ug/kg
Fluorene	14.7	ug/kg
Indeno(1,2,3-cd)pyrene	82.5	ug/kg
Naphthalene	26.5	ug/kg
Phenanthrene	53.5	ug/kg
Pyrene	6.83	ug/kg
alpha-BHC	2.02	ug/kg
beta-BHC	14.5	ug/kg
Endosulfan I	2.99	ug/kg

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

Analyte	Duplicate Analysis		
	Excavation Large	Excavation Small	Staging Pile Area
Aluminum	11.9%	12.8%	5.4%
Barium	11.2%	7.1%	12.9%
Calcium	26.6%	18.3%	35.8%
Chromium	11.4%		16.2%
Copper	14.8%		6.0%
Iron	3.8%	15.0%	1.7%
Lead			42.1%
Magnesium	13.9%	20.2%	6.4%
Manganese	8.2%	11.8%	4.9%
Silicon	1.7%	7.6%	32.6%
Sodium	20.9%	2.0%	3.5%
Vanadium	0.6%		11.0%
Zinc	7.5%		4.5%
TPH-motor oil (high boiling)			24.4%
Chrysene			31.3%
Pyrene			6.1%

[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

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-IU-2/6 Field Remediation
Subject 600-202 Waste Site Cleanup Verification 95% UCL Calculations

Date 03/28/11
Job No. 14655

Calc. No. 0600X-CA-V0115
Checked T. E. Queen

Rev. No. 0
Date 03/28/11
Sheet No. 6 of 22

1 **600-202 Statistical Calculations**

2 **Verification Data - Excavation Large**

3	Sample	Sample	Sample	Antimony			Arsenic			Barium			Beryllium			Boron			Cadmium			Chromium			Cobalt		
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	EXL-1	J1C3W7	11/29/10	0.366	JB	0.550	2.82		0.917	64.3		0.459	0.233		0.183	1.14		1.83	0.0707		0.183	13.2		0.183	4.27		1.83
6	Duplicate of J1C3W7	J1C3X9	11/29/10	0.237	JB	0.452	2.98		0.754	71.9		0.377	0.273		0.151	1.18		1.51	0.0764		0.151	14.8		0.151	4.63		1.51
7	EXL-2	J1C3W8	11/29/10	0.390	JB	0.420	3.34		0.700	51.4		0.350	0.212		0.140	1.27		1.40	0.0570		0.140	11.8		0.140	3.75		1.40
8	EXL-3	J1C3W9	11/29/10	0.367	JB	0.509	4.79		0.848	71.1		0.424	0.294		0.170	2.67		1.70	0.0675		0.170	13.0		0.170	4.76		1.70
9	EXL-4	J1C3X0	11/29/10	0.451	JB	0.513	3.70		0.854	67.7		0.427	0.254		0.171	0.881		1.71	0.0809		0.171	15.6		0.171	4.40		1.71
10	EXL-5	J1C3X1	11/29/10	0.298	JB	0.435	3.41		0.724	90.6		0.362	0.280		0.145	0.921		1.45	0.104		0.145	15.4		0.145	4.82		1.45
11	EXL-6	J1C3X2	11/29/10	0.480	UJ	0.480	3.93		0.801	56.3		0.400	0.252		0.160	1.97		1.60	0.0603		0.160	13.3		0.160	4.41		1.60
12	EXL-7	J1C3X3	11/29/10	0.306	JB	0.501	4.66		0.834	90.0		0.417	0.346		0.167	1.65		1.67	0.0784		0.167	17.3		0.167	5.57		1.67
13	EXL-8	J1C3X4	11/29/10	0.489	JB	0.511	6.95		0.852	85.7		0.426	0.349		0.170	1.61		1.70	0.0891		0.170	20.7		0.170	6.04		1.70
14	EXL-9	J1C3X5	11/29/10	0.344	JB	0.533	3.63		0.888	66.5		0.444	0.249		0.178	1.27		1.78	0.0723		0.178	13.0		0.178	4.61		1.78
15	EXL-10	J1C3X6	11/29/10	0.388	JB	0.423	4.37		0.705	97.2		0.352	0.327		0.141	0.633		1.41	0.0492		0.141	17.5		0.141	5.68		1.41
16	EXL-11	J1C3X7	11/29/10	0.391	JB	0.613	5.46		0.102	84.7		0.511	0.337		0.204	1.68		2.04	0.0913		0.204	21.2		0.204	6.21		2.04
17	EXL-12	J1C3X8	11/29/10	0.292	JB	0.466	5.84		0.777	91.0		0.388	0.340		0.155	1.77		1.55	0.0814		0.155	18.8		0.155	5.60		1.55

19 **Statistical Computation Input Data**

20	Sample	Sample	Sample	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt
21	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
22	EXL-1	J1C3W7/ J1C3X9	11/29/10	0.302	2.90	68.1	0.253	1.16	0.0736	14.0	4.45
23	EXL-2	J1C3W8	11/29/10	0.390	3.34	51.4	0.212	1.27	0.0570	11.8	3.75
24	EXL-3	J1C3W9	11/29/10	0.367	4.79	71.1	0.294	2.67	0.0675	13.0	4.76
25	EXL-4	J1C3X0	11/29/10	0.451	3.70	67.7	0.254	0.881	0.0809	15.6	4.40
26	EXL-5	J1C3X1	11/29/10	0.298	3.41	90.6	0.280	0.921	0.104	15.4	4.82
27	EXL-6	J1C3X2	11/29/10	0.240	3.93	56.3	0.252	1.97	0.0603	13.3	4.41
28	EXL-7	J1C3X3	11/29/10	0.306	4.66	90.0	0.346	1.65	0.0784	17.3	5.57
29	EXL-8	J1C3X4	11/29/10	0.489	6.95	85.7	0.349	1.61	0.0891	20.7	6.04
30	EXL-9	J1C3X5	11/29/10	0.344	3.63	66.5	0.249	1.27	0.0723	13.0	4.61
31	EXL-10	J1C3X6	11/29/10	0.388	4.37	97.2	0.327	0.633	0.0492	17.5	5.68
32	EXL-11	J1C3X7	11/29/10	0.391	5.46	84.7	0.337	1.68	0.0913	21.2	6.21
33	EXL-12	J1C3X8	11/29/10	0.292	5.84	91.0	0.340	1.77	0.0814	18.8	5.60

34 **Statistical Computations**

35		Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt
36	95% UCL based on	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.
37	N	12	12	12	12	12	12	12	12
38	% < Detection limit	8%	0%	0%	0%	0%	0%	0%	0%
39	Mean	0.355	4.42	76.7	0.291	1.46	0.0754	16.0	5.03
40	Standard deviation	0.0718	1.19	15.0	0.0474	0.556	0.0156	3.14	0.769
41	95% UCL on mean	0.398	5.12	86.2	0.319	1.87	0.0852	17.8	5.47
42	Maximum value	0.489	6.95	97.2	0.349	2.67	0.104	21.2	6.21
43	Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)	5 GW & River Protection	20 DE, GW & River Protection	200 GW Protection	1.51 GW and River Protection	320 GW Protection	0.81 GW and River Protection	18.5 GW and River Protection	15.7 GW Protection
44	**WAC 173-340 3-PART TEST**								
45	95% UCL > Cleanup Limit?	NA	NO	NA	NA	NO	NA	NO	NA
46	> 10% above Cleanup Limit?	NA	NO	NA	NA	NO	NA	YES	NA
47	Any sample > 2X Cleanup Limit?	NA	NO	NA	NA	NO	NA	NO	NA
48	**WAC 173-340 Compliance?**	Because all values are below background (5 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.	Because all values are below background (132 mg/kg) the 3-part test is not required.	Because all values are below background (1.51 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.	Because all values are below background (0.81 mg/kg) the 3-part test is not required.	Further 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 (15.7 mg/kg) the 3-part test is not required.

CALCULATION SHEET

Washington Closure Hanford
Originator J. D. Skoglie
Project 100-IU-2/6 Field Remediation
Subject 600-202 Waste Site Cleanup Verification 95% UCL Calculations

Date 03/28/11
Job No. 14655

Calc. No. 0600X-CA-V0115
Checked T. E. Queen

Rev. No. 0
Date 03/28/11
Sheet No. 7 of 22

1 **600-202 Statistical Calculations**
2 **Verification Data - Excavation Large**

3	Sample	Sample	Sample	Copper			Lead			Manganese			Molybdenum			Nickel			Vanadium			Zinc			Acenaphthene		
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	EXL-1	J1C3W7	11/29/10	8.97		0.917	4.11		0.459	234		4.59	0.286		1.83	11.8		3.67	34.6		2.29	32.3		9.17	1.08	J	3.59
6	Duplicate of J1C3W7	J1C3X9	11/29/10	10.4		0.754	4.46		0.377	254		3.77	0.285		1.51	13.7		3.02	34.4		1.88	34.8		7.54	3.48	U	3.48
7	EXL-2	J1C3W8	11/29/10	8.56		0.700	4.32		0.350	215		3.50	0.172		1.40	10.6		2.80	31.1		1.75	28.9		7.00	3.48	U	3.48
8	EXL-3	J1C3W9	11/29/10	10.4		0.848	4.86		0.424	306		4.24	0.238		1.70	11.5		3.39	58.1		2.12	38.4		8.48	2.05	J	3.53
9	EXL-4	J1C3X0	11/29/10	10.4		0.854	4.51		0.427	249		4.27	0.224		1.71	13.4		3.42	35.5		2.14	33.7		8.54	10.9		3.51
10	EXL-5	J1C3X1	11/29/10	11.7		0.724	4.93		0.362	264		3.62	0.194		1.45	13.8		2.90	31.8		1.81	36.7		7.24	8.37		3.56
11	EXL-6	J1C3X2	11/29/10	9.85		0.801	4.57		0.400	260		4.00	0.200		1.60	11.9		3.20	42.8		2.00	34.9		8.01	3.42	U	3.42
12	EXL-7	J1C3X3	11/29/10	12.7		0.834	5.35		0.417	322		4.17	0.233		1.67	14.5		3.34	45.2		2.09	40.8		8.34	3.59	U	3.59
13	EXL-8	J1C3X4	11/29/10	15.1		0.852	5.98		0.426	372		4.26	0.234		1.70	18.8		3.41	50.3		2.13	43.4		8.52	1.07	J	3.56
14	EXL-9	J1C3X5	11/29/10	10.3		0.888	4.93		0.444	260		4.44	0.182		1.78	11.8		3.55	41.1		2.22	36.0		8.88	2.05	J	3.52
15	EXL-10	J1C3X6	11/29/10	16.3		0.705	4.87		0.352	302		3.52	0.218		1.41	15.2		2.82	49.4		1.76	39.4		7.05	6.87		3.61
16	EXL-11	J1C3X7	11/29/10	16.2		0.102	5.98		0.511	318		5.11	2.04	U	2.04	20.7		4.09	40.6		2.56	43.4		10.2	1.44	J	3.59
17	EXL-12	J1C3X8	11/29/10	13.9		0.777	6.27		0.388	311		3.88	0.220		1.55	16.8		3.11	42.0		1.94	45.4		7.77	11.0		3.54

19 **Statistical Computation Input Data**

20	Sample	Sample	Sample	Copper	Lead	Manganese	Molybdenum	Nickel	Vanadium	Zinc	Acenaphthene
21	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	ug/kg
22	EXL-1	J1C3W7/ J1C3X9	11/29/10	9.69	4.29	244	0.286	12.8	34.5	33.6	1.41
23	EXL-2	J1C3W8	11/29/10	8.56	4.32	215	0.172	10.6	31.1	28.9	1.74
24	EXL-3	J1C3W9	11/29/10	10.4	4.86	306	0.238	11.5	58.1	38.4	2.05
25	EXL-4	J1C3X0	11/29/10	10.4	4.51	249	0.224	13.4	35.5	33.7	10.9
26	EXL-5	J1C3X1	11/29/10	11.7	4.93	264	0.194	13.8	31.8	36.7	8.37
27	EXL-6	J1C3X2	11/29/10	9.85	4.57	260	0.200	11.9	42.8	34.9	1.71
28	EXL-7	J1C3X3	11/29/10	12.7	5.35	322	0.233	14.5	45.2	40.8	1.80
29	EXL-8	J1C3X4	11/29/10	15.1	5.98	372	0.234	18.8	50.3	43.4	1.07
30	EXL-9	J1C3X5	11/29/10	10.3	4.93	260	0.182	11.8	41.1	36.0	2.05
31	EXL-10	J1C3X6	11/29/10	16.3	4.87	302	0.218	15.2	49.4	39.4	6.87
32	EXL-11	J1C3X7	11/29/10	16.2	5.98	318	1.02	20.7	40.6	43.4	1.44
33	EXL-12	J1C3X8	11/29/10	13.9	6.27	311	0.220	16.8	42.0	45.4	11.0

34 **Statistical Computations**

35		Copper	Lead	Manganese	Molybdenum	Nickel	Vanadium	Zinc	Acenaphthene
36	95% UCL based on	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	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%	8%	0%	0%	0%	25%
39	Mean	12.1	5.07	285	0.285	14.3	41.9	37.9	4.20
40	Standard deviation	2.69	0.677	43.7	0.233	3.09	8.08	4.85	3.91
41	95% UCL on mean	13.7	5.44	310	0.396	16.1	46.6	40.7	6.06
42	Maximum value	16.3	6.27	372	0.286	20.7	58.1	45.4	11.0
43	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless otherwise noted**	22.0 River Protection	10.2 GW & River Protection	512 GW & River Protection	8 GW Protection	19.1 GW Protection	85.1 GW Protection	67.8 River Protection	96 ug/kg GW Protection
44	**WAC 173-340 3-PART TEST**								
45	95% UCL > Cleanup Limit?	NA	NA	NA	NO	NO	NA	NA	NO
46	> 10% above Cleanup Limit?	NA	NA	NA	NO	NO	NA	NA	NO
47	Any sample > 2X Cleanup Limit?	NA	NA	NA	NO	NO	NA	NA	NO
48	**WAC 173-340 Compliance?**	Because all values are below background (22 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (10.2 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (512 mg/kg) the WAC 173-340 3-part test is not required.	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 direct exposure RAG.	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.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-IU-2/6 Field Remediation
Subject 600-202 Waste Site Cleanup Verification 95% UCL Calculations

Date 03/14/11
Job No. 14655

Calc. No. 0600X-CA-V0115
Checked T. E. Queen

Rev. No. 0
Date 03/14/11
Sheet No. 8 of 22

1 **600-202 Statistical Calculations**

2 **Verification Data - Excavation Small**

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	EXS-3	J1C3Y3	12/1/10	1.47		1.06	76.6		0.529	0.130	B	0.212	1.25	B	2.12	0.212	U	0.212	2.40		0.212	1.12	B	2.12	4.91		1.06
6	Duplicate of J1C3Y3	J1C402	12/1/10	1.68		1.10	82.2		0.549	0.140	B	0.220	1.45	B	2.20	0.220	U	0.220	2.91		0.220	1.33	B	2.20	5.89		1.10
7	EXS-1	J1C3Y0	12/1/10	3.24		0.888	57.0		0.444	0.223		0.178	1.36	B	1.78	0.0774	B	0.178	11.6		0.178	4.48		1.78	9.37		0.888
8	EXS-2	J1C3Y1	12/1/10	8.63		1.14	116		0.571	0.528		0.228	2.22	B	2.28	0.171	B	0.228	28.3		0.228	9.03		2.28	20.3		1.14
9	EXS-4	J1C3Y2	12/1/10	5.09		1.02	120		0.509	0.400		0.204	1.65	B	2.04	0.171	B	0.204	21.7		0.204	6.81		2.04	15.4		1.02
10	EXS-5	J1C3Y4	12/1/10	6.20		1.07	114		0.537	0.512		0.215	2.90		2.15	0.148	B	0.215	27.6		0.215	8.44		2.15	20.1		1.07
11	EXS-6	J1C3Y5	12/1/10	5.75		0.822	94.9		0.411	0.419		0.164	6.90		1.64	0.120	B	0.164	22.3		0.164	6.74		1.64	14.3		0.822
12	EXS-7	J1C3Y6	12/1/10	11.4		1.01	105		0.505	0.473		0.202	1.34	B	2.02	0.170	B	0.202	24.7		0.202	8.00		2.02	17.5		1.01
13	EXS-8	J1C3Y7	12/1/10	3.42		0.890	67.3		0.445	0.265		0.178	1.94		1.78	0.100	B	0.178	11.7		0.178	5.14		1.78	9.50		0.890
14	EXS-9	J1C3Y8	12/1/10	8.58		0.898	109		0.449	0.488		0.180	2.98		1.80	0.197		0.180	26.2		0.180	8.12		1.80	20.8		0.898
15	EXS-10	J1C3Y9	12/1/10	3.17		0.944	73.1		0.472	0.260		0.189	0.976	B	1.89	0.0857	B	0.189	17.0		0.189	5.00		1.89	10.4		0.944
16	EXS-11	J1C400	12/1/10	3.28		0.882	73.3		0.441	0.272		0.176	1.58	B	1.76	0.0948	B	0.176	12.2		0.176	5.24		1.76	10.3		0.882
17	EXS-12	J1C401	12/1/10	3.42		0.741	68.6		0.370	0.232		0.148	2.18		1.48	0.137	B	0.148	12.0		0.148	4.48		1.48	10.8		0.741

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	EXS-3	J1C3Y3/ J1C402	12/1/10	1.58	79.4	0.135	1.35	0.108	2.66	1.23	5.40
23	EXS-1	J1C3Y0	12/1/10	3.24	57.0	0.223	1.36	0.0774	11.6	4.48	9.37
24	EXS-2	J1C3Y1	12/1/10	8.63	116	0.528	2.22	0.171	28.3	9.03	20.3
25	EXS-4	J1C3Y2	12/1/10	5.09	120	0.400	1.65	0.171	21.7	6.81	15.4
26	EXS-5	J1C3Y4	12/1/10	6.20	114	0.512	2.90	0.148	27.6	8.44	20.1
27	EXS-6	J1C3Y5	12/1/10	5.75	94.9	0.419	6.90	0.120	22.3	6.74	14.3
28	EXS-7	J1C3Y6	12/1/10	11.4	105	0.473	1.34	0.170	24.7	8.00	17.5
29	EXS-8	J1C3Y7	12/1/10	3.42	67.3	0.265	1.94	0.100	11.7	5.14	9.50
30	EXS-9	J1C3Y8	12/1/10	8.58	109	0.488	2.98	0.197	26.2	8.12	20.8
31	EXS-10	J1C3Y9	12/1/10	3.17	73.1	0.260	0.976	0.0857	17.0	5.00	10.4
32	EXS-11	J1C400	12/1/10	3.28	73.3	0.272	1.58	0.0948	12.2	5.24	10.3
33	EXS-12	J1C401	12/1/10	3.42	68.6	0.232	2.18	0.137	12.0	4.48	10.8

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), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), use MTCAStat normal distribution.	Large data set (n ≥10), use MTCAStat normal distribution.	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%	8%	0%	0%	0%
39	Mean	5.31	89.8	0.351	2.28	0.132	18.2	6.06	13.7
40	Standard deviation	2.92	22.4	0.134	1.58	0.0396	8.14	2.23	5.12
41	95% UCL on mean	7.87	104	0.463	3.03	0.159	22.4	7.21	17.8
42	Maximum value	11.4	120	0.528	6.90	0.197	28.3	9.03	20.8
43	Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)	20 DE, GW & River Protection	200 GW Protection	1.51 GW and River Protection	320 GW Protection	0.81 GW and River Protection	18.5 GW and 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	YES	NA	NA
46	> 10% above Cleanup Limit?	NO	NA	NA	NO	NA	YES	NA	NA
47	Any sample > 2X Cleanup Limit?	NO	NA	NA	NO	NA	NO	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 3-part test is not required.	Because all values are below background (1.51 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.	Because all values are below background (0.81 mg/kg) the 3-part test is not required.	Further 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 (15.7 mg/kg) the 3-part test is not required.	Because all values are below background (22 mg/kg) the WAC 173-340 3-part test is not required.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie

Project 100-IU-2/6 Field Remediation

Subject 600-202 Waste Site Cleanup Verification 95% UCL Calculations

Date 03/28/11

Job No. 14655

Calc. No. 0600X-CA-V0115

Checked T. E. Queen

Rev. No. 0

Date 03/28/11

Sheet No. 9 of 22

1 **600-202 Statistical Calculations**

2 **Verification Data - Excavation Small**

3	Sample	Sample	Sample	Lead			Manganese			Molybdenum			Nickel			Vanadium			Zinc		
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
5	EXS-3	J1C3Y3	12/1/10	1.25		0.529	135		5.29	0.334	B	2.12	2.31	B	4.23	7.17		2.65	6.48	B	10.6
6	Duplicate of J1C3Y3	J1C402	12/1/10	1.34		0.549	152		5.49	0.349	B	2.20	2.86	B	4.39	8.66		2.75	8.14	B	11.0
7	EXS-1	J1C3Y0	12/1/10	4.38		0.444	225		4.44	0.201	B	1.78	10.4		3.55	37.1		2.22	36.7		8.88
8	EXS-2	J1C3Y1	12/1/10	8.11		0.571	449		5.71	0.331	B	2.28	25.0		4.56	57.7		2.85	57.4		11.4
9	EXS-4	J1C3Y2	12/1/10	6.11		0.509	359		5.09	0.362	B	2.04	17.5		4.08	42.7		2.55	48.9		10.2
10	EXS-5	J1C3Y4	12/1/10	7.92		0.537	419		5.37	0.358	B	2.15	22.8		4.30	51.1		2.68	55.8		10.7
11	EXS-6	J1C3Y5	12/1/10	6.19		0.411	354		4.11	0.301	B	1.64	17.8		3.29	49.2		2.06	45.7		8.22
12	EXS-7	J1C3Y6	12/1/10	6.76		0.505	437		5.05	0.297	B	2.02	22.7		4.04	54.9		2.53	50.2		10.1
13	EXS-8	J1C3Y7	12/1/10	4.30		0.445	259		4.45	0.265	B	1.78	10.4		3.56	39.2		2.22	36.0		8.90
14	EXS-9	J1C3Y8	12/1/10	7.68		0.449	413		4.49	0.304	B	1.80	23.5		3.59	51.1		2.24	55.8		8.98
15	EXS-10	J1C3Y9	12/1/10	4.05		0.472	247		4.72	1.89	U	1.89	10.5		3.78	36.7		2.36	32.8		9.44
16	EXS-11	J1C400	12/1/10	4.53		0.441	268		4.41	0.361	B	1.76	10.6		3.53	40.4		2.20	36.7		8.82
17	EXS-12	J1C401	12/1/10	7.60		0.370	221		3.70	0.217	B	1.48	10.2		2.96	33.1		1.85	45.4		7.41

19 **Statistical Computation Input Data**

20	Sample	Sample	Sample	Lead	Manganese	Molybdenum	Nickel	Vanadium	Zinc
21	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
22	EXS-3	J1C3Y3/ J1C402	12/1/10	1.30	144	0.342	2.59	7.92	7.31
23	EXS-1	J1C3Y0	12/1/10	4.38	225	0.201	10.4	37.1	36.7
24	EXS-2	J1C3Y1	12/1/10	8.11	449	0.331	25.0	57.7	57.4
25	EXS-4	J1C3Y2	12/1/10	6.11	359	0.362	17.5	42.7	48.9
26	EXS-5	J1C3Y4	12/1/10	7.92	419	0.358	22.8	51.1	55.8
27	EXS-6	J1C3Y5	12/1/10	6.19	354	0.301	17.8	49.2	45.7
28	EXS-7	J1C3Y6	12/1/10	6.76	437	0.297	22.7	54.9	50.2
29	EXS-8	J1C3Y7	12/1/10	4.30	259	0.265	10.4	39.2	36.0
30	EXS-9	J1C3Y8	12/1/10	7.68	413	0.304	23.5	51.1	55.8
31	EXS-10	J1C3Y9	12/1/10	4.05	247	0.945	10.5	36.7	32.8
32	EXS-11	J1C400	12/1/10	4.53	268	0.361	10.6	40.4	36.7
33	EXS-12	J1C401	12/1/10	7.60	221	0.217	10.2	33.1	45.4

34 **Statistical Computations**

35		Lead	Manganese	Molybdenum	Nickel	Vanadium	Zinc
36	95% UCL based on	Large data set (n ≥10), use MTCAStat normal distribution.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), use MTCAStat normal distribution.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.
37	N	12	12	12	12	12	12
38	% < Detection limit	0%	0%	8%	0%	0%	0%
39	Mean	5.74	316	0.357	15.3	41.8	42.4
40	Standard deviation	2.07	101	0.193	7.16	13.3	13.9
41	95% UCL on mean	6.82	394	0.448	19.0	48.1	49.0
42	Maximum value	8.11	449	0.362	25.0	57.7	57.4
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 GW Protection	19.1 GW Protection	85.1 GW Protection	67.8 River Protection
44	**WAC 173-340 3-PART TEST**						
45	95% UCL > Cleanup Limit?	NA	NA	NO	NO	NA	NA
46	> 10% above Cleanup Limit?	NA	NA	NO	YES	NA	NA
47	Any sample > 2X Cleanup Limit?	NA	NA	NO	NO	NA	NA
48	**WAC 173-340 Compliance?**	Because all values are below background (10.2 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (512 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	Further 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 (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.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-IU-2/6 Field Remediation
Subject 600-202 Waste Site Cleanup Verification 95% UCL Calculations

Date 03/14/11
Job No. 14655

Calc. No. 0600X-CA-V0115
Checked T. E. Queen

Rev. No. 0
Date 03/14/11
Sheet No. 10 of 22

1 **600-202 Statistical Calculations**

2 **Verification Data - Staging Pile Area**

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	SPA-1	J1C409	12/6/10	4.88		1.06	132		0.530	0.227		0.212	9.74		2.12	0.393		0.212	12.5		0.212	5.80		2.12	29.0		1.06
6	Duplicate of J1C409	J1C421	12/6/10	5.29		0.816	116		0.408	0.185		0.163	7.43		1.63	0.413		0.163	14.7		0.163	5.22		1.63	30.8		0.816
7	SPA-2	J1C410	12/6/10	4.24		0.700	113		0.350	0.234		0.140	6.16		1.40	0.341		0.140	21.0		0.140	4.73		1.40	31.8		0.700
8	SPA-3	J1C411	12/6/10	3.78		0.746	99.1		0.373	0.162		0.149	4.98		1.49	0.317		0.149	11.4		0.149	4.67		1.49	30.7		0.746
9	SPA-4	J1C412	12/6/10	2.24		0.920	74.9		0.460	0.156	B	0.184	1.12	B	1.84	0.0672	B	0.184	8.12		0.184	5.12		1.84	10.5		0.920
10	SPA-5	J1C413	12/6/10	8.75		1.01	138		0.503	0.211		0.201	12.3		2.01	0.514		0.201	28.8		0.201	7.84		2.01	61.9		1.01
11	SPA-6	J1C414	12/6/10	4.25		0.959	92.3		0.480	0.271		0.192	1.24	B	1.92	0.0771	B	0.192	8.74		0.192	7.19		1.92	13.4		0.959
12	SPA-7	J1C415	12/6/10	3.30		0.937	78.3		0.468	0.244		0.187	1.91		1.87	0.108	B	0.187	7.83		0.187	6.78		1.87	12.0		0.937
13	SPA-8	J1C416	12/6/10	4.14		0.919	112		0.459	0.259		0.184	6.43		1.84	0.276		0.184	10.9		0.184	6.77		1.84	20.0		0.919
14	SPA-9	J1C417	12/6/10	3.21		0.845	74.5		0.423	0.235		0.169	0.940	B	1.69	0.0858	B	0.169	8.93		0.169	6.80		1.69	13.0		0.845
15	SPA-10	J1C418	12/6/10	3.93		0.777	76.5		0.388	0.239		0.155	0.806	B	1.55	0.0594	B	0.155	7.71		0.155	6.86		1.55	11.6		0.777
16	SPA-11	J1C419	12/6/10	3.93		0.987	88.0		0.493	0.236		0.197	1.42	B	1.97	0.0712	B	0.197	8.18		0.197	7.83		1.97	13.4		0.987
17	SPA-12	J1C420	12/6/10	3.28		0.976	82.9		0.488	0.252		0.195	1.30	B	1.95	0.0770	B	0.195	7.80		0.195	7.58		1.95	12.2		0.976

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	SPA-1	J1C409/ J1C421	12/6/10	5.09	124	0.206	8.59	0.403	13.6	5.51	29.9
23	SPA-2	J1C410	12/6/10	4.24	113	0.234	6.16	0.341	21.0	4.73	31.8
24	SPA-3	J1C411	12/6/10	3.78	99.1	0.162	4.98	0.317	11.4	4.67	30.7
25	SPA-4	J1C412	12/6/10	2.24	74.9	0.156	1.12	0.0672	8.12	5.12	10.5
26	SPA-5	J1C413	12/6/10	8.75	138	0.211	12.3	0.514	28.8	7.84	61.9
27	SPA-6	J1C414	12/6/10	4.25	92.3	0.271	1.24	0.0771	8.74	7.19	13.4
28	SPA-7	J1C415	12/6/10	3.30	78.3	0.244	1.91	0.108	7.83	6.78	12.0
29	SPA-8	J1C416	12/6/10	4.14	112	0.259	6.43	0.276	10.9	6.77	20.0
30	SPA-9	J1C417	12/6/10	3.21	74.5	0.235	0.940	0.0858	8.93	6.80	13.0
31	SPA-10	J1C418	12/6/10	3.93	76.5	0.239	0.806	0.0594	7.71	6.86	11.6
32	SPA-11	J1C419	12/6/10	3.93	88.0	0.236	1.42	0.0712	8.18	7.83	13.4
33	SPA-12	J1C420	12/6/10	3.28	82.9	0.252	1.30	0.0770	7.80	7.58	12.2

34 **Statistical Computations**

35		Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper
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), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.
37	N	12	12	12	12	12	12	12	12
38	% < Detection limit	0%	0%	0%	0%	0%	0%	0%	0%
39	Mean	4.18	96.1	0.225	3.93	0.200	11.9	6.47	21.7
40	Standard deviation	1.60	21.2	0.0359	3.76	0.161	6.54	1.17	15.1
41	95% UCL on mean	4.94	108	0.242	5.72	0.276	15.0	7.03	28.9
42	Maximum value	8.75	138	0.271	12.3	0.514	28.8	7.84	61.9
43	**Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)**	20 DE, GW & River Protection	200 GW Protection	1.51 GW and River Protection	320 GW Protection	0.81 GW and River Protection	18.5 GW and River Protection	15.7 GW Protection	22.0 River Protection
44	**WAC 173-340 3-PART TEST**								
45	95% UCL > Cleanup Limit?	NO	NO	NA	NO	NA	NO	NA	YES
46	> 10% above Cleanup Limit?	NO	NO	NA	NO	NA	YES	NA	YES
47	Any sample > 2X Cleanup Limit?	NO	NO	NA	NO	NA	NO	NA	YES
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 direct exposure RAG.	Because all values are below background (1.51 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.	Because all values are below background (0.81 mg/kg) the 3-part test is not required.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	Because all values are below background (15.7 mg/kg) the 3-part test is not required.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie

Project 100-IU-2/6 Field Remediation

Subject 600-202 Waste Site Cleanup Verification 95% UCL Calculations

Date 03/28/11

Job No. 14655

Calc. No. 0600X-CA-V0115

Checked T. E. Queen

Rev. No. 0

Date 03/28/11

Sheet No. 11 of 22

1 600-202 Statistical Calculations

2 Verification Data - Staging Pile Area

3	Sample	Sample	Sample	Lead			Manganese			Molybdenum			Nickel			Vanadium			Zinc			TPH-motor oil (high boiling)			Acenaphthylene		
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	ug/kg	Q	PQL	ug/kg	Q	PQL
5	SPA-1	J1C409	12/6/10	54.8		0.530	274		5.30	0.888	B	2.12	10.1		4.24	43.0		2.65	159		10.6	25500		10400	43.7		3.60
6	Duplicate of J1C409	J1C421	12/6/10	84.0		0.408	261		4.08	0.653	B	1.63	11.3		3.26	38.5		2.04	152		8.16	32600		10500	113		3.55
7	SPA-2	J1C410	12/6/10	35.7		0.350	253		3.50	0.552	B	1.40	11.9		2.80	32.4		1.75	133		7.00	168000		21000	3.46	U	3.46
8	SPA-2 re-sample	J1DWX0	2/3/11																			224000		10800			
9	SPA-3	J1C411	12/6/10	39.8		0.373	223		3.73	0.649	B	1.49	7.94		2.98	27.9		1.86	99.6		7.46	236000		10800	47.8		3.49
10	SPA-3 re-sample	J1DWX2	2/3/11																			10300	U	10300			
11	SPA-4	J1C412	12/6/10	7.98		0.460	224		4.60	0.264	B	1.84	6.23		3.68	41.0		2.30	38.6		9.20	14500		10300	2.67	J	3.49
12	SPA-5	J1C413	12/6/10	79.0		0.503	407		5.03	2.61		2.01	24.9		4.02	32.7		2.51	255		10.1	1020000		104000	85.5		3.51
13	SPA-5 re-sample	J1DWX1	2/3/11																			54900		11000			
14	SPA-6	J1C414	12/6/10	6.64		0.480	360		4.80	0.388	B	1.92	8.58		3.84	59.6		2.40	46.9		9.59	3790	J	10300	1.78	J	3.55
15	SPA-7	J1C415	12/6/10	7.47		0.468	323		4.68	0.307	B	1.87	8.15		3.75	56.9		2.34	48.0		9.37	41900		10400	3.47	U	3.47
16	SPA-8	J1C416	12/6/10	39.2		0.459	334		4.59	0.580	B	1.84	10.4		3.68	51.2		2.30	124		9.19	29100		10600	41.8		3.48
17	SPA-9	J1C417	12/6/10	4.92		0.423	313		4.23	0.276	B	1.69	8.30		3.38	58.7		2.11	43.2		8.45	7110	J	10500	3.44	U	3.44
18	SPA-10	J1C418	12/6/10	4.41		0.388	334		3.88	0.252	B	1.55	7.78		3.11	57.4		1.94	43.2		7.77	21000		10400	9.03		3.47
19	SPA-11	J1C419	12/6/10	6.30		0.493	335		4.93	0.336	B	1.97	11.1		3.95	64.8		2.47	48.2		9.87	4620	J	10700	2.28	J	3.47
20	SPA-12	J1C420	12/6/10	6.05		0.488	383		4.88	0.323	B	1.95	8.12		3.90	62.8		2.44	45.9		9.76	10500		10400	3.41	U	3.41

21 Statistical Computation Input Data

22	Sample	Sample	Sample	Lead	Manganese	Molybdenum	Nickel	Vanadium	Zinc	TPH-motor oil (high boiling)	Acenaphthylene
23	Area	Number	Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	ug/kg	ug/kg
24	SPA-1	J1C409/ J1C421	12/6/10	69.4	268	0.771	10.7	40.8	156	29050	78.4
25	SPA-2	J1C410	12/6/10	35.7	253	0.552	11.9	32.4	133	224000	1.73
26	SPA-3	J1C411	12/6/10	39.8	223	0.649	7.94	27.9	99.6	5150	47.8
27	SPA-4	J1C412	12/6/10	7.98	224	0.264	6.23	41.0	38.6	14500	2.67
28	SPA-5	J1C413	12/6/10	79.0	407	2.610	24.9	32.7	255	54900	85.5
29	SPA-6	J1C414	12/6/10	6.64	360	0.388	8.58	59.6	46.9	3790	1.78
30	SPA-7	J1C415	12/6/10	7.47	323	0.307	8.15	56.9	48.0	41900	1.74
31	SPA-8	J1C416	12/6/10	39.2	334	0.580	10.4	51.2	124	29100	41.8
32	SPA-9	J1C417	12/6/10	4.92	313	0.276	8.30	58.7	43.2	7110	1.72
33	SPA-10	J1C418	12/6/10	4.41	334	0.252	7.78	57.4	43.2	21000	9.03
34	SPA-11	J1C419	12/6/10	6.30	335	0.336	11.1	64.8	48.2	4620	2.28
35	SPA-12	J1C420	12/6/10	6.05	383	0.323	8.12	62.8	45.9	10500	1.71

36 Statistical Computations

37		Lead	Manganese	Molybdenum	Nickel	Vanadium	Zinc	TPH-motor oil (high boiling)	Acenaphthylene
38	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), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), use MTCAStat normal distribution.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥10), use MTCAStat lognormal distribution.	Large data set (n ≥10), lognormal and normal distribution rejected, use z-statistic.
39	N	12	12	12	12	12	12	12	12
40	% < Detection limit	0%	0%	0%	0%	0%	0%	8%	33%
41	Mean	25.6	313	0.609	10.3	48.8	90.1	37135	23.0
42	Standard deviation	26.8	59.6	0.653	4.87	13.2	66.7	61023	32.0
43	95% UCL on mean	38.3	350	0.919	12.7	55.6	122	119123	38.2
44	Maximum value	84.0	407	2.61	24.9	64.8	255	224000	113
45	Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless noted otherwise	10.2 GW & River Protection	512 GW & River Protection	8 GW Protection	19.1 GW Protection	85.1 GW Protection	67.8 River Protection	200000 ug/kg DE, GW & River Protection	96000 ug/kg GW Protection
46	WAC 173-340 3-PART TEST								
47	95% UCL > Cleanup Limit?	YES	NA	NO	NO	NA	YES	NO	NO
48	> 10% above Cleanup Limit?	YES	NA	NO	NO	NA	YES	NO	NO
49	Any sample > 2X Cleanup Limit?	YES	NA	NO	NO	NA	YES	NO	NO
50	WAC 173-340 Compliance?	Further 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.	The data set meets the 3-part test criteria when compared to the direct exposure RAG.	Because all values are below background (85.1 mg/kg) the WAC 173-340 3-part test is not required.	Further 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 direct exposure RAG.

