Date Submitted: 4/10/07 Originator: L. M. Dittmer Phone: 372-9664	**WASTE SITE RECLASSIFICATION FORM** Operable Unit(s): 100-BC-2 Waste Site Code: 100-C-9:2 Type of Reclassification Action: Closed Out ☐ Interim Closed Out ☒ No Action ☐ RCRA Postclosure ☐ Rejected ☐ Consolidated ☐	Control Number: 2004-013

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

Description of current waste site condition:

The 100-C-9:2 sanitary sewer pipelines include the feeder pipelines associated with the 1607-B8, the 1607-B9, the 1607-B10 and the 1607-B11 Septic Systems. Remedial actions and verification sampling at the subsite have been performed in accordance with remedial action objectives and goals established by the *Interim Action Record of Decision for the 100-BC-1, 100 BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD), U.S. Environmental Protection Agency, Region 10, Seattle, Washington. The selected action involved (1) evaluating the site using available process information and confirmatory sample data, (2) remediating the subsite, (3) demonstrating through verification sampling that cleanup goals have been met, and (4) proposing the site for reclassification as Interim Closed Out.

Basis for reclassification:

Contaminated soil and piping from the feeder lines to the former 1607-B8, 1607-B9, 1607-B10 and 1607-B11 Septic Systems were removed and disposed of. The remaining soil in the excavations has been shown to meet the remedial action objectives specified in the Remaining Sites ROD. The results of verification sampling demonstrated that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow-zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also showed that residual contaminant concentrations are protective of groundwater and the Columbia River. This subsite does not have a deep zone; therefore, no deep zone institutional controls are required. The basis for reclassification is described in detail in the *Remaining Sites Verification Package for the 100-C-9:2 Sanitary Sewer Pipeline* (attached).

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.

K. D. Bazzell DOE Federal Project Director (printed)	Signature	6/8/2007 Date
Ecology Project Manager (printed)	Signature	Date
D. A. Faulk EPA Project Manager (printed)	Signature	7/11/07 Date

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-C-9:2 SANITARY SEWER PIPELINES

Attachment to Waste Site Reclassification Form 2004-013

July 2007

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-C-9:2 SANITARY SEWER PIPELINES

EXECUTIVE SUMMARY

The 100-C-9:2 subsite is located within the 100-BC-2 Operable Unit in the 100-B/C Area of the Hanford Site. The 100-C-9:2 sanitary sewer pipelines include the feeder pipelines associated with the 1607-B8, 1607-B9, 1607-B10 and 1607-B11 Septic Systems. The septic tanks, drain fields, and contaminated soil for these four systems were removed between March and May 2003. Historic information suggesting contamination at the 1607-B8 pipeline site and the proximity of 1607-B10 and 1607-B11 pipeline sites to the 100-C-7 waste site drove the requirement for remedial action at these three areas. Confirmatory sampling at the 1607-B9 pipelines site in September 2003 indicated contamination, thus requiring remedial action at this site as well.

Remediation of the site was performed from early 2005 to September 2006, consisting of the removal of approximately 3,701 metric tons (4,080 U.S. tons) of sanitary sewer pipeline and soil from the subsite, transporting and disposal of such at the Environmental Restoration Disposal Facility (ERDF). Verification sampling of the subsite was performed between April 25, 2006, and September 29, 2006. The results indicated that the waste removal action achieved compliance with the remedial action objectives established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2005b) and the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units,* Hanford Site, Benton County, Washington (Remaining Sites ROD) (EPA 1999). The results for the 100-C-9:2 pipeline site show that residual contaminant concentrations do not exceed cleanup levels for direct exposure (i.e., ingestion and inhalation of the soil) or protection of groundwater and the Columbia River. Accordingly, an interim closure reclassification is supported for the 100-C-9:2 subsite. The site does not have a deep zone or residual contaminant concentrations that would require any institutional controls.

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 100-C-9:2 subsite in accordance with the TPA-MP-14 (DOE-RL 2007) procedure.

Soil cleanup levels were established in the Remaining Sites ROD (EPA 1999) based on a limited ecological risk assessment. Although not required by the Remaining Sites ROD, a comparison against ecological risk screening levels was made for the site contaminants of concern, contaminants of potential concern, and other constituents. Ecological screening levels were exceeded for antimony, boron, cadmium, chromium, copper, lead, mercury, vanadium, and zinc. Exceedance of screening values does not necessarily indicate the existence of risk to ecological receptors. Residual concentrations of antimony, cadmium, and vanadium are below site background levels, and boron concentrations are consistent with those seen elsewhere at the

Hanford Site (no established background value is available). Concentrations of chromium, copper, lead, mercury, and zinc are within the range of Hanford Site background levels. All exceedances at the site will be evaluated in the context of additional lines of evidence for ecological effects following a baseline risk assessment for the river corridor portion of the Hanford Site, which includes a more complete quantitative ecological risk assessment. That baseline risk assessment will be used to support the final closeout decision for the 100-C-9 site.

Table ES-1. Summary of Remedial Action Goals for the 100-C-9:2 Pipelines. (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.	Only cesium-137 was detected, but at a level below the corresponding single-radionuclide 15 mrem/yr dose-equivalence value.	Yes
Direct Exposure – Nonradionuclides	Attain individual COC/COPC RAGs.	All individual COC/COPC concentrations are below direct exposure RAGs.	Yes
Risk Requirements – Nonradionuclides	Attain a hazard quotient of <1 for all individual noncarcinogens.	All individual hazard quotients are <1.	Yes
	Attain a cumulative hazard quotient of <1 for noncarcinogens.	The cumulative hazard quotient for each of the four sanitary sewer pipelines is <1.	Yes
	Attain an excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens.	All individual excess cancer risk values are $<1 \times 10^{-6}$.	
	Attain a cumulative excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.	The total excess cancer risk for each of the four sanitary sewer pipelines is $<1 \times 10^{-5}$.	

Table ES-1. Summary of Remedial Action Goals for the 100-C-9:2 Pipelines. (2 Pages)

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Groundwater/River Protection – Radionuclides	Attain single COC/COPC groundwater and river protection RAGs.	All radionuclide COC/COPC concentrations are below groundwater and river protection lookup values.	Yes
	Attain national primary drinking water standards:[a] 4 mrem/yr (beta/gamma) dose rate to target receptor/organs.		N/A
	Meet drinking water standards for alpha emitters: the most stringent of 15 pCi/L MCL or 1/25th of the derived concentration guides from DOE Order 5400.5.[b]	No alpha-emitting radionuclide COC/COPC were identified for the 100-C-9:2 pipelines site.	
	Meet total uranium standard of 30 µg/L (21.2 pCi/L).[c]	Uranium was not identified as a COC/COPC for the 100-C-9:2 pipelines site.	N/A
Groundwater/River Protection – Nonradionuclides	Attain individual nonradionuclide groundwater and river cleanup requirements.	Residual concentrations of multiple metals, polychlorinated biphenyls, and chlorinated pesticides are above soil RAGs for groundwater and/or river protection in one or more site sampling areas. However, results of vertical migration modeling predict that these constituents will not reach groundwater (and, therefore, the Columbia River) within 1,000 years.[d]	Yes

[a] "National Primary Drinking Water Regulations" (40 *Code of Federal Regulations* 141).
[b] *Radiation Protection of the Public and the Environment* (DOE Order 5400.5).
[c] Based on the isotopic distribution of uranium in the 100 Areas, 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] *100 Area Analogous Sites RESRAD Calculations* (BHI 2005).

COC = contaminant of concern
COPC = contaminant of potential concern
MCL = maximum contaminant level
N/A = not applicable
RAG = remedial action goal
RESRAD = RESidual RADioactivity (dose model)

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-C-9:2 SANITARY SEWER PIPELINES

STATEMENT OF PROTECTIVENESS

This report demonstrates that the 100-C-9:2 waste site meets the objectives for interim closure as established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (hereinafter referred to as the RDR/RAWP) (DOE-RL 2005b) 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 (hereinafter referred to as the Remaining Sites ROD) (EPA 1999). The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are sufficiently protective of groundwater and the Columbia River to preclude further remedial action. No institutional controls are required for the site.

Soil cleanup levels were established in the Remaining Sites ROD (EPA 1999) based on a limited ecological risk assessment. Although not required by the Remaining Sites ROD, a comparison against ecological risk screening levels has been made for the site contaminants of concern (COC), contaminants of potential concern (COPC), and other constituents. Ecological screening levels were exceeded for antimony, boron, cadmium, total chromium, copper, lead, mercury, vanadium, and zinc. Exceedance of screening values does not necessarily indicate the existence of risk to ecological receptors. Residual concentrations of antimony, cadmium, total chromium, copper, lead, mercury, vanadium, and zinc are within the range of Hanford Site background levels, and boron concentrations are consistent with those seen elsewhere at the Hanford Site (no established background value is available). Concentrations of chromium, copper, lead, mercury, and zinc are within the range of Hanford Site background levels. All exceedances of screening values at the 100-C-9:2 waste site will be evaluated in the context of additional lines of evidence for ecological effects following a baseline risk assessment for the river corridor portion of the Hanford Site, which includes a more complete quantitative ecological risk assessment. That baseline risk assessment will be used to support the final closeout decision for the 100-C-9 site.

GENERAL SITE INFORMATION AND BACKGROUND

The 100-C-9 waste site includes the underground sanitary and process sewers and process lines associated with the 100-C Area pre-reactor water treatment facilities that operated from 1952 to 1969. It also includes the treated cooling water pipelines and tunnels between the 190-C Building and the 105-C Reactor. The 100-C-9 waste site was divided into four subsites based on the intended use of the pipe (e.g., sanitary or process sewer), expected sources of contamination, and potentially different remedial decisions.

The four subsites are:

- 100-C-9:1 main process sewer
- 100-C-9:2 sanitary sewers
- 100-C-9:3 clearwell pipes
- 100-C-9:4 cooling water pipelines/tunnels servicing the 105-C Reactor.

This document addresses the 100-C-9:2 subsite only. Subsite 100-C-9:2 is a collection of the feeder pipelines for the former 1607-B8, 1607-B9, 1607-B10, and 1607-B11 septic systems (Figure 1). Each of the systems consisted of a septic tank, vitrified clay sanitary sewer pipe and a drain field.

The piping details and tank capacities varied by site, as shown in Table 1.

Table 1. Septic System Details

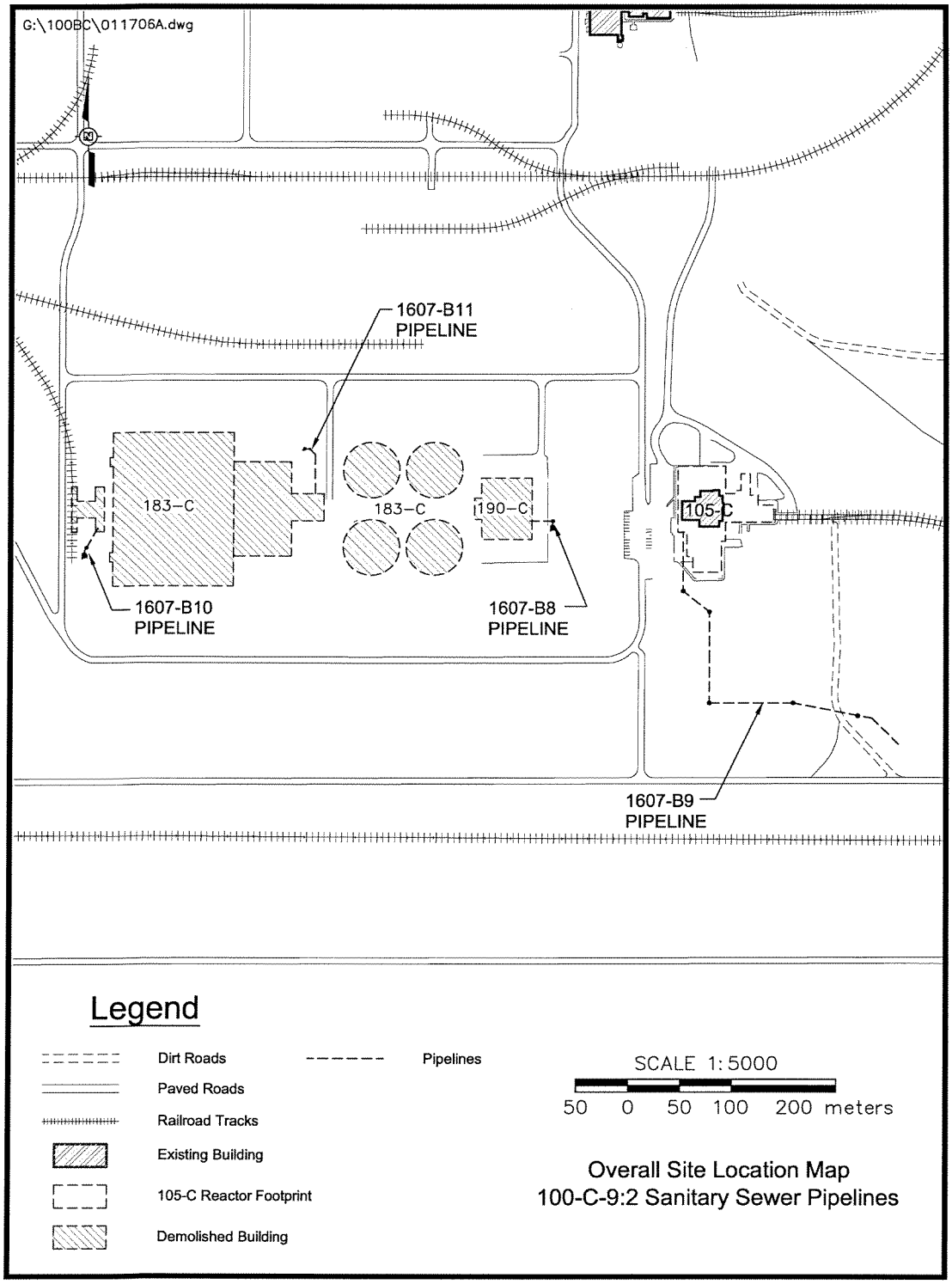
Septic System	Facility Serviced	Drain Field Located	Tank Capacity	Pipe Diameter	Piping Length
1607-B8	190-C pump house	East of building	1,325 L (350 gal)	15-cm (6 in.)	21 m (69 ft)
1607-B9	105-C Reactor	Southeast of building	9,085 L (2,400 gal)	20-cm (8 in.)	340 m (1,114 ft)
1607-B10	183-C Filter Building head house	South of building	1,325 L (350 gal)	20-cm (8 in.)	25 m (84 ft)
1607-B11	183-C Filter Building pumphouse	North of building	1,325 L (350 gal)	15-cm (6 in.)	46 m (150 ft)

The septic system (septic tank and drain field) and underlying contaminated soil were removed at all four locations between March and May 2003 and disposed of at the Environmental Restoration Disposal Facility (ERDF). The cleanup at each of the four septic systems achieved all of the remedial action objectives and goals for direct exposure, protection of groundwater, and protection of the Columbia River (BHI 2003a, BHI 2003b, BHI 2003c and BHI 2003d). The feeder pipelines outside the septic system excavation limits were left in place to be addressed during the 100-C-9:2 pipelines confirmatory evaluation and subsequent remedial actions and is the subject of this report.

CONFIRMATORY SAMPLING ACTIVITIES

Confirmatory sampling conducted at the 1607-B9 pipelines site in September 2003 revealed that remedial action was necessary (BHI 2003e). A decision for remediation was made for the 1607-B8 feeder line based on the presence of lead joints and for the 1607-B10 and 1607-B11 feeder lines due to co-location of these pipelines within the 100-C-7 waste site. Therefore, no confirmatory sampling activities were performed for these feeder lines (BHI 2003e).

Figure 1. Map of the 100-C-9:2 Sanitary Sewer Lines.



Confirmatory Sampling of the 1607-B9 Pipeline

Confirmatory sampling was conducted at the 1607-B9 pipeline site in September 2003 to determine if remedial action was necessary at the site. A focused sampling approach was selected for this site, which was biased toward worst-case sample locations and locations that were accessible (BHI 2003e).

Contaminants of Potential Concern

The COPC for the 1607-B9 pipeline were identified through process knowledge and analogous site data. The COPC for this site consisted of inductively coupled plasma (ICP) metals, hexavalent chromium, pesticides, polychlorinated biphenyls (PCBs), and semivolatile organic compounds. Radiological screening was also performed using gross alpha, gross beta, and gamma energy analyses.

Confirmatory Sample Design

The sample design called for samples to be taken at three manholes (sample locations A1, A2, and A3) and at the end of the pipeline that was exposed by remediation of the 1607-B9 septic system (sample locations A4 and A5). Sample location A1 did not have sufficient sediment or pipe-scale material to sample (BHI 2003f). Sediment and pipe scale from an alternate location 30 m (100 ft) northwest of A1 was collected and combined with sediment and pipe scale from location A1. The sampling approach consisted of collecting a sample of sediment from each of three manholes (A1, A2, and A3), one soil sample (A5), and one pipe matrix sample (A4) from the end of the pipe at the previously excavated 1607-B9 Septic Tank and Drain Field (WCH 2006a).

Table 2 provides a sample summary, and the sample locations are shown in Figure 2.

Confirmatory Sample Results

The samples were analyzed by offsite contract laboratories using U.S. Environmental Protection Agency (EPA) approved analytical methods (DOE-RL 2005a), and the results were compared to the cleanup criteria specified in the RDR/RAWP (DOE-RL 2005b). The laboratory results are stored in the Environmental Restoration (ENRE) project-specific database prior to being provided to the Hanford Environmental Information System (HEIS). The results are attached to this document as Appendix A, as well as summarized below.

The pipe scale analytical laboratory data resulted in the site exceeding action levels for: benzo(a)anthracene (direct exposure, groundwater and river protection remedial action goals [RAGs]); benzo(a)pyrene (direct exposure, groundwater and river protection RAGs); benzo(b)fluoranthene (direct exposure, groundwater and river protection RAGs); benzo(k)fluoranthene (direct exposure, groundwater and river protection RAGs); chrysene

Figure 2. Sampling Locations at the 1607-B9 Feeder Line.