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CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-IU-2/6 Field Remediation
Subject 600-202 Waste Site Cleanup Verification 95% UCL Calculations

Date 03/28/11
Job No. 14655

Calc. No. 0600X-CA-V0115
Checked T. E. Queen

Rev. No. 0
Date 03/28/11
Sheet No. 12 of 22

1 600-202 Statistical Calculations

2 Verification Data - Staging Pile Area

3	Sample	Sample	Sample	Anthracene			Benzo(a)anthracene			Benzo(b)fluoranthene			Chrysene			Fluoranthene			Flourene			Phenanthrene			Pyrene		
4	Area	Number	Date	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
5	SPA-1	J1C409	12/6/10	4.87		3.6	11.4		3.6	36.5		3.6	105		3.6	62.5		3.6	7.35		3.6	22.0		3.60	152		3.60
6	Duplicate of J1C409	J1C421	12/6/10	4.26		3.55	8.08		3.55	25.1		3.55	76.6		3.55	52.4		3.55	5.04		3.55	23.7		3.55	143		3.55
7	SPA-2	J1C410	12/6/10	1.66	J	3.46	41.3		3.46	35.0		3.46	65.6		3.46	3.46	U	3.46	10.7		3.46	5.93		3.46	99.1		3.46
8	SPA-3	J1C411	12/6/10	6.26		3.49	6.63		3.49	46.3		3.49	4.71		3.49	25.8		3.49	4.36		3.49	25.5		3.49	57.5		3.49
9	SPA-4	J1C412	12/6/10	3.49	U	3.49	3.49	U	3.49	2.79	J	3.49	1.12	J	3.49	18.7		3.49	3.49	U	3.49	2.27	J	3.49	3.49	U	3.49
10	SPA-5	J1C413	12/6/10	2.53	J	3.51	37.5		3.51	88.7		3.51	120		3.51	108		3.51	10.1		3.51	52.0		3.51	371		3.51
11	SPA-6	J1C414	12/6/10	3.55	U	3.55	3.55	U	3.55	3.55	U	3.55	3.55	U	3.55	6.18		3.55	3.55	U	3.55	1.10	J	3.55	3.55	U	3.55
12	SPA-7	J1C415	12/6/10	3.47	U	3.47	3.47	U	3.47	3.47	U	3.47	3.47	U	3.47	196		3.47	3.47	U	3.47	4.14		3.47	3.46	J	3.47
13	SPA-8	J1C416	12/6/10	4.53		3.48	2.98	J	3.48	28.1		3.48	40.9		3.48	51.1		3.48	3.70		3.48	10.1		3.48	99.7		3.48
14	SPA-9	J1C417	12/6/10	3.44	U	3.44	3.44	U	3.44	3.44	U	3.44	3.44	U	3.44	12.6		3.44	3.44	U	3.44	1.03	J	3.44	5.50		3.44
15	SPA-10	J1C418	12/6/10	4.43		3.47	38.9		3.47	17.1		3.47	2.00	J	3.47	27.8		3.47	6.94		3.47	10.2		3.47	7.62		3.47
16	SPA-11	J1C419	12/6/10	3.47	U	3.47	3.47	U	3.47	3.47	U	3.47	3.47	U	3.47	9.51		3.47	3.47	U	3.47	3.47	U	3.47	3.47	U	3.47
17	SPA-12	J1C420	12/6/10	3.41	U	3.41	3.41	U	3.41	1.04	J	3.41	7.05		3.41	15.4		3.41	3.41	U	3.41	1.40	J	3.41	11.4		3.41

19 Statistical Computation Input Data

20	Sample	Sample	Sample	Anthracene	Benzo(a)anthracene	Benzo(b)fluoranthene	Chrysene	Fluoranthene	Flourene	Phenanthrene	Pyrene
21	Area	Number	Date	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
22	SPA-1	J1C409/ J1C421	12/6/10	4.57	9.74	30.8	90.8	57.5	6.20	22.9	148
23	SPA-2	J1C410	12/6/10	1.66	41.3	35.0	65.6	1.73	10.7	5.93	99.1
24	SPA-3	J1C411	12/6/10	6.26	6.63	46.3	4.71	25.8	4.36	25.5	57.5
25	SPA-4	J1C412	12/6/10	1.75	1.75	2.79	1.12	18.7	1.75	2.27	1.75
26	SPA-5	J1C413	12/6/10	2.53	37.5	88.7	120	108	10.1	52.0	371
27	SPA-6	J1C414	12/6/10	1.78	1.78	1.78	1.78	6.18	1.78	1.10	1.78
28	SPA-7	J1C415	12/6/10	1.74	1.74	1.74	1.74	196	1.74	4.14	3.46
29	SPA-8	J1C416	12/6/10	4.53	2.98	28.1	40.9	51.1	3.70	10.1	99.7
30	SPA-9	J1C417	12/6/10	1.72	1.72	1.72	1.72	12.6	1.72	1.03	5.50
31	SPA-10	J1C418	12/6/10	4.43	38.9	17.1	2.00	27.8	6.94	10.2	7.62
32	SPA-11	J1C419	12/6/10	1.74	1.74	1.74	1.74	9.51	1.74	1.74	1.74
33	SPA-12	J1C420	12/6/10	1.71	1.71	1.04	7.05	15.4	1.71	1.40	11.4

34 Statistical Computations

35		Anthracene	Benzo(a)anthracene	Benzo(b)fluoranthene	Chrysene	Fluoranthene	Flourene	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), 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.
37	N	12	12	12	12	12	12	12	12
38	% < Detection limit	50%	50%	33%	33%	8%	50%	8%	25%
39	Mean	2.87	12.3	21.4	28.3	44.2	4.37	11.5	67.3
40	Standard deviation	1.62	16.5	26.6	41.7	56.3	3.37	15.2	108
41	95% UCL on mean	3.64	20.1	34.0	48.1	198	5.97	54.2	1882
42	Maximum value	6.26	41.3	88.7	120	196	10.7	52.0	371
43	Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg) unless noted otherwise	240000 ug/kg GW Protection	15 ug/kg GW & River Protection	15 ug/kg GW & River Protection	100 ug/kg River Protection	18000 ug/kg River Protection	64000 ug/kg GW Protection	240000 ug/kg GW Protection	48000 ug/kg GW Protection
44	WAC 173-340 3-PART TEST								
45	95% UCL > Cleanup Limit?	NO	YES	YES	NO	NO	NO	NO	NO
46	> 10% above Cleanup Limit?	NO	YES	YES	NO	NO	NO	NO	NO
47	Any sample > 2X Cleanup Limit?	NO	YES	YES	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.	Further assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	Further assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-IU-2/6 Field Remediation
Subject 600-202 Waste Site Cleanup Verification 95% UCL Calculations

Date 03/28/11
Job No. 14655

Calc. No. 0600X-CA-V0115
Checked T. E. Queen

Rev. No. 0
Date 03/28/11
Sheet No. 13 of 22

Ecology Software (MTCAStat) Results, 600-202 Waste Site Large Excavation

	DATA	ID	Antimony 95% UCL Calculation				DATA	ID	Arsenic 95% UCL Calculation				DATA	ID	Barium 95% UCL Calculation			
1		J1C3W7/						J1C3W7/						J1C3W7/				
2	0.302	J1C3X9					2.90	J1C3X9					68.1	J1C3X9				
3	0.390	J1C3W8					3.34	J1C3W8					51.4	J1C3W8				
4	0.367	J1C3W9	Number of samples		Uncensored values		4.79	J1C3W9	Number of samples		Uncensored values		71.1	J1C3W9	Number of samples		Uncensored values	
5	0.451	J1C3X0	Uncensored	12	Mean	0.355	3.70	J1C3X0	Uncensored	12	Mean	4.42	67.7	J1C3X0	Uncensored	12	Mean	76.7
6	0.298	J1C3X1	Censored		Lognormal mean	0.355	3.41	J1C3X1	Censored		Lognormal mean	4.42	90.6	J1C3X1	Censored		Lognormal mean	76.9
7	0.240	J1C3X2	Detection limit or PQL		Std. devn.	0.0718	3.93	J1C3X2	Detection limit or PQL		Std. devn.	1.19	56.3	J1C3X2	Detection limit or PQL		Std. devn.	15.0
8	0.306	J1C3X3	Method detection limit		Median	0.356	4.66	J1C3X3	Method detection limit		Median	4.15	90.0	J1C3X3	Method detection limit		Median	77.9
9	0.489	J1C3X4	TOTAL	12	Min.	0.240	6.95	J1C3X4	TOTAL	12	Min.	2.90	85.7	J1C3X4	TOTAL	12	Min.	51.4
10	0.344	J1C3X5			Max.	0.489	3.63	J1C3X5			Max.	6.95	66.5	J1C3X5			Max.	97.2
11	0.388	J1C3X6					4.37	J1C3X6					97.2	J1C3X6				
12	0.391	J1C3X7					5.46	J1C3X7					84.7	J1C3X7				
13	0.292	J1C3X8					5.84	J1C3X8					91.0	J1C3X8				
14			Lognormal distribution?		Normal distribution?				Lognormal distribution?		Normal distribution?				Lognormal distribution?		Normal distribution?	
15			r-squared is: 0.966		r-squared is:	0.960			r-squared is: 0.977		r-squared is:	0.936			r-squared is: 0.922		r-squared is:	0.935
16			Recommendations:						Recommendations:						Recommendations:			
17			Use lognormal distribution.						Use lognormal distribution.						Use lognormal distribution.			
18																		
19			UCL (Land's method) is		0.398				UCL (Land's method) is		5.12				UCL (Land's method) is		86.2	
20																		

	DATA	ID	Beryllium 95% UCL Calculation				DATA	ID	Boron 95% UCL Calculation				DATA	ID	Cadmium 95% UCL Calculation			
21		J1C3W7/						J1C3W7/						J1C3W7/				
22	0.253	J1C3X9					1.16	J1C3X9					0.0736	J1C3X9				
23	0.212	J1C3W8					1.27	J1C3W8					0.0570	J1C3W8				
24	0.294	J1C3W9	Number of samples		Uncensored values		2.67	J1C3W9	Number of samples		Uncensored values		0.0675	J1C3W9	Number of samples		Uncensored values	
25	0.254	J1C3X0	Uncensored	12	Mean	0.291	0.881	J1C3X0	Uncensored	12	Mean	1.46	0.0809	J1C3X0	Uncensored	12	Mean	0.0754
26	0.280	J1C3X1	Censored		Lognormal mean	0.291	0.921	J1C3X1	Censored		Lognormal mean	1.47	0.104	J1C3X1	Censored		Lognormal mean	0.0756
27	0.252	J1C3X2	Detection limit or PQL		Std. devn.	0.0474	1.97	J1C3X2	Detection limit or PQL		Std. devn.	0.556	0.0603	J1C3X2	Detection limit or PQL		Std. devn.	0.0156
28	0.346	J1C3X3	Method detection limit		Median	0.287	1.65	J1C3X3	Method detection limit		Median	1.44	0.0784	J1C3X3	Method detection limit		Median	0.0760
29	0.349	J1C3X4	TOTAL	12	Min.	0.212	1.61	J1C3X4	TOTAL	12	Min.	0.633	0.0891	J1C3X4	TOTAL	12	Min.	0.0492
30	0.249	J1C3X5			Max.	0.349	1.27	J1C3X5			Max.	2.67	0.0723	J1C3X5			Max.	0.104
31	0.327	J1C3X6					0.633	J1C3X6					0.0492	J1C3X6				
32	0.337	J1C3X7					1.68	J1C3X7					0.0913	J1C3X7				
33	0.340	J1C3X8					1.77	J1C3X8					0.0814	J1C3X8				
34			Lognormal distribution?		Normal distribution?				Lognormal distribution?		Normal distribution?				Lognormal distribution?		Normal distribution?	
35			r-squared is: 0.909		r-squared is:	0.911			r-squared is: 0.969		r-squared is:	0.951			r-squared is: 0.979		r-squared is:	0.989
36			Recommendations:						Recommendations:						Recommendations:			
37			Use lognormal distribution.						Use lognormal distribution.						Use lognormal distribution.			
38																		
39			UCL (Land's method) is		0.319				UCL (Land's method) is		1.87				UCL (Land's method) is		0.0852	
40																		

	DATA	ID	Chromium 95% UCL Calculation				DATA	ID	Cobalt 95% UCL Calculation				DATA	ID	Copper 95% UCL Calculation			
41		J1C3W7/						J1C3W7/						J1C3W7/				
42	14.0	J1C3X9					4.45	J1C3X9					9.69	J1C3X9				
43	11.8	J1C3W8					3.75	J1C3W8					8.56	J1C3W8				
44	13.0	J1C3W9	Number of samples		Uncensored values		4.76	J1C3W9	Number of samples		Uncensored values		10.4	J1C3W9	Number of samples		Uncensored values	
45	15.6	J1C3X0	Uncensored	12	Mean	16.0	4.40	J1C3X0	Uncensored	12	Mean	5.03	10.4	J1C3X0	Uncensored	12	Mean	12.1
46	15.4	J1C3X1	Censored		Lognormal mean	16.0	4.82	J1C3X1	Censored		Lognormal mean	5.03	11.7	J1C3X1	Censored		Lognormal mean	12.1
47	13.3	J1C3X2	Detection limit or PQL		Std. devn.	3.14	4.41	J1C3X2	Detection limit or PQL		Std. devn.	0.769	9.85	J1C3X2	Detection limit or PQL		Std. devn.	2.69
48	17.3	J1C3X3	Method detection limit		Median	15.5	5.57	J1C3X3	Method detection limit		Median	4.79	12.7	J1C3X3	Method detection limit		Median	11.1
49	20.7	J1C3X4	TOTAL	12	Min.	11.8	6.04	J1C3X4	TOTAL	12	Min.	3.75	15.1	J1C3X4	TOTAL	12	Min.	8.56
50	13.0	J1C3X5			Max.	21.2	4.61	J1C3X5			Max.	6.21	10.3	J1C3X5			Max.	16.3
51	17.5	J1C3X6					5.68	J1C3X6					16.3	J1C3X6				
52	21.2	J1C3X7					6.21	J1C3X7					16.2	J1C3X7				
53	18.8	J1C3X8					5.60	J1C3X8					13.9	J1C3X8				
54			Lognormal distribution?		Normal distribution?				Lognormal distribution?		Normal distribution?				Lognormal distribution?		Normal distribution?	
55			r-squared is: 0.961		r-squared is:	0.948			r-squared is: 0.943		r-squared is:	0.942			r-squared is: 0.937		r-squared is:	0.917
56			Recommendations:						Recommendations:						Recommendations:			
57			Use lognormal distribution.						Use lognormal distribution.						Use lognormal distribution.			
58																		
59			UCL (Land's method) is		17.8				UCL (Land's method) is		5.47				UCL (Land's method) is		13.7	
60																		

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-IU-2/6 Field Remediation
Subject 600-202 Waste Site Cleanup Verification 95% UCL Calculations

Date 03/28/11
Job No. 14655

Calc. No. 0600X-CA-V0115
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Ecology Software (MTCAStat) Results, 600-202 Waste Site Large Excavation

Lead 95% UCL Calculation

DATA	ID
4.29	J1C3W7/ J1C3X9
4.32	J1C3W8
4.86	J1C3W9
4.51	J1C3X0
4.93	J1C3X1
4.57	J1C3X2
5.35	J1C3X3
5.98	J1C3X4
4.93	J1C3X5
4.87	J1C3X6
5.98	J1C3X7
6.27	J1C3X8

Number of samples		Uncensored values	
Uncensored	12	Mean	5.07
Censored		Lognormal mean	5.07
Detection limit or PQL		Std. devn.	0.677
Method detection limit		Median	4.90
TOTAL	12	Min.	4.29
		Max.	6.27

Lognormal distribution? r-squared is: 0.922
Normal distribution? r-squared is: 0.903
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 5.44

Manganese 95% UCL Calculation

DATA	ID
244	J1C3W7/ J1C3X9
215	J1C3W8
306	J1C3W9
249	J1C3X0
264	J1C3X1
260	J1C3X2
322	J1C3X3
372	J1C3X4
260	J1C3X5
302	J1C3X6
318	J1C3X7
311	J1C3X8

Number of samples		Uncensored values	
Uncensored	12	Mean	285
Censored		Lognormal mean	286
Detection limit or PQL		Std. devn.	43.7
Method detection limit		Median	283
TOTAL	12	Min.	215
		Max.	372

Lognormal distribution? r-squared is: 0.958
Normal distribution? r-squared is: 0.950
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 310

Molybdenum 95% UCL Calculation

DATA	ID
0.286	J1C3W7/ J1C3X9
0.172	J1C3W8
0.238	J1C3W9
0.224	J1C3X0
0.194	J1C3X1
0.200	J1C3X2
0.233	J1C3X3
0.234	J1C3X4
0.182	J1C3X5
0.218	J1C3X6
1.02	J1C3X7
0.220	J1C3X8

Number of samples		Uncensored values	
Uncensored	12	Mean	0.285
Censored		Lognormal mean	0.275
Detection limit or PQL		Std. devn.	0.233
Method detection limit		Median	0.222
TOTAL	12	Min.	0.172
		Max.	1.02

Lognormal distribution? r-squared is: 0.570
Normal distribution? r-squared is: 0.411
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.396

Nickel 95% UCL Calculation

DATA	ID
12.8	J1C3W7/ J1C3X9
10.6	J1C3W8
11.5	J1C3W9
13.4	J1C3X0
13.8	J1C3X1
11.9	J1C3X2
14.5	J1C3X3
18.8	J1C3X4
11.8	J1C3X5
15.2	J1C3X6
20.7	J1C3X7
16.8	J1C3X8

Number of samples		Uncensored values	
Uncensored	12	Mean	14.3
Censored		Lognormal mean	14.3
Detection limit or PQL		Std. devn.	3.09
Method detection limit		Median	13.6
TOTAL	12	Min.	10.6
		Max.	20.7

Lognormal distribution? r-squared is: 0.960
Normal distribution? r-squared is: 0.922
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 16.1

Vanadium 95% UCL Calculation

DATA	ID
34.5	J1C3W7/ J1C3X9
31.1	J1C3W8
58.1	J1C3W9
35.5	J1C3X0
31.8	J1C3X1
42.8	J1C3X2
45.2	J1C3X3
50.3	J1C3X4
41.1	J1C3X5
49.4	J1C3X6
40.6	J1C3X7
42.0	J1C3X8

Number of samples		Uncensored values	
Uncensored	12	Mean	41.9
Censored		Lognormal mean	41.9
Detection limit or PQL		Std. devn.	8.08
Method detection limit		Median	41.6
TOTAL	12	Min.	31.1
		Max.	58.1

Lognormal distribution? r-squared is: 0.974
Normal distribution? r-squared is: 0.961
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 46.6

Zinc 95% UCL Calculation

DATA	ID
33.6	J1C3W7/ J1C3X9
28.9	J1C3W8
38.4	J1C3W9
33.7	J1C3X0
36.7	J1C3X1
34.9	J1C3X2
40.8	J1C3X3
43.4	J1C3X4
36.0	J1C3X5
39.4	J1C3X6
43.4	J1C3X7
45.4	J1C3X8

Number of samples		Uncensored values	
Uncensored	12	Mean	37.9
Censored		Lognormal mean	37.9
Detection limit or PQL		Std. devn.	4.85
Method detection limit		Median	37.6
TOTAL	12	Min.	28.9
		Max.	45.4

Lognormal distribution? r-squared is: 0.969
Normal distribut 0.803 r-squared is: 0.978
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 40.7

Acenaphthene 95% UCL Calculation

DATA	ID
1.41	J1C3W7/ J1C3X9
1.74	J1C3W8
2.05	J1C3W9
10.9	J1C3X0
8.37	J1C3X1
1.71	J1C3X2
1.80	J1C3X3
1.07	J1C3X4
2.05	J1C3X5
6.87	J1C3X6
1.44	J1C3X7
11.0	J1C3X8

Number of samples		Uncensored values	
Uncensored	12	Mean	4.20
Censored		Lognormal mean	4.23
Detection limit or PQL		Std. devn.	3.91
Method detection limit		Median	1.92
TOTAL	12	Min.	1.07
		Max.	11.0

Lognormal distribution? r-squared is: 0.828
Normal distribution? r-squared is: 0.746
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 6.06

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
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Ecology Software (MTCAStat) Results, 600-202 Waste Site Small Excavation Area

	DATA	ID	Arsenic 95% UCL Calculation			
1		J1C3Y3/				
2	1.58	J1C402				
3	3.24	J1C3Y0				
4	8.63	J1C3Y1	Number of samples		Uncensored values	
5	5.09	J1C3Y2	Uncensored	12	Mean	5.31
6	6.20	J1C3Y4	Censored		Lognormal mean	5.41
7	5.75	J1C3Y5	Detection limit or PQL		Std. devn.	2.92
8	11.4	J1C3Y6	Method detection limit		Median	4.26
9	3.42	J1C3Y7	TOTAL	12	Min.	1.58
10	8.56	J1C3Y8			Max.	11.4
11	3.17	J1C3Y9				
12	3.28	J1C400				
13	3.42	J1C401				
14			Lognormal distribution?		Normal distribution?	
15			r-squared is: 0.941		r-squared is: 0.897	
16			Recommendations:			
17			Use lognormal distribution.			
18						
19			UCL (Land's method) is		7.87	
20						

	DATA	ID	Barium 95% UCL Calculation			
		J1C3Y3/				
	79.4	J1C402				
	57.0	J1C3Y0				
	116	J1C3Y1	Number of samples		Uncensored values	
	120	J1C3Y2	Uncensored	12	Mean	89.8
	114	J1C3Y4	Censored		Lognormal mean	90.1
	94.9	J1C3Y5	Detection limit or PQL		Std. devn.	22.4
	105	J1C3Y6	Method detection limit		Median	87.2
	67.3	J1C3Y7	TOTAL	12	Min.	57.0
	109	J1C3Y8			Max.	120
	73.1	J1C3Y9				
	73.3	J1C400				
	68.6	J1C401				
			Lognormal distribution?		Normal distribution?	
			r-squared is: 0.927		r-squared is: 0.923	
			Recommendations:			
			Use lognormal distribution.			
			UCL (Land's method) is		104	

	DATA	ID	Beryllium 95% UCL Calculation			
		J1C3Y3/				
	0.135	J1C402				
	0.223	J1C3Y0				
	0.528	J1C3Y1	Number of samples		Uncensored values	
	0.400	J1C3Y2	Uncensored	12	Mean	0.351
	0.512	J1C3Y4	Censored		Lognormal mean	0.356
	0.419	J1C3Y5	Detection limit or PQL		Std. devn.	0.134
	0.473	J1C3Y6	Method detection limit		Median	0.336
	0.265	J1C3Y7	TOTAL	12	Min.	0.135
	0.488	J1C3Y6			Max.	0.528
	0.260	J1C3Y9				
	0.272	J1C400				
	0.232	J1C401				
			Lognormal distribution?		Normal distribution?	
			r-squared is: 0.911		r-squared is: 0.927	
			Recommendations:			
			Use lognormal distribution.			
			UCL (Land's method) is		0.463	

	DATA	ID	Boron 95% UCL Calculation			
21		J1C3Y3/				
22	1.35	J1C402				
23	1.36	J1C3Y0				
24	2.22	J1C3Y1	Number of samples		Uncensored values	
25	1.65	J1C3Y2	Uncensored	12	Mean	2.28
26	2.90	J1C3Y4	Censored		Lognormal mean	2.25
27	6.90	J1C3Y5	Detection limit or PQL		Std. devn.	1.58
28	1.34	J1C3Y6	Method detection limit		Median	1.80
29	1.94	J1C3Y7	TOTAL	12	Min.	0.976
30	2.96	J1C3Y8			Max.	6.90
31	0.976	J1C3Y9				
32	1.56	J1C400				
33	2.18	J1C401				
34			Lognormal distribution?		Normal distribution?	
35			r-squared is: 0.893		r-squared is: 0.662	
36			Recommendations:			
37			Reject BOTH lognormal and normal distributions.			
38						
39			UCL (based on Z-statistic) is		3.03	
40						

	DATA	ID	Cadmium 95% UCL Calculation			
		J1C3Y3/	0.212			
	0.108	J1C402				
	0.077	J1C3Y0	0.22			
	0.171	J1C3Y1	0.178 of samples		Uncensored values	
	0.171	J1C3Y2	0.228 Incensored	12	Mean	0.132
	0.148	J1C3Y4	0.204 Censored		Lognormal mean	0.132
	0.120	J1C3Y5	0.215 imit or PQL		Std. devn.	0.0396
	0.170	J1C3Y6	0.164 tection limit		Median	0.129
	0.100	J1C3Y7	0.202 TOTAL	12	Min.	0.0774
	0.197	J1C3Y8	0.178		Max.	0.197
	0.086	J1C3Y9	0.18			
	0.0948	J1C400				
	0.137	J1C401				
			Lognormal distribution?		Normal distribution?	
			r-squared is: 0.959		r-squared is: 0,952	
			Recommendations:			
			Use lognormal distribution.			
			UCL (Land's method) is		0.159	

	DATA	ID	Chromium 95% UCL Calculation			
		J1C3Y3/				
	2.66	J1C402				
	11.6	J1C3Y0				
	28.3	J1C3Y1	Number of samples		Uncensored values	
	21.7	J1C3Y2	Uncensored	12	Mean	18.2
	27.6	J1C3Y4	Censored		Lognormal mean	19.5
	22.3	J1C3Y5	Detection limit or PQL		Std. devn.	8.14
	24.7	J1C3Y6	Method detection limit		Median	19.4
	11.7	J1C3Y7	TOTAL	12	Min.	2.66
	26.2	J1C3Y8			Max.	28.3
	17.0	J1C3Y9				
	12.2	J1C400				
	12.0	J1C401				
			Lognormal distribution?		Normal distribution?	
			r-squared is: 0.772		r-squared is: 0.927	
			Recommendations:			
			Use normal distribution.			
			UCL (based on t-statistic) is		22.4	

	DATA	ID	Cobalt 95% UCL Calculation			
41		J1C3Y3/				
42	1.23	J1C402				
43	4.48	J1C3Y0				
44	9.03	J1C3Y1	Number of samples		Uncensored values	
45	6.81	J1C3Y2	Uncensored	12	Mean	6.06
46	8.44	J1C3Y4	Censored		Lognormal mean	6.34
47	6.74	J1C3Y5	Detection limit or PQL		Std. devn.	2.23
48	8.00	J1C3Y6	Method detection limit		Median	5.99
49	5.14	J1C3Y7	TOTAL	12	Min.	1.23
50	8.12	J1C3Y8			Max.	9.03
51	5.00	J1C3Y9				
52	5.24	J1C400				
53	4.48	J1C401				
54			Lognormal distribution?		Normal distribution?	
55			r-squared is: 0.740		r-squared is: 0.927	
56			Recommendations:			
57			Use normal distribution.			
58						
59			UCL (based on t-statistic) is		7.21	
60						

	DATA	ID	Copper 95% UCL Calculation			
		J1C3Y3/				
	5.40	J1C402				
	9.37	J1C3Y0				
	20.3	J1C3Y1	Number of samples		Uncensored values	
	15.4	J1C3Y2	Uncensored	12	Mean	13.7
	20.1	J1C3Y4	Censored		Lognormal mean	13.8
	14.3	J1C3Y5	Detection limit or PQL		Std. devn.	5.12
	17.5	J1C3Y6	Method detection limit		Median	12.6
	9.50	J1C3Y7	TOTAL	12	Min.	5.40
	20.8	J1C3Y8			Max.	20.8
	10.4	J1C3Y9				
	10.3	J1C400				
	10.8	J1C401				
			Lognormal distribution?		Normal distribution?	
			r-squared is: 0.920		r-squared is: 0.931	
			Recommendations:			
			Use lognormal distribution.			
			UCL (Land's method) is		17.8	

	DATA	ID	Lead 95% UCL Calculation			
		J1C3Y3/				
	1.30	J1C402				
	4.38	J1C3Y0				
	8.11	J1C3Y1	Number of samples		Uncensored values	
	6.11	J1C3Y2	Uncensored	12	Mean	5.74
	7.92	J1C3Y4	Censored		Lognormal mean	5.97
	6.19	J1C3Y5	Detection limit or PQL		Std. devn.	2.07
	6.76	J1C3Y6	Method detection limit		Median	6.15
	4.30	J1C3Y7	TOTAL	12	Min.	1.30
	7.68	J1C3Y8			Max.	8.11
	4.05	J1C3Y9				
	4.53	J1C400				
	7.60	J1C401				
			Lognormal distribution?		Normal distribution?	
			r-squared is: 0.755		r-squared is: 0.912	
			Recommendations:			
			Use normal distribution.			
			UCL (based on t-statistic) is		6.82	

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Ecology Software (MTCAStat) Results, 600-202 Waste Site Small Excavation Area

Manganese 95% UCL Calculation

DATA	ID
144	J1C3Y3/ J1C402
225	J1C3Y0
449	J1C3Y1
359	J1C3Y2
419	J1C3Y4
354	J1C3Y5
437	J1C3Y6
259	J1C3Y7
413	J1C3Y8
247	J1C3Y9
268	J1C400
221	J1C401

Number of samples		Uncensored values	
Uncensored	12	Mean	316
Censored		Lognormal mean	319
Detection limit or PQL		Std. devn.	101
Method detection limit		Median	311
TOTAL	12	Min.	144
		Max.	449

Lognormal distribution? r-squared is: 0.918
Normal distribution? r-squared is: 0.937
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 394

Molybdenum 95% UCL Calculation

DATA	ID
0.342	J1C3Y3/ J1C402
0.201	J1C3Y0
0.331	J1C3Y1
0.362	J1C3Y2
0.358	J1C3Y4
0.301	J1C3Y5
0.297	J1C3Y6
0.265	J1C3Y7
0.304	J1C3Y8
0.945	J1C3Y9
0.361	J1C400
0.217	J1C401

Number of samples		Uncensored values	
Uncensored	12	Mean	0.357
Censored		Lognormal mean	0.354
Detection limit or PQL		Std. devn.	0.193
Method detection limit		Median	0.318
TOTAL	12	Min.	0.201
		Max.	0.945

Lognormal distribution? r-squared is: 0.760
Normal distribution? r-squared is: 0.559
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.448

Nickel 95% UCL Calculation

DATA	ID
2.59	J1C3Y3/ J1C402
10.4	J1C3Y0
25.0	J1C3Y1
17.5	J1C3Y2
22.8	J1C3Y4
17.8	J1C3Y5
22.7	J1C3Y6
10.4	J1C3Y7
23.5	J1C3Y8
10.5	J1C3Y9
10.6	J1C400
10.2	J1C401

Number of samples		Uncensored values	
Uncensored	12	Mean	15.3
Censored		Lognormal mean	16.2
Detection limit or PQL		Std. devn.	7.16
Method detection limit		Median	14.1
TOTAL	12	Min.	2.59
		Max.	25.0

Lognormal distribution? r-squared is: 0.793
Normal distribution? r-squared is: 0.901
Recommendations:
Use normal distribution.

UCL (based on t-statistic) is 19.0

Vanadium 95% UCL Calculation

DATA	ID
7.92	J1C3Y3/ J1C402
37.1	J1C3Y0
57.7	J1C3Y1
42.7	J1C3Y2
51.1	J1C3Y4
49.2	J1C3Y5
54.9	J1C3Y6
39.2	J1C3Y7
51.1	J1C3Y8
36.7	J1C3Y9
40.4	J1C400
33.1	J1C401

Number of samples		Uncensored values	
Uncensored	12	Mean	41.8
Censored		Lognormal mean	43.9
Detection limit or PQL		Std. devn.	13.3
Method detection limit		Median	41.6
TOTAL	12	Min.	7.92
		Max.	57.7

Lognormal distribution? r-squared is: 0.620
Normal distribution? r-squared is: 0.858
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 48.1

Zinc 95% UCL Calculation

DATA	ID
7.31	J1C3Y3/ J1C402
36.7	J1C3Y0
57.4	J1C3Y1
48.9	J1C3Y2
55.8	J1C3Y4
45.7	J1C3Y5
50.2	J1C3Y6
36.0	J1C3Y7
55.8	J1C3Y8
32.8	J1C3Y9
36.7	J1C400
45.4	J1C401

Number of samples		Uncensored values	
Uncensored	12	Mean	42.4
Censored		Lognormal mean	45.0
Detection limit or PQL		Std. devn.	13.9
Method detection limit		Median	45.6
TOTAL	12	Min.	7.31
		Max.	57.4

Lognormal distribution? r-squared is: 0.619
Normal distribution? r-squared is: 0.855
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 49.0

CALCULATION SHEET

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Ecology Software (MTCAStat) Results, 600-202 Waste Site Staging Pile Area

1	DATA	ID	Arsenic 95% UCL Calculation				DATA	ID	Barium 95% UCL Calculation				DATA	ID	Beryllium 95% UCL Calculation			
		J1C409/						J1C409/						J1C409/				
2	5.09	J1C421					124	J1C421					0.206	J1C421				
3	4.24	J1C410					113	J1C410					0.234	J1C410				
4	3.78	J1C411	Number of samples		Uncensored values		99.1	J1C411	Number of samples		Uncensored values		0.162	J1C411	Number of samples		Uncensored values	
5	2.24	J1C412	Uncensored	12	Mean	4.18	74.9	J1C412	Uncensored	12	Mean	96.1	0.156	J1C412	Uncensored	12	Mean	0.225
6	8.75	J1C413	Censored		Lognormal mean	4.18	138	J1C413	Censored		Lognormal mean	96.3	0.211	J1C413	Censored		Lognormal mean	0.226
7	4.25	J1C414	Detection limit or PQL		Std. devn.	1.60	92.3	J1C414	Detection limit or PQL		Std. devn.	21.2	0.271	J1C414	Detection limit or PQL		Std. devn.	0.0359
8	3.30	J1C415	Method detection limit		Median	3.93	78.3	J1C415	Method detection limit		Median	90.2	0.244	J1C415	Method detection limit		Median	0.236
9	4.14	J1C416	TOTAL	12	Min.	2.24	112	J1C416	TOTAL	12	Min.	74.5	0.259	J1C416	TOTAL	12	Min.	0.156
10	3.21	J1C417			Max.	8.75	74.5	J1C417			Max.	138	0.235	J1C417			Max.	0.271
11	3.93	J1C418					76.5	J1C418					0.239	J1C418				
12	3.93	J1C419					88.0	J1C419					0.236	J1C419				
13	3.28	J1C420					82.9	J1C420					0.252	J1C420				
14			Lognormal distribution?		Normal distribution?				Lognormal distribution?		Normal distribution?				Lognormal distribution?		Normal distribution?	
15			r-squared is: 0.857		r-squared is: 0.714				r-squared is: 0.932		r-squared is: 0.910				r-squared is: 0.842		r-squared is: 0.887	
16			Recommendations:						Recommendations:						Recommendations:			
17			Reject BOTH lognormal and normal distributions.						Use lognormal distribution.						Reject BOTH lognormal and normal distributions.			
18																		
19			UCL (based on Z-statistic) is		4.94				UCL (Land's method) is		108				UCL (based on Z-statistic) is		0.242	
20																		

21	DATA	ID	Boron 95% UCL Calculation				DATA	ID	Cadmium 95% UCL Calculation				DATA	ID	Chromium 95% UCL Calculation			
		J1C409/					0.403	J1C409/						J1C409/				
22	8.59	J1C421						J1C421					13.6	J1C421				
23	6.16	J1C410					0.341	J1C410					21.0	J1C410				
24	4.98	J1C411	Number of samples		Uncensored values		0.317	J1C411	Number of samples		Uncensored values		11.4	J1C411	Number of samples		Uncensored values	
25	1.12	J1C412	Uncensored	12	Mean	3.93	0.0672	J1C412	Uncensored	12	Mean	0.200	8.12	J1C412	Uncensored	12	Mean	11.9
26	12.3	J1C413	Censored		Lognormal mean	4.10	0.514	J1C413	Censored		Lognormal mean	0.205	28.8	J1C413	Censored		Lognormal mean	11.8
27	1.24	J1C414	Detection limit or PQL		Std. devn.	3.76	0.0771	J1C414	Detection limit or PQL		Std. devn.	0.161	8.74	J1C414	Detection limit or PQL		Std. devn.	6.54
28	1.91	J1C415	Method detection limit		Median	1.67	0.108	J1C415	Method detection limit		Median	0.097	7.83	J1C415	Method detection limit		Median	8.84
29	6.43	J1C416	TOTAL	12	Min.	0.806	0.276	J1C416	TOTAL	12	Min.	0.059	10.90	J1C416	TOTAL	12	Min.	7.71
30	0.940	J1C417			Max.	12.3	0.0858	J1C417			Max.	0.514	8.93	J1C417			Max.	28.8
31	0.806	J1C418					0.0594	J1C418					7.71	J1C418				
32	1.42	J1C419					0.0712	J1C419					8.18	J1C419				
33	1.30	J1C420					0.0770	J1C420					7.80	J1C420				
34			Lognormal distribution?		Normal distribution?				Lognormal distribution?		Normal distribution?				Lognormal distribution?		Normal distribution?	
35			r-squared is: 0.897		r-squared is: 0.816				r-squared is: 0.857		r-squared is: 0.826				r-squared is: 0.789		r-squared is: 0.684	
36			Recommendations:						Recommendations:						Recommendations:			
37			Reject BOTH lognormal and normal distributions.						Reject BOTH lognormal and normal distributions.						Reject BOTH lognormal and normal distributions.			
38																		
39			UCL (based on Z-statistic) is		5.72				UCL (based on Z-statistic) is		0.276				UCL (based on Z-statistic) is		15.0	
40																		

41	DATA	ID	Cobalt 95% UCL Calculation				DATA	ID	Copper 95% UCL Calculation				DATA	ID	Lead 95% UCL Calculation			
		J1C409/						J1C409/						J1C409/				
42	5.51	J1C421					29.9	J1C421					69.4	J1C421				
43	4.73	J1C410					31.8	J1C410					35.7	J1C410				
44	4.67	J1C411	Number of samples		Uncensored values		30.7	J1C411	Number of samples		Uncensored values		39.8	J1C411	Number of samples		Uncensored values	
45	5.12	J1C412	Uncensored	12	Mean	6.47	10.5	J1C412	Uncensored	12	Mean	21.7	7.98	J1C412	Uncensored	12	Mean	25.6
46	7.84	J1C413	Censored		Lognormal mean	6.49	61.9	J1C413	Censored		Lognormal mean	21.5	79.0	J1C413	Censored		Lognormal mean	27.2
47	7.19	J1C414	Detection limit or PQL		Std. devn.	1.17	13.4	J1C414	Detection limit or PQL		Std. devn.	15.1	6.64	J1C414	Detection limit or PQL		Std. devn.	26.8
48	6.78	J1C415	Method detection limit		Median	6.79	12.0	J1C415	Method detection limit		Median	13.4	7.47	J1C415	Method detection limit		Median	7.73
49	6.77	J1C416	TOTAL	12	Min.	4.67	20.0	J1C416	TOTAL	12	Min.	10.5	39.2	J1C416	TOTAL	12	Min.	4.41
50	6.80	J1C417			Max.	7.84	13.0	J1C417			Max.	61.9	4.92	J1C417			Max.	79.0
51	6.86	J1C418					11.6	J1C418					4.41	J1C418				
52	7.83	J1C419					13.4	J1C419					6.30	J1C419				
53	7.58	J1C420					12.2	J1C420					6.05	J1C420				
54			Lognormal distribution?		Normal distribution?				Lognormal distribution?		Normal distribution?				Lognormal distribution?		Normal distribution?	
55			r-squared is: 0.878		r-squared is: 0.899				r-squared is: 0.844		r-squared is: 0.719				r-squared is: 0.848		r-squared is: 0.785	
56			Recommendations:						Recommendations:						Recommendations:			
57			Reject BOTH lognormal and normal distributions.						Reject BOTH lognormal and normal distributions.						Reject BOTH lognormal and normal distributions.			
58																		
59			UCL (based on Z-statistic) is		7.03				UCL (based on Z-statistic) is		28.9				UCL (based on Z-statistic) is		38.3	
60																		

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-IU-2/6 Field Remediation
Subject 600-202 Waste Site Cleanup Verification 95% UCL Calculations

Date 03/28/11
Job No. 14655

Calc. No. 0600X-CA-V0115
Checked T. E. Queen

Rev. No. 0
Date 03/28/11
Sheet No. 18 of 22

Ecology Software (MTCAStat) Results, 600-202 Waste Site Staging Pile Area

Manganese 95% UCL Calculation

DATA	ID
	J1C409/
268	J1C421
253	J1C410
223	J1C411
224	J1C412
407	J1C413
360	J1C414
323	J1C415
334	J1C416
313	J1C417
334	J1C418
335	J1C419
383	J1C420

Number of samples		Uncensored values	
Uncensored	12	Mean	313
Censored		Lognormal mean	314
Detection limit or PQL		Std. devn.	59.6
Method detection limit		Median	329
TOTAL	12	Min.	223
		Max.	407

Lognormal distribution? r-squared is: 0.933
Normal distribution? r-squared is: 0.953
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 350

Molybdenum 95% UCL Calculation

DATA	ID
	J1C409/
0.771	J1C421
0.552	J1C410
0.649	J1C411
0.264	J1C412
2.61	J1C413
0.388	J1C414
0.307	J1C415
0.580	J1C416
0.276	J1C417
0.252	J1C418
0.336	J1C419
0.323	J1C420

Number of samples		Uncensored values	
Uncensored	12	Mean	0.609
Censored		Lognormal mean	0.578
Detection limit or PQL		Std. devn.	0.653
Method detection limit		Median	0.362
TOTAL	12	Min.	0.252
		Max.	2.61

Lognormal distribution? r-squared is: 0.810
Normal distribution? r-squared is: 0.527
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.919

Nickel 95% UCL Calculation

DATA	ID
	J1C409/
10.7	J1C421
11.9	J1C410
7.94	J1C411
6.23	J1C412
24.9	J1C413
8.58	J1C414
8.15	J1C415
10.4	J1C416
8.30	J1C417
7.78	J1C418
11.1	J1C419
8.12	J1C420

Number of samples		Uncensored values	
Uncensored	12	Mean	10.3
Censored		Lognormal mean	10.3
Detection limit or PQL		Std. devn.	4.87
Method detection limit		Median	8.44
TOTAL	12	Min.	6.23
		Max.	24.9

Lognormal distribution? r-squared is: 0.784
Normal distribution? r-squared is: 0.612
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 12.7

Vanadium 95% UCL Calculation

DATA	ID
	J1C409/
40.8	J1C421
32.4	J1C410
27.9	J1C411
41.0	J1C412
32.7	J1C413
59.6	J1C414
56.9	J1C415
51.2	J1C416
58.7	J1C417
57.4	J1C418
64.8	J1C419
62.8	J1C420

Number of samples		Uncensored values	
Uncensored	12	Mean	48.8
Censored		Lognormal mean	49.1
Detection limit or PQL		Std. devn.	13.2
Method detection limit		Median	54.1
TOTAL	12	Min.	27.9
		Max.	64.8

Lognormal distribution? r-squared is: 0.890
Normal distribution? r-squared is: 0.911
Recommendations:
Use normal distribution.

UCL (based on t-statistic) is 55.6

Zinc 95% UCL Calculation

DATA	ID
	J1C409/
156	J1C421
133	J1C410
99.6	J1C411
38.6	J1C412
255	J1C413
46.9	J1C414
48.0	J1C415
124	J1C416
43.2	J1C417
43.2	J1C418
48.2	J1C419
45.9	J1C420

Number of samples		Uncensored values	
Uncensored	12	Mean	90.1
Censored		Lognormal mean	90.1
Detection limit or PQL		Std. devn.	66.7
Method detection limit		Median	48.1
TOTAL	12	Min.	38.6
		Max.	255

Lognormal distribution? r-squared is: 0.841
Normal distribution? r-squared is: 0.766
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 122

TPH - motor oil (high boiling) 95% UCL Calculation

DATA	ID
	J1C409/
29050	J1C421
224000	J1C410
5150	J1C411
14500	J1C412
54900	J1C413
3790	J1C414
41900	J1C415
29100	J1C416
7110	J1C417
21000	J1C418
4620	J1C419
10500	J1C420

Number of samples		Uncensored values	
Uncensored	12	Mean	37135
Censored		Lognormal mean	36182
Detection limit or PQL		Std. devn.	61023
Method detection limit		Median	17750
TOTAL	12	Min.	3790
		Max.	224000

Lognormal distribution? r-squared is: 0.952
Normal distribution? r-squared is: 0.531
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 119123

Acenaphthylene 95% UCL Calculation

DATA	ID
	J1C409/
78.4	J1C421
1.73	J1C410
47.8	J1C411
2.67	J1C412
85.5	J1C413
1.78	J1C414
1.74	J1C415
41.8	J1C416
1.72	J1C417
9.03	J1C418
2.28	J1C419
1.71	J1C420

Number of samples		Uncensored values	
Uncensored	12	Mean	23.0
Censored		Lognormal mean	28.2
Detection limit or PQL		Std. devn.	32.0
Method detection limit		Median	2.48
TOTAL	12	Min.	1.71
		Max.	85.5

Lognormal distribution? r-squared is: 0.787
Normal distribution? r-squared is: 0.720
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 38.2

Anthracene 95% UCL Calculation

DATA	ID
	J1C409/
4.57	J1C421
1.66	J1C410
6.26	J1C411
1.75	J1C412
2.53	J1C413
1.78	J1C414
1.74	J1C415
4.53	J1C416
1.72	J1C417
4.43	J1C418
1.74	J1C419
1.71	J1C420

Number of samples		Uncensored values	
Uncensored	12	Mean	2.87
Censored		Lognormal mean	2.87
Detection limit or PQL		Std. devn.	1.62
Method detection limit		Median	1.76
TOTAL	12	Min.	1.66
		Max.	6.26

Lognormal distribution? r-squared is: 0.770
Normal distribution? r-squared is: 0.751
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 3.64

Benzo(a)anthracene 95% UCL Calculation

DATA	ID
	J1C409/
9.74	J1C421
41.3	J1C410
6.63	J1C411
1.75	J1C412
37.5	J1C413
1.78	J1C414
1.74	J1C415
2.98	J1C416
1.72	J1C417
38.9	J1C418
1.74	J1C419
1.71	J1C420

Number of samples		Uncensored values	
Uncensored	12	Mean	12.3
Censored		Lognormal mean	12.8
Detection limit or PQL		Std. devn.	16.5
Method detection limit		Median	2.38
TOTAL	12	Min.	1.71
		Max.	41.3

Lognormal distribution? r-squared is: 0.784
Normal distribution? r-squared is: 0.670
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 20.1

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-IU-2/6 Field Remediation
Subject 600-202 Waste Site Cleanup Verification 95% UCL Calculations

Date 03/28/11
Job No. 14655

Calc. No. 0600X-CA-V0115
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Date 03/28/11
Sheet No. 19 of 22

Ecology Software (MTCAStat) Results, 600-202 Waste Site Staging Pile Area

	DATA	ID	Benzo(b)fluoranthene 95% UCL Calculation			
1	DATA	ID	Benzo(b)fluoranthene 95% UCL Calculation			
2		J1C409/				
	30.8	J1C421				
3	35.0	J1C410				
4	46.3	J1C411	Number of samples		Uncensored values	
5	2.79	J1C412	Uncensored	12	Mean	21.4
6	88.7	J1C413	Censored		Lognormal mean	30.2
7	1.78	J1C414	Detection limit or PQL		Std. devn.	26.6
8	1.74	J1C415	Method detection limit		Median	9.95
9	28.1	J1C416	TOTAL	12	Min.	1.04
10	1.72	J1C417			Max.	88.7
11	17.1	J1C418				
12	1.74	J1C419				
13	1.04	J1C420				
14			Lognormal distribution?		Normal distribution?	
15			r-squared is: 0.866		r-squared is: 0.778	
16			Recommendations:			
17			Reject BOTH lognormal and normal distributions.			
18						
19			UCL (based on Z-statistic) is		34.0	
20						

	DATA	ID	Chrysene 95% UCL Calculation			
	DATA	ID	Chrysene 95% UCL Calculation			
		J1C409/				
	90.8	J1C421				
	65.6	J1C410				
	4.71	J1C411	Number of samples		Uncensored values	
	1.12	J1C412	Uncensored	12	Mean	28.3
	120	J1C413	Censored		Lognormal mean	36.4
	1.78	J1C414	Detection limit or PQL		Std. devn.	41.7
	1.74	J1C415	Method detection limit		Median	3.36
	40.9	J1C416	TOTAL	12	Min.	1.12
	1.72	J1C417			Max.	120
	2.00	J1C418				
	1.74	J1C419				
	7.05	J1C420				
			Lognormal distribution?		Normal distribution?	
			r-squared is: 0.837		r-squared is: 0.714	
			Recommendations:			
			Reject BOTH lognormal and normal distributions.			
			UCL (based on Z-statistic) is		48.1	

	DATA	ID	Fluoranthene 95% UCL Calculation			
	DATA	ID	Fluoranthene 95% UCL Calculation			
		J1C409/				
	57.5	J1C421				
	1.73	J1C410				
	25.8	J1C411	Number of samples		Uncensored values	
	18.7	J1C412	Uncensored	12	Mean	44.2
	108	J1C413	Censored		Lognormal mean	51.5
	6.18	J1C414	Detection limit or PQL		Std. devn.	56.3
	196	J1C415	Method detection limit		Median	22.3
	51.1	J1C416	TOTAL	12	Min.	1.73
	12.6	J1C417			Max.	196
	27.8	J1C418				
	9.51	J1C419				
	15.4	J1C420				
			Lognormal distribution?		Normal distribution?	
			r-squared is: 0.983		r-squared is: 0.710	
			Recommendations:			
			Use lognormal distribution.			
			UCL (Land's method) is		198	

	DATA	ID	Fluorene 95% UCL Calculation			
21	DATA	ID	Fluorene 95% UCL Calculation			
		J1C409/				
22	6.20	J1C421				
23	10.7	J1C410				
24	4.36	J1C411	Number of samples		Uncensored values	
25	1.75	J1C412	Uncensored	12	Mean	4.37
26	10.1	J1C413	Censored		Lognormal mean	4.44
27	1.78	J1C414	Detection limit or PQL		Std. devn.	3.37
28	1.74	J1C415	Method detection limit		Median	2.74
29	3.70	J1C416	TOTAL	12	Min.	1.71
30	1.72	J1C417			Max.	10.7
31	6.94	J1C418				
32	1.74	J1C419				
33	1.71	J1C420				
34			Lognormal distribution?		Normal distribution?	
35			r-squared is: 0.834		r-squared is: 0.808	
36			Recommendations:			
37			Reject BOTH lognormal and normal distributions.			
38						
39			UCL (based on Z-statistic) is		5.97	
40						

	DATA	ID	Phenanthrene 95% UCL Calculation			
	DATA	ID	Phenanthrene 95% UCL Calculation			
		J1C409/				
	22.9	J1C421				
	5.93	J1C410				
	25.5	J1C411	Number of samples		Uncensored values	
	2.27	J1C412	Uncensored	12	Mean	11.5
	52.0	J1C413	Censored		Lognormal mean	12.9
	1.10	J1C414	Detection limit or PQL		Std. devn.	15.2
	4.14	J1C415	Method detection limit		Median	5.04
	10.1	J1C416	TOTAL	12	Min.	1.03
	1.03	J1C417			Max.	52.0
	10.2	J1C418				
	1.74	J1C419				
	1.40	J1C420				
			Lognormal distribution?		Normal distribution?	
			r-squared is: 0.951		r-squared is: 0.719	
			Recommendations:			
			Use lognormal distribution.			
			UCL (Land's method) is		54.2	

	DATA	ID	Pyrene 95% UCL Calculation			
	DATA	ID	Pyrene 95% UCL Calculation			
		J1C409/				
	148	J1C421				
	99.1	J1C410				
	57.5	J1C411	Number of samples		Uncensored values	
	1.75	J1C412	Uncensored	12	Mean	67.3
	371	J1C413	Censored		Lognormal mean	108
	1.78	J1C414	Detection limit or PQL		Std. devn.	108
	3.46	J1C415	Method detection limit		Median	9.51
	99.7	J1C416	TOTAL	12	Min.	1.74
	5.50	J1C417			Max.	371
	7.62	J1C418				
	1.74	J1C419				
	11.4	J1C420				
			Lognormal distribution?		Normal distribution?	
			r-squared is: 0.916		r-squared is: 0.656	
			Recommendations:			
			Use lognormal distribution.			
			UCL (Land's method) is		1882	

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-IU-2/6 Field Remediation
Subject 600-202 Waste Site Cleanup Verification 95% UCL Calculations

Date 03/28/11
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Calc. No. 0600X-CA-V0115
Checked T. E. Queen

Rev. No. 0
Date 03/28/11
Sheet No. 20 of 22

Duplicate Analysis - 600-202 Excavation Large

Sampling Area	Sample Number	Sample Date	Aluminum			Antimony			Arsenic			Barium			Beryllium			Boron			Cadmium			Calcium		
			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
EXL-1	J1C3W7	11/29/10	6700		4.59	0.366	JB	0.550	2.82		0.917	64.3		0.459	0.233		0.183	1.14		1.83	0.0707		0.183	6880	J	91.7
Duplicate of J1C3W7	J1C3X9	11/29/10	7550		3.77	0.237	JB	0.452	2.98		0.754	71.9		0.377	0.273		0.151	1.18		1.51	0.0764		0.151	8990	J	75.4

Analysis:

TDL		5	0.6	10	2	0.2	2	0.2	100
Duplicate Analysis	Both > PQL?	Yes (continue)	No-Stop (acceptable)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)		No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)			Yes (calc RPD)
	RPD	11.9%			11.2%				26.6%
	Difference > 2 TDL?	Not applicable	No - acceptable	No - acceptable	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable

Duplicate Analysis - 600-202 Excavation Large

Sampling Area	HEIS Number	Sample Date	Chromium			Cobalt			Copper			Iron			Lead			Magnesium			Manganese			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	mg/kg	Q	PQL	mg/kg	Q	PQL
EXL-1	J1C3W7	11/29/10	13.2		0.183	4.27		1.83	8.97		0.917	15500		18.3	4.11		0.459	4940		68.8	234		4.59	0.286		1.83
Duplicate of J1C3W7	J1C3X9	11/29/10	14.8		0.151	4.63		1.51	10.4		0.754	16100		15.1	4.46		0.377	5680		56.5	254		3.77	0.285		1.51

Analysis:

TDL		1	2	1	5	5	75	5	2
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	
	RPD	11.4%		14.8%	3.8%		13.9%	8.2%	
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable

Duplicate Analysis - 600-202 Excavation Large

Sampling Area	HEIS Number	Sample Date	Nickel			Potassium			Silicon			Sodium			Vanadium			Zinc		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	ug/kg	Q	PQL
EXL-1	J1C3W7	11/29/10	11.8		3.67	1510		367	582		1.83	257		45.9	34.6		2.29	32.3		9.17
Duplicate of J1C3W7	J1C3X9	11/29/10	13.7		3.02	1730		302	592		1.51	317		37.7	34.4		1.88	34.8		7.54

Analysis:

TDL		4	400	2	50	2.5	1
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)
	RPD			1.7%	20.9%	0.6%	7.5%
	Difference > 2 TDL?	No - acceptable	No - acceptable	Not applicable	Not applicable	Not applicable	Not applicable

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-IU-2/6 Field Remediation
Subject 600-202 Waste Site Cleanup Verification 95% UCL Calculations

Date 03/28/11
Job No. 14655

Calc. No. 0600X-CA-V0115
Checked T. E. Queen

Rev. No. 0
Date 03/28/11
Sheet No. 21 of 22

Duplicate Analysis - 600-202 Excavation Small

Sampling Area	Sample Number	Sample Date	Aluminum			Arsenic			Barium			Beryllium			Boron			Calcium			Chromium			Cobalt		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXS-3	J1C3Y3	12/1/10	5410		5.29	1.47		1.06	76.6		0.529	0.130	B	0.212	1.25	B	2.12	1240		106	2.40		0.212	1.12	B	2.12
Duplicate of J1C3Y3	J1C402	12/1/10	6150		5.49	1.68		1.10	82.2		0.549	0.140	B	0.220	1.45	B	2.20	1490		110	2.91		0.220	1.33	B	2.20

Analysis:

		Aluminum	Arsenic	Barium	Beryllium	Boron	Calcium	Chromium	Cobalt
TDL		5	10	2	0.2	2	100	1	2
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (continue)	Yes (continue)	No-Stop (acceptable)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)			Yes (calc RPD)	No-Stop (acceptable)	
	RPD	12.8%		7.1%			18.3%		
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	Not applicable	No - acceptable	No - acceptable

Duplicate Analysis - 600-202 Excavation Small

Sampling Area	HEIS Number	Sample Date	Copper			Iron			Lead			Magnesium			Manganese			Molybdenum			Nickel			Potassium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXS-3	J1C3Y3	12/1/10	4.91		1.06	3650		21.2	1.25		0.529	580		79.4	135		5.29	0.334	B	2.12	2.31	B	4.23	551		423
Duplicate of J1C3Y3	J1C402	12/1/10	5.89		1.10	4240		22.0	1.34		0.549	710		82.4	152		5.49	0.349	B	2.20	2.86	B	4.39	545		439

Analysis:

		Copper	Iron	Lead	Magnesium	Manganese	Molybdenum	Nickel	Potassium
TDL		1	5	5	75	5	2	4	400
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)			No-Stop (acceptable)
	RPD		15.0%		20.2%	11.8%			
	Difference > 2 TDL?	No - acceptable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable

Duplicate Analysis - 600-202 Excavation Small

Sampling Area	HEIS Number	Sample Date	Silicon			Sodium			Vanadium			Zinc		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXS-3	J1C3Y3	12/1/10	518		2.12	1000		52.9	7.17		2.65	6.48	B	10.6
Duplicate of J1C3Y3	J1C402	12/1/10	559		2.20	1020		54.9	8.66		2.75	8.14	B	11.0

Analysis:

		Silicon	Sodium	Vanadium	Zinc
TDL		2	50	2.5	1
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)
	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)
	RPD	7.6%	2.0%		
	Difference > 2 TDL?	Not applicable	Not applicable	No - acceptable	Not applicable

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie
Project 100-IU-2/6 Field Remediation
Subject 600-202 Waste Site Cleanup Verification 95% UCL Calculations

Date 03/28/11
Job No. 14655

Calc. No. 0600X-CA-V0115
Checked T. E. Queen

Rev. No. 0
Date 03/28/11
Sheet No. 22 of 22

Duplicate Analysis - 600-202 Staging Pile Area

Sampling Area	Sample Number	Sample Date	Aluminum			Arsenic			Barium			Beryllium			Boron			Cadmium			Calcium			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	mg/kg	Q	PQL	mg/kg	Q	PQL
SPA-1	J1C409	12/6/10	6460		5.30	4.88		1.06	132		0.530	0.227		0.212	9.74		2.12	0.393		0.212	20100		106	12.5		0.212
Duplicate of J1C409	J1C421	12/6/10	6120		4.08	5.29		0.816	116		0.408	0.185		0.163	7.43		1.63	0.413		0.163	14000		81.6	14.7		0.163

Analysis:

	TDL	5	10	2	0.2	2	0.2	100	1
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)
	RPD	5.4%		12.9%				35.8%	16.2%
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable

Duplicate Analysis - 600-202 Staging Pile Area

Sampling Area	HEIS Number	Sample Date	Cobalt			Copper			Iron			Lead			Magnesium			Manganese			Molybdenum			Nickel		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
SPA-1	J1C409	12/6/10	5.80		2.12	29		1.06	18200		21.2	54.8		0.530	3890		79.5	274		5.30	0.888	B	2.12	10.1		4.24
Duplicate of J1C409	J1C421	12/6/10	5.22		1.63	30.8		0.816	17900		16.3	84.0		0.408	3650		61.2	261		4.08	0.653	B	1.63	11.3		3.26

Analysis:

	TDL	2	1	5	5	75	5	2	4
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	No-Stop (acceptable)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)		No-Stop (acceptable)
	RPD		6.0%	1.7%	42.1%	6.4%	4.9%		
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	No - acceptable	No - acceptable

Duplicate Analysis - 600-202 Staging Pile Area

Sampling Area	HEIS Number	Sample Date	Potassium			Silicon			Sodium			Vanadium			Zinc			TPH - motor oil (high boiling)			Acenaphthylene			Anthracene		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
SPA-1	J1C409	12/6/10	1250		424	603		2.12	638		53.0	43.0		2.65	159		10.6	25500		10400	43.7		3.60	4.87		3.60
Duplicate of J1C409	J1C421	12/6/10	1310		326	434		1.63	616		40.8	38.5		2.04	152		8.16	32600		10500	113		3.55	4.26		3.55

Analysis:

	TDL	400	2	50	2.5	1	5000	15	15
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)
	RPD		32.6%	3.5%	11.0%	4.5%	24.4%		
	Difference > 2 TDL?	No - acceptable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Yes - assess further	No - acceptable

Duplicate Analysis - 600-202 Staging Pile Area

Sampling Area	HEIS Number	Sample Date	Benzo(a)anthracene			Benzo(b)fluoranthene			Benzo(k)fluoranthene			Chrysene			Fluoranthene			Fluorene			Phenanthrene			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	ug/kg	Q	PQL	ug/kg	Q	PQL
SPA-1	J1C409	12/6/10	11.4		3.60	36.5		3.60	9.41		3.60	105		3.60	62.5		3.60	7.35		3.60	22.0		3.60	152		3.60
Duplicate of J1C409	J1C421	12/6/10	8.08		3.55	25.1		3.55	6.21		3.55	76.6		3.55	52.4		3.55	5.04		3.55	23.7		3.55	143		3.55

Analysis:

	TDL	15	15	15	15	15	15	15	15
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)
	RPD				31.3%				6.1%
	Difference > 2 TDL?	No - acceptable	No - acceptable	No - acceptable	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable

Attachment 1. 600-202 Waste Site Verification Sample Results (Organics)

CONSTITUENT	CLASS	EXL-1 - J1C3W7			Duplicate of J1C3W7 - J1C3X9			EXL-2 - J1C3W8			EXL-3 - J1C3W9			EXL-4 - J1C3X0			EXL-5 - J1C3X1		
		11/29/10			11/29/10			11/29/10			11/29/10			11/29/10			11/29/10		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	1.08	J	3.59	3.48	U	3.48	3.48	U	3.48	2.05	J	3.53	10.9		3.51	8.37		3.56
Acenaphthylene	PAH	3.59	U	3.59	3.48	U	3.48	3.48	U	3.48	3.53	U	3.53	3.51	U	3.51	3.56	U	3.56
Anthracene	PAH	3.59	U	3.59	3.48	U	3.48	3.48	U	3.48	3.53	U	3.53	3.51	U	3.51	3.56	U	3.56
Benzo(a)anthracene	PAH	3.59	U	3.59	3.48	U	3.48	3.48	U	3.48	3.53	U	3.53	3.51	U	3.51	3.56	U	3.56
Benzo(a)pyrene	PAH	3.59	U	3.59	3.48	U	3.48	3.48	U	3.48	3.53	U	3.53	3.51	U	3.51	3.56	U	3.56
Benzo(b)fluoranthene	PAH	3.59	U	3.59	3.48	U	3.48	0.924	J	3.48	3.53	U	3.53	0.879	J	3.51	3.56	U	3.56
Benzo(ghi)perylene	PAH	3.59	U	3.59	3.48	U	3.48	3.48	U	3.48	3.53	U	3.53	3.51	U	3.51	3.56	U	3.56
Benzo(k)fluoranthene	PAH	3.59	U	3.59	3.48	U	3.48	3.48	U	3.48	3.53	U	3.53	3.51	U	3.51	3.56	U	3.56
Chrysene	PAH	3.59	U	3.59	3.48	U	3.48	3.48	U	3.48	3.53	U	3.53	2.39	J	3.51	3.56	U	3.56
Dibenz[a,h]anthracene	PAH	3.59	U	3.59	3.48	U	3.48	3.48	U	3.48	3.53	U	3.53	3.51	U	3.51	3.56	U	3.56
Fluoranthene	PAH	3.59	U	3.59	3.48	U	3.48	1.74	J	3.48	3.53	U	3.53	3.51	U	3.51	3.56	U	3.56
Fluorene	PAH	3.59	U	3.59	3.48	U	3.48	3.48	U	3.48	3.53	U	3.53	3.51	U	3.51	3.56	U	3.56
Indeno(1,2,3-cd)pyrene	PAH	4.28		3.59	3.48	U	3.48	1.81	J	3.48	3.53	U	3.53	3.51	U	3.51	3.56	U	3.56
Naphthalene	PAH	3.59	U	3.59	3.48	U	3.48	3.48	U	3.48	3.53	U	3.53	3.51	U	3.51	3.56	U	3.56
Phenanthrene	PAH	3.59	U	3.59	3.48	U	3.48	3.48	U	3.48	3.53	U	3.53	1.23	J	3.51	3.56	U	3.56
Pyrene	PAH	3.59	U	3.59	3.48	U	3.48	3.48	U	3.48	3.53	U	3.53	3.51	U	3.51	3.56	U	3.56
Aldrin	PEST	1.42	UD	1.42	1.40	UD	1.40	1.39	UD	1.39	1.40	UD	1.40	1.41	UD	1.41	1.44	UD	1.44
Alpha-BHC	PEST	1.42	UD	1.42	1.40	UD	1.40	1.39	UD	1.39	1.40	UD	1.40	1.41	UD	1.41	1.44	UD	1.44
alpha-Chlordane	PEST	1.42	UD	1.42	1.40	UD	1.40	1.39	UD	1.39	1.40	UD	1.40	1.41	UD	1.41	1.44	UD	1.44
beta-1,2,3,4,5,6-Hexachlorocyclohexane	PEST	1.42	UD	1.42	1.40	UD	1.40	1.39	UD	1.39	3.32	JD	1.40	1.41	UD	1.41	2.44	JD	1.44
Delta-BHC	PEST	1.42	UD	1.42	1.40	UD	1.40	1.40	JD	1.39	2.61	JD	1.40	1.41	UD	1.41	1.44	UD	1.44
Dichlorodiphenyldichloroethane	PEST	1.42	UD	1.42	1.40	UD	1.40	1.39	UD	1.39	1.40	UD	1.40	1.41	UD	1.41	1.44	UD	1.44
Dichlorodiphenyldichloroethylene	PEST	1.42	UD	1.42	1.40	UD	1.40	1.39	UD	1.39	1.40	UD	1.40	1.41	UD	1.41	1.44	UD	1.44
Dichlorodiphenyltrichloroethane	PEST	1.42	UD	1.42	1.40	UD	1.40	1.39	UD	1.39	1.40	UD	1.40	1.41	UD	1.41	1.44	UD	1.44
Dieldrin	PEST	1.42	UD	1.42	1.40	UD	1.40	1.39	UD	1.39	1.40	UD	1.40	1.41	UD	1.41	1.44	UD	1.44
Endosulfan I	PEST	1.42	UD	1.42	1.40	UD	1.40	1.39	UD	1.39	1.40	UD	1.40	1.41	UD	1.41	1.44	UD	1.44
Endosulfan II	PEST	1.42	UD	1.42	1.40	UD	1.40	1.39	UD	1.39	1.40	UD	1.40	1.41	UD	1.41	1.44	UD	1.44
Endosulfan sulfate	PEST	1.42	UD	1.42	1.40	UD	1.40	1.39	UD	1.39	1.40	UD	1.40	1.41	UD	1.41	1.44	UD	1.44
Endrin	PEST	1.42	UD	1.42	1.40	UD	1.40	1.39	UD	1.39	1.40	UD	1.40	1.41	UD	1.41	1.44	UD	1.44
Endrin aldehyde	PEST	1.42	UD	1.42	1.40	UD	1.40	1.39	UD	1.39	1.40	UD	1.40	1.41	UD	1.41	1.44	UD	1.44
Endrin ketone	PEST	1.42	UD	1.42	1.40	UD	1.40	1.39	UD	1.39	1.40	UD	1.40	1.41	UD	1.41	1.44	UD	1.44
Gamma-BHC (Lindane)	PEST	1.42	UD	1.42	1.40	UD	1.40	1.39	UD	1.39	1.40	UD	1.40	1.41	UD	1.41	1.44	UD	1.44
gamma-Chlordane	PEST	1.42	UD	1.42	1.40	UD	1.40	1.39	UD	1.39	1.40	UD	1.40	1.41	UD	1.41	1.44	UD	1.44
Heptachlor	PEST	1.42	UD	1.42	1.40	UD	1.40	1.39	UD	1.39	1.40	UD	1.40	1.41	UD	1.41	1.44	UD	1.44
Heptachlor epoxide	PEST	1.42	UD	1.42	1.40	UD	1.40	1.39	UD	1.39	1.40	UD	1.40	1.41	UD	1.41	1.44	UD	1.44
Methoxychlor	PEST	1.42	UD	1.42	1.40	UD	1.40	1.39	UD	1.39	1.40	UD	1.40	1.41	UD	1.41	1.44	UD	1.44
Toxaphene	PEST	14.2	UJD	14.2	14.0	UJD	14.0	13.9	UJD	13.9	14.0	UJD	14.0	14.1	UJD	14.1	14.4	UJD	14.4