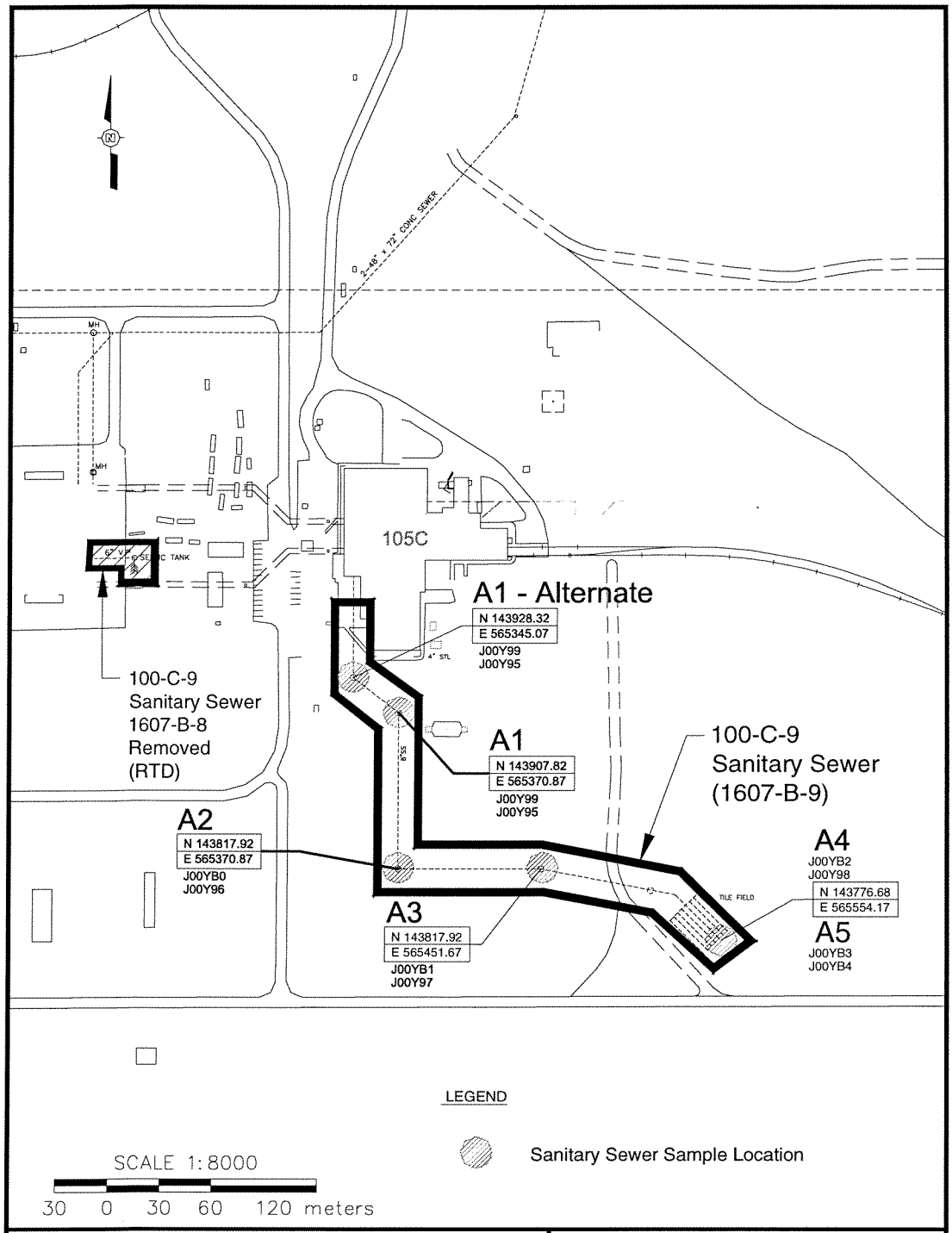


Table 2. Sample Summary Table[a]. (2 Pages)

Sample Designator	Sampling Access	Sample Location	WSP Coordinates	Sample Media	Sample Number	Sample Analyses
A1	Manhole	Bottom of manhole 3 m (10 ft) bgs	N 143928.32, E 565345.07 and N 143907.82, E 565370.87	Sediment samples collected from manholes A1 and A1 alternate (located approx. 100 ft NW of A1). Silt/sand, some pipe scale.	J00Y99	ICP metals, mercury, pesticides, PCBs, SVOA, GEA, gross alpha, gross beta
					J00Y95	hexavalent chromium
A2	Manhole	Bottom of manhole 3 m (10 ft) bgs	N 143817.92, E 565370.87	Sediment sample from manhole. Sample very dry sand/silt, clumps of light-weight compacted material, some mortar.	J00YB0	ICP metals, mercury, pesticides, PCBs, SVOA, GEA, gross alpha, gross beta
					J00Y96	hexavalent chromium
A3	Manhole	Bottom of manhole 3 m (10 ft) bgs	N 143817.92, E 565451.67	Sediment sample from manhole, very dry, light-weight, compacted material.	J00YB1	ICP metals, mercury, pesticides, PCBs, SVOA, GEA, gross alpha, gross beta
					J00Y97	hexavalent chromium
A4	20 cm (8 in.) Vitrified-Clay Pipe	3 m (10 ft) bgs	N 143776.68, E 565554.17	No sediment in pipe; sample pieces of 20 cm (8 in.) vitrified-clay pipe.	J00YB2	ICP metals, mercury, pesticides, PCBs, SVOA, GEA, gross alpha, gross beta
					J00Y98	hexavalent chromium
A5	Trench Beneath A4	3 m (10 ft) bgs	N 143776.68, E 565554.17	Dry rust-colored soil beneath pipe joint.	J00YB3	ICP metals, mercury, hexavalent chromium, pesticides, PCBs, SVOA, GEA, gross alpha, gross beta

Table 2. Sample Summary Table[a]. (2 Pages)

Sample Designator	Sampling Access	Sample Location	WSP Coordinates	Sample Media	Sample Number	Sample Analyses
Equipment blank	N/A	N/A	N/A	Silica Sand	J00YB5	ICP metals, mercury, hexavalent chromium, pesticides, PCBs, SVOA
Duplicate	Trench Beneath A4	3 m (10 ft) bgs	N 143776.68, E 565554.17	Duplicate of J00YB3	J00YB4	ICP metals, mercury, hexavalent chromium, pesticides, PCBs, SVOA, GEA, gross alpha, gross beta

[a] Logbook EL-1578-1 (BHI 2003f).

bgs = below ground surface
GEA = gamma energy analysis
ICP = inductively coupled plasma
N/A = not applicable
PCB = polychlorinated biphenyl
SVOA = semivolatile organic analysis
WSP = Washington State Plane

(direct exposure, groundwater and river protection RAGs); dibenz(a,h)anthracene (direct exposure, groundwater and river protection RAGs); and indeno(1,2,3-cd)pyrene (direct exposure, groundwater and river protection RAGs) indicating that site remediation (remove, treat, and dispose [RTD]) was required. These pipe scale constituents were retained as COC/COPC for verification sampling. Hexavalent chromium was also retained as a COPC for verification sampling, based on a review of data quality issues associated with sample matrix interference for some of the confirmatory samples.

Other contaminants (i.e., cobalt-60, antimony, arsenic, barium, cadmium, total chromium, copper, lead, manganese, mercury, nickel, selenium, silver, zinc, aroclor-1254, 4'4' DDE, 4'4' DDT, and carbazole), were retained as COC/COPC for verification sampling, since they were present at concentrations above the applicable RAGs.

Based on the results of confirmatory sampling, remedial action was deemed necessary at the pipeline (Feist 2004).

REMEDIAL ACTION SUMMARY

Remedial action for the subsite 100-C-9:2 began in early 2005 and concluded on September 29, 2006. The cleanup associated with each of the four feeder pipelines is summarized below. The extent of remediation for each of the four septic system pipelines is shown in Figures 3 through 6.

The pipeline from the 1607-B8 septic system was removed between March 23, 2005 and April 13, 2005. The site was excavated 2 m (6.6 ft) below grade and the waste was direct loaded with 266 metric tons (293 U.S. tons) of material disposed of at ERDF. The resulting trench was approximately 9 m (29.5 ft) in length by 3.5 m (11.5 ft) wide.

Remediation of the 1607-B9 pipeline was initiated on May 23, 2005 and continued through July 11, 2005. The overburden was removed from the site and stockpiled to the east of the excavation. The site was excavated to 3.5 m (11.5 ft) below grade and the waste was direct loaded with 2,626 metric tons (2,895 U.S. tons) of material disposed of at ERDF. An additional 310 metric tons (342 U.S. tons) was removed on September 29, 2006, following detection of strontium-90 above the cleanup criterion in one verification sample. During excavation of the pipeline on May 25, 2005, an anomaly was discovered within the 1607-B9 pipeline excavation. A reddish-brown material was discovered after a concrete structure was removed. Radiological readings were all at background levels. A sample (J03701) of the material was collected and analyzed for total metals, leachable metals (toxicity characteristic leaching procedure [TCLP]), and semivolatile organic compounds (SVOCs) to support waste characterization and disposal. There were no significant metal or SVOC concentrations associated with this anomaly (WCH 2006a). Refer to Table A-2 of Appendix A for a summary of the results.

The 1607-B10 pipeline was removed by March 2005. Approximately 9 m (29.5 ft) of sanitary sewer pipeline and an estimated 45 metric tons (50 U.S. tons) of material was removed and sent to ERDF. The resulting trench was approximately 9 m (29.5 ft) in length by 3.5 m (11.5 ft) wide.

Figure 3. Post-Excavation Footprint for the 1607-B8 Pipelines.

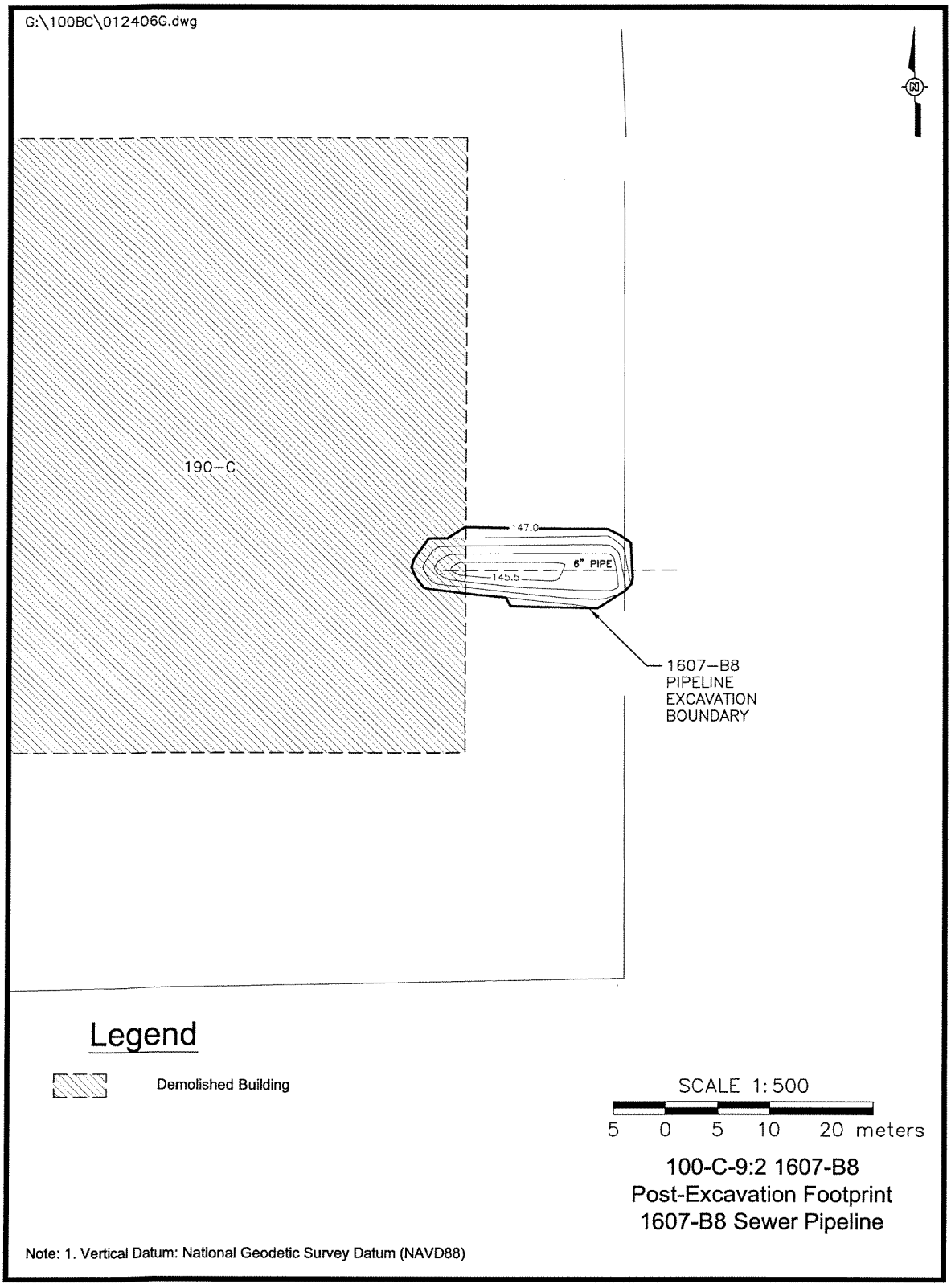


Figure 6. Post- Excavation Footprint for the 1607-B9 Pipelines.

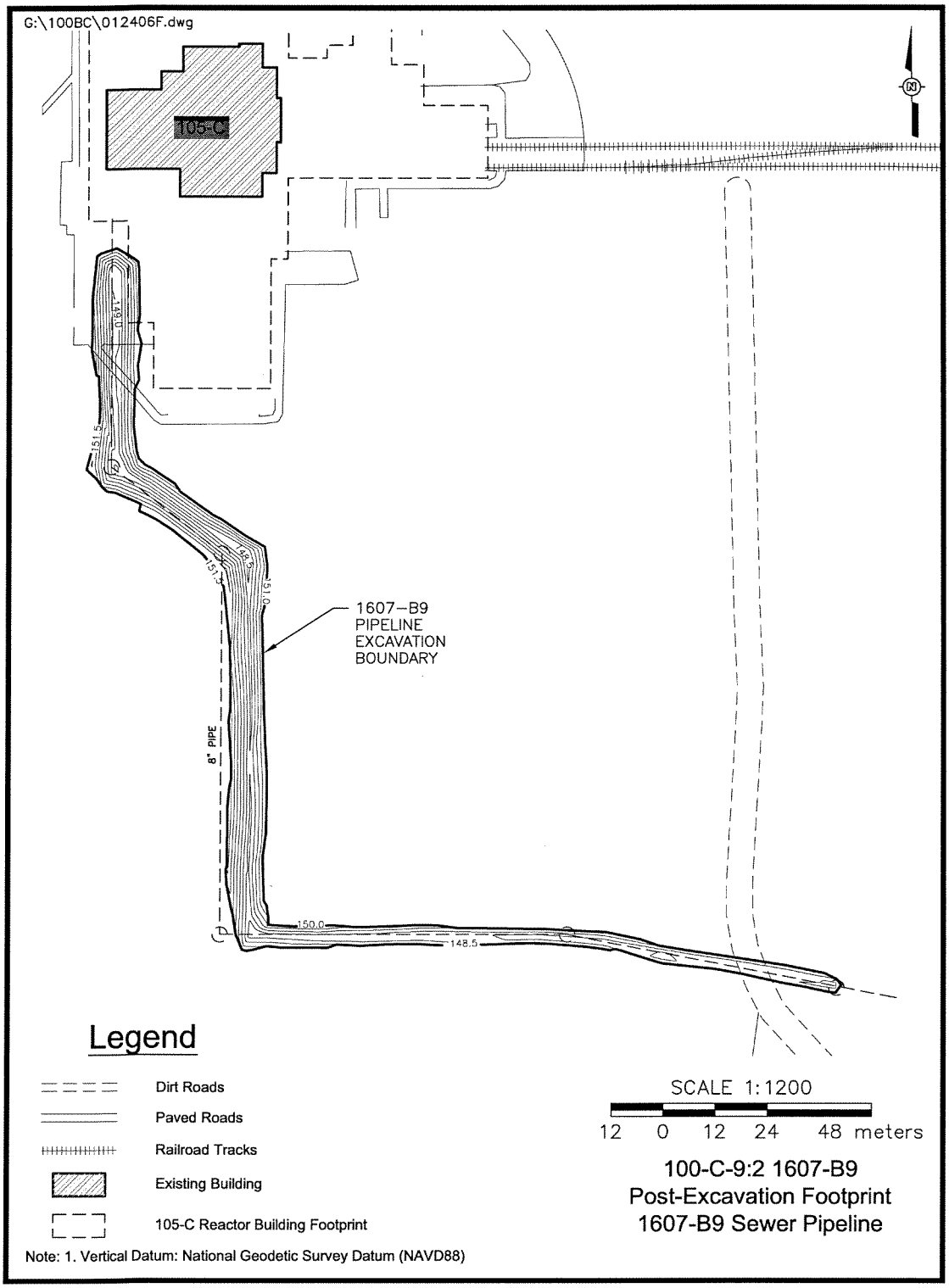


Figure 4. Post- Excavation Footprint for the 1607-B10 Pipelines.