Note: Gray cells indicate not applicable.
B = estimated result; result is less than the RL but greater than the MDL
D = analyte reported from a dilution
HEIS = Hanford Environmental Information System
J = estimated result
PQL = practical quantitation limit
Q = qualifier
U = undetected

Attachment	1	Sheet No.	1 of 13
Originator	J. D. Skoglie	Date	3/28/11
Checked	T. E. Queen	Date	3/28/11
Calc. No.	0600X-CA-V0115	Rev. No.	0

Attachment 1. 600-202 Waste Site Verification Sample Results (Organics)

CONSTITUENT	CLASS	EXL-6 - J1C3X2			EXL-7 - J1C3X3			EXL-8 - J1C3X4			EXL-9 - J1C3X5			EXL-10 - J1C3X6			EXL-11 - J1C3X7		
		11/29/10			11/29/10			11/29/10			11/29/10			11/29/10			11/29/10		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	3.42	U	3.42	3.59	U	3.59	1.07	J	3.56	2.05	J	3.52	6.87		6.87	1.44	J	3.59
Acenaphthylene	PAH	3.42	U	3.42	3.59	U	3.59	3.56	U	3.56	3.52	U	3.52	3.61	U	3.61	3.59	U	3.59
Anthracene	PAH	3.42	U	3.42	3.59	U	3.59	3.56	U	3.56	3.52	U	3.52	3.61	U	3.61	3.59	U	3.59
Benzo(a)anthracene	PAH	3.42	U	3.42	3.59	U	3.59	3.56	U	3.56	3.52	U	3.52	3.61	U	3.61	3.59	U	3.59
Benzo(a)pyrene	PAH	3.42	U	3.42	3.59	U	3.59	3.56	U	3.56	3.52	U	3.52	3.61	U	3.61	3.59	U	3.59
Benzo(b)fluoranthene	PAH	3.42	U	3.42	3.59	U	3.59	3.56	U	3.56	3.52	U	3.52	3.61	U	3.61	3.59	U	3.59
Benzo(ghl)perylene	PAH	3.42	U	3.42	3.59	U	3.59	3.56	U	3.56	3.52	U	3.52	3.61	U	3.61	3.59	U	3.59
Benzo(k)fluoranthene	PAH	3.42	U	3.42	3.59	U	3.59	3.56	U	3.56	3.52	U	3.52	3.61	U	3.61	3.59	U	3.59
Chrysene	PAH	3.42	U	3.42	3.59	U	3.59	3.56	U	3.56	3.52	U	3.52	3.61	U	3.61	3.59	U	3.59
Dibenz[a,h]anthracene	PAH	3.42	U	3.42	3.59	U	3.59	3.56	U	3.56	3.52	U	3.52	3.61	U	3.61	3.59	U	3.59
Fluoranthene	PAH	3.42	U	3.42	3.59	U	3.59	3.56	U	3.56	2.82	J	3.52	3.78		3.61	3.59	U	3.59
Fluorene	PAH	3.42	U	3.42	3.59	U	3.59	3.56	U	3.56	3.52	U	3.52	3.61	U	3.61	3.59	U	3.59
Indeno(1,2,3-cd)pyrene	PAH	3.42	U	3.42	3.59	U	3.59	3.56	U	3.56	0.97	J	3.52	3.61	U	3.61	3.59	U	3.59
Naphthalene	PAH	3.42	U	3.42	3.59	U	3.59	3.56	U	3.56	3.52	U	3.52	3.61	U	3.61	3.59	U	3.59
Phenanthrene	PAH	3.42	U	3.42	3.59	U	3.59	3.56	U	3.56	1.11	J	3.52	3.61	U	3.61	3.59	U	3.59
Pyrene	PAH	3.42	U	3.42	3.59	U	3.59	3.56	U	3.56	3.52	U	3.52	3.61	U	3.61	3.59	U	3.59
Aldrin	PEST	1.37	UD	1.37	1.43	UD	1.43	2.86	JD	1.41	1.40	UD	1.40	1.45	UD	1.45	1.40	UD	1.40
Alpha-BHC	PEST	1.37	UD	1.37	1.43	UD	1.43	1.41	UD	1.41	1.40	UD	1.40	1.45	UD	1.45	1.40	UD	1.40
alpha-Chlordane	PEST	1.37	UD	1.37	1.43	UD	1.43	1.41	UD	1.41	1.40	UD	1.40	1.45	UD	1.45	1.40	UD	1.40
beta-1,2,3,4,5,6-Hexachlorocyclohexane	PEST	1.37	UD	1.37	1.43	UD	1.43	1.41	UD	1.41	1.40	UD	1.40	1.45	UD	1.45	1.40	UD	1.40
Delta-BHC	PEST	1.97	JD	1.37	1.43	UD	1.43	1.41	UD	1.41	1.40	UD	1.40	1.45	UD	1.45	1.40	UD	1.40
Dichlorodiphenyldichloroethane	PEST	1.37	UD	1.37	1.43	UD	1.43	1.41	UD	1.41	1.40	UD	1.40	1.45	UD	1.45	1.40	UD	1.40
Dichlorodiphenyldichloroethylene	PEST	1.37	UD	1.37	1.43	UD	1.43	1.41	UD	1.41	1.40	UD	1.40	1.45	UD	1.45	1.40	UD	1.40
Dichlorodiphenyltrichloroethane	PEST	1.37	UD	1.37	1.43	UD	1.43	1.41	UD	1.41	1.40	UD	1.40	1.45	UD	1.45	1.40	UD	1.40
Dieldrin	PEST	1.37	UD	1.37	1.43	UD	1.43	1.41	UD	1.41	1.40	UD	1.40	1.45	UD	1.45	1.40	UD	1.40
Endosulfan I	PEST	1.37	UD	1.37	1.43	UD	1.43	1.41	UD	1.41	1.40	UD	1.40	1.45	UD	1.45	1.40	UD	1.40
Endosulfan II	PEST	1.37	UD	1.37	1.43	UD	1.43	1.41	UD	1.41	1.40	UD	1.40	1.45	UD	1.45	1.40	UD	1.40
Endosulfan sulfate	PEST	1.37	UD	1.37	1.43	UD	1.43	1.41	UD	1.41	1.40	UD	1.40	1.45	UD	1.45	1.40	UD	1.40
Endrin	PEST	1.37	UD	1.37	1.43	UD	1.43	1.41	UD	1.41	1.40	UD	1.40	1.45	UD	1.45	1.40	UD	1.40
Endrin aldehyde	PEST	1.37	UD	1.37	1.43	UD	1.43	1.41	UD	1.41	1.40	UD	1.40	1.45	UD	1.45	1.40	UD	1.40
Endrin ketone	PEST	1.37	UD	1.37	1.43	UD	1.43	1.41	UD	1.41	1.40	UD	1.40	1.45	UD	1.45	1.40	UD	1.40
Gamma-BHC (Lindane)	PEST	1.37	UD	1.37	1.43	UD	1.43	1.41	UD	1.41	1.40	UD	1.40	1.45	UD	1.45	1.40	UD	1.40
gamma-Chlordane	PEST	1.37	UD	1.37	1.43	UD	1.43	1.41	UD	1.41	1.40	UD	1.40	1.45	UD	1.45	1.40	UD	1.40
Heptachlor	PEST	1.37	UD	1.37	1.43	UD	1.43	1.41	UD	1.41	1.40	UD	1.40	1.45	UD	1.45	1.40	UD	1.40
Heptachlor epoxide	PEST	1.37	UD	1.37	1.43	UD	1.43	1.41	UD	1.41	1.40	UD	1.40	1.45	UD	1.45	1.40	UD	1.40
Methoxychlor	PEST	1.37	UD	1.37	1.43	UD	1.43	1.41	UD	1.41	1.40	UD	1.40	1.45	UD	1.45	1.40	UD	1.40
Toxaphene	PEST	13.7	UJD	13.7	14.3	UJD	14.3	14.1	UJD	14.1	14.0	UJD	14.0	14.5	UJD	14.5	14.0	UJD	14.0

Attachment	1	Sheet No.	2 of 13
Originator	J. D. Skoglie	Date	3/28/11
Checked	T. E. Queen	Date	3/28/11
Calc. No.	0600X-CA-V0115	Rev. No.	0

Attachment 1. 600-202 Waste Site Verification Sample Results (Organics)

CONSTITUENT	CLASS	EXL-12 - J1C3X8			EXS-3 - J1C3Y3			Duplicate of J1C3Y3 - J1C402			EXS-1 - J1C3Y0			EXS-2 - J1C3Y1			EXS-4 - J1C3Y2		
		11/29/10			12/1/10			12/1/10			12/1/10			12/1/10			12/1/10		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	11.0		3.54	3.66	U	3.66	3.78	U	3.78	3.70	U	3.70	3.45	J	3.89	3.64	U	3.64
Acenaphthylene	PAH	3.54	U	3.54	3.66	U	3.66	3.78	U	3.78	3.70	U	3.70	3.89	U	3.89	3.64	U	3.64
Anthracene	PAH	3.54	U	3.54	3.66	U	3.66	3.78	U	3.78	3.70	U	3.70	3.89	U	3.89	3.64	U	3.64
Benzo(a)anthracene	PAH	3.54	U	3.54	3.66	U	3.66	3.78	U	3.78	3.70	U	3.70	3.89	U	3.89	3.64	U	3.64
Benzo(a)pyrene	PAH	3.54	U	3.54	3.66	U	3.66	3.78	U	3.78	3.70	U	3.70	3.89	U	3.89	3.64	U	3.64
Benzo(b)fluoranthene	PAH	1.20	J	3.54	3.66	U	3.66	3.78	U	3.78	3.70	U	3.70	3.89	U	3.89	3.64	U	3.64
Benzo(ghi)perylene	PAH	3.54	U	3.54	3.66	U	3.66	3.78	U	3.78	3.70	U	3.70	3.89	U	3.89	3.64	U	3.64
Benzo(k)fluoranthene	PAH	3.54	U	3.54	3.66	U	3.66	3.78	U	3.78	3.70	U	3.70	3.89	U	3.89	3.64	U	3.64
Chrysene	PAH	1.47	J	3.54	3.66	U	3.66	3.78	U	3.78	3.70	U	3.70	3.89	U	3.89	3.64	U	3.64
Dibenz[a,h]anthracene	PAH	3.54	U	3.54	3.66	U	3.66	3.78	U	3.78	3.70	U	3.70	3.89	U	3.89	3.64	U	3.64
Fluoranthene	PAH	7.08		3.54	3.66	U	3.66	3.78	U	3.78	3.70	U	3.70	3.89	U	3.89	3.64	U	3.64
Fluorene	PAH	3.54	U	3.54	3.66	U	3.66	3.78	U	3.78	3.70	U	3.70	3.89	U	3.89	3.64	U	3.64
Indeno(1,2,3-cd)pyrene	PAH	3.05	J	3.54	3.66	U	3.66	3.78	U	3.78	3.70	U	3.70	3.89	U	3.89	3.64	U	3.64
Naphthalene	PAH	3.54	U	3.54	3.66	U	3.66	3.78	U	3.78	3.70	U	3.70	3.89	U	3.89	3.64	U	3.64
Phenanthrene	PAH	4.07		3.54	3.66	U	3.66	3.78	U	3.78	1.56	J	3.70	3.89	U	3.89	3.64	U	3.64
Pyrene	PAH	3.54	U	3.54	3.66	U	3.66	3.78	U	3.78	3.70	U	3.70	1.25	J	3.89	3.64	U	3.64
Aldrin	PEST	1.41	UD	1.41	1.51	UD	1.51	1.50	UD	1.50	1.42	UD	1.42	1.53	UD	1.53	1.44	UD	1.44
Alpha-BHC	PEST	1.41	UD	1.41	1.51	UD	1.51	1.50	UD	1.50	1.42	UD	1.42	1.53	UD	1.53	1.44	UD	1.44
alpha-Chlordane	PEST	1.41	UD	1.41	1.51	UD	1.51	1.50	UD	1.50	1.42	UD	1.42	1.53	UD	1.53	1.44	UD	1.44
beta-1,2,3,4,5,6-Hexachlorocyclohexane	PEST	1.41	UD	1.41	1.51	UD	1.51	1.50	UD	1.50	1.42	UD	1.42	1.53	UD	1.53	1.44	UD	1.44
Delta-BHC	PEST	1.41	UD	1.41	1.51	UD	1.51	1.50	UD	1.50	1.42	UD	1.42	1.53	UD	1.53	1.44	UD	1.44
Dichlorodiphenyldichloroethane	PEST	1.41	UD	1.41	1.51	UD	1.51	1.50	UD	1.50	1.42	UD	1.42	1.53	UD	1.53	1.44	UD	1.44
Dichlorodiphenyldichloroethylene	PEST	1.41	UD	1.41	1.51	UD	1.51	1.50	UD	1.50	1.42	UD	1.42	1.53	UD	1.53	1.44	UD	1.44
Dichlorodiphenyltrichloroethane	PEST	1.41	UD	1.41	1.51	UD	1.51	1.50	UD	1.50	1.42	UD	1.42	1.53	UD	1.53	1.44	UD	1.44
Dieldrin	PEST	1.41	UD	1.41	1.51	UD	1.51	1.50	UD	1.50	1.42	UD	1.42	1.53	UD	1.53	1.44	UD	1.44
Endosulfan I	PEST	1.41	UD	1.41	1.51	UD	1.51	1.50	UD	1.50	1.42	UD	1.42	1.53	UD	1.53	1.44	UD	1.44
Endosulfan II	PEST	1.41	UD	1.41	1.51	UD	1.51	1.50	UD	1.50	1.42	UD	1.42	1.53	UD	1.53	1.44	UD	1.44
Endosulfan sulfate	PEST	1.41	UD	1.41	1.51	UD	1.51	1.50	UD	1.50	1.42	UD	1.42	1.53	UD	1.53	1.44	UD	1.44
Endrin	PEST	1.41	UD	1.41	1.51	UD	1.51	1.50	UD	1.50	1.42	UD	1.42	1.53	UD	1.53	1.44	UD	1.44
Endrin aldehyde	PEST	1.41	UD	1.41	1.51	UD	1.51	1.50	UD	1.50	1.42	UD	1.42	1.53	UD	1.53	1.44	UD	1.44
Endrin ketone	PEST	1.41	UD	1.41	1.51	UD	1.51	1.50	UD	1.50	1.42	UD	1.42	1.53	UD	1.53	1.44	UD	1.44
Gamma-BHC (Lindane)	PEST	1.41	UD	1.41	1.51	UD	1.51	1.50	UD	1.50	1.42	UD	1.42	1.53	UD	1.53	1.44	UD	1.44
gamma-Chlordane	PEST	1.41	UD	1.41	1.51	UD	1.51	1.50	UD	1.50	1.42	UD	1.42	1.53	UD	1.53	1.44	UD	1.44
Heptachlor	PEST	1.41	UD	1.41	1.51	UD	1.51	1.50	UD	1.50	1.42	UD	1.42	1.53	UD	1.53	1.44	UD	1.44
Heptachlor epoxide	PEST	1.41	UD	1.41	1.51	UD	1.51	1.50	UD	1.50	1.42	UD	1.42	1.53	UD	1.53	1.44	UD	1.44
Methoxychlor	PEST	1.41	UD	1.41	1.51	UD	1.51	1.50	UD	1.50	1.42	UD	1.42	1.53	UD	1.53	1.44	UD	1.44
Toxaphene	PEST	14.1	UJD	14.1	15.1	UD	15.1	15.0	UD	15.0	14.2	UD	14.2	15.3	UD	15.3	14.4	UD	14.4

Attachment	1	Sheet No.	3 of 13
Originator	J. D. Skoglie	Date	3/28/11
Checked	T. E. Queen	Date	3/28/11
Calc. No.	0600X-CA-V0115	Rev. No.	0

Attachment 1. 600-202 Waste Site Verification Sample Results (Organics)

CONSTITUENT	CLASS	EXS-5 - J1C3Y4			EXS-6 - J1C3Y5			EXS-7 - J1C3Y6			EXS-8 - J1C3Y7			EXS-9 - J1C3Y8			EXS-10 - J1C3Y9		
		12/1/10			12/1/10			12/1/10			12/1/10			12/1/10			12/1/10		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	3.68	U	3.68	3.66	U	3.66	3.53	U	3.53	24.8		3.47	3.65	U	3.65	3.69	U	3.69
Acenaphthylene	PAH	3.68	U	3.68	3.66	U	3.66	3.53	U	3.53	82.1		3.47	3.65	U	3.65	3.69	U	3.69
Anthracene	PAH	3.68	U	3.68	3.66	U	3.66	3.53	U	3.53	2.03	J	3.47	3.65	U	3.65	3.69	U	3.69
Benzo(a)anthracene	PAH	3.68	U	3.68	3.66	U	3.66	3.53	U	3.53	3.47	U	3.47	3.65	U	3.65	3.69	U	3.69
Benzo(a)pyrene	PAH	3.68	U	3.68	3.66	U	3.66	3.53	U	3.53	3.47	U	3.47	3.65	U	3.65	3.69	U	3.69
Benzo(b)fluoranthene	PAH	3.68	U	3.68	3.66	U	3.66	3.53	U	3.53	3.47	U	3.47	3.65	U	3.65	3.69	U	3.69
Benzo(ghi)perylene	PAH	3.68	U	3.68	3.66	U	3.66	3.53	U	3.53	3.47	U	3.47	3.65	U	3.65	3.69	U	3.69
Benzo(k)fluoranthene	PAH	3.68	U	3.68	3.66	U	3.66	3.53	U	3.53	3.47	U	3.47	3.65	U	3.65	3.69	U	3.69
Chrysene	PAH	3.68	U	3.68	3.66	U	3.66	3.53	U	3.53	3.47	U	3.47	3.65	U	3.65	3.69	U	3.69
Dibenz[a,h]anthracene	PAH	3.68	U	3.68	3.66	U	3.66	3.53	U	3.53	3.47	U	3.47	3.65	U	3.65	3.69	U	3.69
Fluoranthene	PAH	3.68	U	3.68	3.66	U	3.66	3.53	U	3.53	3.47	U	3.47	3.65	U	3.65	3.69	U	3.69
Fluorene	PAH	3.68	U	3.68	3.66	U	3.66	3.53	U	3.53	34.5		3.47	3.65	U	3.65	3.69	U	3.69
Indeno(1,2,3-cd)pyrene	PAH	3.68	U	3.68	3.66	U	3.66	3.53	U	3.53	3.47	U	3.47	3.65	U	3.65	3.69	U	3.69
Naphthalene	PAH	3.68	U	3.68	3.66	U	3.66	3.53	U	3.53	20.7		3.47	3.65	U	3.65	3.69	U	3.69
Phenanthrene	PAH	3.68	U	3.68	3.66	U	3.66	3.53	U	3.53	5.24		3.47	3.65	U	3.65	3.69	U	3.69
Pyrene	PAH	3.68	U	3.68	3.66	U	3.66	1.50	J	3.53	0.972	J	3.47	3.65	U	3.65	3.69	U	3.69
Aldrin	PEST	1.47	UD	1.47	1.40	UD	1.40	1.40	UD	1.40	1.42	UD	1.42	1.45	UD	1.45	1.45	UD	1.45
Alpha-BHC	PEST	1.47	UD	1.47	1.40	UD	1.40	1.40	UD	1.40	1.42	UD	1.42	1.45	UD	1.45	1.45	UD	1.45
alpha-Chlordane	PEST	1.47	UD	1.47	1.40	UD	1.40	1.40	UD	1.40	1.42	UD	1.42	1.45	UD	1.45	1.45	UD	1.45
beta-1,2,3,4,5,6-Hexachlorocyclohexane	PEST	1.47	UD	1.47	1.40	UD	1.40	1.40	UD	1.40	1.42	UD	1.42	1.45	UD	1.45	1.45	UD	1.45
Delta-BHC	PEST	1.47	UD	1.47	1.40	UD	1.40	1.40	UD	1.40	1.42	UD	1.42	1.45	UD	1.45	1.45	UD	1.45
Dichlorodiphenyldichloroethane	PEST	1.47	UD	1.47	1.40	UD	1.40	1.40	UD	1.40	1.42	UD	1.42	1.45	UD	1.45	1.45	UD	1.45
Dichlorodiphenyldichloroethylene	PEST	1.47	UD	1.47	1.40	UD	1.40	1.40	UD	1.40	1.42	UD	1.42	1.45	UD	1.45	1.45	UD	1.45
Dichlorodiphenyltrichloroethane	PEST	1.47	UD	1.47	1.40	UD	1.40	1.40	UD	1.40	1.42	UD	1.42	1.45	UD	1.45	1.45	UD	1.45
Dieldrin	PEST	1.47	UD	1.47	1.40	UD	1.40	1.40	UD	1.40	1.42	UD	1.42	1.45	UD	1.45	1.45	UD	1.45
Endosulfan I	PEST	1.47	UD	1.47	1.40	UD	1.40	1.40	UD	1.40	1.42	UD	1.42	1.45	UD	1.45	1.45	UD	1.45
Endosulfan II	PEST	1.47	UD	1.47	1.40	UD	1.40	1.40	UD	1.40	1.42	UD	1.42	1.45	UD	1.45	1.45	UD	1.45
Endosulfan sulfate	PEST	1.47	UD	1.47	1.40	UD	1.40	1.40	UD	1.40	1.42	UD	1.42	1.45	UD	1.45	1.45	UD	1.45
Endrin	PEST	1.47	UD	1.47	1.40	UD	1.40	1.40	UD	1.40	1.42	UD	1.42	1.45	UD	1.45	1.45	UD	1.45
Endrin aldehyde	PEST	1.47	UD	1.47	1.40	UD	1.40	1.40	UD	1.40	1.42	UD	1.42	1.45	UD	1.45	1.45	UD	1.45
Endrin ketone	PEST	1.47	UD	1.47	1.40	UD	1.40	1.40	UD	1.40	1.42	UD	1.42	1.45	UD	1.45	1.45	UD	1.45
Gamma-BHC (Lindane)	PEST	1.47	UD	1.47	1.40	UD	1.40	1.40	UD	1.40	1.42	UD	1.42	1.45	UD	1.45	1.45	UD	1.45
gamma-Chlordane	PEST	1.47	UD	1.47	1.40	UD	1.40	1.40	UD	1.40	1.42	UD	1.42	1.45	UD	1.45	1.45	UD	1.45
Heptachlor	PEST	1.47	UD	1.47	1.40	UD	1.40	1.40	UD	1.40	1.42	UD	1.42	1.45	UD	1.45	1.45	UD	1.45
Heptachlor epoxide	PEST	1.47	UD	1.47	1.40	UD	1.40	1.40	UD	1.40	1.42	UD	1.42	1.45	UD	1.45	1.45	UD	1.45
Methoxychlor	PEST	1.47	UD	1.47	1.40	UD	1.40	1.40	UD	1.40	1.42	UD	1.42	1.45	UD	1.45	1.45	UD	1.45
Toxaphene	PEST	14.7	UD	14.7	14.0	UD	14.0	14.0	UD	14.0	14.2	UD	14.2	14.5	UD	14.5	14.5	UD	14.5

Attachment	1	Sheet No.	4 of 13
Originator	J. D. Skoglie	Date	3/28/11
Checked	T. E. Queen	Date	3/28/11
Calc. No.	0600X-CA-V0115	Rev. No.	0

Attachment 1. 600-202 Waste Site Verification Sample Results (Organics)

CONSTITUENT	CLASS	EXS-11 - J1C400			EXS-12 - J1C401			SPA-1 - J1C409			Duplicate of J1C409 - J1C421			SPA-2 - J1C410			SPA-3 - J1C411		
		12/1/10			12/1/10			12/6/10			12/6/10			12/6/10			12/6/10		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	1.22	J	3.47	1.66	J	3.61	3.60	U	3.60	3.55	U	3.55	43.3		3.46	53.9		3.49
Acenaphthylene	PAH	3.47	U	3.47	3.61	U	3.61	43.7		3.60	113		3.55	3.46	U	3.46	47.8		3.49
Anthracene	PAH	3.47	U	3.47	3.61	U	3.61	4.87		3.60	4.26		3.55	1.66	J	3.46	6.26		3.49
Benzo(a)anthracene	PAH	3.47	U	3.47	3.61	U	3.61	11.4		3.60	8.08		3.55	41.3		3.46	6.63		3.49
Benzo(a)pyrene	PAH	3.47	U	3.47	3.61	U	3.61	36.3		3.60	3.55	U	3.55	17.9		3.46	14.1		3.49
Benzo(b)fluoranthene	PAH	3.47	U	3.47	3.61	U	3.61	36.5		3.60	25.1		3.55	35.0		3.46	46.3		3.49
Benzo(ghi)perylene	PAH	3.47	U	3.47	3.61	U	3.61	3.60	U	3.60	26.0		3.55	3.46	U	3.46	3.49	U	3.49
Benzo(k)fluoranthene	PAH	3.47	U	3.47	3.61	U	3.61	9.41		3.60	6.21		3.55	10.5		3.46	13.7		3.49
Chrysene	PAH	3.47	U	3.47	3.61	U	3.61	105		3.60	76.6		3.55	65.6		3.46	4.71		3.49
Dibenz[a,h]anthracene	PAH	3.47	U	3.47	3.61	U	3.61	3.60	U	3.60	3.55	U	3.55	16.8		3.46	13.1		3.49
Fluoranthene	PAH	0.99	J	3.47	5.14		3.61	62.5		3.60	52.4		3.55	3.46	U	3.46	25.8		3.49
Fluorene	PAH	7.22		3.47	3.61	U	3.61	7.35		3.60	5.04		3.55	10.7		3.46	4.36		3.49
Indeno(1,2,3-cd)pyrene	PAH	3.47	U	3.47	3.61	U	3.61	3.60	U	3.60	3.55	U	3.55	3.46	U	3.46	3.49	U	3.49
Naphthalene	PAH	3.47	U	3.47	3.61	U	3.61	2.60	J	3.60	3.55	U	3.55	3.79		3.46	11.1		3.49
Phenanthrene	PAH	3.47	U	3.47	1.59	J	3.61	22.0		3.60	23.7		3.55	5.93		3.46	25.5		3.49
Pyrene	PAH	5.14		3.47	3.86		3.61	152		3.60	143		3.55	99.1		3.46	57.5		3.49
Aldrin	PEST	1.35	UD	1.35	1.43	UD	1.43	1.38	UD	1.38	1.40	UD	1.40	1.40	UD	1.40	1.36	UD	1.36
Alpha-BHC	PEST	1.35	UD	1.35	1.43	UD	1.43	1.38	UD	1.38	1.40	UD	1.40	1.40	UD	1.40	1.36	UD	1.36
alpha-Chlordane	PEST	1.35	UD	1.35	1.43	UD	1.43	1.38	UD	1.38	1.40	UD	1.40	1.40	UD	1.40	1.36	UD	1.36
beta-1,2,3,4,5,6-Hexachlorocyclohexane	PEST	1.35	UD	1.35	1.43	UD	1.43	1.38	UD	1.38	1.40	UD	1.40	1.40	UD	1.40	1.36	UD	1.36
Delta-BHC	PEST	1.35	UD	1.35	1.43	UD	1.43	1.38	UD	1.38	1.40	UD	1.40	1.40	UD	1.40	1.36	UD	1.36
Dichlorodiphenyldichloroethane	PEST	1.35	UD	1.35	1.43	UD	1.43	2.45	JD	1.38	1.40	UD	1.40	1.40	UD	1.40	1.36	UD	1.36
Dichlorodiphenyldichloroethylene	PEST	1.35	UD	1.35	1.43	UD	1.43	1.38	UD	1.38	1.40	UD	1.40	1.40	UD	1.40	1.36	UD	1.36
Dichlorodiphenyltrichloroethane	PEST	1.35	UD	1.35	1.43	UD	1.43	1.50	JD	1.38	1.40	UD	1.40	1.84	JD	1.40	1.48	JD	1.36
Dieldrin	PEST	1.35	UD	1.35	1.43	UD	1.43	1.38	UD	1.38	1.40	UD	1.40	1.40	UD	1.40	1.36	UD	1.36
Endosulfan I	PEST	1.35	UD	1.35	1.43	UD	1.43	1.38	UD	1.38	1.40	UD	1.40	1.40	UD	1.40	1.36	UD	1.36
Endosulfan II	PEST	1.35	UD	1.35	1.43	UD	1.43	1.38	UD	1.38	1.40	UD	1.40	1.40	UD	1.40	1.36	UD	1.36
Endosulfan sulfate	PEST	1.35	UD	1.35	1.43	UD	1.43	1.38	UD	1.38	1.40	UD	1.40	1.40	UD	1.40	1.36	UD	1.36
Endrin	PEST	1.35	UD	1.35	1.43	UD	1.43	1.38	UD	1.38	1.40	UD	1.40	1.40	UD	1.40	1.36	UD	1.36
Endrin aldehyde	PEST	1.35	UD	1.35	1.43	UD	1.43	1.38	UD	1.38	1.40	UD	1.40	1.40	UD	1.40	1.36	UD	1.36
Endrin ketone	PEST	1.35	UD	1.35	1.43	UD	1.43	1.38	UD	1.38	1.40	UD	1.40	1.41	JD	1.40	1.36	UD	1.36
Gamma-BHC (Lindane)	PEST	1.35	UD	1.35	1.43	UD	1.43	1.38	UD	1.38	1.40	UD	1.40	1.40	UD	1.40	1.36	UD	1.36
gamma-Chlordane	PEST	1.35	UD	1.35	1.43	UD	1.43	1.38	UD	1.38	1.40	UD	1.40	1.40	UD	1.40	1.36	UD	1.36
Heptachlor	PEST	1.35	UD	1.35	1.43	UD	1.43	1.38	UD	1.38	1.40	UD	1.40	1.40	UD	1.40	1.36	UD	1.36
Heptachlor epoxide	PEST	1.35	UD	1.35	1.43	UD	1.43	1.38	UD	1.38	1.40	UD	1.40	1.40	UD	1.40	1.36	UD	1.36
Methoxychlor	PEST	1.35	UD	1.35	1.43	UD	1.43	1.61	JD	1.38	1.40	UD	1.40	1.40	UD	1.40	1.36	UD	1.36
Toxaphene	PEST	13.5	UD	13.5	14.3	UD	14.3	13.8	UD	13.8	14.0	UD	14.0	14.0	UD	14.0	13.6	UD	13.6

Attachment	1	Sheet No.	5 of 13
Originator	J. D. Skoglie	Date	3/28/11
Checked	T. E. Queen	Date	3/28/11
Calc. No.	0600X-CA-V0115	Rev. No.	0

Attachment 1. 600-202 Waste Site Verification Sample Results (Organics)

CONSTITUENT	CLASS	SPA-4 - J1C412			SPA-5 - J1C413			SPA-6 - J1C414			SPA-7 - J1C415			SPA-8 - J1C416			SPA-9 - J1C417		
		12/6/10			12/6/10			12/6/10			12/6/10			12/6/10			12/6/10		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	3.49	U	3.49	40.5		3.51	3.55	U	3.55	3.47	U	3.47	3.48	U	3.48	10.2		3.44
Acenaphthylene	PAH	2.67	J	3.49	85.5		3.51	1.78	J	3.55	3.47	U	3.47	41.8		3.48	3.44	U	3.44
Anthracene	PAH	3.49	U	3.49	2.53	J	3.51	3.55	U	3.55	3.47	U	3.47	4.53		3.48	3.44	U	3.44
Benzo(a)anthracene	PAH	3.49	U	3.49	37.5		3.51	3.55	U	3.55	3.47	U	3.47	2.98	J	3.48	3.44	U	3.44
Benzo(a)pyrene	PAH	3.49	U	3.49	27.9		3.51	3.55	U	3.55	3.47	U	3.47	3.48	U	3.48	3.44	U	3.44
Benzo(b)fluoranthene	PAH	2.79	J	3.49	88.7		3.51	3.55	U	3.55	3.47	U	3.47	28.1		3.48	3.44	U	3.44
Benzo(ghi)perylene	PAH	3.49	U	3.49	3.51	U	3.51	3.55	U	3.55	3.47	U	3.47	52.8		3.48	3.44	U	3.44
Benzo(k)fluoranthene	PAH	3.49	U	3.49	16.5		3.51	3.55	U	3.55	3.47	U	3.47	5.13		3.48	3.44	U	3.44
Chrysene	PAH	1.12	J	3.49	120		3.51	3.55	U	3.55	3.47	U	3.47	40.9		3.48	3.44	U	3.44
Dibenz[a,h]anthracene	PAH	3.49	U	3.49	3.51	U	3.51	3.55	U	3.55	3.47	U	3.47	3.48	U	3.48	3.44	U	3.44
Fluoranthene	PAH	18.7		3.49	108		3.51	6.18		3.55	196		3.47	51.1		3.48	12.6		3.44
Fluorene	PAH	3.49	U	3.49	10.1		3.51	3.55	U	3.55	3.47	U	3.47	3.70		3.48	3.44	U	3.44
Indeno(1,2,3-cd)pyrene	PAH	3.49	U	3.49	3.51	U	3.51	3.55	U	3.55	3.47	U	3.47	3.48	U	3.48	3.44	U	3.44
Naphthalene	PAH	3.49	U	3.49	13.1		3.51	3.55	U	3.55	3.47	U	3.47	3.48	U	3.48	3.44	U	3.44
Phenanthrene	PAH	2.27	J	3.49	52.0		3.51	1.10	J	3.55	4.14		3.47	10.1		3.48	1.03	J	3.44
Pyrene	PAH	3.49	U	3.49	371		3.51	3.55	U	3.55	3.46	J	3.47	99.7		3.48	5.50		3.44
Aldrin	PEST	1.43	UD	1.43	1.35	UD	1.35	1.44	UD	1.44	1.42	UD	1.42	1.37	UD	1.37	2.77	JD	1.39
Alpha-BHC	PEST	1.43	UD	1.43	1.35	UD	1.35	1.44	UD	1.44	1.42	UD	1.42	1.37	UD	1.37	1.39	UD	1.39
alpha-Chlordane	PEST	1.43	UD	1.43	1.35	UD	1.35	1.44	UD	1.44	1.42	UD	1.42	1.37	UD	1.37	1.39	UD	1.39
beta-1,2,3,4,5,6-Hexachlorocyclohexane	PEST	1.43	UD	1.43	1.35	UD	1.35	1.44	UD	1.44	1.42	UD	1.42	1.37	UD	1.37	1.39	UD	1.39
Delta-BHC	PEST	1.43	UD	1.43	1.35	UD	1.35	1.44	UD	1.44	1.42	UD	1.42	1.37	UD	1.37	1.39	UD	1.39
Dichlorodiphenyldichloroethane	PEST	1.43	UD	1.43	2.65	JD	1.35	1.44	UD	1.44	1.42	UD	1.42	1.37	UD	1.37	1.39	UD	1.39
Dichlorodiphenyldichloroethylene	PEST	1.43	UD	1.43	2.04	JD	1.35	1.44	UD	1.44	1.86	JD	1.42	1.37	UD	1.37	1.39	UD	1.39
Dichlorodiphenyltrichloroethane	PEST	1.43	UD	1.43	4.01	JD	1.35	1.44	UD	1.44	1.42	UD	1.42	1.37	UD	1.37	1.39	UD	1.39
Dieldrin	PEST	1.43	UD	1.43	1.35	UD	1.35	1.44	UD	1.44	1.42	UD	1.42	1.37	UD	1.37	1.39	UD	1.39
Endosulfan I	PEST	1.43	UD	1.43	1.35	UD	1.35	1.44	UD	1.44	1.42	UD	1.42	1.37	UD	1.37	1.39	UD	1.39
Endosulfan II	PEST	1.43	UD	1.43	1.35	UD	1.35	1.44	UD	1.44	1.42	UD	1.42	1.37	UD	1.37	1.39	UD	1.39
Endosulfan sulfate	PEST	1.43	UD	1.43	1.35	UD	1.35	1.44	UD	1.44	1.42	UD	1.42	1.37	UD	1.37	1.39	UD	1.39
Endrin	PEST	1.43	UD	1.43	2.24	JD	1.35	1.44	UD	1.44	1.42	UD	1.42	1.37	UD	1.37	1.39	UD	1.39
Endrin aldehyde	PEST	1.43	UD	1.43	1.97	JD	1.35	1.44	UD	1.44	1.42	UD	1.42	1.37	UD	1.37	1.39	UD	1.39
Endrin ketone	PEST	1.43	UD	1.43	1.35	UD	1.35	1.44	UD	1.44	1.42	UD	1.42	1.37	UD	1.37	1.39	UD	1.39
Gamma-BHC (Lindane)	PEST	1.43	UD	1.43	1.35	UD	1.35	1.44	UD	1.44	1.42	UD	1.42	1.37	UD	1.37	1.39	UD	1.39
gamma-Chlordane	PEST	1.43	UD	1.43	1.35	UD	1.35	1.44	UD	1.44	1.42	UD	1.42	1.37	UD	1.37	1.39	UD	1.39
Heptachlor	PEST	1.43	UD	1.43	1.35	UD	1.35	1.44	UD	1.44	1.42	UD	1.42	1.37	UD	1.37	1.39	UD	1.39
Heptachlor epoxide	PEST	1.43	UD	1.43	1.35	UD	1.35	1.44	UD	1.44	1.42	UD	1.42	1.37	UD	1.37	1.39	UD	1.39
Methoxychlor	PEST	1.43	UD	1.43	1.35	UD	1.35	1.44	UD	1.44	1.42	UD	1.42	1.37	UD	1.37	1.39	UD	1.39
Toxaphene	PEST	14.3	UD	14.3	13.5	UD	13.5	14.4	UD	14.4	14.2	UD	14.2	13.7	UD	13.7	13.9	UD	13.9

Attachment	1	Sheet No.	6 of 13
Originator	J. D. Skoglie	Date	3/28/11
Checked	T. E. Queen	Date	3/28/11
Calc. No.	0600X-CA-V0115	Rev. No.	0

Attachment 1. 600-202 Waste Site Verification Sample Results (Organics)

CONSTITUENT	CLASS	SPA-10 - J1C418			SPA-11 - J1C419			SPA-12 - J1C420			FS-1 - J1C422			FS-2 - J1C423		
		12/6/10			12/6/10			12/6/10			11/29/10			12/6/10		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	9.22		3.47	3.47	U	3.47	3.41	U	3.41	13.9		3.33	3.69	U	3.69
Acenaphthylene	PAH	9.03		3.47	2.28	J	3.47	3.41	U	3.41	3.33	U	3.33	132		3.69
Anthracene	PAH	4.43		3.47	3.47	U	3.47	3.41	U	3.41	3.33	U	3.33	11.4		3.69
Benzo(a)anthracene	PAH	38.9		3.47	3.47	U	3.47	3.41	U	3.41	3.33	U	3.33	17.3		3.69
Benzo(a)pyrene	PAH	1.22	J	3.47	3.47	U	3.47	1.48	J	3.41	1.22	J	3.33	3.69	U	3.69
Benzo(b)fluoranthene	PAH	17.1		3.47	3.47	U	3.47	1.04	J	3.41	1.33	J	3.33	15.6		3.69
Benzo(ghi)perylene	PAH	1.15	J	3.47	3.47	U	3.47	3.41	U	3.41	1.33	J	3.33	3.69	U	3.69
Benzo(k)fluoranthene	PAH	3.47	U	3.47	3.47	U	3.47	3.41	U	3.41	3.33	U	3.33	3.69	U	3.69
Chrysene	PAH	2.00	J	3.47	3.47	U	3.47	7.05		3.41	0.867	J	3.33	2.45	J	3.69
Dibenz[a,h]anthracene	PAH	3.47	U	3.47	3.47	U	3.47	3.41	U	3.41	3.33	U	3.33	3.69	U	3.69
Fluoranthene	PAH	27.8		3.47	9.51		3.47	15.4		3.41	3.50		3.33	61.0		3.69
Fluorene	PAH	6.94		3.47	3.47	U	3.47	3.41	U	3.41	3.33	U	3.33	14.7		3.69
Indeno(1,2,3-cd)pyrene	PAH	3.47	U	3.47	3.47	U	3.47	3.41	U	3.41	3.33	U	3.33	82.5		3.69
Naphthalene	PAH	3.47	U	3.47	3.47	U	3.47	3.41	U	3.41	3.33	U	3.33	26.5		3.69
Phenanthrene	PAH	10.2		3.47	3.47	U	3.47	1.40	J	3.41	2.17	J	3.33	53.5		3.69
Pyrene	PAH	7.62		3.47	3.47	U	3.47	11.4		3.41	3.33	U	3.33	6.83		3.69
Aldrin	PEST	1.37	UD	1.37	6.00	JD	1.42	1.38	UD	1.38	1.33	UD	1.33	1.48	UD	1.48
Alpha-BHC	PEST	1.37	UD	1.37	1.42	UD	1.42	1.38	UD	1.38	1.33	UD	1.33	2.02	JD	1.48
alpha-Chlordane	PEST	1.37	UD	1.37	1.42	UD	1.42	1.38	UD	1.38	1.33	UD	1.33	1.48	UD	1.48
beta-1,2,3,4,5,6-Hexachlorocyclohexane	PEST	1.37	UD	1.37	1.42	UD	1.42	1.38	UD	1.38	1.33	UD	1.33	14.5	D	1.48
Delta-BHC	PEST	1.37	UD	1.37	1.42	UD	1.42	1.38	UD	1.38	1.33	UD	1.33	1.48	UD	1.48
Dichlorodiphenyldichloroethane	PEST	1.37	UD	1.37	1.42	UD	1.42	1.38	UD	1.38	1.33	UD	1.33	1.48	UD	1.48
Dichlorodiphenyldichloroethylene	PEST	1.37	UD	1.37	1.42	UD	1.42	1.60	JD	1.38	1.33	UD	1.33	1.48	UD	1.48
Dichlorodiphenyltrichloroethane	PEST	1.37	UD	1.37	1.42	UD	1.42	1.38	UD	1.38	1.33	UD	1.33	1.48	UD	1.48
Dieldrin	PEST	1.37	UD	1.37	1.42	UD	1.42	1.38	UD	1.38	1.33	UD	1.33	1.48	UD	1.48
Endosulfan I	PEST	1.37	UD	1.37	1.42	UD	1.42	1.38	UD	1.38	1.33	UD	1.33	2.99	JD	1.48
Endosulfan II	PEST	1.37	UD	1.37	1.42	UD	1.42	1.38	UD	1.38	1.33	UD	1.33	1.48	UD	1.48
Endosulfan sulfate	PEST	1.37	UD	1.37	1.42	UD	1.42	1.38	UD	1.38	1.33	UD	1.33	1.48	UD	1.48
Endrin	PEST	1.37	UD	1.37	1.42	UD	1.42	1.38	UD	1.38	1.33	UD	1.33	1.48	UD	1.48
Endrin aldehyde	PEST	1.37	UD	1.37	1.42	UD	1.42	1.38	UD	1.38	1.33	UD	1.33	1.48	UD	1.48
Endrin ketone	PEST	1.37	UD	1.37	1.42	UD	1.42	1.38	UD	1.38	1.33	UD	1.33	1.48	UD	1.48
Gamma-BHC (Lindane)	PEST	1.37	UD	1.37	1.42	UD	1.42	1.38	UD	1.38	1.33	UD	1.33	1.48	UD	1.48
gamma-Chlordane	PEST	1.37	UD	1.37	1.42	UD	1.42	1.38	UD	1.38	1.33	UD	1.33	1.48	UD	1.48
Heptachlor	PEST	1.37	UD	1.37	1.42	UD	1.42	1.38	UD	1.38	1.33	UD	1.33	1.48	UD	1.48
Heptachlor epoxide	PEST	1.37	UD	1.37	1.42	UD	1.42	1.38	UD	1.38	1.33	UD	1.33	1.48	UD	1.48
Methoxychlor	PEST	1.37	UD	1.37	1.42	UD	1.42	1.38	UD	1.38	1.33	UD	1.33	1.48	UD	1.48
Toxaphene	PEST	13.7	UD	13.7	14.2	UD	14.2	13.8	UD	13.8	13.3	UJD	13.3	14.8	UD	14.8

Attachment	1	Sheet No.	7 of 13
Originator	J. D. Skoglie	Date	3/28/11
Checked	T. E. Queen	Date	3/28/11
Calc. No.	0600X-CA-V0115	Rev. No.	0

Attachment 1. 600-202 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
EXL-1	J1C3W7	11/29/10	6700		4.59	0.366	JB	0.550	2.82		0.917	64.3		0.459	0.233		0.183	1.14		1.83
Duplicate of J1C3W7	J1C3X9	11/29/10	7550		3.77	0.237	JB	0.452	2.98		0.754	71.9		0.377	0.273		0.151	1.18		1.51
EXL-2	J1C3W8	11/29/10	5680		3.50	0.390	JB	0.420	3.34		0.700	51.4		0.350	0.212		0.140	1.27		1.40
EXL-3	J1C3W9	11/29/10	6850		4.24	0.367	JB	0.509	4.79		0.848	71.1		0.424	0.294		0.170	2.67		1.70
EXL-4	J1C3X0	11/29/10	6790		4.27	0.451	JB	0.513	3.70		0.854	67.7		0.427	0.254		0.171	0.881		1.71
EXL-5	J1C3X1	11/29/10	7900		3.62	0.298	JB	0.435	3.41		0.724	90.6		0.362	0.280		0.145	0.921		1.45
EXL-6	J1C3X2	11/29/10	6380		4.00	0.480	UJ	0.480	3.93		0.801	56.3		0.400	0.252		0.160	1.97		1.60
EXL-7	J1C3X3	11/29/10	8990		4.17	0.306	JB	0.501	4.66		0.834	90.0		0.417	0.346		0.167	1.65		1.67
EXL-8	J1C3X4	11/29/10	9260		4.26	0.489	JB	0.511	6.95		0.852	85.7		0.426	0.349		0.170	1.61		1.70
EXL-9	J1C3X5	11/29/10	6730		4.44	0.344	JB	0.533	3.63		0.888	66.5		0.444	0.249		0.178	1.27		1.78
EXL-10	J1C3X6	11/29/10	8630		3.52	0.388	JB	0.423	4.37		0.705	97.2		0.352	0.327		0.141	0.633		1.41
EXL-11	J1C3X7	11/29/10	9320		5.11	0.391	JB	0.613	5.46		0.102	84.7		0.511	0.337		0.204	1.68		2.04
EXL-12	J1C3X8	11/29/10	9010		3.88	0.292	JB	0.466	5.84		0.777	91.0		0.388	0.340		0.155	1.77		1.55
EXS-3	J1C3Y3	12/1/10	5410		5.29	0.635	U	0.635	1.47		1.06	76.6		0.529	0.130	B	0.212	1.25	B	2.12
Duplicate of J1C3Y3	J1C402	12/1/10	6150		5.49	0.659	U	0.659	1.68		1.10	82.2		0.549	0.140	B	0.220	1.45	B	2.20
EXS-1	J1C3Y0	12/1/10	6690		4.44	0.533	U	0.533	3.24		0.888	57.0		0.444	0.223		0.178	1.36	B	1.78
EXS-2	J1C3Y1	12/1/10	13300		5.71	0.685	U	0.685	8.63		1.14	116		0.571	0.528		0.228	2.22	B	2.28
EXS-4	J1C3Y2	12/1/10	11000		5.09	0.611	U	0.611	5.09		1.02	120		0.509	0.400		0.204	1.65	B	2.04
EXS-5	J1C3Y4	12/1/10	12700		5.37	0.644	U	0.644	6.20		1.07	114		0.537	0.512		0.215	2.9		2.15
EXS-6	J1C3Y5	12/1/10	10500		4.11	0.493	U	0.493	5.75		0.822	94.9		0.411	0.419		0.164	6.9		1.64
EXS-7	J1C3Y6	12/1/10	12200		5.05	0.606	U	0.606	11.4		1.01	105		0.505	0.473		0.202	1.34	B	2.02
EXS-8	J1C3Y7	12/1/10	7470		4.45	0.534	U	0.534	3.42		0.890	67.3		0.445	0.265		0.178	1.94		1.78
EXS-9	J1C3Y8	12/1/10	13000		4.49	0.539	U	0.539	8.58		0.898	109		0.449	0.488		0.180	2.98		1.80
EXS-10	J1C3Y9	12/1/10	7490		4.72	0.566	U	0.566	3.17		0.944	73.1		0.472	0.260		0.189	0.976	B	1.89
EXS-11	J1C400	12/1/10	7630		4.41	0.529	U	0.529	3.28		0.882	73.3		0.441	0.272		0.176	1.58	B	1.76
EXS-12	J1C401	12/1/10	7060		3.70	0.444	U	0.444	3.42		0.741	68.6		0.370	0.232		0.148	2.18		1.48
SPA-1	J1C409	12/6/10	6460		5.30	0.636	U	0.636	4.88		1.06	132		0.530	0.227		0.212	9.74		2.12
Duplicate of J1C409	J1C421	12/6/10	6120		4.08	0.543		0.489	5.29		0.816	116		0.408	0.185		0.163	7.43		1.63
SPA-2	J1C410	12/6/10	6760		3.50	0.228	B	0.420	4.24		0.700	113		0.350	0.234		0.140	6.16		1.40
SPA-3	J1C411	12/6/10	5080		3.73	0.228	B	0.447	3.78		0.746	99.1		0.373	0.162		0.149	4.98		1.49
SPA-4	J1C412	12/6/10	4270		4.60	0.552	U	0.552	2.24		0.920	74.9		0.460	0.156	B	0.184	1.12	B	1.84
SPA-5	J1C413	12/6/10	6830		5.03	1.74		0.603	8.75		1.01	138		0.503	0.211		0.201	12.3		2.01
SPA-6	J1C414	12/6/10	6500		4.80	0.576	U	0.576	4.25		0.959	92.3		0.480	0.271		0.192	1.24	B	1.92
SPA-7	J1C415	12/6/10	6390		4.68	0.562	U	0.562	3.30		0.937	78.3		0.468	0.244		0.187	1.91		1.87
SPA-8	J1C416	12/6/10	6360		4.59	0.458	B	0.551	4.14		0.919	112		0.459	0.259		0.184	6.43		1.84
SPA-9	J1C417	12/6/10	6340		4.23	0.507	U	0.507	3.21		0.845	74.5		0.423	0.235		0.169	0.94	B	1.69
SPA-10	J1C418	12/6/10	6530		3.88	0.466	U	0.466	3.93		0.777	76.5		0.388	0.239		0.155	0.806	B	1.55
SPA-11	J1C419	12/6/10	6360		4.93	0.592	U	0.592	3.93		0.987	88.0		0.493	0.236		0.197	1.42	B	1.97
SPA-12	J1C420	12/6/10	6130		4.88	0.585	U	0.585	3.28		0.976	82.9		0.488	0.252		0.195	1.3	B	1.95
FS-1	J1C422	11/29/10	10100		4.93	0.496	JB	0.592	7.03		0.987	93.9		0.493	0.376		0.197	4.28		1.97
FS-2	J1C423	12/6/10	7080		4.59	0.735		0.551	10.2		0.918	201		0.459	0.204		0.184	13		1.84
Equipment Blank	J1C424	11/29/10	194		3.91	0.469	UJ	0.469	0.438		0.781	2.11		0.391	0.156	U	0.156	1.56	U	1.56

Attachment	1	Sheet No.	8 of 13
Originator	J. D. Skoglie	Date	3/28/11
Checked	T. E. Queen	Date	3/28/11
Calc. No.	0600X-CA-V0115	Rev. No.	0

Attachment 1. 600-202 Waste Site Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Cadmium			Calcium			Chromium			Hexavalent Chromium			Cobalt			Copper		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXL-1	J1C3W7	11/29/10	0.0707		0.183	6880	J	91.7	13.2		0.183	0.22	U	0.22	4.27		1.83	8.97		0.917
Duplicate of J1C3W7	J1C3X9	11/29/10	0.0764		0.151	8990	J	75.4	14.8		0.151	0.22	U	0.22	4.63		1.51	10.4		0.754
EXL-2	J1C3W8	11/29/10	0.0570		0.140	6610	J	70.0	11.8		0.140	0.22	U	0.22	3.75		1.40	8.56		0.700
EXL-3	J1C3W9	11/29/10	0.0675		0.170	3090	J	84.8	13.0		0.170	0.21	U	0.21	4.76		1.70	10.4		0.848
EXL-4	J1C3X0	11/29/10	0.0809		0.171	9590	J	85.4	15.6		0.171	0.22	U	0.22	4.40		1.71	10.4		0.854
EXL-5	J1C3X1	11/29/10	0.104		0.145	13400	J	72.4	15.4		0.145	0.22	U	0.22	4.82		1.45	11.7		0.724
EXL-6	J1C3X2	11/29/10	0.0603		0.160	5060	J	80.1	13.3		0.160	0.21	U	0.21	4.41		1.60	9.85		0.801
EXL-7	J1C3X3	11/29/10	0.0784		0.167	9520	J	83.4	17.3		0.167	0.22	U	0.22	5.57		1.67	12.7		0.834
EXL-8	J1C3X4	11/29/10	0.0891		0.170	3980	J	85.2	20.7		0.170	0.22	U	0.22	6.04		1.70	15.1		0.852
EXL-9	J1C3X5	11/29/10	0.0723		0.178	5220	J	88.8	13.0		0.178	0.21	U	0.21	4.61		1.78	10.3		0.888
EXL-10	J1C3X6	11/29/10	0.0492		0.141	3700	J	70.5	17.5		0.141	0.22	U	0.22	5.68		1.41	16.3		0.705
EXL-11	J1C3X7	11/29/10	0.0913		0.204	4340	J	102	21.2		0.204	0.22	U	0.22	6.21		2.04	16.2		0.102
EXL-12	J1C3X8	11/29/10	0.0814		0.155	6030	J	77.7	18.8		0.155	0.21	U	0.21	5.60		1.55	13.9		0.777
EXS-3	J1C3Y3	12/1/10	0.212	U	0.212	1240		106	2.40		0.212				1.12	B	2.12	4.91		1.06
Duplicate of J1C3Y3	J1C402	12/1/10	0.220	U	0.220	1490		110	2.91		0.220				1.33	B	2.20	5.89		1.10
EXS-1	J1C3Y0	12/1/10	0.0774	B	0.178	6670		88.8	11.6		0.178				4.48		1.78	9.37		0.888
EXS-2	J1C3Y1	12/1/10	0.171	B	0.228	5280		114	28.3		0.228				9.03		2.28	20.3		1.14
EXS-4	J1C3Y2	12/1/10	0.171	B	0.204	16400		102	21.7		0.204				6.81		2.04	15.4		1.02
EXS-5	J1C3Y4	12/1/10	0.148	B	0.215	6990		107	27.6		0.215				8.44		2.15	20.1		1.07
EXS-6	J1C3Y5	12/1/10	0.120	B	0.164	4050		82.2	22.3		0.164				6.74		1.64	14.3		0.822
EXS-7	J1C3Y6	12/1/10	0.170	B	0.202	5440		101	24.7		0.202				8.00		2.02	17.5		1.01
EXS-8	J1C3Y7	12/1/10	0.100	B	0.178	5400		89.0	11.7		0.178				5.14		1.78	9.50		0.890
EXS-9	J1C3Y8	12/1/10	0.197		0.180	6900		89.8	26.2		0.180				8.12		1.80	20.8		0.898
EXS-10	J1C3Y9	12/1/10	0.0857	B	0.189	3580		94.4	17.0		0.189				5.00		1.89	10.4		0.944
EXS-11	J1C400	12/1/10	0.0948	B	0.176	5450		88.2	12.2		0.176				5.24		1.76	10.3		0.882
EXS-12	J1C401	12/1/10	0.137	B	0.148	7920		74.1	12.0		0.148				4.48		1.48	10.8		0.741
SPA-1	J1C409	12/6/10	0.393		0.212	20100		106	12.5		0.212	0.22	U	0.22	5.80		2.12	29.0		1.06
Duplicate of J1C409	J1C421	12/6/10	0.413		0.163	14000		81.6	14.7		0.163	0.22	U	0.22	5.22		1.63	30.8		0.816
SPA-2	J1C410	12/6/10	0.341		0.140	15500		70.0	21.0		0.140	0.22	U	0.22	4.73		1.40	31.8		0.700
SPA-3	J1C411	12/6/10	0.317		0.149	10900		74.6	11.4		0.149	0.22	U	0.22	4.67		1.49	30.7		0.746
SPA-4	J1C412	12/6/10	0.0672	B	0.184	5220		92.0	8.12		0.184	0.26	B	0.26	5.12		1.84	10.5		0.920
SPA-5	J1C413	12/6/10	0.514		0.201	19200		101	28.8		0.201	0.21	U	0.21	7.84		2.01	61.9		1.01
SPA-6	J1C414	12/6/10	0.0771	B	0.192	7530		95.9	8.74		0.192	0.22	U	0.22	7.19		1.92	13.4		0.959
SPA-7	J1C415	12/6/10	0.108	B	0.187	6530		93.7	7.83		0.187	0.22	U	0.22	6.78		1.87	12.0		0.937
SPA-8	J1C416	12/6/10	0.276		0.184	7420		91.9	10.9		0.184	0.21	U	0.21	6.77		1.84	20.0		0.919
SPA-9	J1C417	12/6/10	0.0858	B	0.169	6280		84.5	8.93		0.169	0.21	U	0.21	6.80		1.69	13.0		0.845
SPA-10	J1C418	12/6/10	0.0594	B	0.155	7350		77.7	7.71		0.155	0.21	U	0.21	6.86		1.55	11.6		0.777
SPA-11	J1C419	12/6/10	0.0712	B	0.197	7130		98.7	8.18		0.197	0.22	U	0.22	7.83		1.97	13.4		0.987
SPA-12	J1C420	12/6/10	0.0770	B	0.195	6500		97.6	7.80		0.195	0.21	U	0.21	7.58		1.95	12.2		0.976
FS-1	J1C422	11/29/10	0.0884		0.197	5250	J	98.7	21.9		0.197	0.21	U	0.21	6.62		1.97	16.2		0.987
FS-2	J1C423	12/6/10	1.29		0.184	26200		91.8	20.2		0.184	0.23	U	0.23	5.24		1.84	87.9		0.918
Equipment Blank	J1C424	11/29/10	0.156	U	0.156	45.0	J	78.1	0.170		0.156				1.56	U	1.56	0.781	U	0.781

Attachment	1	Sheet No.	9 of 13
Originator	J. D. Skoglie	Date	3/28/11
Checked	T. E. Queen	Date	3/28/11
Calc. No.	0600X-CA-V0115	Rev. No.	0

Attachment 1. 600-202 Waste Site Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Iron			Lead			Magnesium			Manganese			Molybdenum			Nickel		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXL-1	J1C3W7	11/29/10	15500		18.3	4.11		0.459	4940		68.8	234		4.59	0.286		1.83	11.8		3.67
Duplicate of J1C3W7	J1C3X9	11/29/10	16100		15.1	4.46		0.377	5680		56.5	254		3.77	0.285		1.51	13.7		3.02
EXL-2	J1C3W8	11/29/10	13900		14.0	4.32		0.350	4320		52.5	215		3.50	0.172		1.40	10.6		2.80
EXL-3	J1C3W9	11/29/10	21100		17.0	4.86		0.424	4570		63.6	306		4.24	0.238		1.70	11.5		3.39
EXL-4	J1C3X0	11/29/10	16400		17.1	4.51		0.427	5610		64.1	249		4.27	0.224		1.71	13.4		3.42
EXL-5	J1C3X1	11/29/10	15800		14.5	4.93		0.362	6900		54.3	264		3.62	0.194		1.45	13.8		2.90
EXL-6	J1C3X2	11/29/10	17800		16.0	4.57		0.400	4790		60.0	260		4.00	0.200		1.60	11.9		3.20
EXL-7	J1C3X3	11/29/10	20200		16.7	5.35		0.417	6580		62.6	322		4.17	0.233		1.67	14.5		3.34
EXL-8	J1C3X4	11/29/10	20400		17.0	5.98		0.426	5400		63.9	372		4.26	0.234		1.70	18.8		3.41
EXL-9	J1C3X5	11/29/10	17600		17.8	4.93		0.444	4570		66.6	260		4.44	0.182		1.78	11.8		3.55
EXL-10	J1C3X6	11/29/10	20400		14.1	4.87		0.352	5060		52.8	302		3.52	0.218		1.41	15.2		2.82
EXL-11	J1C3X7	11/29/10	18400		20.4	5.98		0.511	5320		76.7	318		5.11	2.04	U	2.04	20.7		4.09
EXL-12	J1C3X8	11/29/10	18700		15.5	6.27		0.388	5620		58.3	311		3.88	0.220		1.55	16.8		3.11
EXS-3	J1C3Y3	12/1/10	3650		21.2	1.25		0.529	580		79.4	135		5.29	0.334	B	2.12	2.31	B	4.23
Duplicate of J1C3Y3	J1C402	12/1/10	4240		22.0	1.34		0.549	710		82.4	152		5.49	0.349	B	2.20	2.86	B	4.39
EXS-1	J1C3Y0	12/1/10	15700		17.8	4.38		0.444	4260		66.6	225		4.44	0.201	B	1.78	10.4		3.55
EXS-2	J1C3Y1	12/1/10	25500		22.8	8.11		0.571	7370		85.6	449		5.71	0.331	B	2.28	25.0		4.56
EXS-4	J1C3Y2	12/1/10	20700		20.4	6.11		0.509	6630		76.4	359		5.09	0.362	B	2.04	17.5		4.08
EXS-5	J1C3Y4	12/1/10	24600		21.5	7.92		0.537	7910		80.5	419		5.37	0.358	B	2.15	22.8		4.30
EXS-6	J1C3Y5	12/1/10	22200		16.4	6.19		0.411	6000		61.7	354		4.11	0.301	B	1.64	17.8		3.29
EXS-7	J1C3Y6	12/1/10	23600		20.2	6.76		0.505	6570		75.8	437		5.05	0.297	B	2.02	22.7		4.04
EXS-8	J1C3Y7	12/1/10	17300		17.8	4.30		0.445	4630		66.7	259		4.45	0.265	B	1.78	10.4		3.56
EXS-9	J1C3Y8	12/1/10	23400		18.0	7.68		0.449	8360		67.3	413		4.49	0.304	B	1.80	23.5		3.59
EXS-10	J1C3Y9	12/1/10	16000		18.9	4.05		0.472	3930		70.8	247		4.72	1.89	U	1.89	10.5		3.78
EXS-11	J1C400	12/1/10	18400		17.6	4.53		0.441	4790		66.1	268		4.41	0.361	B	1.76	10.6		3.53
EXS-12	J1C401	12/1/10	14600		14.8	7.60		0.370	4350		55.5	221		3.70	0.217	B	1.48	10.2		2.96
SPA-1	J1C409	12/6/10	18200		21.2	54.8		0.530	3890		79.5	274		5.30	0.888	B	2.12	10.1		4.24
Duplicate of J1C409	J1C421	12/6/10	17900		16.3	84.0		0.408	3650		61.2	261		4.08	0.653	B	1.63	11.3		3.26
SPA-2	J1C410	12/6/10	16700		14.0	35.7		0.350	4510		52.5	253		3.50	0.552	B	1.40	11.9		2.80
SPA-3	J1C411	12/6/10	15200		14.9	39.8		0.373	3330		55.9	223		3.73	0.649	B	1.49	7.94		2.98
SPA-4	J1C412	12/6/10	15400		18.4	7.98		0.460	3150		69.0	224		4.60	0.264	B	1.84	6.23		3.68
SPA-5	J1C413	12/6/10	47400		20.1	79.0		0.503	4280		75.4	407		5.03	2.61		2.01	24.9		4.02
SPA-6	J1C414	12/6/10	23200		19.2	6.64		0.480	4450		72.0	360		4.80	0.388	B	1.92	8.58		3.84
SPA-7	J1C415	12/6/10	22200		18.7	7.47		0.468	4310		70.3	323		4.68	0.307	B	1.87	8.15		3.75
SPA-8	J1C416	12/6/10	22400		18.4	39.2		0.459	4380		68.9	334		4.59	0.580	B	1.84	10.4		3.68
SPA-9	J1C417	12/6/10	22000		16.9	4.92		0.423	4690		63.4	313		4.23	0.276	B	1.69	8.30		3.38
SPA-10	J1C418	12/6/10	21400		15.5	4.41		0.388	4280		58.3	334		3.88	0.252	B	1.55	7.78		3.11
SPA-11	J1C419	12/6/10	24100		19.7	6.30		0.493	4880		74.0	335		4.93	0.336	B	1.97	11.1		3.95
SPA-12	J1C420	12/6/10	23400		19.5	6.05		0.488	4360		73.2	383		4.88	0.323	B	1.95	8.12		3.90
FS-1	J1C422	11/29/10	21400		19.7	6.81		0.493	6010		74.0	358		4.93	0.218		1.97	20.5		3.95
FS-2	J1C423	12/6/10	19300		18.4	278		0.459	4120		68.8	323		4.59	1.17	B	1.84	15.7		3.67
Equipment Blank	J1C424	11/29/10	293		15.6	0.682		0.391	39.8		58.6	4.87		3.91	1.56	U	1.56	3.13	U	3.13

Attachment	I	Sheet No.	10 of 13
Originator	J. D. Skoglie	Date	3/28/11
Checked	T. E. Queen	Date	3/28/11
Calc. No.	0600X-CA-V0115	Rev. No.	0