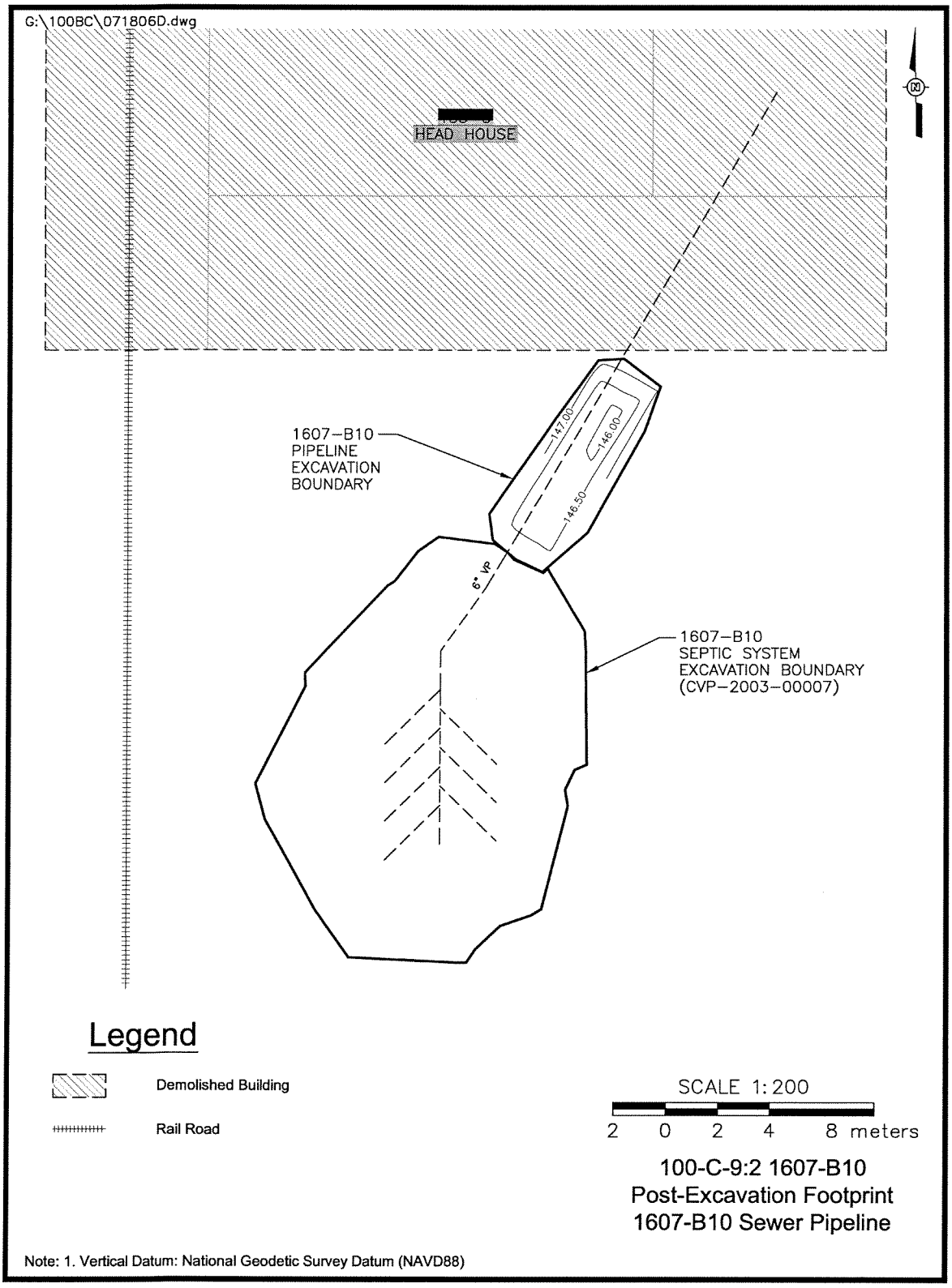
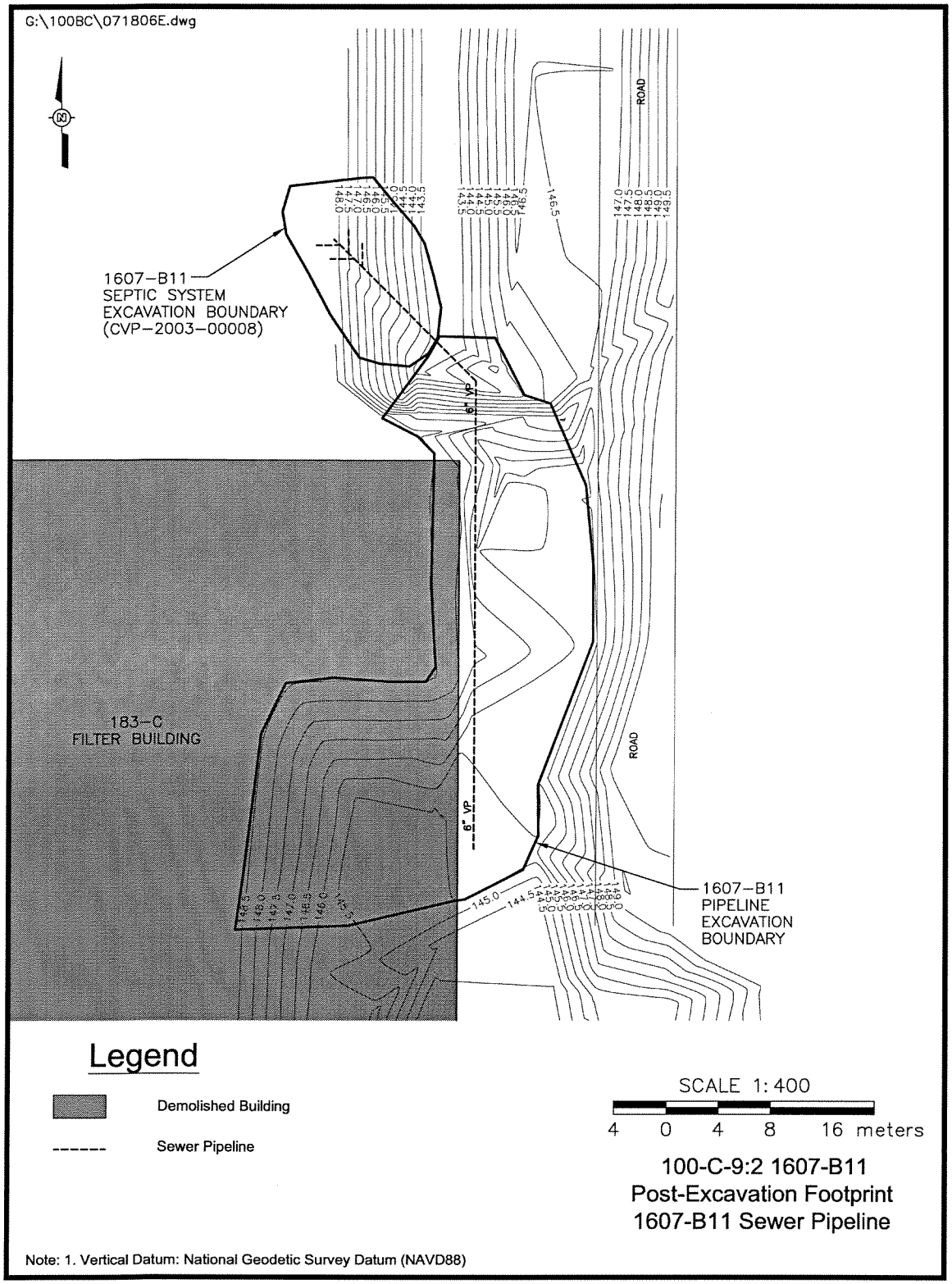


Figure 5. Post- Excavation Footprint for the 1607-B11 Pipelines.



The 1607-B11 pipeline was co-located with the 100-C-9:1, 100-C main process sewer collection pipelines. The 100-C-9:1 subsite included the process sewers that serviced the pre-reactor water treatment and management facilities. The 100-C-9:1 process sewer pipelines were excavated to at least 4 m (13 ft) below grade, which concurrently removed the 1607-B11 sanitary sewer pipeline that was approximately 1.2 m (4 ft) below grade. The 100-C-9:1 remediation activities were completed by April 2006. Approximately 40 m (131 ft) of the sanitary sewer pipeline and an estimated 454 metric tons (500 U.S. tons) of material associated with the 1607-B11 feeder line was removed and sent to ERDF.

VERIFICATION SAMPLING ACTIVITIES

Verification sampling for the subsite 100-C-9:2 was performed between April 25, 2006, and September 29, 2006, to support interim closeout of the site, according to approved verification work instructions (WCH 2006a, WCH 2006b). This section presents the sampling design, contaminants of concern/contaminants of potential concern and the analytical results. The results are compared to the cleanup criteria that are specified in the RDR/RAWP (DOE-RL 2005b). All sampling was performed in accordance with the *100 Area Remedial Action Sampling and Analysis Plan* (herein referred to as the SAP) (DOE-RL 2005a).

Contaminants of Concern /Contaminants of Potential Concern

Historical information, process knowledge, and the results of confirmatory sampling were used to determine the COC and COPC for verification sampling. The waste associated with the sanitary sewer pipelines was sanitary sewage. The COC and COPC for each feeder pipeline are identified in Table 3, and are inclusive of the constituents that were detected above direct exposure RAGs or dose-equivalence lookup values and/or above RAGs for the protection of groundwater and the Columbia River. These analyses are also inclusive of those methods with significant data quality deficiencies in the confirmatory data set. Radiological constituents were added as COPC because confirmatory sampling at 1607-B9 indicated their presence.

The laboratory analyses performed for verification sampling at each sampling area are identified in Table 3.

Verification Sample Design

Two separate verification sampling work instructions were developed by grouping the field work at the four septic systems as follows:

- **1607-B8** and **1607-B9:** *Work Instruction for Verification Sampling of the 100-C-9:2 Sanitary Sewer Pipelines* (WCH 2006a).

- **1607-B10** and **1607-B11:** *Work Instruction for Verification Sampling of the 100-C-9:2 Sanitary Sewer Pipelines Servicing the 1607-B10 and 1607-B11 Septic Tanks* (WCH 2006b).

These work instructions established the logic for the sampling design and determined the number of samples to be taken at each site. A summary of the sample design strategies and excavation depths for each septic system pipeline site is provided in Table 4. A summary of the verification samples collected for each of the pipeline sites is presented in Table 5.

Table 3. Laboratory Analytical Methods.

Pipelines	Analytical Method	COC/COPC
All[a]	PCBs - EPA Method 8082	Polychlorinated biphenyls
All	Pesticides – EPA Method 8081	Pesticides
All	SVOAs – EPA Method 8270	Semivolatile organic compounds
All	ICP metals – EPA Method 6010	Lead[b]
All	Mercury – EPA Method 7471	Mercury
All	Cr VI – EPA Method 7196	Hexavalent chromium
All	GEA – Gamma Spectroscopy	Cobalt-60, cesium-137, europium-152, europium-154
1607-B8 1607-B9	Gross alpha – Proportional Counting	Alpha-emitting radionuclides
1607-B8 1607-B9	Gross beta[c] – Proportional Counting	Strontium-90

[a] The term "All" pipelines refers to 1607-B8, 1607-B9, 1607-B10 and 1607-B11 pipelines.
[b] The expanded list of ICP metals was performed to include antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel silver, selenium, vanadium, and zinc in the analytical results package.
[c] Strontium analysis was performed on the sample at 1607-B9 location #7 after gross beta activity was detected above background.
COC = contaminant of concern
COPC = contaminant of potential concern
GEA = gamma energy analysis
ICP = inductively coupled plasma
PCB = polychlorinated biphenyl
SVOA = semivolatile organic analysis

Table 4. Summary of Pipeline Excavation Depths and Sample Design Strategies.

Septic System	Excavation Depth	Sample Design	Total Number of Samples
1607-B8	2 m (6.6 ft)	Excavation divided into 3 segments with one verification sample collected per segment. Each verification sample consisted of 15 aliquots distributed across the base of the segment and then combined into one sample.	3
1607-B9	3.5 m (11.5 ft)	Excavation overlain with systematic grid to perform statistical sampling, with collection of one discrete soil sample within each grid. Overburden soil stockpile stratified into two portions, with one verification sample collected within each portion; each verification sample consisted of 25 aliquots.	Excavation – 12[a] Overburden - 2
1607-B10	9 m (29.5 ft)	Excavation divided into 4 segments with one verification sample collected per segment. Each verification sample consisted of 25 aliquots distributed across the base of the segment and then combined into one sample.	4
1607-B11	4 m (13 ft)	Excavation divided into 4 segments with one verification sample collected per segment. Each verification sample consisted of 15 aliquots distributed across the base of the segment and then combined into one sample.	4

[a] The excavation contains 12 samples, 10 statistical and 2 focused.

Table 5. Summary of Verification Samples.

Sample Number	Sample Date	Sample Location		Comments[a]
		Latitude	Longitude	
1607-B8 Septic System Pipeline				
J11VM3	4/5/06	NA	NA	Trench bottom – eastern third
J11VM4	4/5/06	NA	NA	Trench bottom – middle section
J11VM5	4/5/06	NA	NA	Trench bottom – western third
1607-B9 Septic System Pipeline				
J11VK9	4/5/06	N 143815.1	E 565377.4	Trench bottom – location 1
J11VL0	4/5/06	N 143815.1	E 565456.1	Trench bottom – location 2
J11VL1	4/5/06	N 143815.1	E 565471.8	Trench bottom – location 3
J11VM7	4/5/06	N/A	N/A	Equipment blank
J11VL2	4/5/06	N 143842.3	E 565377.4	Trench bottom – location 4
J11VM6	4/5/06	N 143842.3	E 565377.4	Duplicate w/ J11VL2
J11VL3	4/5/06	N 143869.6	E 565377.4	Trench bottom – location 5
J11VL4	4/5/06	N 143896.8	E 565377.4	Trench bottom – location 6
J11VL5	4/5/06	N 143910.5	E 565369.5	Trench bottom – location 7
J11VL6	4/5/06	N 143924.1	E 565345.9	Trench bottom – location 8
J11VL7	4/5/06	N 143951.3	E 565345.9	Trench bottom – location 9
J11VL8	4/5/06	N 143978.6	E 565345.9	Trench bottom – location 10
J11VL9	4/5/06	N 143818.1	E 565389.4	Trench bottom – location 11
J11VM0	4/5/06	N 143847.7	E 565380.7	Trench bottom – location 12
J11VM1	4/5/06	NA	NA	Stockpile – northern half
J11VM2	4/5/06	NA	NA	Stockpile – southern half
J13H31	9/29/06	N 143910.5	E 565369.5	Trench bottom – location 7[b]
1607-B10 Septic System Pipeline				
J135M0	9/7/06	N 143977.9 N 143979.8	E 564769.9 E 564770.9	Trench bottom – 1st quarter
J135M1	9/7/06	N 143976.0 N 143977.9	E 564768.8 E 564769.9	Trench bottom – 2nd quarter
J135M2	9/7/06	N 143974.1 N 143976.0	E 564767.7 E 564768.8	Trench bottom – 3rd quarter
J135M3	9/7/06	N 143972.2 N 143974.1	E 564766.6 E 564767.7	Trench bottom – 4th quarter
1607-B11 Septic System Pipeline				
J134X0	8/3/06	N 144042.7	E 564988.7	Trench bottom – 3rd quarter
J134X3	8/3/06	N 144024.3	E 564988.7	Duplicate w/J134W8
J134X4	8/3/06	NA	NA	Equipment blank
J134W8	8/3/06	N 144024.3	E 564988.7	Trench bottom – 1st quarter
J134X1	8/3/06	N 144033.5	E 564988.7	Trench bottom – 2nd quarter
J134W9	8/3/06	N 144051.9	E 564988.7	Trench bottom – 4th quarter

[a] The samples were obtained as provided in the verification work instructions (WCH 2006a, WCH 2006b) and as described in the field logbooks (WCH 2006c, 2006d, 2006e).

[b] A replacement verification sample (J13H31) was taken after additional material was removed.

The trenches underlying the former pipelines at 1607-B8, 1607-B10 and 1607-B11 were divided into segments of approximately equal size and staked. The post-excavation civil surveys for each of these are shown in Figures 3 through 5, respectively. Figure 7 shows the locations of the staked segments at 1607-B11 as an example. One verification soil sample was collected within each segment. Each verification soil sample for 1607-B10 and 1607-B11 pipeline sites consisted of 25 aliquots distributed within the segment and then combined into one verification sample. For the 1607-B8 site, 15 aliquots were collected and combined within each segment. The below cleanup level (BCL) stockpile (shown in Figure 8) associated with the 1607-B9 pipeline site was stratified into two portions and a verification soil sample was collected for each portion. Each verification sample consisted of 25 aliquots distributed over the applicable portion of the soil stockpile.

The 1607-B9 pipeline excavation area was delineated in Visual Sample Plan[1] (VSP) to develop a statistically based sample design. The post-excavation civil survey and sample locations for 1607-B9 are presented in Figure 8. The 1607-B9 pipeline verification samples were collected on a random-start, triangular grid. A triangular grid was selected for this investigation based on studies that indicate triangular grids are superior to square grids (Gilbert 1987). Additional details concerning the use of VSP to develop the statistical sampling design and derive the number of verification samples to collect are discussed in Appendix D of the *Work Instruction for Verification Sampling of the 100-C-9:2 Sanitary Sewer Pipelines* (WCH 2006a). Two focused samples were also collected. The samples were collected at locations where undocumented pipelines intersected the 1607-B9 pipeline excavation (locations 11 and 12).

Verification Sampling Results

Verification samples were analyzed using EPA-approved analytical methods (DOE-RL 2005a). The 95% upper confidence limits (UCLs) on the true population mean for residual concentrations of COC and COPC were calculated for the 1607-B9 pipeline excavation as specified by the RDR/RAWP (DOE-RL 2005b), with calculations provided in Appendix B. When a nonradionuclide COC or COPC was detected in fewer than 50% of the verification samples collected for each sampling area, the maximum detected value was used for comparison against RAGs. If no detections for a given COC/COPC were reported in a given data set, then no statistical evaluation or calculations were performed for that COC/COPC for the associated sampling area. Additional material was removed from 1607-B9 after preliminary results for the sample at location 7 (J11VL5) indicated the presence of strontium-90 (18.3 pCi/g) above the cleanup criterion, and a replacement verification sample (J13H31) was taken at this location on September 29, 2006.

Evaluation of the verification data from the three other feeder pipelines and BCL stockpile was performed by direct comparison of the maximum sample results for each COC/COPC against RAGs for each sampling area.

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

Figure 7. Post-Excavation Topographic Survey for the 1607-B11 Pipelines (showing the staked segments).