Attachment 1. 600-202 Waste Site Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Potassium			Selenium			Silicon			Silver			Sodium			Vanadium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXL-1	J1C3W7	11/29/10	1510		367	0.275	U	0.275	582		1.83	0.183	U	0.183	257		45.9	34.6		2.29
Duplicate of J1C3W7	J1C3X9	11/29/10	1730		302	0.226	U	0.226	592		1.51	0.151	U	0.151	317		37.7	34.4		1.88
EXL-2	J1C3W8	11/29/10	1070		280	0.210	U	0.210	498		1.40	0.140	U	0.140	255		35.0	31.1		1.75
EXL-3	J1C3W9	11/29/10	879		339	0.254	U	0.254	505		1.70	0.170	U	0.170	1210		42.4	58.1		2.12
EXL-4	J1C3X0	11/29/10	1260		342	0.256	U	0.256	671		1.71	0.171	U	0.171	369		42.7	35.5		2.14
EXL-5	J1C3X1	11/29/10	1470		290	0.217	U	0.217	511		1.45	0.145	U	0.145	313		36.2	31.8		1.81
EXL-6	J1C3X2	11/29/10	1030		320	0.240	U	0.240	537		1.60	0.160	U	0.160	396		40.0	42.8		2.00
EXL-7	J1C3X3	11/29/10	1650		334	0.250	U	0.250	643		1.67	0.167	U	0.167	313		41.7	45.2		2.09
EXL-8	J1C3X4	11/29/10	1890		341	0.256	U	0.256	705		1.70	0.170	U	0.170	353		42.6	50.3		2.13
EXL-9	J1C3X5	11/29/10	1220		355	0.266	U	0.266	635		1.78	0.178	U	0.178	225		44.4	41.1		2.22
EXL-10	J1C3X6	11/29/10	1190		282	0.211	U	0.211	604		1.41	0.141	U	0.141	230		35.2	49.4		1.76
EXL-11	J1C3X7	11/29/10	1240		409	0.307	U	0.307	703		2.04	0.204	U	0.204	332		51.1	40.6		2.56
EXL-12	J1C3X8	11/29/10	1130		311	0.233	U	0.233	608		1.55	0.155	U	0.155	246		38.8	42.0		1.94
EXS-3	J1C3Y3	12/1/10	551		423	0.318	U	0.318	518		2.12	0.212	U	0.212	1000		52.9	7.17		2.65
Duplicate of J1C3Y3	J1C402	12/1/10	545		439	0.330	U	0.330	559		2.20	0.220	U	0.220	1020		54.9	8.66		2.75
EXS-1	J1C3Y0	12/1/10	1310		355	0.266	U	0.266	491		1.78	0.178	U	0.178	446		44.4	37.1		2.22
EXS-2	J1C3Y1	12/1/10	1150		456	0.342	U	0.342	926		2.28	0.228	U	0.228	584		57.1	57.7		2.85
EXS-4	J1C3Y2	12/1/10	2600		408	0.337		0.310	748		2.04	0.204	U	0.204	252		50.9	42.7		2.55
EXS-5	J1C3Y4	12/1/10	1760		430	0.322	U	0.322	700		2.15	0.215	U	0.215	889		53.7	51.1		2.68
EXS-6	J1C3Y5	12/1/10	963		329	0.258		0.250	604		1.64	0.164	U	0.164	2470		41.1	49.2		2.06
EXS-7	J1C3Y6	12/1/10	1180		404	0.303	U	0.303	741		2.02	0.202	U	0.202	478		50.5	54.9		2.53
EXS-8	J1C3Y7	12/1/10	2300		356	0.267	U	0.267	518		1.78	0.178	U	0.178	231		44.5	39.2		2.22
EXS-9	J1C3Y8	12/1/10	2010		359	0.269	U	0.269	595		1.80	0.180	U	0.180	855		44.9	51.1		2.24
EXS-10	J1C3Y9	12/1/10	1040		378	0.283	U	0.283	411		1.89	0.189	U	0.189	384		47.2	36.7		2.36
EXS-11	J1C400	12/1/10	1590		353	0.265	U	0.265	499		1.76	0.176	U	0.176	307		44.1	40.4		2.20
EXS-12	J1C401	12/1/10	1750		296	0.222	U	0.222	443		1.48	0.148	U	0.148	328		37.0	33.1		1.85
SPA-1	J1C409	12/6/10	1250		424	0.318	U	0.318	603		2.12	0.212	U	0.212	638		53.0	43.0		2.65
Duplicate of J1C409	J1C421	12/6/10	1310		326	0.245	U	0.245	434		1.63	0.275		0.163	616		40.8	38.5		2.04
SPA-2	J1C410	12/6/10	1540		280	0.210	U	0.210	451		1.40	0.140	U	0.140	482		35.0	32.4		1.75
SPA-3	J1C411	12/6/10	1280		298	0.224	U	0.224	427		1.49	0.149	U	0.149	325		37.3	27.9		1.86
SPA-4	J1C412	12/6/10	870		368	0.276	U	0.276	422		1.84	0.184	U	0.184	245		46.0	41.0		2.30
SPA-5	J1C413	12/6/10	1690		402	0.302	U	0.302	655		2.01	0.201	U	0.201	755		50.3	32.7		2.51
SPA-6	J1C414	12/6/10	1170		384	0.288	U	0.288	582		1.92	0.192	U	0.192	284		48.0	59.6		2.40
SPA-7	J1C415	12/6/10	1420		375	0.281	U	0.281	544		1.87	0.187	U	0.187	287		46.8	56.9		2.34
SPA-8	J1C416	12/6/10	1330		368	0.276	U	0.276	556		1.84	0.184	U	0.184	439		45.9	51.2		2.30
SPA-9	J1C417	12/6/10	1130		338	0.254	U	0.254	497		1.69	0.169	U	0.169	245		42.3	58.7		2.11
SPA-10	J1C418	12/6/10	1210		311	0.233	U	0.233	496		1.55	0.155	U	0.155	260		38.8	57.4		1.94
SPA-11	J1C419	12/6/10	1270		395	0.296	U	0.296	596		1.97	0.197	U	0.197	240		49.3	64.8		2.47
SPA-12	J1C420	12/6/10	1440		390	0.293	U	0.293	579		1.95	0.195	U	0.195	247		48.8	62.8		2.44
FS-1	J1C422	11/29/10	1120		395	0.296	U	0.296	808		1.97	0.197	U	0.197	996		49.3	50.3		2.47
FS-2	J1C423	12/6/10	2580		367	0.275	U	0.275	588		1.84	1.54		0.184	390		45.9	33.3		2.29
Equipment Blank	J1C424	11/29/10	53.2		313	0.234	U	0.234	188		1.56	0.156	U	0.156	39.1	U	39.1	0.482		1.95

Attachment	1	Sheet No.	11 of 13
Originator	J. D. Skoglie	Date	3/28/11
Checked	T. E. Queen	Date	3/28/11
Calc. No.	0600X-CA-V0115	Rev. No.	0

Attachment 1. 600-202 Waste Site Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Zinc		
			mg/kg	Q	PQL
EXL-1	J1C3W7	11/29/10	32.3		9.17
Duplicate of J1C3W7	J1C3X9	11/29/10	34.8		7.54
EXL-2	J1C3W8	11/29/10	28.9		7.00
EXL-3	J1C3W9	11/29/10	38.4		8.48
EXL-4	J1C3X0	11/29/10	33.7		8.54
EXL-5	J1C3X1	11/29/10	36.7		7.24
EXL-6	J1C3X2	11/29/10	34.9		8.01
EXL-7	J1C3X3	11/29/10	40.8		8.34
EXL-8	J1C3X4	11/29/10	43.4		8.52
EXL-9	J1C3X5	11/29/10	36.0		8.88
EXL-10	J1C3X6	11/29/10	39.4		7.05
EXL-11	J1C3X7	11/29/10	43.4		10.2
EXL-12	J1C3X8	11/29/10	45.4		7.77
EXS-3	J1C3Y3	12/1/10	6.48	B	10.6
Duplicate of J1C3Y3	J1C402	12/1/10	8.14	B	11.0
EXS-1	J1C3Y0	12/1/10	36.7		8.88
EXS-2	J1C3Y1	12/1/10	57.4		11.4
EXS-4	J1C3Y2	12/1/10	48.9		10.2
EXS-5	J1C3Y4	12/1/10	55.8		10.7
EXS-6	J1C3Y5	12/1/10	45.7		8.22
EXS-7	J1C3Y6	12/1/10	50.2		10.1
EXS-8	J1C3Y7	12/1/10	36.0		8.90
EXS-9	J1C3Y8	12/1/10	55.8		8.98
EXS-10	J1C3Y9	12/1/10	32.8		9.44
EXS-11	J1C400	12/1/10	36.7		8.82
EXS-12	J1C401	12/1/10	45.4		7.41
SPA-1	J1C409	12/6/10	159		10.6
Duplicate of J1C409	J1C421	12/6/10	152		8.16
SPA-2	J1C410	12/6/10	133		7.00
SPA-3	J1C411	12/6/10	99.6		7.46
SPA-4	J1C412	12/6/10	38.6		9.20
SPA-5	J1C413	12/6/10	255		10.1
SPA-6	J1C414	12/6/10	46.9		9.59
SPA-7	J1C415	12/6/10	48.0		9.37
SPA-8	J1C416	12/6/10	124		9.19
SPA-9	J1C417	12/6/10	43.2		8.45
SPA-10	J1C418	12/6/10	43.2		7.77
SPA-11	J1C419	12/6/10	48.2		9.87
SPA-12	J1C420	12/6/10	45.9		9.76
FS-1	J1C422	11/29/10	47.5		9.87
FS-2	J1C423	12/6/10	403		9.18
Equipment Blank	J1C424	11/29/10	1.22		7.81

Attachment	1	Sheet No.	12 of 13
Originator	J. D. Skoglie	Date	3/28/11
Checked	T. E. Queen	Date	3/28/11
Calc. No.	0600X-CA-V0115	Rev. No.	0

Attachment 1. 600-202 Waste Site Verification Sample Results (TPH).

Sample Location	HEIS Number	Sample Date	Percent Solids			Total petroleum hydrocarbons - diesel range[a]			Total petroleum hydrocarbons - motor oil (high boiling)[a]		
			%	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
EXL-1	J1C3W7	11/29/10	92.4		0.1	3590	U	3590	10800	UJ	10800
Duplicate of J1C3W7	J1C3X9	11/29/10	92.1		0.1	3580	U	3580	10800	UJ	10800
EXL-2	J1C3W8	11/29/10	92.8		0.1	3530	U	3530	10600	UJ	10600
EXL-3	J1C3W9	11/29/10	93.6		0.1	3560	U	3560	10700	UJ	10700
EXL-4	J1C3X0	11/29/10	91.4		0.1	3500	U	3500	10500	UJ	10500
EXL-5	J1C3X1	11/29/10	90.8		0.1	3600	U	3600	10800	UJ	10800
EXL-6	J1C3X2	11/29/10	94.6		0.1	3380	U	3380	10100	UJ	10100
EXL-7	J1C3X3	11/29/10	92.2		0.1	3590	U	3590	10800	UJ	10800
EXL-8	J1C3X4	11/29/10	91.7		0.1	3550	U	3550	10700	UJ	10700
EXL-9	J1C3X5	11/29/10	93.9		0.1	3500	U	3500	10500	UJ	10500
EXL-10	J1C3X6	11/29/10	91.0		0.1	3600	U	3600	10800	UJ	10800
EXL-11	J1C3X7	11/29/10	92.3		0.1	3530	U	3530	10600	UJ	10600
EXL-12	J1C3X8	11/29/10	93.3		0.1	3570	U	3570	10700	UJ	10700
EXS-3	J1C3Y3	12/1/10				3740	U	3740	11200	U	11200
Duplicate of J1C3Y3	J1C402	12/1/10				3760	U	3760	11300	U	11300
EXS-1	J1C3Y0	12/1/10				3600	U	3600	10800	U	10800
EXS-2	J1C3Y1	12/1/10				3760	U	3760	11300	U	11300
EXS-4	J1C3Y2	12/1/10				3560	U	3560	10700	U	10700
EXS-5	J1C3Y4	12/1/10				3700	U	3700	11100	U	11100
EXS-6	J1C3Y5	12/1/10				3520	U	3520	10600	U	10600
EXS-7	J1C3Y6	12/1/10				3580	U	3580	10700	U	10700
EXS-8	J1C3Y7	12/1/10				3600	U	3600	8170	J	10800
EXS-9	J1C3Y8	12/1/10				3520	U	3520	10600	U	10600
EXS-10	J1C3Y9	12/1/10				3580	U	3580	10700	U	10700
EXS-11	J1C400	12/1/10				3500	U	3500	10500	U	10500
EXS-12	J1C401	12/1/10				3690	U	3690	11100	U	11100
SPA-1	J1C409	12/6/10	92.4		0.1	3470	U	3470	25500		10400
Duplicate of J1C409	J1C421	12/6/10	92.9		0.1	11500		3510	32600		10500
SPA-2	J1C410	12/6/10	90.4		0.1	42300		7020	168000		21000
SPA-2 Re-Samlpe	J1DWX0	2/3/11				3580	U	3580	224000		10800
SPA-3	J1C411	12/6/10	91.9		0.1	58700		3580	236000		10800
SPA-3 Re-Sample	J1DWX2	2/3/11				3420	U	3420	10300	U	10300
SPA-4	J1C412	12/6/10	92.1		0.1	3420	U	3420	14500		10300
SPA-5	J1C413	12/6/10	93.8		0.1	228000		34700	1020000		104000
SPA-5 Re-Sample	J1DWX1	2/3/11				3650	U	3650	54900		11000
SPA-6	J1C414	12/6/10	91.4		0.1	3430	U	3430	3790	J	10300
SPA-7	J1C415	12/6/10	92.0		0.1	3910		3460	41900		10400
SPA-8	J1C416	12/6/10	93.8		0.1	9100		3550	29100		10600
SPA-9	J1C417	12/6/10	93.9		0.1	3510	U	3510	7110	J	10500
SPA-10	J1C418	12/6/10	93.3		0.1	3470	U	3470	21000		10400
SPA-11	J1C419	12/6/10	92.1		0.1	3580	U	3580	4620	J	10700
SPA-12	J1C420	12/6/10	93.2		0.1	3480	U	3480	10500		10400
FS-1	J1C422	11/29/10	93.9		0.1	3340	U	3340	10000	UJ	10000
FS-2	J1C423	12/6/10	86.5		0.1	3840	U	3840	104000		11500
Equipment Blank	J1C424	11/29/10	100		0.1						

[a] SPA-2, SPA-3, and SPA-5 were re-sampled for TPH only due to RAG exceedances. Original data is greyed out and for information only.

Attachment	1	Sheet No.	13 of 13
Originator	J. D. Skoglie	Date	3/28/11
Checked	T. E. Queen	Date	3/28/11
Calc. No.	0600X-CA-V0115	Rev. No.	0

Acrobat 8.0

CALCULATION COVER SHEET

Project Title: 100-IU-2/6 Field Remediation **Job No. 14655**

Area: 100-IU-6

Discipline: Environmental Calculation No: 0600X-CA-V0116

Subject: 600-202 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	J. D. Skoglie	I. B. Berezovskiy	T. E. Queen	D. F. Obenauer	4/4/11

SUMMARY OF REVISION

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

DE01-437.03

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	3/28/2011	Calc. No.:	0600X-CA-V0116	Rev.:	0
Project:	100-IU-6 Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	3/28/2011
Subject:	600-202 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 600-202 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 600-202 Hanford Townsite Four Burn and Burial Pits*, Attachment to Waste Site Reclassification Form 2011-030, 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

Originator:	J. D. Skoglie	Date:	3/30/2011	Calc. No.:	0600X-CA-V0116	Rev.:	0
Project:	100-IU-6 Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	3/30/2011
Subject:	600-202 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 2 of 4	

METHODOLOGY:

The 600-202 waste site is comprised of three decision units for verification sampling, consisting of the small excavation, large excavation, and staging pile area. Also taken were two focused samples. The direct contact hazard quotient and carcinogenic risk calculations for the 600-202 waste site were conservatively calculated for the entire waste site using the greater of the statistical and composite verification soil sample results (WCH 2011). Of the contaminants of potential concern (COPCs) for this site, barium, cadmium, chromium, copper, nickel, silver, and zinc require HQ and risk calculations because these analytes were detected above background values. Boron, hexavalent chromium, molybdenum, the detected polycyclic aromatic hyrdrocarbons, and pesticides require HQ and risk calculations because these analytes were detected and a Washington State or Hanford Site background value is not available. Lead was detected above background; however, lead does not have a reference dose for calculation of a hazard quotient because toxic effects of lead are correlated with blood-lead levels rather than exposure levels or daily intake. Additionally, arsenic was detected above background; however, the arsenic standard is not toxicity based. Although total petroleum hydrocarbons (motor oil & diesel range) 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 13.0 mg/kg, divided by the noncarcinogenic RAG value of 7,200 mg/kg (calculated in accordance with the noncarcinogenic toxics effects formula in WAC 173-340-740[3]), is 1.8×10^{-3}. Comparing this value, and all other individual values, to the requirement of <1.0, this criterion is met.

2) After the HQ calculation is completed for the appropriate analytes, the cumulative HQ can be obtained by summing the individual values. To avoid errors due to intermediate rounding, the individual HQ values prior to rounding are used for this calculation. The sum of the HQ values is 1.3×10^{-1}. Comparing this value to the requirement of <1.0, this criterion is met.

3) To calculate the excess cancer risk, the maximum or statistical value is divided by the carcinogenic RAG value, then multiplied by 1.0×10^{-6}. For example, the maximum value for benzo(a)pyrene is 0.0363 mg/kg, divided by 0.137 mg/kg, and multiplied as indicated, is 2.6×10^{-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 7.5×10^{-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

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	3/28/2011	Calc. No.:	0600X-CA-V0116	Rev.:	0
Project:	100-IU-6 Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	3/28/2011
Subject:	600-202 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No.	3 of 4

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

Table 1. Direct Contact Hazard Quotient and Excess Cancer Risk Results for the 600-202 Waste Site (2 pages).

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]	10.2	20	--	--	--
Barium	201	5,600	3.6E-02	--	--
Boron	13.0	7,200	1.8E-03	--	--
Cadmium	1.29	80	1.6E-02	13.9	9.3E-08
Chromium, total	22.4	80,000	2.8E-04	--	--
Chromium, hexavalent[d]	0.26	240	1.1E-03	2.1	1.2E-07
Copper	87.9	2,960	3.0E-02	--	--
Lead[e]	278	353	--	--	--
Molybdenum	1.17	400	2.9E-03	--	--
Nickel	20.5	1,600	1.3E-02	--	--
Silver	1.54	400	3.9E-03	--	--
Zinc	403	24,000	1.7E-02	--	--
Polycyclic Aromatic Hydrocarbons					
Acenaphthene	0.0539	4,800	1.1E-05	--	--
Acenaphthylene[f]	0.132	4,800	2.8E-05	--	--
Anthracene	0.0114	24,000	4.8E-07	--	--
Benzo(a)anthracene	0.0201	--	--	1.37	1.5E-08
Benzo(a)pyrene	0.0363	--	--	0.137	2.6E-07
Benzo(b)fluoranthene	0.0340	--	--	1.37	2.5E-08
Benzo(ghi)perylene[f]	0.0528	2,400	2.2E-05	--	--
Benzo(k)fluoranthene	0.0165	--	--	1.37	1.2E-08
Chrysene	0.0481	--	--	13.7	3.5E-09
Dibenz(a,h)anthracene	0.0168	--	--	1.37	1.2E-08
Fluoranthene	0.198	3,200	6.2E-05	--	--
Fluorene	0.0345	3,200	1.1E-05	--	--
Indeno(1,2,3-cd)pyrene	0.0825	--	--	1.37	6.0E-08
Naphthalene	0.0265	1,600	1.7E-05	--	--
Phenanthrene[f]	0.0542	24,000	2.3E-06	--	--
Pyrene	1.88	2,400	7.8E-04	--	--

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	3/30/2011	Calc. No.:	0600X-CA-V0116	Rev.:	0
Project:	100-IU-6 Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	3/30/2011
Subject:	600-202 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 4 of 4	

Table 1. Direct Contact Hazard Quotient and Excess Cancer Risk Results for the 600-202 Waste Site (2 pages).

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
Pesticides					
Aldrin	0.00600	2.40	2.5E-03	0.0588	1.0E-07
BHC, alpha	0.00202	--	--	0.159	1.3E-08
BHC, beta (Hexachlorocyclohexane)	0.0145	--	--	0.556	2.6E-08
DDD, 4,4'-	0.00265	--	--	4.17	6.4E-10
DDE, 4,4'-	0.00204	--	--	2.94	6.9E-10
DDT, 4,4'-	0.00401	40	1.0E-04	2.94	1.4E-09
Endosulfan (I, II, sulfate)	0.00299	480	6.2E-06	--	--
Endrin (and ketone, aldehyde) Total	0.00562	24	2.3E-04	--	--
Methoxychlor	0.00161	400	4.0E-06	--	--
Total Petroleum Hydrocarbons					
Diesel range and motor oil[g]	131	200	--	--	--
Totals					
Cumulative Hazard Quotient:			**1.3E-01**		
Cumulative Excess Cancer Risk:					**7.5E-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 carcinogen RAG calculated based on the inhalation exposure pathway WAC 173-340-750(3), 1996.

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

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

Contaminant: acenapthylene; surrogate: acenapthene

Contaminant: benzo(ghi)perylene, surrogate: pyrene

Contaminant: phenanthrene; surrogate: anthracene

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

-- = not applicable RAG = remedial action goal

CONCLUSION:

The calculations in Table 1 demonstrates that the 600-202 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.

APPENDIX D

RESRAD CALCULATION

CALCULATION COVER SHEET

Project Title: 100-IU-2/6 Field Remediation **Job No. 14655**

Area: 100-IU-6

Discipline: Environmental *Calculation No: 0600X-CA-V0111

Subject: 600-202 RESRAD Calculation Brief for Groundwater and River Protection

Computer Program: RESRAD Program No: Version 6.5

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 pg Summary – 5 pg Attm. 1 - 23 pg Attm. 2 - 11 pg Total – 40 pages	S. W. Clark	M. W. Perrott	T. E. Queen	D. F. Obenauer	3/31/11

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:	S. W. Clark	Date:	3/30/11	Calc. No.:	0600X-CA-V0111	Rev.:	0
Project:	100-IU-2/6 Field Remediation	Job No:	14655	Checked:	M. W. Perrott	Date:	3/30/11
Subject:	600-202 RESRAD Calculation Brief for Groundwater and River Protection					Sheet No. 1 of 5	

PURPOSE:

Predict the groundwater and Columbia River concentrations over a period of 1,000 years from alpha- and beta-BHC analyses of the soil at the 600-202 cleanup verification soils sampling site.

GIVEN/REFERENCES:

1) A focused surface sample was collected from soil beneath a discarded battery at the 600-202 waste site (HEIS #J1C423). Alpha- and beta-BHC (hexachlorocyclohexane) analyses of the soil exceeded the soil cleanup levels for protection of groundwater and the Columbia River presented in Appendix B of the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP). The alpha- and beta-BHC analyses of 0.00202 mg/kg and 0.0145 mg/kg, respectively, were evaluated by site-specific RESidual RADioactivity (RESRAD) modeling for nonradionuclides as described in Appendix C of the RDR/RAWP. The area of influence of the sample for purposes of the RESRAD evaluation is 170 m^2 (1,830 ft^2). A site-specific RESRAD evaluation was performed to predict the alpha- and beta-BHC concentrations in groundwater. Dilution and attenuation of alpha- and beta-BHC concentrations in groundwater as it flows from the area of the 600-202 waste site to the Columbia River were calculated using the U.S. Environmental Protection Agency (EPA) *Soil Screening Guidance: User's Guide.*
2) Alpha- and beta-BHC analyses from the focused sampling area (HEIS # J1C423) were obtained from the *600-202 Waste Site Cleanup Verification 95% UCL Calculations*, Calc. No. 0600X-CA-V0115, Rev. 0, Washington Closure Hanford, Richland, Washington.
3) *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.
3) RESidual RADioactivity (RESRAD) computer code, version 6.5, to calculate compliance with residual radioactivity guidelines, developed for the U.S. Department of Energy by the Environmental Assessment Division of Argonne National Laboratory, Argonne, Illinois.
4) Calculation of dilution and attenuation in groundwater between the waste site and the Columbia River are from the *Soil Screening Guidance: User's Guide*, OSWER 9355.4-23, July 1996, U.S. Environmental Protection Agency, Washington, D.C.
5) Sample design from the *Work Instruction for Verification Sampling of the 600-202, Hanford Townsite Four Burn and Burial Pits*, Work Instruction No. 0600X-WI-G0056, Rev. 0, Washington Closure Hanford, Richland, Washington.

SOLUTION:

1) A site-specific RESRAD evaluation was performed for the maximum alpha- and beta-BHC concentrations at the 600-202 waste site focused sample location of soil beneath a discarded battery (HEIS # J1C423). The area of influence of the sample for purposes of the RESRAD evaluation is 170 m^2 (1,830 ft^2). Table 1 shows the waste site area dimensions and thickness of each soil horizon used in the RESRAD and dilution-attenuation calculations. Input factors for each run are shown in the "Summary" section of the RESRAD "Mixture Sums and Single Radionuclide Guidelines" printout in Attachment 1 to this Calculation Summary.

Washington Closure Hanford CALCULATION SHEET

Originator:	S. W. Clark	Date:	3/30/11	Calc. No.:	0600X-CA-V0111	Rev.:	0
Project:	100-IU-2/6 Field Remediation	Job No:	14655	Checked:	M. W. Perrott	Date:	3/30/11
Subject:	600-202 RESRAD Calculation Brief for Groundwater and River Protection					Sheet No. 2 of 5	

2) As discussed in Section 3.6.9 of the RDR/RAWP, the residual concentrations of nonradionuclides in the soil are compared to the soil remedial action goals (RAGs) for Columbia River protection developed in Table B-6 of Appendix B of the RDR/RAWP. The river protection RAG is attained if the residual concentrations in soil are less than the Table B-6 RAGs and each sample data set meets the requirements of the WAC 173-340-740(7)(e) (1996) three-part test. If this is not the case, a more detailed assessment using RESRAD or other appropriate methods (e.g., dilution-attenuation evaluations) is used to assess the potential of residual site soil contaminants to impact groundwater and the river. If this assessment indicates that the residual contamination in the site soils will not impact groundwater or the river at concentrations above groundwater or surface water cleanup levels, then the groundwater and river protection RAGs have been attained.

Table 1. Waste Site-Specific Parameters for RESRAD and Dilution-Attenuation Modeling

Parameter	Units	Value
Contaminant Concentrations		
Alpha- BHC (hexachlorocyclohexane)	mg/kg	0.00202
Beta-BHC (hexachlorocyclohexane)	mg/kg	0.0145
Contaminant Distribution Coefficient (Kd) Values		
Alpha- BHC (hexachlorocyclohexane)	mL/g	1.76
Beta-BHC (hexachlorocyclohexane)	mL/g	2.14
Contaminated Zone Dimensions		
Cover Depth	m	0
Area of Contaminated Zone (CZ)	m^2	170
Length Parallel to Aquifer Flow	m	13
Thickness of Vadose Zone Horizons		
Thickness: Contaminated Zone	m	1.0
Thickness: Unsaturated Zone	m	7.2
Thickness: Unconfined Aquifer	m	22.9
Distance from the Waste Site to the Columbia River		
Saturated Zone Groundwater Flow Distance	m	58

3) The year when the peak alpha- and beta-BHC concentrations are predicted to occur in groundwater from the waste site were determined by preliminary RESRAD modeling runs. These years were then added for all horizons for the final RESRAD run. For the water pathways, the peak years for alpha- and beta-BHC in groundwater are predicted to occur at years 108 and 130, respectively.

METHODOLOGY:

1) Using the methodology described in Appendix C of the RDR/RAWP, RESRAD modeling was used to determine if residual soil concentrations of alpha- and beta-BHC are protective

Washington Closure Hanford CALCULATION SHEET

Originator:	S. W. Clark	Date:	3/30/11	Calc. No.:	0600X-CA-V0111	Rev.:	0
Project:	100-IU-2/6 Field Remediation	Job No:	14655	Checked:	M. W. Perrott	Date:	3/30/11
Subject:	600-202 RESRAD Calculation Brief for Groundwater and River Protection					Sheet No. 3 of 5	

of groundwater. Runs of RESRAD version 6.5 were completed for the maximum alpha- and beta-BHC concentrations in the 600-202 waste site cleanup verification focused sampling activities using the neptunium-237 and uranium-238 isotopes as surrogates for alpha- and beta-BHC. These isotopes were selected because they have long half-lives without daughter ingrowth as discussed in Section C-3.1.1 of the RDR/RAWP. RESRAD numerical output reports of determinations of alpha- and beta-BHC concentrations in soil and groundwater are presented in the Attachments to this calculation summary.

2) Methodology for modeling to protect the Columbia River is similar to that for modeling the protection of groundwater, with the groundwater concentrations reduced by using a dilution factor to account for dilution and attenuation as contaminants migrate through the groundwater to the river. Calculation of an appropriate dilution factor is accomplished using the formulas in the EPA *Soil Screening Guidance: User's Guide.*

The following Excel spreadsheet incorporates the formulas for calculation of the dilution factor to account for dilution and attenuation as contaminants migrate through the groundwater to the river:

Table 2. Excel Calculation of Dilution Factor for Protection of the Columbia River

	A	B	C	D	E	F	G	H
1	Apparent Mixing Zone Depth (d) is calculated per the EPA *Soil Screening Guidance: User's Guide User's*, Equation 12:							
2	Apparent Mixing Zone Depth (d) = $(0.0112*L^2)^{0.5} + d_a(1 - \exp((-L*I)/(K*i*d_a)))$							
3	Variable	Value	Description					
4	L	58	m, Distance to the Columbia River					
5	d_a	22.9	m, Aquifer Thickness					
6	I	0.07992	m/yr, Infiltration Rate, from I = (1-Ce((1-Cr)Pr + Irr					
7	Ce	0.91	Evapotranspiration Coefficient					
8	Cr	0.2	Runoff Coefficient					
9	Pr	0.16	m/yr, Precipitation					
10	Irr	0.76	m/yr, Irrigation					
11	K	5530	m/yr, Aquifer Hydraulic Conductivity					
12	i	0.00125	m/m, Hydraulic Gradient					
13								
14	Calculation of Dilution Factor per the EPA *Soil Screening Guidance: User's Guide User's*, Equation 11.							
15	Dilution Factor, D = 1 + (K*i*d/I*L)							
16	Variable	Value	Description					
17	K	5530	m/yr, Aquifer Hydraulic Conductivity					
18	i	0.00125	m/m, Hydraulic Gradient					
19	d	6.8	m, Apparent Mixing Zone Depth (see formula below)					
20	I	0.07992	m/yr, Infiltration Rate, from I = (1-Ce((1-Cr)Pr + Irr					
21	L	58	m, Distance to the Columbia River					
22								
23	Apparent Mixing Zone Depth (d) = E26 = ((0.0112*B4*B4)^0.5)+(B5*(1-EXP((-B4)*(B6)/(B11*B12*B5)))							
24	Dilution Factor (D) = E27 = 1+((B17*B18*B19)/(B20*B21))							
25								
26			Apparent Mixing Zone Depth (d) =		6.8	m		
27			Dilution Factor (D) =		11.1			

Washington Closure Hanford CALCULATION SHEET

Originator:	S. W. Clark	Date:	3/30/11	Calc. No.:	0600X-CA-V0111	Rev.:	0
Project:	100-IU-2/6 Field Remediation	Job No:	14655	Checked:	M. W. Perrott	Date:	3/30/11
Subject:	600-202 RESRAD Calculation Brief for Groundwater and River Protection					Sheet No. 4 of 5	

RESULTS:

1) Groundwater Protection

The alpha- and beta-BHC concentrations in groundwater at different time intervals for 1,000 years as calculated by the RESRAD model using radionuclide surrogates for alpha- and beta-BHC. RESRAD output is presented in Attachment 2 and summarized in Table 3. Alpha- and beta-BHC are predicted to reach groundwater at maximum groundwater concentrations of 0.00370 ug/L and 0.0219 ug/L, respectively, which are less than the respective groundwater remedial action goals (RAGs) of 0.0139 ug/L and 0.0486 ug/L from Table B-2 of Appendix B of the RDR/RAWP.

Table 3. Predicted Groundwater (Well Water/Drinking Water) Concentrations at 600-202

Contaminant	RESRAD Run	Groundwater Concentrations in ug/L at Each Time Interval (yr)								RAG, ug/L
		0	1	10	30	108	130	300	1000	
Alpha-BHC	600-202	0	0	0	0	0.00370	0.00348	0.00216	0.00030	0.0139 [a]
Beta-BHC	600-202	0	0	0	0	0	0.0219	0.0147	0.0029	0.0486 [a]

[a] Based on the groundwater carcinogenic cleanup levels for alpha- and beta-BHC calculated from WAC 173-340-730, Ecology 1996, as discussed in Appendix B, Table B-2, of the 100 Area RDR/RAWP.

2) Columbia River Protection

Predicted alpha- and beta-BHC concentrations in groundwater at the Columbia River were calculated by dividing the predicted groundwater concentrations at the 600-202 waste site in Table 3 by the dilution factor of 11.1 determined in Table 2. Results are summarized in Table 4. Due to dilution and attenuation, alpha- and beta-BHC are predicted to reach the river at maximum groundwater concentrations of 0.00033 ug/L and 0.0020 ug/L, respectively, which are less than the respective remedial action goals (RAGs) of 0.00791 ug/L and 0.0277 ug/L from Table B-3 of Appendix B of the RDR/RAWP.

Table 4. Predicted Groundwater Concentration at the Columbia River Based on Dilution and Attenuation of Groundwater from 600-202

Contaminant	RESRAD Run	Groundwater Concentrations in ug/L at Each Time Interval (yr)								RAG, ug/L
		0	1	10	30	108	130	300	1000	
Alpha-BHC	600-202	0	0	0	0	0.00033	0.00031	0.00019	0.00003	0.00791 [a]
Beta-BHC	600-202	0	0	0	0	0	0.0020	0.0013	0.00026	0.0277 [a]

[a] Based on the surface water carcinogenic cleanup levels for alpha- and beta-BHC calculated from WAC 173-340-730, Ecology 1996, as discussed in Appendix B, Table B-3, of the 100 Area RDR/RAWP.

Washington Closure Hanford CALCULATION SHEET

Originator:	S. W. Clark	Date:	3/30/11	Calc. No.:	0600X-CA-V0111	Rev.:	0
Project:	100-IU-2/6 Field Remediation	Job No:	14655	Checked:	M. W. Perrott	Date:	3/30/11
Subject:	600-202 RESRAD Calculation Brief for Groundwater and River Protection					Sheet No. 5 of 5	

CONCLUSIONS:

- Maximum alpha- and beta-BHC concentrations in the soil at the 600-202 waste site are predicted to be protective of groundwater and the Columbia River for 1,000 years based upon RESRAD vadose zone modeling and evaluation of dilution-attenuation in the saturated zone using the formulas in the EPA *Soil Screening Guidance: User's Guide.*

- The alpha- and beta-BHC concentrations in groundwater at different time intervals to 1,000 years are calculated by the RESRAD modeling using neptunium-237 and uranium-238 as surrogates. The results of these evaluations are summarized in Table 3. Alpha-BHC concentrations in groundwater are predicted to peak at year 108 at a maximum concentration of 0.00370 ug/L, which is less than the groundwater cleanup RAG of 0.0139 ug/L from Table B-2 of Appendix B of the RDR/RAWP. Beta-BHC concentrations in groundwater are predicted to peak at year 130 at a maximum concentration of 0.0219 ug/L, which is less than the groundwater cleanup RAG of 0.0486 ug/L from Table B-2 of Appendix B of the RDR/RAWP.

- Alpha- and beta-BHC concentrations in groundwater at the Columbia River were calculated by dividing the predicted maximum groundwater concentrations at the 600-202 waste site in Table 3 by the dilution factor determined in Table 2. Results are summarized in Table 4. Due to dilution and attenuation, alpha- and beta-BHC are predicted to reach the river at maximum groundwater concentrations of 0.00033 ug/L and 0.0020 ug/L, respectively, which are less than the respective surface water cleanup RAGs of 0.00791 ug/L and 0.0277 ug/L from Table B-3 of Appendix B of the RDR/RAWP.

ATTACHMENTS:

1. RESRAD Output: 600-202 Alpha- and Beta-BHC Groundwater and River Protection – Mixture Sums and Single Radionuclide Guidelines (23 pages)
2. RESRAD Output: 600-202 Alpha- and Beta-BHC Groundwater and River Protection – Concentration of Radionuclides, (11 pages)

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days        02/16/2011  07:09  Page   1
 Summary : 600-202 Alpha and Beta BHC Groundwater and River Protection
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD
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Originator:	S. W. Clark	Date	3/30/11
Chk'd By	M. W. Perrott	Date	3/30/11
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Dose Conversion Factor (and Related) Parameter Summary
Dose Library: FGR 12 & FGR 11

0 Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Ac-225 (Source: FGR 12)	6.371E-02	6.371E-02	DCF1(1)
A-1	At-217 (Source: FGR 12)	1.773E-03	1.773E-03	DCF1(2)
A-1	At-218 (Source: FGR 12)	5.847E-03	5.847E-03	DCF1(3)
A-1	Bi-210 (Source: FGR 12)	3.606E-03	3.606E-03	DCF1(4)
A-1	Bi-213 (Source: FGR 12)	7.660E-01	7.660E-01	DCF1(5)
A-1	Bi-214 (Source: FGR 12)	9.808E+00	9.808E+00	DCF1(6)
A-1	Fr-221 (Source: FGR 12)	1.536E-01	1.536E-01	DCF1(7)
A-1	Np-237 (Source: FGR 12)	7.790E-02	7.790E-02	DCF1(8)
A-1	Pa-233 (Source: FGR 12)	1.020E+00	1.020E+00	DCF1(9)
A-1	Pa-234 (Source: FGR 12)	1.155E+01	1.155E+01	DCF1(10)
A-1	Pa-234m (Source: FGR 12)	8.967E-02	8.967E-02	DCF1(11)
A-1	Pb-209 (Source: FGR 12)	7.734E-04	7.734E-04	DCF1(12)
A-1	Pb-210 (Source: FGR 12)	2.447E-03	2.447E-03	DCF1(13)
A-1	Pb-214 (Source: FGR 12)	1.341E+00	1.341E+00	DCF1(14)
A-1	Po-210 (Source: FGR 12)	5.231E-05	5.231E-05	DCF1(15)
A-1	Po-213 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(16)
A-1	Po-214 (Source: FGR 12)	5.138E-04	5.138E-04	DCF1(17)
A-1	Po-218 (Source: FGR 12)	5.642E-05	5.642E-05	DCF1(18)
A-1	Ra-225 (Source: FGR 12)	1.102E-02	1.102E-02	DCF1(19)
A-1	Ra-226 (Source: FGR 12)	3.176E-02	3.176E-02	DCF1(20)
A-1	Rn-222 (Source: FGR 12)	2.354E-03	2.354E-03	DCF1(21)
A-1	Th-229 (Source: FGR 12)	3.213E-01	3.213E-01	DCF1(22)
A-1	Th-230 (Source: FGR 12)	1.209E-03	1.209E-03	DCF1(23)
A-1	Th-234 (Source: FGR 12)	2.410E-02	2.410E-02	DCF1(24)
A-1	Tl-209 (Source: FGR 12)	1.293E+01	1.293E+01	DCF1(25)
A-1	Tl-210 (Source: no data)	0.000E+00	-2.000E+00	DCF1(26)
A-1	U-233 (Source: FGR 12)	1.397E-03	1.397E-03	DCF1(27)
A-1	U-234 (Source: FGR 12)	4.017E-04	4.017E-04	DCF1(28)
A-1	U-238 (Source: FGR 12)	1.031E-04	1.031E-04	DCF1(29)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Np-237+D	5.400E-01	5.400E-01	DCF2(1)
B-1	Pb-210+D	2.320E-02	1.360E-02	DCF2(2)
B-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(3)
B-1	Th-229+D	2.169E+00	2.150E+00	DCF2(4)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(5)
B-1	U-233	1.350E-01	1.350E-01	DCF2(6)
B-1	U-234	1.320E-01	1.320E-01	DCF2(7)
B-1	U-238	1.180E-01	1.180E-01	DCF2(8)
B-1	U-238+D	1.180E-01	1.180E-01	DCF2(9)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Np-237+D	4.444E-03	4.440E-03	DCF3(1)
D-1	Pb-210+D	7.276E-03	5.370E-03	DCF3(2)
D-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(3)
D-1	Th-229+D	4.027E-03	3.530E-03	DCF3(4)
D-1	Th-230	5.480E-04	5.480E-04	DCF3(5)
D-1	U-233	2.890E-04	2.890E-04	DCF3(6)
D-1	U-234	2.830E-04	2.830E-04	DCF3(7)

Attachment 1 Sheet No. 2 of 23
Originator: S. W. Clark Date 3/30/11
Chk'd By M. W. Perrott Date 3/30/11
Calc. No. 0600X-CA-V0111 Rev. No. 0

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days       02/16/2011  07:09  Page   3
 Summary : 600-202 Alpha and Beta BHC Groundwater and River Protection
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD
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Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: FGR 12 & FGR 11

0 Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-1	U-238	2.550E-04	2.550E-04	DCF3(8)
D-1	U-238+D	2.687E-04	2.550E-04	DCF3(9)
D-34	Food transfer factors:			
D-34	Np-237+D , plant/soil concentration ratio, dimensionless	2.000E-02	2.000E-02	RTF(1,1)
D-34	Np-237+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(1,2)
D-34	Np-237+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(1,3)
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(2,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(2,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(2,3)
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(3,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(3,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(3,3)
D-34	Th-229+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(4,1)
D-34	Th-229+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(4,2)
D-34	Th-229+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(4,3)
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(5,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(5,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(5,3)
D-34	U-233 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(6,1)
D-34	U-233 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(6,2)
D-34	U-233 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(6,3)
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(7,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(7,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(7,3)
D-34	U-238 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(8,1)
D-34	U-238 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(8,2)
D-34	U-238 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(8,3)
D-34	U-238+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(9,1)
D-34	U-238+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(9,2)
D-34	U-238+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(9,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Np-237+D , fish	3.000E+01	3.000E+01	BIOFAC(1,1)
D-5	Np-237+D , crustacea and mollusks	4.000E+02	4.000E+02	BIOFAC(1,2)
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(2,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(2,2)
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(3,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(3,2)

Attachment	1	Sheet No.	3 of 23
Originator:	S. W. Clark	Date	3/30/11
Chk'd By	M. W. Perrott	Date	3/30/11
Calc. No.	0600X-CA-V0111	Rev. No.	0

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days       02/16/2011  07:09  Page   4
 Summary : 600-202 Alpha and Beta BHC Groundwater and River Protection
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD

                         Dose Conversion Factor (and Related) Parameter Summary (continued)
                                        Dose Library: FGR 12 & FGR 11
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Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-5	Th-229+D , fish	1.000E+02	1.000E+02	BIOFAC(4,1)
D-5	Th-229+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(4,2)
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(5,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(5,2)
D-5				
D-5	U-233 , fish	1.000E+01	1.000E+01	BIOFAC(6,1)
D-5	U-233 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(6,2)
D-5				
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(7,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(7,2)
D-5				
D-5	U-238 , fish	1.000E+01	1.000E+01	BIOFAC(8,1)
D-5	U-238 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(8,2)
D-5				
D-5	U-238+D , fish	1.000E+01	1.000E+01	BIOFAC(9,1)
D-5	U-238+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(9,2)

#For DCF1(xxx) only, factors are for infinite depth & area. See ETFG table in Ground Pathway of Detailed Report.
*Base Case means Default.Lib w/o Associate Nuclide contributions.

Attachment	1	Sheet No. 4 of 23	
Originator:	S. W. Clark	Date	3/30/11
Chk'd By	M. W. Perrott	Date	3/30/11
Calc. No.	0600X-CA-V0111	Rev. No.	0

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1RESRAD, Version 6.5 T« Limit = 180 days 02/16/2011 07:09 Page 5
Summary : 600-202 Alpha and Beta BHC Groundwater and River Protection
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD

Site-Specific Parameter Summary

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	1.700E+02	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	1.000E+00	2.000E+00	---	THICKO
R011	Fraction of contamination that is submerged	0.000E+00	0.000E+00	---	SUBMFRACT
R011	Length parallel to aquifer flow (m)	1.300E+01	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	1.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	1.080E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.300E+02	1.000E+03	---	T(8)
R011	Times for calculations (yr)	3.000E+02	0.000E+00	---	T(9)
R011	Times for calculations (yr)	1.000E+03	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Np-237	2.020E-03	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): U-238	1.450E-02	0.000E+00	---	S1(8)
R012	Concentration in groundwater (pCi/L): Np-237	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---	W1(8)
R013	Cover depth (m)	0.000E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	not used	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	not used	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.600E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	0.000E+00	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	1.500E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	2.500E+02	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	4.050E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	3.400E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	9.100E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.600E-01	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	7.600E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.600E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.500E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	1.500E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	5.530E+03	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	1.250E-03	2.000E-02	---	HGWT
R014	Saturated zone b parameter	not used	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	0.000E+00	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	4.600E+00	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL

Attachment 1 Sheet No. 5 of 23
Originator: S. W. Clark Date 3/30/11
Chk'd By M. W. Perrott Date 3/30/11
Calc. No. 0600X-CA-V0111 Rev. No. 0

ATTACHMENT 1

1RESRAD, Version 6.5 T« Limit = 180 days 02/16/2011 07:09 Page 6
Summary : 600-202 Alpha and Beta BHC Groundwater and River Protection
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R014	Well pumping rate (m**3/yr)	not used	2.500E+02	---	UW
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	7.240E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.600E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	1.500E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	2.500E-01	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	4.050E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	2.500E+02	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Np-237				
R016	Contaminated zone (cm**3/g)	1.760E+00	-1.000E+00	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	1.760E+00	-1.000E+00	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	1.760E+00	-1.000E+00	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.819E-03	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for U-238				
R016	Contaminated zone (cm**3/g)	2.140E+00	5.000E+01	---	DCNUCC(8)
R016	Unsaturated zone 1 (cm**3/g)	2.140E+00	5.000E+01	---	DCNUCU(8,1)
R016	Saturated zone (cm**3/g)	2.140E+00	5.000E+01	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.321E-03	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
R016	Distribution coefficients for daughter Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	4.989E-04	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for daughter Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.123E-04	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for daughter Th-229				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.325E-07	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)

Attachment 1 Sheet No. 6 of 23
Originator: S. W. Clark Date 3/30/11
Chk'd By M. W. Perrott Date 3/30/11
Calc. No. 0600X-CA-V0111 Rev. No. 0

ATTACHMENT 1

1RESRAD, Version 6.5 T½ Limit = 180 days 02/16/2011 07:09 Page 7
Summary : 600-202 Alpha and Beta BHC Groundwater and River Protection
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for daughter Th-230				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.325E-07	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R016	Distribution coefficients for daughter U-233				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(6)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(6,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(6)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.966E-04	ALEACH(6)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
R016	Distribution coefficients for daughter U-234				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(7,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	9.966E-04	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R017	Inhalation rate (m**3/yr)	not used	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	not used	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	not used	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	not used	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	not used	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	not used	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	not used	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)

Attachment 1 Sheet No. 7 of 23
Originator: S. W. Clark Date 3/30/11
Chk'd By M. W. Perrott Date 3/30/11
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1RESRAD, Version 6.5      T« Limit = 180 days       02/16/2011  07:09  Page   8
 Summary : 600-202 Alpha and Beta BHC Groundwater and River Protection
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD
```

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	not used	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	not used	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	not used	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	7.300E+02	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	1.000E+00	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	not used	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	not used	-1	---	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	not used	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	not used	1.500E-01	---	DM
R019	Depth of roots (m)	not used	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	not used	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	not used	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	not used	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	not used	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	not used	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	not used	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)

Attachment 1 Sheet No. 8 of 23
Originator: S. W. Clark Date 3/30/11
Chk'd By M. W. Perrott Date 3/30/11
Calc. No. 0600X-CA-V0111 Rev. No. 0

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1RESRAD, Version 6.5 T« Limit = 180 days 02/16/2011 07:09 Page 9
Summary : 600-202 Alpha and Beta BHC Groundwater and River Protection
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R19B	Translocation Factor for Non-Leafy	not used	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	not used	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	not used	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	not used	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	not used	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	32	---	---	NPTS

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Originator: S. W. Clark Date 3/30/11
Chk'd By M. W. Perrott Date 3/30/11
Calc. No. 0600X-CA-V0111 Rev. No. 0

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days        02/16/2011  07:09  Page  10
 Summary : 600-202 Alpha and Beta BHC Groundwater and River Protection
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD
```

Site-Specific Parameter Summary (continued)

0 Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
TITL	Maximum number of integration points for dose	1	---	---	LYMAX
TITL	Maximum number of integration points for risk	5	---	---	KYMAX

Summary of Pathway Selections

Pathway	User Selection
1 -- external gamma	suppressed
2 -- inhalation (w/o radon)	suppressed
3 -- plant ingestion	suppressed
4 -- meat ingestion	suppressed
5 -- milk ingestion	suppressed
6 -- aquatic foods	suppressed
7 -- drinking water	active
8 -- soil ingestion	suppressed
9 -- radon	suppressed
Find peak pathway doses	suppressed

Attachment	1	Sheet No.	10 of 23
Originator:	S. W. Clark	Date	3/30/11
Chk'd By	M. W. Perrott	Date	3/30/11
Calc. No.	0600X-CA-V0111	Rev. No.	0

ATTACHMENT 1

1RESRAD, Version 6.5 T« Limit = 180 days 02/16/2011 07:09 Page 11
Summary : 600-202 Alpha and Beta BHC Groundwater and River Protection
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	170.00 square meters	Np-237	2.020E-03
Thickness:	1.00 meters	U-238	1.450E-02
Cover Depth:	0.00 meters		

0

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 1.500E+01 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	1.080E+02	1.300E+02	3.000E+02	1.000E+03
TDOSE(t):	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.202E-02	1.558E-02	9.884E-03	1.542E-03
M(t):	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.011E-04	1.039E-03	6.589E-04	1.028E-04

0Maximum TDOSE(t): 1.560E-02 mrem/yr at t = 129.4 ñ 0.3 years
0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.294E+02 years
0 Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract.
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.294E+02 years
0 Water Dependent Pathways

Radio-Nuclide	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
Np-237	1.131E-02	0.7248	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.131E-02	0.7248
U-238	4.294E-03	0.2752	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.294E-03	0.2752
Total	1.560E-02	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.560E-02	1.0000

0*Sum of all water independent and dependent pathways.

Attachment 1	Sheet No. 11 of 23
Originator: S. W. Clark	Date 3/30/11
Chk'd By M. W. Perrott	Date 3/30/11
Calc. No. 0600X-CA-V0111	Rev. No. 0

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days        02/16/2011  07:09  Page  12
 Summary : 600-202 Alpha and Beta BHC Groundwater and River Protection
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD
```

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years
Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years
Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

0*Sum of all water independent and dependent pathways.

Attachment	1	Sheet No.	12 of 23
Originator:	S. W. Clark	Date	3/30/11
Chk'd By	M. W. Perrott	Date	3/30/11
Calc. No.	0600X-CA-V0111	Rev. No.	0

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days      02/16/2011  07:09  Page  13
 Summary : 600-202 Alpha and Beta BHC Groundwater and River Protection
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD
```

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years
Water Independent Pathways (Inhalation excludes radon)

Radio- Nuclide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract.
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years
Water Dependent Pathways

Radio- Nuclide	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

0*Sum of all water independent and dependent pathways.

Attachment	1	Sheet No.	13 of 23
Originator:	S. W. Clark	Date	3/30/11
Chk'd By	M. W. Perrott	Date	3/30/11
Calc. No.	0600X-CA-V0111	Rev. No.	0

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days        02/16/2011  07:09  Page  14
 Summary : 600-202 Alpha and Beta BHC Groundwater and River Protection
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD
```

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years
Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years
Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

0*Sum of all water independent and dependent pathways.

Attachment	1	Sheet No.	14 of 23
Originator:	S. W. Clark	Date	3/30/11
Chk'd By	M. W. Perrott	Date	3/30/11
Calc. No.	0600X-CA-V0111	Rev. No.	0

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days       02/16/2011  07:09  Page  15
 Summary : 600-202 Alpha and Beta BHC Groundwater and River Protection
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD
```

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years
Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years
Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

0*Sum of all water independent and dependent pathways.

Attachment	1	Sheet No.	15 of 23
Originator:	S. W. Clark	Date	3/30/11
Chk'd By	M. W. Perrott	Date	3/30/11
Calc. No.	0600X-CA-V0111	Rev. No.	0

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days      02/16/2011  07:09  Page  16
 Summary : 600-202 Alpha and Beta BHC Groundwater and River Protection
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD
```

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

0 Water Independent Pathways (Inhalation excludes radon)

0	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Radio-	ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
ßßßßßßß	ßßßßßßßßß	ßßßßßß	ßßßßßßßßß	ßßßßßß	ßßßßßßßßß	ßßßßßß	ßßßßßßßßß	ßßßßßß	ßßßßßßßßß	ßßßßßß	ßßßßßßßßß	ßßßßßß	ßßßßßßßßß	ßßßßßß
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

0

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

0 Water Dependent Pathways

0	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Radio-	ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ		ÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ	ÄÄÄÄÄÄÄÄÄ	ÄÄÄÄÄÄ
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
ßßßßßßß	ßßßßßßßßß	ßßßßßß	ßßßßßßßßß	ßßßßßß	ßßßßßßßßß	ßßßßßß	ßßßßßßßßß	ßßßßßß	ßßßßßßßßß	ßßßßßß	ßßßßßßßßß	ßßßßßß	ßßßßßßßßß	ßßßßßß
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

0*Sum of all water independent and dependent pathways.

Attachment	1	Sheet No.	16 of 23
Originator:	S. W. Clark	Date	3/30/11
Chk'd By	M. W. Perrott	Date	3/30/11
Calc. No.	0600X-CA-V0111	Rev. No.	0

ATTACHMENT 1

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1RESRAD, Version 6.5      T½ Limit = 180 days        02/16/2011  07:09  Page  17
 Summary : 600-202 Alpha and Beta BHC Groundwater and River Protection
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD
```

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years
Water Independent Pathways (Inhalation excludes radon)

Radio- Nuclide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract.
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years
Water Dependent Pathways

Radio- Nuclide	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

0*Sum of all water independent and dependent pathways.

Attachment	1	Sheet No.	17 of 23
Originator:	S. W. Clark	Date	3/30/11
Chk'd By	M. W. Perrott	Date	3/30/11
Calc. No.	0600X-CA-V0111	Rev. No.	0

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days        02/16/2011  07:09  Page  18
 Summary : 600-202 Alpha and Beta BHC Groundwater and River Protection
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD
```

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.080E+02 years
Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.080E+02 years
Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Np-237	1.202E-02	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.202E-02	1.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.202E-02	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.202E-02	1.0000

*Sum of all water independent and dependent pathways.

Attachment	1	Sheet No.	18 of 23
Originator:	S. W. Clark	Date	3/30/11
Chk'd By	M. W. Perrott	Date	3/30/11
Calc. No.	0600X-CA-V0111	Rev. No.	0

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days       02/16/2011  07:09  Page  19
 Summary : 600-202 Alpha and Beta BHC Groundwater and River Protection
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD
```

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.300E+02 years
Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.300E+02 years
Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Np-237	1.129E-02	0.7247	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.129E-02	0.7247
U-238	4.289E-03	0.2753	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.289E-03	0.2753
Total	1.558E-02	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.558E-02	1.0000

*Sum of all water independent and dependent pathways.

Attachment	1	Sheet No.	19 of 23
Originator:	S. W. Clark	Date	3/30/11
Chk'd By	M. W. Perrott	Date	3/30/11
Calc. No.	0600X-CA-V0111	Rev. No.	0

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days      02/16/2011  07:09  Page  20
 Summary : 600-202 Alpha and Beta BHC Groundwater and River Protection
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD
```

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years
Water Independent Pathways (Inhalation excludes radon)

Radio- Nuclide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract.
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years
Water Dependent Pathways

Radio- Nuclide	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
Np-237	6.993E-03	0.7075	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.993E-03	0.7075
U-238	2.891E-03	0.2925	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.891E-03	0.2925
Total	9.884E-03	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.884E-03	1.0000

*Sum of all water independent and dependent pathways.

Attachment	1	Sheet No.	20 of 23
Originator:	S. W. Clark	Date	3/30/11
Chk'd By	M. W. Perrott	Date	3/30/11
Calc. No.	0600X-CA-V0111	Rev. No.	0

ATTACHMENT 1

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1RESRAD, Version 6.5      T½ Limit = 180 days      02/16/2011  07:09  Page  21
 Summary : 600-202 Alpha and Beta BHC Groundwater and River Protection
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD
```

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years
Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground mrem/yr	Ground fract.	Inhalation mrem/yr	Inhalation fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	Soil mrem/yr	Soil fract.
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years
Water Dependent Pathways

Radio-Nuclide	Water mrem/yr	Water fract.	Fish mrem/yr	Fish fract.	Radon mrem/yr	Radon fract.	Plant mrem/yr	Plant fract.	Meat mrem/yr	Meat fract.	Milk mrem/yr	Milk fract.	All Pathways* mrem/yr	All Pathways* fract.
Np-237	9.721E-04	0.6305	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.721E-04	0.6305
U-238	5.696E-04	0.3695	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.696E-04	0.3695
Total	1.542E-03	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.542E-03	1.0000

0*Sum of all water independent and dependent pathways.

Attachment	1	Sheet No.	21 of 23
Originator:	S. W. Clark	Date	3/30/11
Chk'd By	M. W. Perrott	Date	3/30/11
Calc. No.	0600X-CA-V0111	Rev. No.	0

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days       02/16/2011  07:09  Page  22
 Summary : 600-202 Alpha and Beta BHC Groundwater and River Protection
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD
```

Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

0 Parent (i)	Product (j)	Thread Fraction	OSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	1.080E+02	1.300E+02	3.000E+02	1.000E+03
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.949E+00	5.590E+00	3.462E+00	4.812E-01
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.364E-07	1.568E-06	1.004E-05	2.193E-05
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.500E-12	2.399E-11	1.188E-09	1.453E-08
Np-237+D	ãDSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.949E+00	5.590E+00	3.462E+00	4.812E-01
0U-238	U-238	5.400E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.516E-05	1.022E-05	2.012E-06
0U-238+D	U-238+D	9.999E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.958E-01	1.993E-01	3.927E-02
U-238+D	U-234	9.999E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.273E-07	6.053E-06	1.587E-05
U-238+D	Th-230	9.999E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.485E-13	3.277E-12	1.178E-10
U-238+D	Ra-226+D	9.999E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.018E-10	0.000E+00	1.087E-08
U-238+D	Pb-210+D	9.999E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.937E-09	0.000E+00	3.370E-08
U-238+D	ãDSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.958E-01	1.994E-01	3.928E-02

The DSR includes contributions from associated (half-life ó 180 days) daughters.

0

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 1.500E+01 mrem/yr

0Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	1.080E+02	1.300E+02	3.000E+02	1.000E+03
Np-237	*7.047E+08	*7.047E+08	*7.047E+08	*7.047E+08	*7.047E+08	*7.047E+08	2.521E+00	2.683E+00	4.333E+00	3.117E+01
U-238	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	*3.361E+05	5.071E+01	7.524E+01	3.818E+02

*At specific activity limit

0

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 129.4 ñ 0.3 years

0Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Np-237	2.020E-03	108.0 ñ 0.2	5.949E+00	2.521E+00	5.599E+00	2.679E+00
U-238	1.450E-02	129.4 ñ 0.3	2.962E-01	5.064E+01	2.962E-01	5.065E+01

Attachment	1	Sheet No. 22 of 23	
Originator:	S. W. Clark	Date	3/30/11
Chk'd By	M. W. Perrott	Date	3/30/11
Calc. No.	0600X-CA-V0111	Rev. No.	0

ATTACHMENT 1

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1RESRAD, Version 6.5      T« Limit = 180 days       02/16/2011  07:09  Page  23
 Summary : 600-202 Alpha and Beta BHC Groundwater and River Protection
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD
```

Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

ONuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	1.080E+02	1.300E+02	3.000E+02	1.000E+03
Np-237	Np-237	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.202E-02	1.129E-02	6.993E-03	9.720E-04
OU-233	Np-237	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.755E-10	3.167E-09	2.028E-08	4.430E-08
OTh-229	Np-237	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	7.069E-15	4.847E-14	2.399E-12	2.935E-11
OU-238	U-238	5.400E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.198E-07	1.481E-07	2.918E-08
U-238	U-238	9.999E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.289E-03	2.890E-03	5.693E-04
U-238	äDOSE(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.289E-03	2.891E-03	5.694E-04
OU-234	U-238	9.999E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.845E-09	8.777E-08	2.301E-07
OTh-230	U-238	9.999E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.603E-15	4.751E-14	1.708E-12
ORa-226	U-238	9.999E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	7.276E-12	0.000E+00	1.576E-10
OPb-210	U-238	9.999E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.808E-11	0.000E+00	4.886E-10

THF(i) is the thread fraction of the parent nuclide.

Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

ONuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	1.080E+02	1.300E+02	3.000E+02	1.000E+03
Np-237	Np-237	1.000E+00	2.020E-03	2.014E-03	2.003E-03	1.964E-03	1.856E-03	1.524E-03	1.490E-03	1.400E-03	8.671E-04	1.205E-04
OU-233	Np-237	1.000E+00	0.000E+00	8.817E-09	2.635E-08	8.667E-08	2.503E-07	7.308E-07	7.775E-07	8.980E-07	1.513E-06	1.496E-06
OTh-229	Np-237	1.000E+00	0.000E+00	4.166E-13	3.739E-12	4.117E-11	3.610E-10	3.667E-09	4.233E-09	5.965E-09	2.574E-08	1.313E-07
OU-238	U-238	5.400E-05	7.830E-07	7.812E-07	7.776E-07	7.650E-07	7.303E-07	6.208E-07	6.094E-07	5.791E-07	3.903E-07	7.687E-08
U-238	U-238	9.999E-01	1.450E-02	1.447E-02	1.440E-02	1.417E-02	1.352E-02	1.150E-02	1.128E-02	1.072E-02	7.227E-03	1.423E-03
U-238	äS(j):		1.450E-02	1.447E-02	1.440E-02	1.417E-02	1.352E-02	1.150E-02	1.129E-02	1.072E-02	7.227E-03	1.424E-03
OU-234	U-238	9.999E-01	0.000E+00	4.104E-08	1.227E-07	4.043E-07	1.173E-06	3.484E-06	3.714E-06	4.312E-06	7.543E-06	8.395E-06
OTh-230	U-238	9.999E-01	0.000E+00	1.848E-13	1.660E-12	1.830E-11	1.611E-10	1.658E-09	1.917E-09	2.712E-09	1.205E-08	6.795E-08
ORa-226	U-238	9.999E-01	0.000E+00	2.669E-17	7.189E-16	2.642E-14	6.976E-13	2.390E-11	2.985E-11	5.081E-11	5.188E-10	9.323E-09
OPb-210	U-238	9.999E-01	0.000E+00	2.061E-19	1.646E-17	1.934E-15	1.369E-13	1.121E-11	1.462E-11	2.748E-11	3.891E-10	8.603E-09

THF(i) is the thread fraction of the parent nuclide.
ORESCALC.EXE execution time = 5.16 seconds

Attachment	1	Sheet No.	23 of 23
Originator:	S. W. Clark	Date	3/30/11
Chk'd By	M. W. Perrott	Date	3/30/11
Calc. No.	0600X-CA-V0111	Rev. No.	0

ATTACHMENT 2

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1RESRAD, Version 6.5      T« Limit = 180 days       02/16/2011  07:09  Page   1
 Concent : 600-202 Alpha and Beta BHC Groundwater and River Protection
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD
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Table of Contents
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Part IV: Concentration of Radionuclides
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Concentration of radionuclides in different media

Time= 0.000E+00 2
Time= 1.000E+00 3
Time= 3.000E+00 4
Time= 1.000E+01 5
Time= 3.000E+01 6
Time= 1.000E+02 7
Time= 1.080E+02 8
Time= 1.300E+02 9
Time= 3.000E+02 10
Time= 1.000E+03 11

Attachment 2 Sheet No. 1 of 11
Originator: S. W. Clark [signature] Date 3/30/11
Chk'd By M. W. Perrott [signature] Date 3/30/11
Calc. No. 0600X-CA-V0111 Rev. No. 0

ATTACHMENT 2

1RESRAD, Version 6.5 T« Limit = 180 days 02/16/2011 07:09 Page 2
Concent : 600-202 Alpha and Beta BHC Groundwater and River Protection
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD

Concentration of radionuclides in environmental media
at t = 0.000E+00 years

Radio-Nuclide	Contaminated Zone pCi/g	Surface Soil* pCi/g	Air Particulate pCi/m**3	Well Water pCi/L	Surface Water pCi/L
Np-237	2.020E-03	2.020E-03	1.651E-08	0.000E+00	0.000E+00
Pb-210	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-229	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-230	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-233	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-234	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-238	1.450E-02	1.450E-02	1.185E-07	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of radionuclides in foodstuff media
at t = 0.000E+00 years*

Radio-Nuclide	Drinking Water pCi/L	Nonleafy Vegetable pCi/kg	Leafy Vegetable pCi/kg	Fodder Meat pCi/kg	Fodder Milk pCi/kg	Meat pCi/kg	Milk pCi/L	Fish pCi/kg	Crustacea pCi/kg
Np-237	0.000E+00	4.040E-02	4.040E-02	4.040E-02	4.040E-02	3.758E-03	1.616E-05	0.000E+00	0.000E+00
Pb-210	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-229	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-230	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-233	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-234	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-238	0.000E+00	3.626E-02	3.628E-02	3.628E-02	3.628E-02	3.304E-03	5.547E-03	0.000E+00	0.000E+00

*Concentrations are at consumption time and include radioactive decay and ingrowth during storage time.
For livestock fodder, consumption time is t minus meat or milk storage time.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Attachment	2	Sheet No.	2 of 11
Originator:	S. W. Clark	Date	3/30/11
Chk'd By	M. W. Perrott	Date	3/30/11
Calc. No.	0600X-CA-V0111	Rev. No.	0

ATTACHMENT 2

1RESRAD, Version 6.5 T« Limit = 180 days 02/16/2011 07:09 Page 3
Concent : 600-202 Alpha and Beta BHC Groundwater and River Protection
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD

Concentration of radionuclides in environmental media
at t = 1.000E+00 years

Radio-Nuclide	Contaminated Zone pCi/g	Surface Soil* pCi/g	Air Particulate pCi/m**3	Well Water pCi/L	Surface Water pCi/L
Np-237	2.014E-03	2.014E-03	1.646E-08	0.000E+00	0.000E+00
Pb-210	2.061E-19	2.061E-19	1.684E-24	0.000E+00	0.000E+00
Ra-226	2.669E-17	2.669E-17	2.181E-22	0.000E+00	0.000E+00
Th-229	4.166E-13	4.166E-13	3.404E-18	0.000E+00	0.000E+00
Th-230	1.848E-13	1.848E-13	1.510E-18	0.000E+00	0.000E+00
U-233	8.817E-09	8.817E-09	7.205E-14	0.000E+00	0.000E+00
U-234	4.104E-08	4.104E-08	3.353E-13	0.000E+00	0.000E+00
U-238	1.447E-02	1.447E-02	1.182E-07	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of radionuclides in foodstuff media
at t = 1.000E+00 years*

Radio-Nuclide	Drinking Water pCi/L	Nonleafy Vegetable pCi/kg	Leafy Vegetable pCi/kg	Fodder Meat pCi/kg	Fodder Milk pCi/kg	Meat pCi/kg	Milk pCi/L	Fish pCi/kg	Crustacea pCi/kg
Np-237	0.000E+00	4.029E-02	4.029E-02	4.031E-02	4.031E-02	3.748E-03	1.612E-05	0.000E+00	0.000E+00
Pb-210	0.000E+00	2.898E-18	2.130E-18	3.224E-18	3.943E-18	3.299E-19	1.002E-19	0.000E+00	0.000E+00
Ra-226	0.000E+00	9.533E-16	1.059E-15	6.026E-16	7.233E-16	5.253E-17	5.302E-17	0.000E+00	0.000E+00
Th-229	0.000E+00	4.745E-13	4.210E-13	6.197E-13	6.698E-13	3.724E-14	2.252E-15	0.000E+00	0.000E+00
Th-230	0.000E+00	2.058E-13	1.867E-13	2.259E-13	2.481E-13	1.428E-14	9.142E-16	0.000E+00	0.000E+00
U-233	0.000E+00	2.796E-08	2.248E-08	3.986E-08	4.101E-08	3.236E-09	3.991E-09	0.000E+00	0.000E+00
U-234	0.000E+00	1.026E-07	1.027E-07	9.709E-08	1.024E-07	9.351E-09	1.570E-08	0.000E+00	0.000E+00
U-238	0.000E+00	3.618E-02	3.620E-02	3.621E-02	3.621E-02	3.297E-03	5.535E-03	0.000E+00	0.000E+00

*Concentrations are at consumption time and include radioactive decay and ingrowth during storage time.
For livestock fodder, consumption time is t minus meat or milk storage time.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Attachment	2	Sheet No.	3 of 11
Originator:	S. W. Clark	Date	3/30/11
Chk'd By	M. W. Perrott	Date	3/30/11
Calc. No.	0600X-CA-V0111	Rev. No.	0

ATTACHMENT 2

1RESRAD, Version 6.5 T« Limit = 180 days 02/16/2011 07:09 Page 4
Concent : 600-202 Alpha and Beta BHC Groundwater and River Protection
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD

Concentration of radionuclides in environmental media
at t = 3.000E+00 years

Radio-Nuclide	Contaminated Zone pCi/g	Surface Soil* pCi/g	Air Particulate pCi/m**3	Well Water pCi/L	Surface Water pCi/L
Np-237	2.003E-03	2.003E-03	1.637E-08	0.000E+00	0.000E+00
Pb-210	1.646E-17	1.646E-17	1.345E-22	0.000E+00	0.000E+00
Ra-226	7.189E-16	7.189E-16	5.875E-21	0.000E+00	0.000E+00
Th-229	3.739E-12	3.739E-12	3.056E-17	0.000E+00	0.000E+00
Th-230	1.660E-12	1.660E-12	1.356E-17	0.000E+00	0.000E+00
U-233	2.635E-08	2.635E-08	2.153E-13	0.000E+00	0.000E+00
U-234	1.227E-07	1.227E-07	1.003E-12	0.000E+00	0.000E+00
U-238	1.440E-02	1.440E-02	1.177E-07	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of radionuclides in foodstuff media
at t = 3.000E+00 years*

Radio-Nuclide	Drinking Water pCi/L	Nonleafy Vegetable pCi/kg	Leafy Vegetable pCi/kg	Fodder Meat pCi/kg	Fodder Milk pCi/kg	Meat pCi/kg	Milk pCi/L	Fish pCi/kg	Crustacea pCi/kg
Np-237	0.000E+00	4.007E-02	4.006E-02	4.008E-02	4.008E-02	3.727E-03	1.603E-05	0.000E+00	0.000E+00
Pb-210	0.000E+00	1.892E-16	1.665E-16	2.203E-16	2.351E-16	2.143E-17	6.488E-18	0.000E+00	0.000E+00
Ra-226	0.000E+00	2.770E-14	2.868E-14	2.403E-14	2.538E-14	1.977E-15	1.754E-15	0.000E+00	0.000E+00
Th-229	0.000E+00	3.894E-12	3.758E-12	4.165E-12	4.301E-12	2.436E-13	1.328E-14	0.000E+00	0.000E+00
Th-230	0.000E+00	1.723E-12	1.668E-12	1.800E-12	1.860E-12	1.059E-13	5.809E-15	0.000E+00	0.000E+00
U-233	0.000E+00	7.177E-08	6.635E-08	8.364E-08	8.478E-08	7.225E-09	1.070E-08	0.000E+00	0.000E+00
U-234	0.000E+00	3.068E-07	3.070E-07	3.015E-07	3.068E-07	2.796E-08	4.694E-08	0.000E+00	0.000E+00
U-238	0.000E+00	3.601E-02	3.603E-02	3.605E-02	3.604E-02	3.282E-03	5.509E-03	0.000E+00	0.000E+00

*Concentrations are at consumption time and include radioactive decay and ingrowth during storage time.
For livestock fodder, consumption time is t minus meat or milk storage time.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Attachment	2	Sheet No.	4 of 11
Originator:	S. W. Clark	Date	3/30/11
Chk'd By	M. W. Perrott	Date	3/30/11
Calc. No.	0600X-CA-V0111	Rev. No.	0

ATTACHMENT 2

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1RESRAD, Version 6.5      T« Limit = 180 days        02/16/2011  07:09  Page   5
Concent : 600-202 Alpha and Beta BHC Groundwater and River Protection
File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD
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Concentration of radionuclides in environmental media
at t = 1.000E+01 years

Radio-Nuclide	Contaminated Zone pCi/g	Surface Soil* pCi/g	Air Particulate pCi/m**3	Well Water pCi/L	Surface Water pCi/L
Np-237	1.964E-03	1.964E-03	1.605E-08	0.000E+00	0.000E+00
Pb-210	1.934E-15	1.934E-15	1.580E-20	0.000E+00	0.000E+00
Ra-226	2.642E-14	2.642E-14	2.159E-19	0.000E+00	0.000E+00
Th-229	4.117E-11	4.117E-11	3.364E-16	0.000E+00	0.000E+00
Th-230	1.830E-11	1.830E-11	1.495E-16	0.000E+00	0.000E+00
U-233	8.667E-08	8.667E-08	7.082E-13	0.000E+00	0.000E+00
U-234	4.043E-07	4.043E-07	3.304E-12	0.000E+00	0.000E+00
U-238	1.417E-02	1.417E-02	1.158E-07	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of radionuclides in foodstuff media
at t = 1.000E+01 years*

Radio-Nuclide	Drinking Water pCi/L	Nonleafy Vegetable pCi/kg	Leafy Vegetable pCi/kg	Fodder Meat pCi/kg	Fodder Milk pCi/kg	Meat pCi/kg	Milk pCi/L	Fish pCi/kg	Crustacea pCi/kg
Np-237	0.000E+00	3.928E-02	3.928E-02	3.930E-02	3.930E-02	3.655E-03	1.572E-05	0.000E+00	0.000E+00
Pb-210	0.000E+00	2.027E-14	1.941E-14	2.179E-14	2.222E-14	2.077E-15	6.623E-16	0.000E+00	0.000E+00
Ra-226	0.000E+00	1.045E-12	1.056E-12	1.003E-12	1.018E-12	8.119E-14	6.922E-14	0.000E+00	0.000E+00
Th-229	0.000E+00	4.167E-11	4.129E-11	4.242E-11	4.286E-11	2.431E-12	1.234E-13	0.000E+00	0.000E+00
Th-230	0.000E+00	1.851E-11	1.835E-11	1.881E-11	1.900E-11	1.078E-12	5.475E-14	0.000E+00	0.000E+00
U-233	0.000E+00	2.225E-07	2.173E-07	2.343E-07	2.354E-07	2.095E-08	3.376E-08	0.000E+00	0.000E+00
U-234	0.000E+00	1.011E-06	1.012E-06	1.006E-06	1.012E-06	9.213E-08	1.547E-07	0.000E+00	0.000E+00
U-238	0.000E+00	3.543E-02	3.545E-02	3.547E-02	3.546E-02	3.229E-03	5.420E-03	0.000E+00	0.000E+00

*Concentrations are at consumption time and include radioactive decay and ingrowth during storage time.
For livestock fodder, consumption time is t minus meat or milk storage time.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Attachment	2	Sheet No.	5 of 11
Originator:	S. W. Clark	Date	3/30/11
Chk'd By	M. W. Perrott	Date	3/30/11
Calc. No.	0600X-CA-V0111	Rev. No.	0

ATTACHMENT 2

1RESRAD, Version 6.5 T« Limit = 180 days 02/16/2011 07:09 Page 6
Concent : 600-202 Alpha and Beta BHC Groundwater and River Protection
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD

Concentration of radionuclides in environmental media
at t = 3.000E+01 years

Radio-Nuclide	Contaminated Zone pCi/g	Surface Soil* pCi/g	Air Particulate pCi/m**3	Well Water pCi/L	Surface Water pCi/L
Np-237	1.856E-03	1.856E-03	1.517E-08	0.000E+00	0.000E+00
Pb-210	1.369E-13	1.369E-13	1.119E-18	0.000E+00	0.000E+00
Ra-226	6.976E-13	6.976E-13	5.701E-18	0.000E+00	0.000E+00
Th-229	3.610E-10	3.610E-10	2.950E-15	0.000E+00	0.000E+00
Th-230	1.611E-10	1.611E-10	1.316E-15	0.000E+00	0.000E+00
U-233	2.503E-07	2.503E-07	2.045E-12	0.000E+00	0.000E+00
U-234	1.173E-06	1.173E-06	9.588E-12	0.000E+00	0.000E+00
U-238	1.352E-02	1.352E-02	1.105E-07	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of radionuclides in foodstuff media
at t = 3.000E+01 years*

Radio-Nuclide	Drinking Water pCi/L	Nonleafy Vegetable pCi/kg	Leafy Vegetable pCi/kg	Fodder Meat pCi/kg	Fodder Milk pCi/kg	Meat pCi/kg	Milk pCi/L	Fish pCi/kg	Crustacea pCi/kg
Np-237	0.000E+00	3.713E-02	3.713E-02	3.715E-02	3.714E-02	3.454E-03	1.485E-05	0.000E+00	0.000E+00
Pb-210	0.000E+00	1.394E-12	1.371E-12	1.438E-12	1.448E-12	1.362E-13	4.457E-14	0.000E+00	0.000E+00
Ra-226	0.000E+00	2.780E-11	2.790E-11	2.742E-11	2.757E-11	2.212E-12	1.865E-12	0.000E+00	0.000E+00
Th-229	0.000E+00	3.626E-10	3.619E-10	3.650E-10	3.663E-10	2.077E-11	1.028E-12	0.000E+00	0.000E+00
Th-230	0.000E+00	1.618E-10	1.615E-10	1.628E-10	1.634E-10	9.264E-12	4.586E-13	0.000E+00	0.000E+00
U-233	0.000E+00	6.313E-07	6.266E-07	6.428E-07	6.438E-07	5.816E-08	9.633E-08	0.000E+00	0.000E+00
U-234	0.000E+00	2.934E-06	2.936E-06	2.931E-06	2.936E-06	2.674E-07	4.489E-07	0.000E+00	0.000E+00
U-238	0.000E+00	3.382E-02	3.384E-02	3.386E-02	3.385E-02	3.082E-03	5.175E-03	0.000E+00	0.000E+00

*Concentrations are at consumption time and include radioactive decay and ingrowth during storage time.
For livestock fodder, consumption time is t minus meat or milk storage time.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Attachment 2 Sheet No. 6 of 11
Originator: S. W. Clark Date 3/30/11
Chk'd By M. W. Perrott Date 3/30/11
Calc. No. 0600X-CA-V0111 Rev. No. 0

ATTACHMENT 2

1RESRAD, Version 6.5 T« Limit = 180 days 02/16/2011 07:09 Page 7
Concent : 600-202 Alpha and Beta BHC Groundwater and River Protection
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD

Concentration of radionuclides in environmental media
at t = 1.000E+02 years

Radio-Nuclide	Contaminated Zone pCi/g	Surface Soil* pCi/g	Air Particulate pCi/m**3	Well Water pCi/L	Surface Water pCi/L
Np-237	1.524E-03	1.524E-03	1.245E-08	0.000E+00	0.000E+00
Pb-210	1.121E-11	1.121E-11	9.159E-17	0.000E+00	0.000E+00
Ra-226	2.390E-11	2.390E-11	1.953E-16	0.000E+00	0.000E+00
Th-229	3.667E-09	3.667E-09	2.996E-14	0.000E+00	0.000E+00
Th-230	1.658E-09	1.658E-09	1.355E-14	0.000E+00	0.000E+00
U-233	7.308E-07	7.308E-07	5.972E-12	0.000E+00	0.000E+00
U-234	3.484E-06	3.484E-06	2.847E-11	0.000E+00	0.000E+00
U-238	1.150E-02	1.150E-02	9.395E-08	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of radionuclides in foodstuff media
at t = 1.000E+02 years*

Radio-Nuclide	Drinking Water pCi/L	Nonleafy Vegetable pCi/kg	Leafy Vegetable pCi/kg	Fodder Meat pCi/kg	Fodder Milk pCi/kg	Meat pCi/kg	Milk pCi/L	Fish pCi/kg	Crustacea pCi/kg
Np-237	0.000E+00	3.048E-02	3.048E-02	3.049E-02	3.049E-02	2.836E-03	1.219E-05	0.000E+00	0.000E+00
Pb-210	0.000E+00	1.129E-10	1.122E-10	1.146E-10	1.148E-10	1.082E-11	3.581E-12	0.000E+00	0.000E+00
Ra-226	0.000E+00	9.551E-10	9.561E-10	9.514E-10	9.528E-10	7.663E-11	6.435E-11	0.000E+00	0.000E+00
Th-229	0.000E+00	3.672E-09	3.675E-09	3.684E-09	3.688E-09	2.091E-10	1.025E-11	0.000E+00	0.000E+00
Th-230	0.000E+00	1.660E-09	1.661E-09	1.666E-09	1.667E-09	9.451E-11	4.635E-12	0.000E+00	0.000E+00
U-233	0.000E+00	1.832E-06	1.829E-06	1.842E-06	1.843E-06	1.675E-07	2.801E-07	0.000E+00	0.000E+00
U-234	0.000E+00	8.712E-06	8.718E-06	8.716E-06	8.720E-06	7.940E-07	1.333E-06	0.000E+00	0.000E+00
U-238	0.000E+00	2.875E-02	2.877E-02	2.878E-02	2.878E-02	2.620E-03	4.399E-03	0.000E+00	0.000E+00

*Concentrations are at consumption time and include radioactive decay and ingrowth during storage time.
For livestock fodder, consumption time is t minus meat or milk storage time.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Attachment	2	Sheet No.	7 of 11
Originator:	S. W. Clark	Date	3/30/11
Chk'd By	M. W. Perrott	Date	3/30/11
Calc. No.	0600X-CA-V0111	Rev. No.	0

ATTACHMENT 2

1RESRAD, Version 6.5 T« Limit = 180 days 02/16/2011 07:09 Page 8
Concent : 600-202 Alpha and Beta BHC Groundwater and River Protection
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD

Concentration of radionuclides in environmental media
at t = 1.080E+02 years

Radio-Nuclide	Contaminated Zone pCi/g	Surface Soil* pCi/g	Air Particulate pCi/m**3	Well Water pCi/L	Surface Water pCi/L
Np-237	1.490E-03	1.490E-03	1.217E-08	3.704E-03	1.913E-05
Pb-210	1.462E-11	1.462E-11	1.195E-16	0.000E+00	0.000E+00
Ra-226	2.985E-11	2.985E-11	2.439E-16	0.000E+00	0.000E+00
Th-229	4.233E-09	4.233E-09	3.460E-14	2.129E-15	1.100E-17
Th-230	1.917E-09	1.917E-09	1.566E-14	0.000E+00	0.000E+00
U-233	7.775E-07	7.775E-07	6.353E-12	1.263E-09	6.524E-12
U-234	3.714E-06	3.714E-06	3.035E-11	0.000E+00	0.000E+00
U-238	1.129E-02	1.129E-02	9.222E-08	0.000E+00	0.000E+00

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of radionuclides in foodstuff media
at t = 1.080E+02 years*

Radio-Nuclide	Drinking Water pCi/L	Nonleafy Vegetable pCi/kg	Leafy Vegetable pCi/kg	Fodder Meat pCi/kg	Fodder Milk pCi/kg	Meat pCi/kg	Milk pCi/L	Fish pCi/kg	Crustacea pCi/kg
Np-237	3.705E-03	3.470E-02	5.315E-02	5.458E-02	5.492E-02	4.641E-03	2.179E-05	5.746E-04	7.661E-03
Pb-210	0.000E+00	1.473E-10	1.463E-10	1.494E-10	1.497E-10	1.411E-11	4.669E-12	0.000E+00	0.000E+00
Ra-226	0.000E+00	1.193E-09	1.194E-09	1.188E-09	1.190E-09	9.571E-11	8.037E-11	0.000E+00	0.000E+00
Th-229	2.405E-15	4.240E-09	4.243E-09	4.253E-09	4.257E-09	2.413E-10	1.183E-11	1.060E-15	5.778E-15
Th-230	0.000E+00	1.919E-09	1.921E-09	1.925E-09	1.927E-09	1.093E-10	5.356E-12	0.000E+00	0.000E+00
U-233	1.306E-09	1.951E-06	1.954E-06	1.981E-06	1.982E-06	1.790E-07	2.988E-07	1.128E-10	1.030E-09
U-234	0.000E+00	9.286E-06	9.292E-06	9.290E-06	9.294E-06	8.463E-07	1.421E-06	0.000E+00	0.000E+00
U-238	0.000E+00	2.822E-02	2.824E-02	2.825E-02	2.825E-02	2.572E-03	4.318E-03	0.000E+00	0.000E+00

*Concentrations are at consumption time and include radioactive decay and ingrowth during storage time.
For livestock fodder, consumption time is t minus meat or milk storage time.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Attachment	2	Sheet No.	8 of 11
Originator:	S. W. Clark	Date	3/30/11
Chk'd By	M. W. Perrott	Date	3/30/11
Calc. No.	0600X-CA-V0111	Rev. No.	0

ATTACHMENT 2

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1RESRAD, Version 6.5      T½ Limit = 180 days        02/16/2011  07:09  Page   9
 Concent : 600-202 Alpha and Beta BHC Groundwater and River Protection
 File    : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD
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Concentration of radionuclides in environmental media
at t = 1.300E+02 years

Radio-Nuclide	Contaminated Zone pCi/g	Surface Soil* pCi/g	Air Particulate pCi/m**3	Well Water pCi/L	Surface Water pCi/L
Np-237	1.400E-03	1.400E-03	1.144E-08	3.481E-03	1.798E-05
Pb-210	2.748E-11	2.748E-11	2.246E-16	5.241E-12	2.707E-14
Ra-226	5.081E-11	5.081E-11	4.152E-16	7.482E-12	3.865E-14
Th-229	5.965E-09	5.965E-09	4.875E-14	1.254E-14	6.479E-17
Th-230	2.712E-09	2.712E-09	2.216E-14	8.713E-15	4.501E-17
U-233	8.980E-07	8.980E-07	7.338E-12	1.497E-08	7.733E-11
U-234	4.312E-06	4.312E-06	3.523E-11	8.770E-09	4.530E-11
U-238	1.072E-02	1.072E-02	8.763E-08	2.186E-02	1.129E-04

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of radionuclides in foodstuff media
at t = 1.300E+02 years*

Radio-Nuclide	Drinking Water pCi/L	Nonleafy Vegetable pCi/kg	Leafy Vegetable pCi/kg	Fodder Meat pCi/kg	Fodder Milk pCi/kg	Meat pCi/kg	Milk pCi/L	Fish pCi/kg	Crustacea pCi/kg
Np-237	3.481E-03	3.261E-02	4.995E-02	5.204E-02	5.204E-02	4.413E-03	2.060E-05	5.395E-04	7.193E-03
Pb-210	5.286E-12	2.842E-10	3.086E-10	3.201E-10	3.111E-10	2.885E-11	9.523E-12	8.574E-12	2.864E-12
Ra-226	7.546E-12	2.041E-09	2.080E-09	2.081E-09	2.070E-09	1.673E-10	1.405E-10	2.041E-12	1.020E-11
Th-229	1.649E-14	5.973E-09	5.978E-09	5.992E-09	5.996E-09	3.398E-10	1.665E-11	8.164E-15	4.256E-14
Th-230	9.007E-15	2.715E-09	2.718E-09	2.723E-09	2.725E-09	1.545E-10	7.569E-12	4.841E-15	2.429E-14
U-233	1.501E-08	2.270E-06	2.342E-06	2.376E-06	2.376E-06	2.088E-07	3.493E-07	8.179E-10	5.239E-09
U-234	8.933E-09	1.080E-05	1.085E-05	1.090E-05	1.090E-05	9.858E-07	1.654E-06	5.118E-10	3.071E-09
U-238	2.187E-02	5.553E-02	1.644E-01	1.776E-01	1.776E-01	6.302E-03	1.118E-02	1.129E-03	6.777E-03

*Concentrations are at consumption time and include radioactive decay and ingrowth during storage time.
For livestock fodder, consumption time is t minus meat or milk storage time.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

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Originator:	S. W. Clark	Date	3/30/11
Chk'd By	M. W. Perrott	Date	3/30/11
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ATTACHMENT 2

1RESRAD, Version 6.5 T« Limit = 180 days 02/16/2011 07:09 Page 10
Concent : 600-202 Alpha and Beta BHC Groundwater and River Protection
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD

Concentration of radionuclides in environmental media
at t = 3.000E+02 years

Radio-Nuclide	Contaminated Zone pCi/g	Surface Soil* pCi/g	Air Particulate pCi/m**3	Well Water pCi/L	Surface Water pCi/L
Np-237	8.671E-04	8.671E-04	7.086E-09	2.156E-03	1.114E-05
Pb-210	3.891E-10	3.891E-10	3.180E-15	0.000E+00	0.000E+00
Ra-226	5.188E-10	5.188E-10	4.239E-15	0.000E+00	0.000E+00
Th-229	2.574E-08	2.574E-08	2.103E-13	7.914E-13	4.088E-15
Th-230	1.205E-08	1.205E-08	9.851E-14	1.083E-13	5.595E-16
U-233	1.513E-06	1.513E-06	1.236E-11	9.608E-08	4.963E-10
U-234	7.543E-06	7.543E-06	6.164E-11	4.247E-07	2.194E-09
U-238	7.227E-03	7.227E-03	5.906E-08	1.474E-02	7.612E-05

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of radionuclides in foodstuff media
at t = 3.000E+02 years*

Radio-Nuclide	Drinking Water pCi/L	Nonleafy Vegetable pCi/kg	Leafy Vegetable pCi/kg	Fodder Meat pCi/kg	Fodder Milk pCi/kg	Meat pCi/kg	Milk pCi/L	Fish pCi/kg	Crustacea pCi/kg
Np-237	2.156E-03	2.019E-02	3.093E-02	3.223E-02	3.222E-02	2.733E-03	1.275E-05	3.341E-04	4.454E-03
Pb-210	0.000E+00	3.910E-09	3.893E-09	3.949E-09	3.951E-09	3.726E-10	1.237E-10	0.000E+00	0.000E+00
Ra-226	0.000E+00	2.074E-08	2.075E-08	2.072E-08	2.073E-08	1.668E-09	1.399E-09	0.000E+00	0.000E+00
Th-229	8.162E-13	2.576E-08	2.580E-08	2.583E-08	2.584E-08	1.464E-09	7.161E-11	4.177E-13	2.098E-12
Th-230	1.188E-13	1.206E-08	1.208E-08	1.210E-08	1.210E-08	6.857E-10	3.354E-11	5.971E-14	3.023E-13
U-233	9.611E-08	3.912E-06	4.390E-06	4.464E-06	4.464E-06	3.627E-07	6.104E-07	4.990E-09	3.015E-08
U-234	4.248E-07	1.942E-05	2.155E-05	2.184E-05	2.184E-05	1.795E-06	3.024E-06	2.198E-08	1.319E-07
U-238	1.474E-02	3.742E-02	1.108E-01	1.197E-01	1.197E-01	4.247E-03	7.533E-03	7.612E-04	4.567E-03

*Concentrations are at consumption time and include radioactive decay and ingrowth during storage time.
For livestock fodder, consumption time is t minus meat or milk storage time.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Attachment	2	Sheet No.	10 of 11
Originator:	S. W. Clark	Date	3/30/11
Chk'd By	M. W. Perrott	Date	3/30/11
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ATTACHMENT 2

1RESRAD, Version 6.5 T« Limit = 180 days 02/16/2011 07:09 Page 11
Concent : 600-202 Alpha and Beta BHC Groundwater and River Protection
File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\600-202_ALPHA-BETA-BHC.RAD

Concentration of radionuclides in environmental media
at t = 1.000E+03 years

Radio-Nuclide	Contaminated Zone pCi/g	Surface Soil* pCi/g	Air Particulate pCi/m**3	Well Water pCi/L	Surface Water pCi/L
Np-237	1.205E-04	1.205E-04	9.849E-10	2.996E-04	1.548E-06
Pb-210	8.603E-09	8.603E-09	7.030E-14	9.198E-11	4.751E-13
Ra-226	9.323E-09	9.323E-09	7.619E-14	1.635E-10	8.444E-13
Th-229	1.313E-07	1.313E-07	1.073E-12	9.931E-12	5.130E-14
Th-230	6.795E-08	6.795E-08	5.553E-13	4.242E-12	2.191E-14
U-233	1.496E-06	1.496E-06	1.222E-11	2.100E-07	1.085E-09
U-234	8.395E-06	8.395E-06	6.861E-11	1.114E-06	5.753E-09
U-238	1.424E-03	1.424E-03	1.163E-08	2.903E-03	1.499E-05

*The Surface Soil is the top layer of soil within the user specified mixing zone/depth.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Concentration of radionuclides in foodstuff media
at t = 1.000E+03 years*

Radio-Nuclide	Drinking Water pCi/L	Nonleafy Vegetable pCi/kg	Leafy Vegetable pCi/kg	Fodder Meat pCi/kg	Fodder Milk pCi/kg	Meat pCi/kg	Milk pCi/L	Fish pCi/kg	Crustacea pCi/kg
Np-237	2.996E-04	2.807E-03	4.300E-03	4.480E-03	4.479E-03	3.799E-04	1.773E-06	4.643E-05	6.191E-04
Pb-210	9.199E-11	8.649E-08	8.665E-08	8.775E-08	8.776E-08	8.255E-09	2.745E-09	1.425E-10	4.761E-11
Ra-226	1.635E-10	3.731E-07	3.740E-07	3.739E-07	3.739E-07	3.009E-08	2.525E-08	4.221E-11	2.111E-10
Th-229	9.985E-12	1.314E-07	1.316E-07	1.317E-07	1.317E-07	7.462E-09	3.646E-10	5.149E-12	2.577E-11
Th-230	4.269E-12	6.799E-08	6.812E-08	6.816E-08	6.816E-08	3.862E-09	1.887E-10	2.201E-12	1.101E-11
U-233	2.100E-07	4.017E-06	5.064E-06	5.194E-06	5.193E-06	3.780E-07	6.403E-07	1.085E-08	6.513E-08
U-234	1.114E-06	2.246E-05	2.801E-05	2.869E-05	2.869E-05	2.110E-06	3.572E-06	5.753E-08	3.452E-07
U-238	2.903E-03	7.371E-03	2.183E-02	2.358E-02	2.358E-02	8.366E-04	1.484E-03	1.499E-04	8.996E-04

*Concentrations are at consumption time and include radioactive decay and ingrowth during storage time.
For livestock fodder, consumption time is t minus meat or milk storage time.

Concentrations in the media occurring in pathways that are suppressed are calculated using the current input parameters, i.e. using parameters appearing in the input screen when the pathways are active.

Attachment	2	Sheet No.	11 of 11
Originator:	S. W. Clark	Date	3/30/11
Chk'd By	M. W. Perrott	Date	3/30/11
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APPENDIX E

DATA QUALITY ASSESSMENT

APPENDIX E

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 logbooks (WCH 2010a, 2011), and applicable analytical data packages has been performed as part of this DQA. All samples were collected and analyzed per the sample design, with one exception. The sample for EXS-5 was moved from the location specified in the sample design (WCH 2010b) due to the abundance of sea shells present. The location for the sample at EXS-5 was at approximate Washington State Plane coordinates N 137868.0, E 588512.0.

To ensure quality data, the SAP data assurance requirements and the data validation procedures for chemical analysis (BHI 2000) are used as appropriate. This review involves evaluation of the data to determine if they are of the right type, quality, and quantity to support the intended use (i.e., closeout decisions). The DQA completes the data life cycle (i.e., planning, implementation, and assessment) that was initiated by the data quality objectives process (EPA 2006).

Verification sample data collected at the 600-202 waste site were provided by the laboratories in four sample delivery groups (SDGs): SDG K2681, SDG K2700, SDG K2721, and SDG KP0038. SDG K2681 was submitted for third-party validation. No major deficiencies were identified in the analytical data set. Minor deficiencies are discussed for the 600-202 data set, as follows below. If no comments are made about a specific analysis, it should be assumed that no deficiencies affecting the quality of the data were found.

SDG K2681

This SDG comprises 13 verification soil samples (J1C3W7 through J1C3W9, J1C3X0 through J1C3X9) from the 600-202 large excavation, and a focused sample (J1C422). This SDG includes a field duplicate pair (J1C3W7/J1C3X9). These samples were analyzed for inductively coupled plasma (ICP) metals, hexavalent chromium, pesticides, polycyclic aromatic hydrocarbons (PAH), and total petroleum hydrocarbons (TPH). In addition, one equipment blank (J1C424) was collected and analyzed for ICP metals. SDG K2681 was submitted for third-party validation. Minor deficiencies are as follows:

In the TPH analysis, all of the motor oil data in SDG K2681 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 pesticides analysis, all of the toxaphene data in SDG K2681 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 pesticides analysis, a surrogate recovery was above quality control (QC) limits for samples J1C3W8, J1C3W9, J1C3X0, J1C3X1, J1C3X2, and J1C3X5. Third-party validation qualified all detected pesticide results for these samples as estimated with "J" flags. 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 six analytes (aluminum, calcium, iron, manganese, antimony, and silicon). For most of these analytes the spiking concentration was insignificant compared to the native concentration in the sample from which the MS was prepared. The deficiency in the MS is a reflection of the analytical variability of the native concentration rather than a measure of the recovery from the sample. Antimony and calcium did not have mismatched spike and native concentrations in the original MS. The original MS recoveries for antimony and calcium were 49% and 154%, respectively. All antimony and calcium data for SDG K2681 were considered estimated and flagged "J" by third-party validation due to the MS recoveries outside the QC limits. Estimated data are usable for decision-making purposes.

SDG K2700

This SDG comprises 13 verification soil samples (J1C3Y0 through J1C3Y9, J1C400 through J1C402) from the 600-202 small excavation. This SDG includes a field duplicate pair (J1C3Y3/J1C402). These samples were analyzed for ICP metals, pesticides, PAH, and TPH. Minor deficiencies are as follows:

In the TPH analysis, all of the motor oil data in SDG K2700 may be considered estimated due to lack of an MS, MSD, and LCS analysis. Estimated data are acceptable for decision-making purposes.

In the ICP metals analysis, the MS recoveries were out of project acceptance criteria for five analytes (aluminum, calcium, iron, antimony, and silicon). For aluminum, iron, and silicon the spiking concentration was insignificant compared to the native concentration in the sample from which the MS was prepared. The deficiency in the MS is a reflection of the analytical variability of the native concentration rather than a measure of the recovery from the sample. Antimony and calcium did not have mismatched spike and native concentrations in the original MS. The original MS recoveries for antimony and calcium were 59% and 50%, respectively. All antimony and calcium data for SDG K2700 may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the calcium and silicon laboratory duplicate relative percent difference (RPD) are above QC limits at 39% and 38%, respectively. The calcium and silicon data may be considered estimated. The data are acceptable for decision-making purposes.

In the pesticides analysis, all of the toxaphene data in SDG K2700 may be considered estimated due to lack of an MS, MSD, and LCS analysis. Estimated data are acceptable for decision-making purposes.

In the pesticides analysis, the MS and MSD for 4,4'-DDD are above the QC criteria at 157% and 164%, respectively. The 4,4'-DDD sample results for SDG K1700 may be considered estimated. The data are acceptable for decision-making purposes.

SDG K2721

This SDG comprises 13 verification soil samples (J1C409 through J1C420) from the 600-202 staging pile area, and a focused sample (J1C423). This SDG includes a field duplicate pair (J1C411/J1C421). These samples were analyzed for ICP metals, hexavalent chromium, pesticides, PAH, and TPH. Minor deficiencies are as follows:

In the TPH analysis, all of the motor oil data in SDG K2721 may be considered estimated due to lack of an MS, MSD, and LCS analysis. Estimated data are acceptable for decision-making purposes.

In the TPH analysis, all of the diesel range organic data in SDG K2721 may be considered estimated due to an MS recovery below the QC criteria at 33%, and an MS/MSD RPD above the acceptance criteria at 99%. Estimated data are acceptable for decision-making purposes.

In the PAH analysis, the pyrene results for SDG K2721 may be considered estimated due to an MS recovery below the QC criteria at 46%, and an MS/MSD RPD above the acceptance criteria at 41%. In addition the chrysene results may be considered estimated due to an MSD recovery below the QC criteria at 44%. Estimated data are acceptable for decision-making purposes.

In the ICP metals analysis, the MS recoveries were out of project acceptance criteria for 12 analytes (aluminum, boron, calcium, copper, iron, lead, magnesium, manganese, antimony, silicon, vanadium, and zinc). For aluminum, calcium, iron, manganese, and silicon the spiking concentration was insignificant compared to the native concentration in the sample from which the MS was prepared. The deficiency in the MS is a reflection of the analytical variability of the native concentration rather than a measure of the recovery from the sample. Antimony, boron, copper, lead, magnesium, vanadium, and zinc did not have mismatched spike and native concentrations in the original MS. The original MS recoveries for antimony, boron, copper, lead, magnesium, vanadium, and zinc were 40%, 69%, 147%, 66%, 60%, 54%, and 30%, respectively. All antimony, boron, copper, lead, magnesium, vanadium, and zinc data for SDG K2721 may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the boron, calcium, and lead laboratory RPD are above QC limits at 36%, 51%, and 44%, respectively. The boron, calcium, and lead data may be considered estimated. The data are acceptable for decision-making purposes.

SDG KP0038

This SDG comprises three verification soil samples (J1DWX0 through J1DWX2). These samples were taken to replace the TPH results for samples J1C410, J1C411, and J1C413 from the staging pile area, following further remediation at the sample locations. Minor deficiencies are as follows:

A surrogate recovery was below QC limits for sample J1DWX0; therefore, the results for the sample may be considered estimated. The data are acceptable for decision-making purposes.

All of the motor oil data in SDG KP0038 may be considered estimated due to lack of an MS, MSD, and LCS analysis. Estimated data are acceptable for decision-making purposes.

All of the diesel range organic data may be considered estimated due to an MSD recovery below the QC criteria at 43%, and an MS/MSD RPD above the acceptance criteria at 69%. Estimated data are acceptable 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 control/quality assurance (QA/QC) measures are used to assess potential sources of error and cross contamination of samples that could bias results. Field QA/QC samples, listed in the field logbooks (WCH 2010a, 2011), are shown in Table D-1. The main and QA/QC sample results are presented in Appendix C.

Table D-1. Field Quality Assurance/Quality Control Samples.

Sample Area	Main Sample	Duplicate Sample
Large excavation	J1C3W7	J1C3X9
Small excavation	J1C3Y3	J1C402
Staging pile area	J1C409	J1C421

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 5 times the target detection limit (TDL). RPDs of analytes detected at low concentrations (less

than 5 times the detection limit) are not considered to be indicative of the analytical system performance. The calculation brief in Appendix C provides details on duplicate pair evaluation and RPD calculation.

The RPDs calculated for calcium, lead, silicon, and chrysene in the staging pile area duplicate sample (J1C421) are above the acceptance criteria of 30% at 35.8%, 42.1%, 32.6%, and 31.3%, respectively. A secondary check of the data variability is used when one or both of the samples being evaluated (main and duplicate) is less than 5 times the TDL, including undetected analytes. In these cases, a control limit of ±2 times the TDL is used (Appendix C) to indicate that a visual check of the data is required by the reviewer. The acenaphthylene primary and duplicate sample results in the staging pile area required this check. A visual inspection of all of the data is also performed. No additional major or minor deficiencies are noted. The data are usable for decision-making purposes.

SUMMARY

Limited, random, or sample matrix-specific influenced batch QC issues such as those discussed above, are a potential for any analysis. The number and types seen in these data sets are within expectations for the matrix types and analyses performed. The DQA review of the 600-202 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 600-202 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 C.

REFERENCES

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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.

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WCH, 2010a, *IU-2/6 Remaining Sites Sampling and Field Activities*, Logbook EL-1643-03, pp. 49-50, 52-53, and 55-56, Washington Closure Hanford, Richland, Washington.

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WCH, 2011, *IU-2/6 Remaining Sites Sampling and Field Activities*, Logbook EL-1643-04, pp. 12-13, Washington Closure Hanford, Richland, Washington.