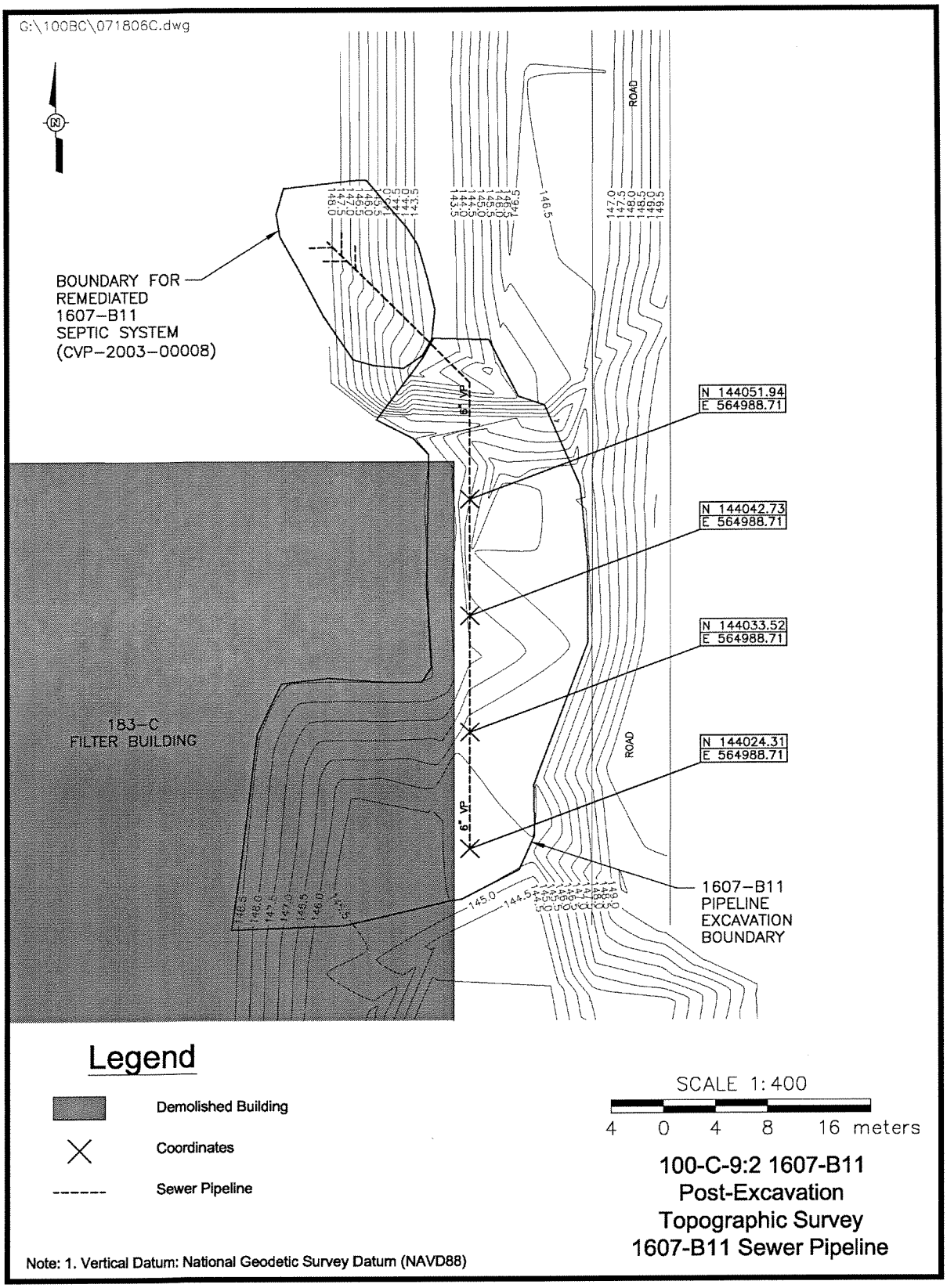
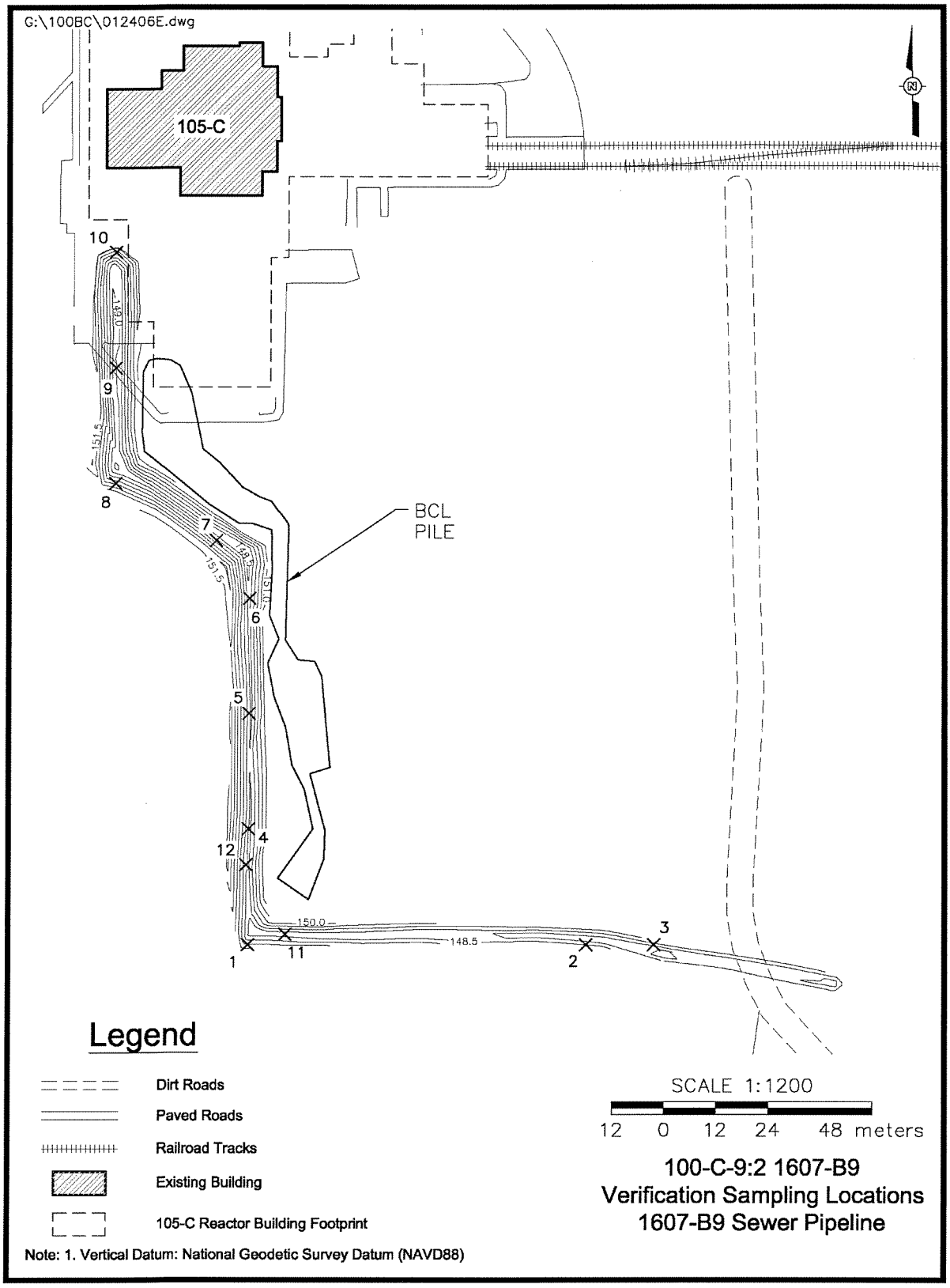


Figure 8. Post-Excavation Topographic Survey for the 1607-B9 Pipelines (showing verification sample locations).



Comparisons of the statistical and maximum results for COC and COPC and the site RAGs for all sampling areas are summarized in Tables 6a through 6f. Contaminants that were not detected by laboratory analysis are excluded from these tables. Potassium-40, radium-226, radium-228, thorium-228, and thorium-232 were also excluded because these isotopes are not related to the operational history of the site and were all detected at levels below statistical background activities. (Based on an assumption of secular equilibrium, the background activities for radium-228 and thorium-228 are equal to the statistical background activity of 1.32 pCi/g for thorium-232 [DOE-RL 1996]).

Calculated cleanup levels for aluminum, calcium, iron, magnesium, phosphate, potassium, silicon, sodium, and zirconium are not presented in the RDR/RAWP (DOE-RL 2005b) (results for total phosphorus are attributed to phosphorus in phosphate). Parameters to calculate cleanup levels under WAC 173-340 (1996) are not available from the *Cleanup Levels and Risk Calculations (CLARC) Database* (Ecology 2005) or other reference databases. These analytes are also essential nutrients and can be eliminated from evaluation as human health concerns per EPA guidance (EPA 1989). Therefore, these constituents are not considered COPC and are not included in the tables. The laboratory-reported data results for all constituents are stored in the ENRE project-specific database prior to being provided to the HEIS and are presented with the statistical calculations in Appendix B.

Table 6a. Comparison of Maximum Contaminant Concentrations to Action Levels for the 100-C-9:2 (1607-B8 Feeder Line) Remediation Footprint Verification Sampling Event. (2 Pages)

COC/COPC	Maximum Result (mg/kg)	Remedial Action Goals[a] (mg/kg)			Does the Maximum Result Exceed RAGs?	Does the Maximum Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	4.4 (<BG)	20	20	20	No	--
Barium	69.0 (<BG)	5,600[b]	132[c,d]	224[e]	No	--
Beryllium	0.51 (<BG)	10.4[f]	1.51[d]	1.51[d]	No	--
Boron[g]	5.1	16,000	320	--[h]	No	--
Cadmium[i]	0.37 (<BG)	13.9	0.81[d]	0.81[d]	No	--
Chromium (total)	16.5 (<BG)	80,000[b]	18.5[d]	18.5[d]	No	--
Chromium (hexavalent)	0.83	2.1	4.8[j]	2	No	--
Cobalt	8.9 (<BG)	1,600	32	--[h]	No	--
Copper	66.1	2,960	59.2	22.0[d]	Yes	Yes[k]
Lead	152	353	10.2[d]	10.2[d]	Yes	Yes[k]
Lithium	7.1 (<BG)	1,600	33.5[d]	--[h]	No	--
Manganese	456 (<BG)	11,200	512[d]	512[d]	No	--
Mercury	0.37	24	0.33[d]	0.33[d]	Yes	Yes[k]
Molybdenum[g]	1.0	400	8	--[h]	No	--
Nickel	11.8 (<BG)	1,600	19.1[d]	27.4	No	--
Strontium[g]	25.5	48,000	960	--[h]	No	--
Titanium	1,960 (<BG)	320,000[l]	6,400[l]	--[h]	No	--
Vanadium	58.4 (<BG)	560	85.1[d]	--[h]	No	--
Zinc	111	24,000	480	67.8[d]	Yes	--
Aroclor-1254	0.12	0.5	0.017[m]	0.017[m]	Yes	Yes[k]
4,4'-DDE	0.0045	2.94	0.0257	0.005[m]	No	--
Endosulfan I	0.00064	480	9.6	0.186	No	--
Endosulfan sulfate	0.0037	480	9.6	0.186	No	--
Endrin ketone	0.00074	24	0.2	0.039	No	--
gamma-Chlordane	0.0016	0.769	0.02[n]	0.02[o]	No	--
Benzo(a)pyrene	0.022	0.33[m]	0.33[m]	0.33[m]	No	--
Benzo(b)fluoranthene	0.073	1.37[p]	0.33[m]	0.33[m]	No	--
Benzo(g,h,i)perylene[q]	0.023	2,400	48	192	No	--
Benzo(k)fluoranthene	0.023	13.7[p]	0.33[m]	0.33[m]	No	--

Table 6a. Comparison of Maximum Contaminant Concentrations to Action Levels for the 100-C-9:2 (1607-B8 Feeder Line) Remediation Footprint Verification Sampling Event. (2 Pages)

COC/COPC	Maximum Result (mg/kg)	Remedial Action Goals[a] (mg/kg)			Does the Maximum Result Exceed RAGs?	Does the Maximum Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Chrysene	0.082	137[p]	1.2[p]	0.33[m]	No	--

[a] Lookup values and remedial action goals (RAGs) obtained from the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP) (DOE-RL 2005b) or calculated per *Washington Administrative Code* (WAC)173-340-720, 173-340-730, and 173-340-740, Method B, 1996, unless otherwise noted.

[b] Noncarcinogenic cleanup level calculated from WAC 173-340-740(3), 1996 (Method B for soils) (as presented in the RDR/RAWP [DOE-RL 2005b]). Updated oral reference dose values (as provided in the Integrated Risk Information System [IRIS]) yield Method B direct exposure RAG values of 16,000 mg/kg and 120,000 mg/kg for barium and chromium, respectively.

[c] Barium soil cleanup level for groundwater protection calculated from WAC 173-340-740(3)(a)(ii)(A), 1996 ("100 times rule") and WAC 173-340-720(3), 1996 (Method B for groundwater) is 112 mg/kg (as presented in the RDR/RAWP [DOE-RL 2005b]). The updated oral reference dose value (as provided in IRIS) yields a Method B groundwater cleanup criteria of 7 mg/L, as compared to the more restrictive maximum contaminant level of 2 mg/L (40 *Code of Federal Regulations* [CFR] 141). Per WAC 173-340-740(3)(a)(ii)(A), 1996 ("100 times rule"), the most restrictive updated soil cleanup level for groundwater protection would be 200 mg/kg.

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

[e] Barium soil cleanup level for river protection calculated from WAC 173-340-740(3)(a)(ii)(A), 1996 ("100 times rule"), a dilution-attenuation factor of 2, and WAC 173-340-720(3), 1996 (Method B for groundwater) is 224 mg/kg (as presented in the RDR/RAWP [DOE-RL 2005b]). No surface water bioconcentration factor is available for barium and no ambient water quality criteria value (AWQC) exists separate from the previous drinking water standard; therefore no WAC 173-340-730(3), 1996 (Method B for surface waters) value can be determined.

[f] 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 (WDOH 1997).

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

[h] No parameters are available from the Cleanup Levels and Risk Calculations (CLARC) database (Ecology 2005), and no bioconcentration factor or AWQC values are available to calculate cleanup levels (WAC 173-340-730(3)(a)(iii), 1996 [Method B for surface waters]).

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

[j] Calculated cleanup level (per WAC 173-340-720(3), 1996 [Method B for groundwater] and WAC 173-340-740(3)(a)(ii)(A), 1996 ["100 times rule"]) presented is lower than that presented in the RDR/RAWP (DOE-RL 2005b), based on updated oral reference dose value (as provided in IRIS).

[k] Based on the *100 Area Analogous Sites RESRAD Calculations* (BHI 2005) and contaminant-specific soil partitioning coefficient (K_d) value, the contaminant will not migrate vertically more than 3 m (10 ft) in 1,000 years. As the vadose zone underlying the site is > 20 m (66 ft) thick, the contaminant will not reach groundwater (and thus, the Columbia River) in 1,000 years.

[l] No cleanup levels are available from the CLARC database (Ecology 2005); RAG values calculated using toxicity data from the Oak Ridge National Laboratory (ORNL) risk assessment database.

[m] Where cleanup levels are less than the required detection limit (RDL), cleanup levels default to the RDL (WAC 173-340-707[2], 1996 and DOE-RL 2005b).

[n] 100 times the groundwater RAG is less than the RDL. Therefore, the RDL is used as the soil lookup value for protection of groundwater (DOE-RL 2005b).

[o] 100 times the DAF times the RAG protective of the Columbia River is less than the RDL. Therefore, the RDL is used as the soil lookup value for protection of the Columbia River (DOE-RL 2005b).

[p] RAG value listed in the RDR/RAWP (DOE-RL 2005b) is based on the use of benzo(a)pyrene as a surrogate. Compound-specific carcinogenic cleanup level calculated per WAC 173-340-740(3), 1996 (Method B for soils) using ORNL oral cancer potency factors.

[q] Toxicity data for this chemical are not available. RAGs for benzo(g,h,i)perylene is based on the surrogate chemical pyrene.

-- = not applicable
AWQC = ambient water quality criteria
BG = background (obtained from DOE-RL [2001], unless otherwise noted)
CFR = Code of Federal Regulations
CLARC = Cleanup Levels and Risk Calculations
COC = contaminant of concern
COPC = contaminant of potential concern
DOE-RL = U.S. Department of Energy, Richland Operations Office
IRIS = Integrated Risk Information System
ORNL = Oak Ridge National Laboratory
RAG = remedial action goal
RAWP = remedial action work plan
RDL = required detection limit
RDR = remedial design report
RESRAD = RESidual RADioactivity (dose-assessment model
WAC = Washington Administrative Code
WDOH = Washington State Department of Health

Table 6b. Comparison of Statistical Contaminant Concentrations to Action Levels for the 100-C-9:2 (1607-B9 Feeder Line) Remediation Footprint Verification Sampling Event. (2 Pages)

COC/COPC	Statistical Result (mg/kg)	Remedial Action Goals[a] (mg/kg)			Does the Statistical Data Set Exceed RAGs?	Does the Statistical Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	2.9 (<BG)	20	20	20	No	--
Barium	64.3 (<BG)	5,600[b]	132[c,d]	224[e]	No	--
Beryllium	0.46 (<BG)	10.4[f]	1.51[d]	1.51[d]	No	--
Cadmium[g]	0.24 (<BG)	13.9	0.81[d]	0.81[d]	No	--
Chromium (total)	8.7 (<BG)	80,000[b]	18.5[d]	18.5[d]	No	--
Chromium (hexavalent)	0.28	2.1	4.8[h]	2	No	--
Cobalt	7.7 (<BG)	1,600	32	--[i]	No	--
Copper	15.6 (<BG)	2,960	59.2	22.0[d]	No	--
Lead	12.8	353	10.2[d]	10.2[d]	Yes	Yes[j]
Lithium	7.0 (<BG)	1,600	33.5[d]	--[i]	No	--
Manganese	343 (<BG)	11,200	512[d]	512[d]	No	--
Mercury	0.04 (<BG)	24	0.33[d]	0.33[d]	No	--
Molybdenum[k]	0.42	400	8	--[i]	No	--
Nickel	10.9 (<BG)	1,600	19.1[d]	27.4	No	--
Strontium[k]	22.7	48,000	960	--[i]	No	--
Titanium	1,570	320,000[l]	6,400[l]	--[i]	No	--
Vanadium	47.5 (<BG)	560	85.1[d]	--[i]	No	--
Zinc	162	24,000	480	67.8[d]	Yes	Yes[j]
Aroclor-1254	0.028	0.5	0.017[m]	0.017[m]	Yes	Yes[j]
4,4'-DDE	0.0012	2.94	0.0257	0.005[m]	No	--
Dieldrin	0.0017	0.0625	0.003[m]	0.003[m]	No	--
Endrin aldehyde	0.00097	24	0.2	0.039	No	--
Benzo(a)anthracene	0.041	1.37[n]	0.33[m]	0.33[m]	No	--
Benzo(a)pyrene	0.048	0.33[m]	0.33[m]	0.33[m]	No	--
Benzo(b)fluoranthene	0.041	1.37[n]	0.33[m]	0.33[m]	No	--
Benzo(g,h,i)perylene[o]	0.037	2,400	48	192	No	--
Benzo(k)fluoranthene	0.045	13.7[n]	0.33[m]	0.33[m]	No	--
Chrysene	0.055	137[n]	1.2[n]	0.33[m]	No	--
Fluoranthene	0.081	3,200[p]	64	18	No	--
Indeno(1,2,3-cd)pyrene	0.030	1.37	0.33[m]	0.33[m]	No	--
Phenanthrene[o]	0.056	24,000	240	1,920	No	--

Table 6b. Comparison of Statistical Contaminant Concentrations to Action Levels for the 100-C-9:2 (1607-B9 Feeder Line) Remediation Footprint Verification Sampling Event. (3 Pages)

COC/COPC	Statistical Result (mg/kg)	Remedial Action Goals[a] (mg/kg)			Does the Statistical Data Set Exceed RAGs?	Does the Statistical Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Pyrene	0.094	2,400	48	192	No	--

[a] Lookup values and remedial action goals (RAGs) obtained from the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP) (DOE-RL 2005b) or calculated per *Washington Administrative Code* (WAC)173-340-720, 173-340-730, and 173-340-740, Method B, 1996, unless otherwise noted.

[b] Noncarcinogenic cleanup level calculated from WAC 173-340-740(3), 1996 (Method B for soils) (as presented in the RDR/RAWP [DOE-RL 2005b]). Updated oral reference dose values (as provided in the Integrated Risk Information System [IRIS]) yield Method B direct exposure RAG values of 16,000 mg/kg and 120,000 mg/kg for barium and chromium, respectively.

[c] Barium soil cleanup level for groundwater protection calculated from WAC 173-340-740(3)(a)(ii)(A), 1996 ("100 times rule") and WAC 173-340-720(3), 1996 (Method B for groundwater) is 112 mg/kg (as presented in the RDR/RAWP [DOE-RL 2005b]). The updated oral reference dose value (as provided in IRIS) yields a Method B groundwater cleanup criteria of 7 mg/L, as compared to the more restrictive maximum contaminant level of 2 mg/L (40 *Code of Federal Regulations* [CFR] 141). Per WAC 173-340-740(3)(a)(ii)(A), 1996 ("100 times rule"), the most restrictive updated soil cleanup level for groundwater protection would be 200 mg/kg.

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

[e] Barium soil cleanup level for river protection calculated from WAC 173-340-740(3)(a)(ii)(A), 1996 ("100 times rule"), a dilution-attenuation factor of 2, and WAC 173-340-720(3), 1996 (Method B for groundwater) is 224 mg/kg (as presented in the RDR/RAWP [DOE-RL 2005b]). No surface water bioconcentration factor is available for barium and no ambient water quality criteria value (AWQC) exists separate from the previous drinking water standard; therefore no WAC 173-340-730(3), 1996 (Method B for surface waters) value can be determined.

[f] 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 (WDOH 1997).

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

[h] Calculated cleanup level (per WAC 173-340-720(3), 1996 [Method B for groundwater] and WAC 173-340-740(3)(a)(ii)(A), 1996 ["100 times rule"]) presented is lower than that presented in the RDR/RAWP (DOE-RL 2005b), based on an updated oral reference dose value (as provided in IRIS).

[i] No parameters are available from the Cleanup Levels and Risk Calculations (CLARC) database (Ecology 2005), and no bioconcentration factor or AWQC values are available to calculate cleanup levels (WAC 173-340-730(3)(a)(iii), 1996 [Method B for surface waters]).

[j] Based on the *100 Area Analogous Sites RESRAD Calculations* (BHI 2005) and contaminant-specific soil partitioning coefficient (K_d) value, the contaminant will not migrate vertically more than 3 m (10 ft) in 1,000 years. As the vadose zone underlying the site is > 20 m (66 ft) thick, the contaminant will not reach groundwater (and thus, the Columbia River) in 1,000 years.

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

[l] No cleanup levels are available from the CLARC database (Ecology 2005); RAG values calculated using toxicity data from the Oak Ridge National Laboratory (ORNL) risk assessment database.

[m] Where cleanup levels are less than the required detection limit (RDL), cleanup levels default to the RDL (WAC 173-340-707[2], 1996 and DOE-RL 2005b).

[n] RAG value listed in the RDR/RAWP (DOE-RL 2005b) is based on the use of benzo(a)pyrene as a surrogate. Compound-specific carcinogenic cleanup level calculated per WAC 173-340-740(3), 1996 (Method B for soils) using ORNL oral cancer potency factors.

[o] Toxicity data for this chemical are not available. RAGs for benzo(g,h,i)perylene and phenanthrene are based on the surrogate chemicals pyrene and anthracene, respectively.

[p] No value presented in the RDR/RAWP (DOE-RL 2005b). Noncarcinogenic cleanup level calculated from WAC 173-340-740(3), 1996 (Method B for soils).

[q] Activity corresponding to a single-radionuclide 15 mrem/yr exposure as calculated using a generic RESidual RADioactivity (RESRAD) model (DOE-RL 2005b).

[r] Revised lookup value per *100 Area Radionuclide and Nonradionuclide Lookup Values for the 1995 Interim Remedial Action Record of Decision* (BHI 2004).

-- = not applicable
AWQC = ambient water quality criteria
BG = background (obtained from DOE-RL [2001], unless otherwise noted)
CFR = Code of Federal Regulations
CLARC = Cleanup Levels and Risk Calculations
COC = contaminant of concern
COPC = contaminant of potential concern
DOE-RL = U.S. Department of Energy, Richland Operations Office
IRIS = Integrated Risk Information System
ORNL = Oak Ridge National Laboratory
RAG = remedial action goal
RAWP = remedial action work plan
RDL = required detection limit
RDR = remedial design report
RESRAD = RESidual RADioactivity (dose-assessment model)
WAC = Washington Administrative Code
WDOH = Washington State Department of Health

Table 6c. Comparison of Maximum Contaminant Concentrations to Action Levels for the 100-C-9:2 (1607-B9 Feeder Line Focused Samples) Remediation Footprint Verification Sampling Event. (2 pages)

COC/COPC	Maximum Result (mg/kg)	Remedial Action Goals[a] (mg/kg)			Does the Maximum Result Exceed RAGs?	Does the Maximum Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Antimony[b]	0.97 (<BG)	32	5[c]	5[c]	No	--
Arsenic	3.4 (<BG)	20	20	20	No	--
Barium	64.1 (<BG)	5,600[d]	132[c,e]	224[f]	No	--
Beryllium	0.48 (<BG)	10.4[g]	1.51[c]	1.51[c]	No	--
Cadmium[b]	0.28 (<BG)	13.9	0.81[c]	0.81[c]	No	--
Chromium (total)	13.5 (<BG)	80,000[d]	18.5[c]	18.5[c]	No	--
Cobalt	7.7 (<BG)	1,600	32	--[h]	No	--
Copper	22.5	2,960	59.2	22.0[c]	Yes	Yes[i]
Lead	55.5	353	10.2[c]	10.2[c]	Yes	Yes[i]
Lithium	6.5 (<BG)	1,600	33.5[c]	--[h]	No	--
Manganese	404 (<BG)	11,200	512[c]	512[c]	No	--
Molybdenum[j]	1.9	400	8	--[h]	No	--
Nickel	22.0	1,600	19.1[c]	27.4	Yes	Yes[i]
Strontium[j]	23.4	48,000	960	--[h]	No	--
Titanium	1,640 (<BG)	320,000[k]	6,400[k]	--[h]	No	--
Vanadium	48.0 (<BG)	560	85.1[c]	--[h]	No	--
Zinc	40.5 (<BG)	24,000	480	67.8[c]	No	--
Aroclor-1254	0.0074	0.5	0.017[l]	0.017[l]	No	--
4,4'-DDD	0.0035	4.17	0.0365	0.005[l]	No	--
4,4'-DDE	0.014	2.94	0.0257	0.005[l]	Yes	Yes[i]
4,4'-DDT	0.0051	2.94	0.0257	0.005[l]	Yes	Yes[i]
Endrin	0.0036	24	0.2	0.039	No	--
Endrin aldehyde	0.0029	24	0.2	0.039	No	--

Table 6c. Comparison of Maximum Contaminant Concentrations to Action Levels for the 100-C-9:2 (1607-B9 Feeder Line Focused Samples) Remediation Footprint Verification Sampling Event. (2 pages)

COC/COPC	Maximum Result (mg/kg)	Remedial Action Goals[a] (mg/kg)			Does the Maximum Result Exceed RAGs?	Does the Maximum Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Endrin ketone	0.00043	24	0.2	0.039	No	--

[a] Lookup values and remedial action goals (RAGs) obtained from the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP) (DOE-RL 2005b) or calculated per *Washington Administrative Code* (WAC)173-340-720, 173-340-730, and 173-340-740, Method B, 1996, unless otherwise noted.

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

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

[d] Noncarcinogenic cleanup level calculated from WAC 173-340-740(3), 1996 (Method B for soils) (as presented in the RDR/RAWP [DOE-RL 2005b]). Updated oral reference dose values (as provided in the Integrated Risk Information System [IRIS]) yield Method B direct exposure RAG values of 16,000 mg/kg and 120,000 mg/kg for barium and chromium, respectively.

[e] Barium soil cleanup level for groundwater protection calculated from WAC 173-340-740(3)(a)(ii)(A), 1996 ("100 times rule") and WAC 173-340-720(3), 1996 (Method B for groundwater) is 112 mg/kg (as presented in the RDR/RAWP [DOE-RL 2005b]). The updated oral reference dose value (as provided in IRIS) yields a Method B groundwater cleanup criteria of 7 mg/L, as compared to the more restrictive maximum contaminant level of 2 mg/L (40 *Code of Federal Regulations* [CFR] 141). Per WAC 173-340-740(3)(a)(ii)(A), 1996 ("100 times rule"), the most restrictive updated soil cleanup level for groundwater protection would be 200 mg/kg.

[f] Barium soil cleanup level for river protection calculated from WAC 173-340-740(3)(a)(ii)(A), 1996 ("100 times rule"), a dilution-attenuation factor of 2, and WAC 173-340-720(3), 1996 (Method B for groundwater) is 224 mg/kg (as presented in the RDR/RAWP [DOE-RL 2005b]). No surface water bioconcentration factor is available for barium and no ambient water quality criteria value (AWQC) exists separate from the previous drinking water standard; therefore no WAC 173-340-730(3), 1996 (Method B for surface waters) value can be determined.

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

[h] No parameters are available from the Cleanup Levels and Risk Calculations (CLARC) database (Ecology 2005), and no bioconcentration factor or AWQC values are available to calculate cleanup levels (WAC 173-340-730(3)(a)(iii), 1996 [Method B for surface waters]).

[i] Based on the *100 Area Analogous Sites RESRAD Calculations* (BHI 2005) and contaminant-specific soil partitioning coefficient (K_d) value, the contaminant will not migrate vertically more than 3 m (10 ft) in 1,000 years. As the vadose zone underlying the site is > 20 m (66 ft) thick, the contaminant will not reach groundwater (and thus, the Columbia River) in 1,000 years.

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

[k] No cleanup levels are available from the CLARC database (Ecology 2005); RAG values calculated using toxicity data from the Oak Ridge National Laboratory (ORNL) risk assessment database.

[l] Where cleanup levels are less than the required detection limit (RDL), cleanup levels default to the RDL (WAC 173-340-707[2], 1996, DOE-RL 2005b).

-- = not applicable
AWQC = ambient water quality criteria
BG = background (obtained from DOE-RL [2001], unless otherwise noted)
CFR = Code of Federal Regulations
CLARC = Cleanup Levels and Risk Calculations
COC = contaminant of concern
COPC = contaminant of potential concern
DOE-RL = U.S. Department of Energy, Richland Operations Office
IRIS = Integrated Risk Information System
ORNL = Oak Ridge National Laboratory
RAG = remedial action goal
RAWP = remedial action work plan
RDL = required detection limit
RDR = remedial design report
RESRAD = RESidual RADioactivity (dose-assessment model)
WAC = Washington Administrative Code
WDOH = Washington State Department of Health

Table 6d. Comparison of Maximum Contaminant Concentrations to Action Levels for the 100-C-9:2 (1607-B9 Feeder Line) Overburden/BCL Material Verification Sampling Event. (2 pages)

COC/COPC	Maximum Result (mg/kg)	Remedial Action Goals[a] (mg/kg)			Does the Maximum Result Exceed RAGs?	Does the Maximum Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	2.4 (<BG)	20	20	20	No	--
Barium	56.7 (<BG)	5,600[b]	132[c,d]	224[e]	No	--
Beryllium	0.48 (<BG)	10.4[f]	1.51[d]	1.51[d]	No	--
Cadmium[g]	0.17 (<BG)	13.9	0.81[d]	0.81[d]	No	--
Chromium (total)	7.2 (<BG)	80,000[b]	18.5[d]	18.5[d]	No	--
Chromium (hexavalent)	0.27	2.1	4.8[j]	2	No	--
Cobalt	7.6 (<BG)	1,600	32	--[i]	No	--
Copper	14.6 (<BG)	2,960	59.2	22.0[d]	No	--
Lead	8.8 (<BG)	353	10.2[d]	10.2[d]	No	--
Lithium	5.1 (<BG)	1,600	33.5[d]	--[i]	No	--
Manganese	345 (<BG)	11,200	512[d]	512[d]	No	--
Molybdenum[j]	0.38	400	8	--[i]	No	--
Nickel	10.0 (<BG)	1,600	19.1[d]	27.4	No	--
Strontium[j]	20.6	48,000	960	--[i]	No	--
Titanium	1,720 (<BG)	320,000[k]	6,400[k]	--[i]	No	--
Vanadium	50.3 (<BG)	560	85.1[d]	--[i]	No	--
Zinc	43.6 (<BG)	24,000	480	67.8[d]	No	--
Aroclor-1254	0.039	0.5	0.017[l]	0.017[l]	Yes	Yes[m]
4,4'-DDE	0.00070	2.94	0.0257	0.005[l]	No	--
Dieldrin	0.0099	0.0625	0.003[l]	0.003[l]	Yes	Yes[m]
Benzo(a)pyrene	0.018	0.33[l]	0.33[l]	0.33[l]	No	--
Benzo(g,h,i)perylene[n]	0.018	2,400	48	192	No	--
Chrysene	0.020	137[o]	1.2[o]	0.33[l]	No	--

Table 6d. Comparison of Maximum Contaminant Concentrations to Action Levels for the 100-C-9:2 (1607-B9 Feeder Line) Overburden/BCL Material Verification Sampling Event. (2 pages)

COC/COPC	Maximum Result (mg/kg)	Remedial Action Goals[a] (mg/kg)			Does the Maximum Result Exceed RAGs?	Does the Maximum Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Fluoranthene	0.024	3,200[p]	64	18	No	--

[a] Lookup values and remedial action goals (RAGs) obtained from the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP) (DOE-RL 2005b) or calculated per *Washington Administrative Code* (WAC)173-340-720, 173-340- 730, and 173-340-740, Method B, 1996, unless otherwise noted.

[b] Noncarcinogenic cleanup level calculated from WAC 173-340-740(3), 1996 (Method B for soils) (as presented in the RDR/RAWP [DOE-RL 2005b]). Updated oral reference dose values (as provided in the Integrated Risk Information System [IRIS]) yield Method B direct exposure RAG values of 16,000 mg/kg and 120,000 mg/kg for barium and chromium, respectively.

[c] Barium soil cleanup level for groundwater protection calculated from WAC 173-340-740(3)(a)(ii)(A), 1996 ("100 times rule") and WAC 173-340-720(3), 1996 (Method B for groundwater) is 112 mg/kg (as presented in the RDR/RAWP [DOE-RL 2005b]). The updated oral reference dose value (as provided in IRIS) yields a Method B groundwater cleanup criteria of 7 mg/L, as compared to the more restrictive maximum contaminant level of 2 mg/L (40 *Code of Federal Regulations* [CFR] 141). Per WAC 173-340-740(3)(a)(ii)(A), 1996 ("100 times rule"), the most restrictive updated soil cleanup level for groundwater protection would be 200 mg/kg.

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

[e] Barium soil cleanup level for river protection calculated from WAC 173-340-740(3)(a)(ii)(A), 1996 ("100 times rule"), a dilution-attenuation factor of 2, and WAC 173-340-720(3), 1996 (Method B for groundwater) is 224 mg/kg (as presented in the RDR/RAWP [DOE-RL 2005b]). No surface water bioconcentration factor is available for barium and no ambient water quality criteria value (AWQC) exists separate from the previous drinking water standard; therefore, no WAC 173-340-730(3), 1996 (Method B for surface waters) value can be determined.

[f] 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 (WDOH 1997).

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

[h] Calculated cleanup level (per WAC 173-340-720(3), 1996 [Method B for groundwater] and WAC 173-340-740(3)(a)(ii)(A), 1996 ["100 times rule"]) presented is lower than that presented in the RDR/RAWP (DOE-RL 2005b), based on updated oral reference dose value (as provided in IRIS).

[i] No parameters are available from the Cleanup Levels and Risk Calculations (CLARC) database (Ecology 2005), and no bioconcentration factor or AWQC values are available to calculate cleanup levels (WAC 173-340-730(3)(a)(iii), 1996 [Method B for surface waters]).

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

[k] No cleanup levels are available from the CLARC database (Ecology 2005); RAG values calculated using toxicity data from the Oak Ridge National Laboratory (ORNL) risk assessment database.

[l] Where cleanup levels are less than the required detection limit (RDL), cleanup levels default to the RDL (WAC 173-340-707[2], 1996 and DOE-RL 2005b).

[m] Based on the *100 Area Analogous Sites RESRAD Calculations* (BHI 2005) and contaminant-specific soil partitioning coefficient (K_d) value, the contaminant will not migrate vertically more than 3 m (10 ft) in 1,000 years. As the vadose zone underlying the site is > 20 m (66 ft) thick, the contaminant will not reach groundwater (and thus, the Columbia River) in 1,000 years.

[n] Toxicity data for this chemical are not available. RAGs for benzo(g,h,i)perylene and phenanthrene are based on the surrogate chemicals pyrene and anthracene, respectively.

[o] RAG value listed in the RDR/RAWP (DOE-RL 2005b) is based on the use of benzo(a)pyrene as a surrogate. Compound-specific carcinogenic cleanup level calculated per WAC 173-340-740(3), 1996 (Method B for soils) using ORNL oral cancer potency factors.

[p] No value presented in the RDR/RAWP (DOE-RL 2005b). Noncarcinogenic cleanup level calculated from WAC 173-340-740(3), 1996 (Method B for soils).

-- = not applicable
AWQC = ambient water quality criteria
BCL = Below Cleanup Level
BG = background (obtained from DOE-RL [2001], unless otherwise noted)
CFR = Code of Federal Regulations
CLARC = Cleanup Levels and Risk Calculations
COC = contaminant of concern
COPC = contaminant of potential concern
DOE-RL = U.S. Department of Energy, Richland Operations Office
IRIS = Integrated Risk Information System
ORNL = Oak Ridge National Laboratory
RAG = remedial action goal
RAWP = remedial action work plan
RDL = required detection limit
RDR = remedial design report
RESRAD = RESidual RADioactivity (dose-assessment model)
WAC = Washington Administrative Code
WDOH = Washington State Department of Health

Table 6e. Comparison of Maximum Contaminant Concentrations to Action Levels for the 100-C-9:2 (1607-B10 Feeder Line) Remediation Footprint Verification Sampling Event. (2 Pages)

COC/COPC	Maximum Result (mg/kg)	Remedial Action Goals[a] (mg/kg)			Does the Maximum Result Exceed RAGs?	Does the Maximum Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	3.6 (<BG)	20	20	20	No	--
Barium	74.1 (<BG)	5,600[b]	132[c,d]	224[e]	No	--
Beryllium	0.20 (<BG)	10.4[f]	1.51[d]	1.51[d]	No	--
Boron[g]	1.1	16,000	320	--[h]	No	--
Cadmium[i]	0.50 (<BG)	13.9	0.81[d]	0.81[d]	No	--
Chromium (total)	11.0 (<BG)	80,000[b]	18.5[d]	18.5[d]	No	--
Chromium (hexavalent)	0.24	2.1	4.8[j]	2	No	--
Cobalt	6.9 (<BG)	1,600	32	--[h]	No	--
Copper	17.6 (<BG)	2,960	59.2	22.0[d]	No	--
Lead	45.3	353	10.2[d]	10.2[d]	Yes	Yes[k]
Lithium	6.7 (<BG)	1,600	33.5[d]	--[h]	No	--
Manganese	311 (<BG)	11,200	512[d]	512[d]	No	--
Mercury	0.85	24	0.33[d]	0.33[d]	Yes	Yes[k]
Molybdenum[g]	0.47	400	8	--[h]	No	--
Nickel	12.2 (<BG)	1,600	19.1[d]	27.4	No	--
Strontium[g]	32.7	48,000	960	--[h]	No	--
Titanium	1,210 (<BG)	320,000[l]	6,400[l]	--[h]	No	--
Vanadium	42.5 (<BG)	560	85.1[d]	--[h]	No	--
Zinc	52.2 (<BG)	24,000	480	67.8[d]	No	--
Aroclor-1254	0.015	0.5	0.017[m]	0.017[m]	No	--
Aroclor-1260	0.011	0.5	0.017[m]	0.017[m]	No	--
4,4'-DDE	0.0014	2.94	0.0257	0.005[m]	No	--
4,4'-DDT	0.0019	2.94	0.0257	0.005[m]	No	--
Endosulfan sulfate	0.0011	480	9.6	0.186	No	--
Methoxychlor	0.0029	400	4	1.67	No	--
bis(2-Ethylhexyl)phthalate	0.25	71.4	0.625	0.36	No	--

Table 6e. Comparison of Maximum Contaminant Concentrations to Action Levels for the 100-C-9:2 (1607-B10 Feeder Line) Remediation Footprint Verification Sampling Event. (2 Pages)

COC/COPC	Maximum Result (mg/kg)	Remedial Action Goals[a] (mg/kg)			Does the Maximum Result Exceed RAGs?	Does the Maximum Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Di-n-butylphthalate	0.040	8,000	160	540	No	--

[a] Lookup values and remedial action goals (RAGs) obtained from the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP) (DOE-RL 2005b) or calculated per *Washington Administrative Code* (WAC)173-340-720, 173-340-730, and 173-340-740, Method B, 1996, unless otherwise noted.

[b] Noncarcinogenic cleanup level calculated from WAC 173-340-740(3), 1996 (Method B for soils) (as presented in the RDR/RAWP [DOE-RL 2005b]). Updated oral reference dose values (as provided in the Integrated Risk Information System [IRIS]) yield Method B direct exposure RAG values of 16,000 mg/kg and 120,000 mg/kg for barium and chromium, respectively.

[c] Barium soil cleanup level for groundwater protection calculated from WAC 173-340-740(3)(a)(ii)(A), 1996 ("100 times rule") and WAC 173-340-720(3), 1996 (Method B for groundwater) is 112 mg/kg (as presented in the RDR/RAWP [DOE-RL 2005b]). The updated oral reference dose value (as provided in IRIS) yields a Method B groundwater cleanup criteria of 7 mg/L, as compared to the more restrictive maximum contaminant level of 2 mg/L (40 *Code of Federal Regulations* [CFR] 141). Per WAC 173-340-740(3)(a)(ii)(A), 1996 ("100 times rule"), the most restrictive updated soil cleanup level for groundwater protection would be 200 mg/kg.

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

[e] Barium soil cleanup level for river protection calculated from WAC 173-340-740(3)(a)(ii)(A), 1996 ("100 times rule"), a dilution-attenuation factor of 2, and WAC 173-340-720(3), 1996 (Method B for groundwater) is 224 mg/kg (as presented in the RDR/RAWP [DOE-RL 2005b]). No surface water bioconcentration factor is available for barium and no ambient water quality criteria value (AWQC) exists separate from the previous drinking water standard; therefore, no WAC 173-340-730(3), 1996 (Method B for surface waters) value can be determined.

[f] 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 (WDOH 1997).

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

[h] No parameters are available from the Cleanup Levels and Risk Calculations (CLARC) database (Ecology 2005), and no bioconcentration factor or AWQC values are available to calculate cleanup levels (WAC 173-340-730(3)(a)(iii), 1996 [Method B for surface waters]).

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

[j] Calculated cleanup level (per WAC 173-340-720(3), 1996 [Method B for groundwater] and WAC 173-340-740(3)(a)(ii)(A), 1996 ["100 times rule"]) presented is lower than that presented in the RDR/RAWP (DOE-RL 2005b), based on updated oral reference dose value (as provided in IRIS).

[k] Based on the *100 Area Analogous Sites RESRAD Calculations* (BHI 2005) and contaminant-specific soil partitioning coefficient (K_d) value, the contaminant will not migrate vertically more than 3 m (10 ft) in 1,000 years. As the vadose zone underlying the site is > 20 m (66 ft) thick, the contaminant will not reach groundwater (and thus, the Columbia River) in 1,000 years.

[l] No cleanup levels are available from the CLARC database (Ecology 2005); RAG values calculated using toxicity data from the Oak Ridge National Laboratory (ORNL) risk assessment database.

[m] Where cleanup levels are less than the required detection limit (RDL), cleanup levels default to the RDL (WAC 173-340-707[2], 1996 and DOE-RL 2005b).

-- = not applicable
AWQC = ambient water quality criteria
BG = background (obtained from DOE-RL [2001], unless otherwise noted)
CFR = Code of Federal Regulations
CLARC = Cleanup Levels and Risk Calculations
COC = contaminant of concern
COPC = contaminant of potential concern
DOE-RL = U.S. Department of Energy, Richland Operations Office
IRIS = Integrated Risk Information System
ORNL = Oak Ridge National Laboratory
RAG = remedial action goal
RAWP = remedial action work plan
RDL = required detection limit
RDR = remedial design report
RESRAD = RESidual RADioactivity (dose-assessment model)
WAC = Washington Administrative Code
WDOH = Washington State Department of Health

Table 6f. Comparison of Maximum Contaminant Concentrations to Action Levels for the 100-C-9:2 (1607-B11 Feeder Line) Remediation Footprint Verification Sampling Event. (2 Pages)

COC/COPC	Maximum Result (mg/kg)	Remedial Action Goals[a] (mg/kg)			Does the Maximum Result Exceed RAGs?	Does the Maximum Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Antimony[b]	0.47 (<BG)	32	5[c]	5[c]	No	--
Arsenic	3.8 (<BG)	20	20	20	No	--
Barium	58.8 (<BG)	5,600[d]	132[c,e]	224[f]	No	--
Beryllium	0.20 (<BG)	10.4[g]	1.51[c]	1.51[c]	No	--
Boron[h]	2.0	16,000	320	--[i]	No	--
Cadmium[b]	0.08 (<BG)	13.9	0.81[c]	0.81[c]	No	--
Chromium (total)	8.8 (<BG)	80,000[d]	18.5[c]	18.5[c]	No	--
Chromium (hexavalent)	0.21	2.1	4.8[j]	2	No	--
Cobalt	8.3 (<BG)	1,600	32	--[i]	No	--
Copper	19.1 (<BG)	2,960	59.2	22.0[c]	No	--
Lead	5.8 (<BG)	353	10.2[c]	10.2[c]	No	--
Lithium	7.2 (<BG)	1,600	33.5[c]	--[i]	No	--
Manganese	352 (<BG)	11,200	512[c]	512[c]	No	--
Molybdenum[h]	0.46	400	8	--[i]	No	--
Nickel	11.0 (<BG)	1,600	19.1[c]	27.4	No	--
Strontium[h]	28.4	48,000	960	--[i]	No	--
Titanium	1,610 (<BG)	320,000[k]	6,400[k]	--[i]	No	--
Vanadium	49.2 (<BG)	560	85.1[c]	--[i]	No	--
Zinc	44.6 (<BG)	24,000	480	67.8[c]	No	--
Methoxychlor	0.0073	400	4	1.67	No	--

Table 6f. Comparison of Maximum Contaminant Concentrations to Action Levels for the 100-C-9:2 (1607-B11 Feeder Line) Remediation Footprint Verification Sampling Event. (2 Pages)

COC/COPC	Maximum Result (mg/kg)	Remedial Action Goals[a] (mg/kg)			Does the Maximum Result Exceed RAGs?	Does the Maximum Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Di-n-butylphthalate	0.034	8,000	160	540	No	--

[a] Lookup values and remedial action goals (RAGs) obtained from the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP) (DOE-RL 2005b) or calculated per *Washington Administrative Code* (WAC)173-340-720, 173-340-730, and 173-340-740, Method B, 1996, unless otherwise noted.

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

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

[d] Noncarcinogenic cleanup level calculated from WAC 173-340-740(3), 1996 (Method B for soils) (as presented in the RDR/RAWP [DOE-RL 2005b]). Updated oral reference dose values (as provided in the Integrated Risk Information System [IRIS]) yield Method B direct exposure RAG values of 16,000 mg/kg and 120,000 mg/kg for barium and chromium, respectively.

[e] Barium soil cleanup level for groundwater protection calculated from WAC 173-340-740(3)(a)(ii)(A), 1996 ("100 times rule") and WAC 173-340-720(3), 1996 (Method B for groundwater) is 112 mg/kg (as presented in the RDR/RAWP [DOE-RL 2005b]). The updated oral reference dose value (as provided in IRIS) yields a Method B groundwater cleanup criteria of 7 mg/L, as compared to the more restrictive maximum contaminant level of 2 mg/L (40 *Code of Federal Regulations* [CFR] 141). Per WAC 173-340-740(3)(a)(ii)(A), 1996 ("100 times rule"), the most restrictive updated soil cleanup level for groundwater protection would be 200 mg/kg.

[f] Barium soil cleanup level for river protection calculated from WAC 173-340-740(3)(a)(ii)(A), 1996 ("100 times rule"), a dilution-attenuation factor of 2, and WAC 173-340-720(3), 1996 (Method B for groundwater) is 224 mg/kg (as presented in the RDR/RAWP [DOE-RL 2005b]). No surface water bioconcentration factor is available for barium and no ambient water quality criteria value (AWQC) exists separate from the previous drinking water standard; therefore, no WAC 173-340-730(3), 1996 (Method B for surface waters) value can be determined.

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

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

[i] No parameters are available from the Cleanup Levels and Risk Calculations (CLARC) database (Ecology 2005), and no bioconcentration factor or AWQC values are available to calculate cleanup levels (WAC 173-340-730(3)(a)(iii), 1996 [Method B for surface waters]).

[j] Calculated cleanup level (per WAC 173-340-720(3), 1996 [Method B for groundwater] and WAC 173-340-740(3)(a)(ii)(A), 1996 ["100 times rule"]) presented is lower than that presented in the RDR/RAWP (DOE-RL 2005b), based on updated oral reference dose value (as provided in IRIS).

[k] No cleanup levels are available from the CLARC database (Ecology 2005); RAG values are calculated using toxicity data from the Oak Ridge National Laboratory (ORNL) risk assessment database.

-- = not applicable
AWQC = ambient water quality criteria
BG = background (obtained from DOE-RL [2001], unless otherwise noted)
CFR = Code of Federal Regulations
CLARC = Cleanup Levels and Risk Calculations
COC = contaminant of concern
COPC = contaminant of potential concern
DOE-RL = U.S. Department of Energy, Richland Operations Office
IRIS = Integrated Risk Information System
ORNL = Oak Ridge National Laboratory
RAG = remedial action goal
RAWP = remedial action work plan
RDR = remedial design report
RESRAD = RESidual RADioactivity (dose-assessment model)
WAC = Washington Administrative Code
WDOH = Washington State Department of Health

DATA EVALUATION

Residual concentrations of the following were determined to exceed soil RAGs for the protection of groundwater and/or the Columbia River at the 100-C-9:2 pipelines subsite:

- Copper, lead, mercury, zinc and aroclor-1254 within the 1607-B8 pipeline excavation (Table 6a)
- Lead, zinc, and aroclor-1254 within the 1607-B9 pipeline excavation (Table 6b)
- Copper, lead, nickel, 4,4'-DDE and 4,4-DDT at the focused samples of the 1607-B9 pipeline (Table 6c)
- Aroclor-1254 and dieldrin within the BCL samples of the 1607-B9 pipeline excavation (Table 6d)
- Lead and mercury within the 1607-B10 pipeline excavation (Table 6e).

There were no exceedances at the 1607-B11 pipeline excavation (Table 6e). Based on the soil-partitioning or distribution coefficient (K_d) values for these constituents (>22 mL/g), none are expected to migrate further than 3 m (10 ft) vertically in 1,000 years (BHI 2005). The vadose zone underlying the feeder line excavations is at least 22 m (72 ft) thick; therefore, residual concentrations of these contaminants are protective of groundwater. The only pathway for contaminants to reach the Columbia River is via groundwater migration, so these contaminant concentrations are also protective of the Columbia River.

When using a statistical sampling approach, a RAG requirement for nonradionuclides is the WAC 173-340-740(7)(e) three-part test. The application of the three-part test for the 1607-B9 pipeline site where statistical sampling was performed is included in the site-specific statistical calculations (Appendix B). The three-part test is not applicable to the results for the pipeline sites 1607-B8, 1607-B10, and 1607-B11, or the 1607-B9 BCL stockpile since direct evaluation of the maximum detected sampling results was used as the compliance basis.

All residual COC/COPC concentrations for the 1607-B9 pipeline site pass the three-part test in comparison to direct exposure RAGs. The site failed the three-part test for lead, zinc, and aroclor-1254 in comparison to soil RAGs for the protection of groundwater and/or the Columbia River. However, as above, neither lead (K_d = 30 mL/g), zinc (K_d = 30 mL/g) nor aroclor-1254 (K_d = 75.6 mL/g) at the 1607-B9 pipeline site are predicted to migrate more than 3 m (10 ft) vertically in 1,000 years, as compared to a vadose zone thickness of 22 m (72 ft). Therefore, residual concentrations of these constituents within the sampling areas are also protective of groundwater and the Columbia River.

Nonradionuclide risk requirements include an individual hazard quotient of <1.0, a cumulative hazard quotient of <1.0, an individual contaminant carcinogenic risk of $<1 \times 10^{-6}$, and a cumulative carcinogenic risk of $<1 \times 10^{-5}$. Risk values were calculated for each pipeline site, inclusive of 1607-B8, 1607-B9, 1607-B10 and 1607-B11. These risk values were conservatively calculated using the highest of the determined concentrations (as summarized in Tables 6a through 6f) for each constituent. 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 values. The calculations are presented in Appendix C. The cumulative risk values for each site are summarized in Table 7.

Table 7. Summary of Hazard Quotient and Carcinogenic Risk Calculations.

Pipeline Site	Cumulative HQ	Cumulative Carcinogenic Risk
1607-B8	5.5×10^{-1}	8.5×10^{-7}
1607-B9	2.2×10^{-1}	8.1×10^{-7}
1607-B10	1.8×10^{-1}	1.7×10^{-7}
1607-B11	2.8×10^{-3}	1.0×10^{-7}
Requirement	**< 1.0**	**$<1 \times 10^{-5}$**

HQ = hazard quotient

All individual hazard quotients were <1.0, and all individual excess carcinogenic risk values were $<1 \times 10^{-6}$. The cumulative values were also less than the nonradionuclide risk requirements for the cumulative hazard quotient (<1.0), and cumulative carcinogenic risk ($<1 \times 10^{-5}$). These calculations demonstrate that the 100-C-9:2 subsite meets the requirements for hazard quotient and excess carcinogenic risk as identified in the RDR/RAWP (DOE-RL 2005b).

DATA QUALITY ASSESSMENT

Individual data quality assessments (DQAs) were performed for each sampling event, and are included as Appendix D. Each DQA was performed to compare the sampling approach and resulting analytical data with the sampling and data requirements specified in the site-specific work instructions (WCH 2006a, 2006b). All DQAs were performed in accordance with specific data quality objectives found in the SAP (DOE-RL 2005a). The data quality requirements in the SAP are used for assessing data resulting from statistical sampling and do not specifically apply to the data sets resulting from the focused sampling performed for the 100-C-9:2 subsite. However, to ensure quality data sets, the SAP data quality assurance requirements, as well as the data validation procedures for chemical and radiochemical analysis (BHI 2000a, 2000b) have been followed, as appropriate.

The DQAs involve 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). A DQA completes the data life cycle (i.e., planning, implementation, and assessment) initiated by the data quality objectives process (EPA 2006). It was concluded that all interim closure data were of the right quality and quantity to support a closeout decision for the 100-C-9:2 waste site.

All analytical data are stored in the ENRE project-specific database prior to being submitted for inclusion in the HEIS database. The verification sample data are also included with the calculations provided in Appendix B.

SUMMARY FOR INTERIM CLOSURE

The 100-C-9:2 pipelines subsite has been remediated in accordance with the Remaining Sites ROD (EPA 1999) and the RDR/RAWP (DOE-RL 2005b). The site was remediated by excavating approximately 3,701 metric tons (4,080 U.S. tons) of material, transporting, and disposing of it at ERDF. Statistical and focused sampling to verify the completeness of remediation was performed, and analytical results were shown to meet the cleanup objectives for direct exposure, groundwater protection, and river protection. Accordingly, an interim closure reclassification is supported for the 100-C-9:2 pipelines subsite. The site does not have deep zone or residual contaminant concentrations that would require any institutional controls.

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APPENDIX A

CONFIRMATORY AND IN-PROCESS ANALYTICAL DATA

Note: This appendix contains the confirmatory sample results that led to a decision that remediation was necessary. Verification sampling results and calculations to support reclassification of the 100-C-9:2 subsite to Interim Closed Out are provided in Appendix B.

Table A-1. 100-C-9:2 Confirmatory Sampling Results. (6 Pages)

Sample Area	HEIS Number	Sample Date	Americium-241 GEA			Cesium-137			Cobalt-60			Europium-152			Europium-154			Europium-155		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
A5	J00YB3	09/17/03	0.28	U	0.28	0.227		0.11	0.15	U	0.15	0.3	U	0.3	0.37	U	0.37	0.24	U	0.24
Duplicate of J00YB3	J00YB4	09/17/03	0.32	U	0.32	0.324		0.16	0.28	U	0.28	0.35	U	0.35	0.45	U	0.45	0.29	U	0.29
A1	J00Y99	09/17/03	0.086	U	0.086	2.94		0.064	3.16		0.044	2.65		0.12	0.888		0.17	0.15	U	0.15
A2	J00YB0	09/17/03	0.44	U	0.44	4.79		0.11	2.08		0.081	2.65		0.18	0.903		0.24	0.19	U	0.19
A3	J00YB1	09/17/03	0.21	U	0.21	3.48		0.088	1.69		0.084	1.81		0.17	0.54		0.24	0.15	U	0.15
A4	J00YB2	09/17/03	0.23	U	0.23	0.049	U	0.049	0.054	U	0.054	0.14	U	0.14	0.18	U	0.18	0.14	U	0.14

Sample Area	HEIS Number	Sample Date	Gross Alpha			Gross Beta			Potassium-40			Radium-226			Radium-228			Thorium-228 GEA		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
A5	J00YB3	09/17/03	4.89	U	4.9	16		5.8	10.4		1.3	0.665		0.21	0.8		0.41	0.765		0.11
Duplicate of J00YB3	J00YB4	09/17/03	3.76	U	4.6	18.7		5.6	11.9		1.5	0.584		0.26	1.26		0.52	0.864		0.13
A1	J00Y99	09/17/03	5.44	U	5.6	21.1		6.3	6.4		0.41	0.258		0.096	0.448		0.26	0.346		0.055
A2	J00YB0	09/17/03	4.66	U	5.8	16.7		6.8	7.76		0.59	0.457		0.15	0.677		0.32	0.484		0.085
A3	J00YB1	09/17/03	6.48		6.1	16.8		5.9	9.67		0.77	0.522		0.16	0.668		0.35	0.51		0.097
A4	J00YB2	09/17/03	9.4		3.2	18.1		5.6	12		0.53	1.31		0.1	1.58		0.23	1.41		0.061

Sample Area	HEIS Number	Sample Date	Thorium-232 GEA			Total Beta Radiostrontium			Uranium-235 GEA			Uranium-238 GEA		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
A5	J00YB3	09/17/03	0.8		0.41				0.39	U	0.39	16	U	16
Duplicate of J00YB3	J00YB4	09/17/03	1.26		0.52				0.47	U	0.47	16	U	16
A1	J00Y99	09/17/03	0.448		0.26	1.06		0.1	0.15	U	0.15	9.1	U	9.1
A2	J00YB0	09/17/03	0.677		0.32	0.634		0.21	0.24	U	0.24	11	U	11
A3	J00YB1	09/17/03	0.668		0.35	0.701		0.25	0.24	U	0.24	9.8	U	9.8
A4	J00YB2	09/17/03	1.58		0.23				0.2	U	0.2	6.1	U	6.1

Acronyms and notes apply to all of the tables in this appendix.
Note: Data qualified with C, D, and/or J are considered acceptable values.
C = blank contamination (inorganic constituents)
D = diluted
GEA = gamma energy analysis
HEIS = Hanford Environmental Information System
J = estimate
MDA = minimum detectable activity
OS = other solids
PQL = practical quantitation limit
Q = qualifier
U = undetected

Table A-1. 100-C-9:2 Confirmatory Sampling Results. (6 Pages)

Sample Area	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
A5	J00YB3	09/17/03	11000		4.7	0.87		0.29	4.6		0.42	241	C	0.02	0.32		0.04	1.5		0.22
Duplicate of J00YB3	J00YB4	09/17/03	10900		4.5	0.64		0.28	4.2		0.41	194	C	0.02	0.26		0.04	1.4		0.21
Equipment Blank	J00YB5	09/17/03	43.5		4.6	0.29	U	0.29	0.42	U	0.42	1.1	C	0.02	0.04	U	0.04	0.22	U	0.22
A1	J00Y99	09/17/03	8430		4.7	4.4		0.29	43.7		0.42	266		0.02	0.191		0.04	8.2		0.22
A2	J00YB0	09/17/03	8530		4.7	3.3		0.29	34.4		0.42	370		0.02	0.254		0.04	9.2		0.22
A3	J00YB1	09/17/03	7370		4.7	6.6		0.29	30		0.43	430		0.02	0.195		0.04	8.2		0.22
A4	J00YB2	09/17/03	1090		4	0.248	U	0.25	0.618		0.36	41.2		0.02	0.034	U	0.03	10.4		0.19

Sample Area	HEIS Number	Sample Date	Cadmium			Calcium			Chromium			Cobalt			Copper			Hexavalent Chromium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
A5	J00YB3	09/17/03	0.76		0.04	5230		3.1	39		0.1	6.3		0.12	56.4		0.12	0.4	U	0.4
Duplicate of J00YB3	J00YB4	09/17/03	0.77		0.04	5580		3	81.4		0.1	5.9		0.12	47.5		0.12	0.61		0.4
Equipment Blank	J00YB5	09/17/03	0.04	U	0.04	20.5		3.1	0.15		0.1	0.12	U	0.12	0.18		0.12	0.4	U	0.4
A1 OS	J00Y95*	09/17/03																0.35	UR	0.35
A2 OS	J00Y96*	09/17/03																0.67	J	0.35
A3 OS	J00Y97*	09/17/03																0.445	J	0.35
A4 OS	J00Y98*	09/17/03																1.08	J	0.35
A1	J00Y99	09/17/03	7.3		0.04	29800		3.1	71.8		0.1	13.5		0.12	288		0.12			
A2	J00YB0	09/17/03	8.5		0.04	37300		3.1	57.9		0.1	12.1		0.12	293		0.12			
A3	J00YB1	09/17/03	7.8		0.04	19000		3.1	73.1		0.1	13.3		0.12	328		0.12			
A4	J00YB2	09/17/03	0.4		0.03	1780		2.7	5.8		0.09	0.558		0.1	9		0.1			

* Submitted for hexavalent chromium analysis only.

Sample Area	HEIS Number	Sample Date	Iron			Lead			Magnesium			Manganese			Mercury			Molybdenum		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
A5	J00YB3	09/17/03	24500		2	43.6		0.19	4790	C	0.7	233		0.03	4.2		0.07	0.52		0.19
Duplicate of J00YB3	J00YB4	09/17/03	23600		1.9	34.3		0.18	4810	C	0.68	212		0.03	2.2		0.05	0.41		0.18
Equipment Blank	J00YB5	09/17/03	124		2	0.46		0.19	6.1	C	0.69	4.1		0.03	0.01	U	0.01	0.19	U	0.19
A1	J00Y99	09/17/03	91900		23.7	256		0.19	3030		0.7	730		0.03	42.8		0.8	4.7		0.19
A2	J00YB0	09/17/03	67900		23.8	567		0.19	3790		0.7	856		0.03	37.3		0.75	3		0.19
A3	J00YB1	09/17/03	77700		24.1	387		0.19	3520		0.71	948		0.03	58.2		0.82	5.7		0.19
A4	J00YB2	09/17/03	1970		1.7	9.2		0.17	628		0.6	40.4		0.03	2.59		0.06	0.217		0.16

Table A-1. 100-C-9:2 Confirmatory Sampling Results. (6 Pages)

Sample Area	HEIS Number	Sample Date	Nickel			Potassium			Selenium			Silicon			Silver			Sodium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQ
A5	J00YB3	09/17/03	15.6		0.2	1390		2.4	0.29	U	0.29	453	C	0.52	2.3		0.08	156	C	
Duplicate of J00YB3	J00YB4	09/17/03	15.6		0.18	1310		2.3	0.48		0.28	495	C	0.53	0.85		0.08	136	C	
Equipment Blank	J00YB5	09/17/03	0.23		0.2	17.2		2.3	0.29	U	0.29	35.4	C	0.54	0.08	U	0.08	7.1	C	
A1	J00Y99	09/17/03	76.6		0.2	1180		2.3	0.877		0.29	686		0.54	0.97		0.08	411		0.
A2	J00YB0	09/17/03	46.1		0.2	1460		2.4	1.1		0.29	547		0.54	63.2		0.08	257		0.
A3	J00YB1	09/17/03	49.4		0.2	1360		2.4	1.7		0.29	515		0.55	16.7		0.08	382		0.
A4	J00YB2	09/17/03	2.8		0.17	117		2	0.248	U	0.25	193		0.46	0.253		0.07	160		0.

Sample Area	HEIS Number	Sample Date	Vanadium			Zinc		
			mg/kg	Q	PQL	mg/kg	Q	PQL
A5	J00YB3	09/17/03	41.4		0.09	223		0.26
Duplicate of J00YB3	J00YB4	09/17/03	39.9		0.09	220		0.25
Equipment Blank	J00YB5	09/17/03	0.14		0.09	0.69		0.26
A1	J00Y99	09/17/03	48.1		0.09	6310		3.1
A2	J00YB0	09/17/03	49.2		0.09	2530		3.1
A3	J00YB1	09/17/03	51.5		0.09	1800		3.2
A4	J00YB2	09/17/03	1.9		0.08	87.4		0.22

Table A-1. 100-C-9:2 Confirmatory Sampling Results. (6 Pages)

Constituent	J00Y99 Sample Area A1 Sample Date 9/17/03			J00YB0 Sample Area A2 Sample Date 9/17/03			J00YB1 Sample Area A3 Sample Date 9/17/03			J00YB2 Sample Area A4 Sample Date 9/17/03			J00YB3 Sample Area A5 Sample Date 9/17/03			J00YB4 Duplicate of A5 Sample Date 9/17/03			J00YB5 Equipment Blank Sample Date 9/17/03		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Polychlorinated Byphenyls (PCBs)																					
Aroclor-1016	68	U	68	68	U	68	68	U	68	13	U	13	13	U	13	13	U	13	13	U	13
Aroclor-1221	68	U	68	68	U	68	68	U	68	13	U	13	13	U	13	13	U	13	13	U	13
Aroclor-1232	68	U	68	68	U	68	68	U	68	13	U	13	13	U	13	13	U	13	13	U	13
Aroclor-1242	68	U	68	68	U	68	68	U	68	13	U	13	13	U	13	13	U	13	13	U	13
Aroclor-1248	68	U	68	68	U	68	68	U	68	13	U	13	13	U	13	13	U	13	13	U	13
Aroclor-1254	200		68	110		68	370		68	13	J	13	110		13	170		13	13	U	13
Aroclor-1260	68	U	68	68	U	68	68	U	68	13	U	13	13	U	13	13	U	13	13	U	13
Pesticides																					
Aldrin	34	U	34	34	U	34	84	U	84	1.7	U	1.7	17	UD	17	17	UD	17	1.7	U	1.7
Alpha-BHC	34	U	34	34	U	34	84	U	84	1.7	U	1.7	17	UD	17	17	UD	17	1.7	U	1.7
alpha-Chlordane	34	U	34	34	U	34	84	U	84	1.7	U	1.7	17	UD	17	17	UD	17	1.7	U	1.7
beta-1,2,3,4,5,6-Hexachlorocyclohexane	34	U	34	34	U	34	84	U	84	1.7	U	1.7	17	UD	17	17	UD	17	1.7	U	1.7
Delta-BHC	34	U	34	34	U	34	84	U	84	1.7	U	1.7	17	UD	17	17	UD	17	1.7	U	1.7
Dichlorodiphenyldi-chloroethane	68	U	68	68	U	68	170	U	170	3.3	U	3.3	34	UD	34	34	UD	34	3.3	U	3.3
Dichlorodiphenyldi-chloroethylene	39	J	68	68	U	68	170	U	170	3.3	U	3.3	34	UD	34	34	UD	34	3.3	U	3.3
Dichlorodiphenyltri-chloroethane	68	U	68	68	U	68	170	U	170	3.3	U	3.3	34	UD	34	37	D	34	3.3	U	3.3
Dieldrin	68	U	68	68	U	68	170	U	170	3.3	U	3.3	34	UD	34	34	UD	34	3.3	U	3.3
Endosulfan I	34	U	34	34	U	34	84	U	84	1.7	U	1.7	17	UD	17	17	UD	17	1.7	U	1.7
Endosulfan II	68	U	68	68	U	68	170	U	170	3.3	U	3.3	34	UD	34	34	UD	34	3.3	U	3.3
Endosulfan sulfate	68	U	68	68	U	68	170	U	170	3.3	U	3.3	34	UD	34	34	UD	34	3.3	U	3.3
Endrin	68	U	68	68	U	68	170	U	170	3.3	U	3.3	34	UD	34	34	UD	34	3.3	U	3.3
Endrin aldehyde	68	U	68	68	U	68	170	U	170	3.3	U	3.3	34	UD	34	34	UD	34	3.3	U	3.3
Endrin ketone	68	U	68	68	U	68	170	U	170	3.3	U	3.3	34	UD	34	34	UD	34	3.3	U	3.3
Gamma-BHC (Lindane)	34	U	34	34	U	34	84	U	84	1.7	U	1.7	17	UD	17	17	UD	17	1.7	U	1.7
gamma-Chlordane	34	U	34	34	U	34	84	U	84	1.7	U	1.7	17	UD	17	17	UD	17	1.7	U	1.7
Heptachlor	34	U	34	34	U	34	84	U	84	1.7	U	1.7	17	UD	17	17	UD	17	1.7	U	1.7
Heptachlor epoxide	34	U	34	34	U	34	84	U	84	1.7	U	1.7	17	UD	17	17	UD	17	1.7	U	1.7
Methoxychlor	340	U	340	340	U	340	840	U	840	17	U	17	170	UD	170	170	UD	170	17	U	17
Toxaphene	3400	U	3400	3400	U	3400	8400	U	8400	170	U	170	1700	UD	1700	1700	UD	1700	170	U	170

Table A-1. 100-C-9:2 Confirmatory Sampling Results. (6 Pages)

Constituent	J00Y99 Sample Area A1 Sample Date 9/17/03			J00YB0 Sample Area A2 Sample Date 9/17/03			J00YB1 Sample Area A3 Sample Date 9/17/03			J00YB2 Sample Area A4 Sample Date 9/17/03			J00YB3 Sample Area A5 Sample Date 9/17/03			J00YB4 Duplicate of A5 Sample Date 9/17/03			J00YB5 Equipment Blank Sample Date 9/17/03		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Semivolatile Organics (SVOAs)																					
1,2,4-Trichlorobenzene	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
1,2-Dichlorobenzene	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
1,3-Dichlorobenzene	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
1,4-Dichlorobenzene	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
2,4,5-Trichlorophenol	8500	U	8500	8500	U	8500	17000	U	17000	830	U	830	840	U	840	840	U	840	830	U	830
2,4,6-Trichlorophenol	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
2,4-Dichlorophenol	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
2,4-Dimethylphenol	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
2,4-Dinitrophenol	8500	U	8500	8500	U	8500	17000	U	17000	830	U	830	840	U	840	840	U	840	830	U	830
2,4-Dinitrotoluene	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
2,6-Dinitrotoluene	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
2-Chloronaphthalene	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
2-Chlorophenol	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
2-Methylnaphthalene	3400	U	3400	215.39	J	3400	2471.1	J	6800	330	U	330	340	U	340	340	U	340	330	U	330
2-Methylphenol (cresol, o-)	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
2-Nitroaniline	8500	U	8500	8500	U	8500	17000	U	17000	830	U	830	840	U	840	840	U	840	830	U	830
2-Nitrophenol	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
3,3'-Dichlorobenzidine	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
3-Nitroaniline	8500	U	8500	8500	U	8500	17000	U	17000	830	U	830	840	U	840	840	U	840	830	U	830
4,6-Dinitro-2-methylphenol	8500	U	8500	8500	U	8500	17000	U	17000	830	U	830	840	U	840	840	U	840	830	U	830
4-Bromophenylphenyl ether	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
4-Chloro-3-methylphenol	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
4-Chloroaniline	3400	U	3400	197.54	J	3400	473.4	J	6800	330	U	330	20	J	340	340	U	340	330	U	330
4-Chlorophenylphenyl ether	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
4-Methylphenol (cresol, p-)	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
4-Nitroaniline	8500	U	8500	8500	U	8500	17000	U	17000	830	U	830	840	U	840	840	U	840	830	U	830
4-Nitrophenol	8500	U	8500	8500	U	8500	17000	U	17000	830	U	830	840	U	840	840	U	840	830	U	830
Acenaphthene	322.81	J	3400	382.5	J	3400	2381.9	J	6800	330	U	330	340	U	340	340	U	340	330	U	330
Acenaphthylene	1679.3	J	3400	1554.7	J	3400	1400.3	J	6800	330	U	330	39	J	340	19	J	340	330	U	330
Anthracene	2755.8	J	3400	2298.7	J	3400	4231.5	J	6800	330	U	330	49	J	340	340	U	340	330	U	330
Benzo(a)anthracene	10425		3400	8806.2		3400	9198		6800	330	U	330	120	J	120	37	J	340	330	U	330
Benzo(a)pyrene	10002		3400	8544.7		3400	8047.4		6800	330	U	330	140	J	140	46	J	340	330	U	330
Benzo(b)fluoranthene	7062.2		3400	6072.2		3400	5827.4	J	6800	330	U	330	110	J	110	45	J	340	330	U	330

Table A-1. 100-C-9:2 Confirmatory Sampling Results. (6 Pages)

Constituent	J00Y99 Sample Area A1 Sample Date 9/17/03			J00YB0 Sample Area A2 Sample Date 9/17/03			J00YB1 Sample Area A3 Sample Date 9/17/03			J00YB2 Sample Area A4 Sample Date 9/17/03			J00YB3 Sample Area A5 Sample Date 9/17/03			J00YB4 Duplicate of A5 Sample Date 9/17/03			J00YB5 Equipment Blank Sample Date 9/17/03		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
SVOAs (continued)																					
Benzo(ghi)perylene	6337.3		3400	5375.9		3400	4296.4	J	6800	330	U	330	110	J	110	45	J	340	330	U	330
Benzo(k)fluoranthene	7405.9		3400	6624.9		3400	6419.4	J	6800	330	U	330	110	J	110	37	J	340	330	U	330
Bis(2-chloro-1-methylethyl)ether	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
Bis(2-Chloroethoxy)methane	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
Bis(2-chloroethyl) ether	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
Bis(2-ethylhexyl) phthalate	301.91	J	3400	293.25	J	3400	6800	U	6800	330	U	330	41	J	340	28	J	340	21	J	330
Butylbenzylphthalate	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
Carbazole	1280.5	J	3400	1112.7	J	3400	2471.7	J	6800	330	U	330	340	U	340	340	U	340	330	U	330
Chrysene	12272		3400	11349		3400	11025		6800	330	U	330	150	J	340	51	J	340	330	U	330
Di-n-butylphthalate	611.47	J	3400	823.31	J	3400	881.24	J	6800	330	U	330	140	J	340	96	J	340	330	U	330
Di-n-octylphthalate	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
Dibenz[a,h]anthracene	1977.1	J	3400	1705.3	J	3400	1547.6	J	6800	330	U	330	36	J	340	340	U	340	330	U	330
Dibenzofuran	323.49	J	3400	303.62	J	3400	2254.5	J	6800	330	U	330	340	U	340	340	U	340	330	U	330
Diethylphthalate	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
Dimethyl phthalate	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
Fluoranthene	16971		3400	15546		3400	24915		6800	330	U	330	180	J	340	54	J	340	330	U	330
Fluorene	598.56	J	3400	514.59	J	3400	3135.7	J	6800	330	U	330	340	U	340	340	U	340	330	U	330
Hexachlorobenzene	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
Hexachlorobutadiene	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
Hexachlorocyclo-pentadiene	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
Hexachloroethane	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
Indeno(1,2,3-cd)pyrene	5486.1		3400	4666.2		3400	4068.3	J	6800	330	U	330	95	J	340	36	J	340	330	U	330
Isophorone	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
N-Nitroso-di-n-dipropylamine	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
N-Nitrosodiphenylamine	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
Naphthalene	510.04	J	3400	655.52	J	3400	10134		6800	330	U	330	340	U	340	340	U	340	330	U	330
Nitrobenzene	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
Pentachlorophenol	8500	U	8500	8500	U	8500	17000	U	17000	830	U	830	840	U	840	840	U	840	830	U	830
Phenanthrene	7788.7		3400	6369		3400	19112		6800	330	U	330	86	J	340	23	J	340	330	U	330
Phenol	3400	U	3400	3400	U	3400	6800	U	6800	330	U	330	340	U	340	340	U	340	330	U	330
Pyrene	12944		3400	11376		3400	13375		6800	330	U	330	130	J	340	38	J	340	330	U	330

Table A-2. 100-C-9:2 In-Process and Waste Characterization Data. (3 Pages)

Sample Location	HEIS Number	Sample Date	Aluminum			Antimony			Arsenic			Barium			Beryllium			Boron			Cadmium		
			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
Anomaly	J03701	5/25/05	4170		2.3	0.78		0.28	6.9		0.42	40.1		0.02	0.28		0.01	4.4		0.22	0.03	U	0.03
Soil	J03N77	7/6/05	4340		2.4	2.4	U	2.4	6.3		2.7	56.3		0.12	0.83		0.06	1.4	U	1.4	0.18	U	0.18

Sample Location	HEIS Number	Sample Date	Calcium			Chromium			Hexavalent Chromium			Cobalt			Copper			Iron			Lead		
			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
Anomaly	J03701	5/25/05	8700		1.8	8.4		0.07	0.27		0.22	6.6		0.09	20.8		0.08	110000		2.2	14.3		0.24
Soil	J03N77	7/6/05	6380		1.8	7.5		0.42	0.27	U	0.22	6.2		0.54	13.9		0.29	16700		17.5	11.8		1.5

Sample Location	HEIS Number	Sample Date	Lithium			Magnesium			Manganese			Mercury			Molybdenum			Nickel			Phosphorus		
			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
Anomaly	J03701	5/25/05	8.3		0.02	3290		4	317		0.02	0.1		0.02	1.5		0.15	15		0.21	854		1.1
Soil	J03N77	7/6/05	5.4		0.12	3460		4.2	273		0.12	0.02	U	0.02	0.96	U	0.96	10.4		1.3	863		1.1

Sample Location	HEIS Number	Sample Date	Potassium			Selenium			Silicon			Silver			Sodium			Strontium			Tin		
			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
Anomaly	J03701	5/25/05	652		51.8	0.47		0.47	309		0.65	0.09	U	0.09	106		2.2	24.5		0.01	1.6		0.52
Soil	J03N77	7/6/05	880		54.2	2.9	U	2.9	398		4.1	0.54	U	0.54	155		2.3	25.5		0.06	3.3	U	3.3

Sample Location	HEIS Number	Sample Date	Titanium			Thallium			Uranium			Vanadium			Zinc			Zirconium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Anomaly	J03701	5/25/05	1060		0.03	0.75	U	0.75	1.9	U	1.9	38.5		0.06	51.6		0.05	13.9		0.34
Soil	J03N77	7/6/05	1080		0.18	4.7	U	4.7	11.8	U	11.8	33.3		0.36	39.6		0.3	13.6		0.91

Sample Location	HEIS Number	Sample Date	Arsenic, TCLP			Barium, TCLP			Cadmium, TCLP			Chromium, TCLP			Mercury, TCLP			Lead, TCLP			Selenium, TCLP		
			µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL	µg/L	Q	PQL
Anomaly	J03701	5/25/05	27	U	27	194		1.2	1.8	U	1.8	4.7		4.2	3.7		0.1	15	U	15	29.4	U	29.4
Soil	J03N77	7/6/05	32.8		30.5	219		2.6	4.7	U	4.7	11.3		10.8	0.1	U	0.1	32.7	U	32.7	48.5	U	48.5

Sample Location	HEIS Number	Sample Date	Silver, TCLP		
			µg/L	Q	PQL
Anomaly	J03701	5/25/05	5.4	U	5.4
Soil	J03N77	7/6/05	5.6	U	5.6

Acronyms and notes apply to all of the tables in this appendix.
Note: Data qualified with B, C, D, and/or J are considered acceptable values.
B = blank contamination (organic constituents)
HEIS = Hanford Environmental Information System
J = estimate
PQL = practical quantitation limit
Q = qualifier
TCLP = Toxicity characteristic leaching procedure
U = undetected

Table A-2. 100-C-9:2 In-Process and Waste Characterization Data.
(3 Pages)

Constituents	J03701 Anomaly Sample Date 5/25/05		
	µg/kg	Q	PQL
Semivolatile Organic Analytes (SVOAs)			
1,2,4-Trichlorobenzene	360	U	360
1,2-Dichlorobenzene	360	U	360
1,3-Dichlorobenzene	360	U	360
1,4-Dichlorobenzene	360	U	360
2,4,5-Trichlorophenol	890	U	890
2,4,6-Trichlorophenol	360	U	360
2,4-Dichlorophenol	360	U	360
2,4-Dimethylphenol	360	U	360
2,4-Dinitrophenol	890	U	890
2,4-Dinitrotoluene	360	U	360
2,6-Dinitrotoluene	360	U	360
2-Chloronaphthalene	360	U	360
2-Chlorophenol	360	U	360
2-Methylnaphthalene	360	U	360
2-Methylphenol (cresol, o-)	360	U	360
2-Nitroaniline	890	U	890
2-Nitrophenol	360	U	360
3+4 Methylphenol (cresol, m+p)	360	U	360
3,3'-Dichlorobenzidine	360	U	360
3-Nitroaniline	890	U	890
4,6-Dinitro-2-methylphenol	890	U	890
4-Bromophenylphenyl ether	360	U	360
4-Chloro-3-methylphenol	360	U	360
4-Chloroaniline	360	U	360
4-Chlorophenylphenyl ether	360	U	360
4-Nitroaniline	890	U	890
4-Nitrophenol	890	U	890
Acenaphthene	360	U	360
Acenaphthylene	360	U	360
Anthracene	360	U	360
Benzo(a)anthracene	360	U	360
Benzo(a)pyrene	360	U	360
Benzo(b)fluoranthene	360	U	360
Benzo(ghi)perylene	360	U	360
Benzo(k)fluoranthene	360	U	360
Bis(2-chloro-1-methylethyl)ether	360	U	360
Bis(2-Chloroethoxy)methane	360	U	360
Bis(2-chloroethyl) ether	360	U	360
Bis(2-ethylhexyl) phthalate	210	JB	360
Butylbenzylphthalate	360	U	360
Carbazole	360	U	360
Chrysene	360	U	360
Di-n-butylphthalate	24	J	360
Di-n-octylphthalate	360	U	360
Dibenz[a,h]anthracene	360	U	360
Dibenzofuran	360	U	360
Diethylphthalate	360	U	360
Dimethyl phthalate	360	U	360
Fluoranthene	360	U	360

Table A-2. 100-C-9:2 In-Process and Waste Characterization Data. (3 Pages)

Constituents	J03701 Anomaly Sample Date 5/25/05		
	µg/kg	Q	PQL
SVOAs (Continued)			
Fluorene	360	U	360
4-Nitrophenol	890	U	890
Hexachlorobenzene	360	U	360
Hexachlorobutadiene	360	U	360
Hexachlorocyclopentadiene	360	U	360
Hexachloroethane	360	U	360
Indeno(1,2,3-cd)pyrene	360	U	360
Isophorone	360	U	360
N-Nitroso-di-n-dipropylamine	360	U	360
N-Nitrosodiphenylamine	360	U	360
Naphthalene	360	U	360
Nitrobenzene	360	U	360
Pentachlorophenol	890	U	890
Phenanthrene	360	U	360
Phenol	360	U	360
Pyrene	360	U	360

Constituents	J03701 Anomaly Sample Date 5/25/05		
	mg/L	Q	PQL
SVOAs			
1,4-Dichlorobenzene	0.05	U	0.05
2,4,5-Trichlorophenol	0.12	U	0.12
2,4,6-Trichlorophenol	0.05	U	0.05
2,4-Dinitrotoluene	0.05	U	0.05
2-Methylphenol (cresol, o-)	0.05	U	0.05
3+4 Methylphenol (cresol, m+p)	0.05	U	0.05
Hexachlorobenzene	0.05	U	0.05
Hexachlorobutadiene	0.05	U	0.05
Hexachloroethane	0.05	U	0.05
Nitrobenzene	0.05	U	0.05
Pentachlorophenol	0.12	U	0.12
Pyridine	0.05	U	0.05

APPENDIX B

95% UCL CALCULATION AND VERIFICATION SAMPLING RESULTS

CALCULATION COVER SHEET

Project Title:	100-B/C Remaining Pipes and Sewers Field Remediation	**Job No.**	14655
Area	100-B/C		
Discipline	Environmental	***Calc. No.**	0100C-CA-V0031
Subject	100-C-9:2 Waste Site Cleanup Verification 95% UCL 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 Sheets = 14 Attm. 1 = 24 Total = 39	*Signed* *11/14/2006* J. M. Capron	*Signed* *11/16/2006* T. M. Blakley	N/A	*Signed* *11/21/2006* D. N. Strom	*Approved* *11/21/2006*
1	Cover = 1 Sheets = 14 Attm. 1 = 24 Total = 39	1/12/07 J. M. Capron	1/24/06 T. M. Blakley	N/A	1-25-07 D. N. Strom	1-25-07

SUMMARY OF REVISIONS

1	Cover page replaced for convenience. Revised attachment 1, sheets 1, 4, 6, 18, 19, 20, 21, 22, 23, and 24 to include data qualifiers added during data quality assesment.

WCH-DE-018 (9/01/2006) * Obtain Calc. No. from R&DC and Form from Intranet

CALCULATION SHEET

Washington Closure Hanford

Originator J. M. Capron JMC **Date** 11/14/06 **Calc. No.** 0100C-CA-V0031 **Rev. No.** 0
Project 100-B/C Remaining Pipes and Sewers Field Remediation **Job No.** 14655 **Checked** T. M. Blakley JMB **Date** 11/16/06
Subject 100-C-9:2 Waste Site Cleanup Verification 95% UCL Calculations **Sheet No.** 1 of 14

Summary

Purpose:
Calculate the 95% upper confidence limit (UCL) values to evaluate compliance with cleanup standards for the 100-C-9:2 subsite, which is inclusive of (discrete) feeder lines for the former 1607-B8, -B9, -B10, and -B11 septic systems. Also, perform the *Washington Administrative Code* (WAC) 173-340-740(7)(e) 3-part test for each nonradioactive contaminant of concern (COC) and contaminant of potential concern (COPC) and calculate the relative percent difference (RPD) for primary-duplicate sample pairs, as necessary.

Table of Contents:

Given/References:

1) Sample Results (Attachment 1).
2) Background values and remedial action goals (RAGs) are taken from DOE-RL (2005b), DOE-RL (2001), Ecology (1994), and Ecology (2005).
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, 2005a, *100 Area Remedial Action Sampling and Analysis Plan* (SAP), DOE/RL-96-22, Rev. 4, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
5) DOE-RL, 2005b, *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP), DOE/RL-96-17, Rev. 5, 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, 1994, Natural Background Soil Metals Concentrations in Washington State, Publication No. 94-115, 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) EPA, 1994, *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, EPA 540/R-94/013. U.S. Environmental Protection Agency, Washington, D.C.
11) 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, as required. The hazard quotient and carcinogenic risk calculations are located in a separate calculation brief as an appendix to the Remaining Sites Verification Package (RSVP).

Calculation Description:
The subject calculations were performed on data from soil verification samples from the subject 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 2005b) is documented by this calculation. Duplicate RPD results are used in evaluation of data quality within the RSVP for this site.

Methodology:
For nonradioactive analytes with ≤50% of the data below detection limits and all detected radionuclide analytes, 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, the maximum detected value for the data set is used instead of the 95% UCL. The 95% UCL is not calculated for data sets with no reported detections. The evaluation of the portion of each analyte's data set below detection limits was performed by direct inspection of the attached sample results, and no further calculations were performed for those data sets where >50% of the data was below detection limits. The 95% UCL values were not calculated for aluminum, calcium, iron, magnesium, phosphate, potassium, silicon, sodium, and zirconium, as no parameters to calculate cleanup values under WAC 173-340-740(3) are available in Ecology (2005) or other reference databases, and these constituents are thus not considered site COPCs (results for total phosphorus are attributed to phosphorus in phosphate).

CALCULATION SHEET

Washington Closure Hanford

Originator J. M. Capron JMC **Date** 11/14/06 **Calc. No.** 0100C-CA-V0031 **Rev. No.** 0
Project 100-B/C Remaining Pipes and Sewers Field Remediation **Job No.** 14655 **Checked** T. M. Blakley TMB **Date** 11/16/06
Subject 100-C-9:2 Waste Site Cleanup Verification 95% UCL Calculations **Sheet No.** 2 of 14

Summary (continued)

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

Gross beta activity above background levels was detected in one sample from the 1607-B9 feeder line excavation, and the presence of strontium-90 in the sample was confirmed by additional analysis. Following additional material removal and resampling, strontium-90 was not detected, and is, therefore, not considered further in the statistical calculations.

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 ($n < 10$) and all radionuclide data sets, 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 and calculation of the 95% UCL is done using Ecology's MTCAStat software (Ecology 1993). Due to differences in addressing censored data between the RDR/RAWP (DOE-RL 2005b) 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 input 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/COCs where the statistical value defaults to the maximum value in the data set. Instead, direct comparison of the maximum value against site RAGs (within the RSVP) is used as the compliance basis.

The RPD values are evaluated for analytes detected in a primary-duplicate or primary-split sample pair for the purposes of data quality assessment within the RSVP (where direct evaluation of the attached data showed that a given analyte was undetected in both the primary and duplicate sample, no further calculations were performed). 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, listed in Table II-1 of the SAP (DOE-RL 2005a). The RPD calculations use the following formula:

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

where, M = main sample value S = split (or duplicate) sample value

For quality assurance/quality control (QA/QC) split and duplicate RPD calculations, a value less than 30% indicates the data compare favorably. For regulatory splits, a threshold of 35% is used (EPA 1994). If the RPD is greater than 30% (or 35% for regulatory split data), further investigation regarding the usability of the data is performed. As a matter of good practice, 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. No split samples were collected for cleanup verification of the subject site. Additional discussion is provided in the data quality assessment section of the applicable RSVP, as necessary.

In addition to the statistical samples collected from the 1607-B9 feeder line remediation footprint, biased samples were collected beneath discovery pipelines and multi-aliquot samples were collected from stockpiled overburden/below-cleanup-level material. The maximum detected values for each of these data sets are presented in the results summary for use in the RSVP. Similarly, verification sampling at the 1607-B8, -B10, and -B11 feeder line remediation footprints was based on multi-aliquot sampling. Statistical methodology is not applicable to non-statistical sampling, and direct evaluation of detected values within these sampling areas will be used as the compliance basis. Maximum detected values from each data set are presented in the results summary for use in the RSVP.

CALCULATION SHEET

Washington Closure Hanford

Originator J. M. Capron **Date** 11/14/06 **Checked** T. M. Blakley **Date** 11/16/06
Project 100-B/C Remaining Pipes and Sewers Field Remediation **Calc. No.** 0100C-CA-V003 **Rev. No.** 0
Subject 100-C-9:2 Waste Site Cleanup Verification 95% UCL Calculations **Job No.** 14655 **Sheet No.** 3 of 14

Summary (continued)

Results:
The results presented in the summary tables that follow are for use in risk analysis and the RSVP for this site.

Results Summary[a] - Remediation Footprint

Analyte	1607-B8[b]	1607-B9 Statistical[c]	1607-B9 Focused[d]	1607-B9 BCL[b]	1607-B10[b]	1607-B11[b]	Units
Cesium-137	ND	0.065	ND	ND	ND	ND	pCi/g
Antimony	ND	ND	0.97	ND	ND	0.47	mg/kg
Arsenic	4.4	2.9	3.4	2.4	3.6	3.8	mg/kg
Barium	69.0	64.3	64.1	56.7	74.1	58.8	mg/kg
Beryllium	0.51	0.46	0.48	0.48	0.20	0.20	mg/kg
Boron	5.1	ND	ND	ND	1.1	2.0	mg/kg
Cadmium	0.37	0.24	0.28	0.17	0.50	0.08	mg/kg
Chromium (total)	16.5	8.7	13.5	7.2	11.0	8.8	mg/kg
Cobalt	8.9	7.7	7.7	7.6	6.9	8.3	mg/kg
Copper	66.1	15.6	22.5	14.6	17.6	19.1	mg/kg
Hexavalent chromium	0.83	0.28	ND	0.27	0.24	0.21	mg/kg
Lead	152	12.8	55.5	8.8	45.3	5.8	mg/kg
Lithium	7.1	7.0	6.5	5.1	6.7	7.2	mg/kg
Manganese	456	343	404	345	311	352	mg/kg
Mercury	0.37	0.04	ND	ND	0.85	ND	mg/kg
Molybdenum	1.0	0.42	1.9	0.38	0.47	0.46	mg/kg
Nickel	11.8	10.9	22.0	10.0	12.2	11.0	mg/kg
Strontium	25.5	22.7	23.4	20.6	32.7	28.4	mg/kg
Titanium	1960	1570	1640	1720	1210	1610	mg/kg
Vanadium	58.4	47.5	48.0	50.3	42.5	49.2	mg/kg
Zinc	111	162	40.5	43.6	52.2	44.6	mg/kg
Aroclor-1254	0.12	0.028	0.0074	0.039	0.015	ND	mg/kg
Aroclor-1260	ND	ND	ND	ND	0.011	ND	mg/kg
4,4'-DDD	ND	ND	0.0035	ND	ND	ND	mg/kg
4,4'-DDE	0.0045	0.0012	0.014	0.00070	0.0014	ND	mg/kg
4,4'-DDT	ND	ND	0.0051	ND	0.0019	ND	mg/kg
Dieldrin	ND	0.0017	ND	0.0099	ND	ND	mg/kg
Endosulfan I	0.00064	ND	ND	ND	ND	ND	mg/kg
Endosulfan sulfate	0.0037	ND	ND	ND	0.0011	ND	mg/kg
Endrin	ND	ND	0.0036	ND	ND	ND	mg/kg
Endrin aldehyde	ND	0.00097	0.0029	ND	ND	ND	mg/kg
Endrin ketone	0.00074	ND	0.00043	ND	ND	ND	mg/kg
gamma-Chlordane	0.0016	ND	ND	ND	ND	ND	mg/kg
Methoxychlor	ND	ND	ND	ND	0.0029	0.0073	mg/kg
Benzo(a)anthracene	ND	0.041	ND	ND	ND	ND	mg/kg
Benzo(a)pyrene	0.022	0.048	ND	0.018	ND	ND	mg/kg
Benzo(b)fluoranthene	0.073	0.041	ND	ND	ND	ND	mg/kg
Benzo(g,h,i)perylene	0.023	0.037	ND	0.018	ND	ND	mg/kg
Benzo(k)fluoranthene	0.023	0.045	ND	ND	ND	ND	mg/kg
bis(2-Ethylhexyl)phthalate	ND	ND	ND	ND	0.25	ND	mg/kg
Chrysene	0.082	0.055	ND	0.020	ND	ND	mg/kg
Di-n-butylphthalate	ND	ND	ND	ND	0.040	0.034	mg/kg
Fluoranthene	ND	0.081	ND	0.024	ND	ND	mg/kg
Indeno(1,2,3-cd)pyrene	ND	0.030	ND	ND	ND	ND	mg/kg
Phenanthrene	ND	0.056	ND	ND	ND	ND	mg/kg
Pyrene	ND	0.094	ND	0.024	ND	ND	mg/kg

[a] No detections were reported in any data set for COCs/COPCs not listed in this table.
[b] Verification sampling of the 1607-B8, -B10, and -B11 feeder line excavations and the 1607-B9 feeder line BCL material was based on multi-aliquot sampling; the maximum detected result for each analyte for each data set is presented.
[c] Maximum or 95% UCL result, depending on data censorship, as described in the calculation methodology.
[d] Maximum detected result from either of the two focused samples (beneath discovery pipelines) at the 1607-B9 feeder line excavation.
BCL = below cleanup levels
COC = contaminant of concern
COPC = contaminant of potential concern
ND = not detected (for all samples in the data set)
UCL = upper confidence limit

CALCULATION SHEET

Washington Closure Hanford

Originator J. M. Capron **Date** 11/14/06 **Checked** T. M. Blakley **Date** 11/14/06
Project 100-B/C Remaining Pipes and Sewers Field Remediation **Calc. No.** 0100C-CA-V0031 **Rev. No.** 0
Subject 100-C-9:2 Waste Site Cleanup Verification 95% UCL Calculations **Job No.** 14655 **Sheet No.** 4 of 14

Summary (continued)

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

Because of the "yes" answers to the WAC 173-340 3-part test for lead, zinc, and aroclor-1254, additional evaluation of the attainment of cleanup criteria will be performed.

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

Analyte	1607-B9 Node 4 Duplicate Analysis[b]	1607-B11 Node 1 Duplicate Analysis[b]
Potassium-40	10%	20%
Aluminum	16%	8.2%
Barium	19%	21%
Calcium	0.24%	5.3%
Chromium	20%	2.5%
Copper	2.1%	28%
Iron	12%	11%
Magnesium	15%	4.9%
Manganese	1.2%	1.7%
Phosphorus	8.0%	4.5%
Silicon	10%	19%
Strontium	1.0%	6.2%
Titanium	14%	25%
Vanadium	20%	14%
Zinc	15%	6.3%
Zirconium	13%	--

[a]Relative percent difference evaluation was not required for analytes not included in this table.
[b]The significance of relative percent difference values are discussed within the RSVP for the subject site.
-- = analysis not required
QA/QC = quality assurance/quality control
RSVP = remaining sites verification package

Washington Closure Hanford

CALCULATION SHEET

Originator J. M. Capron JMC
Project 100-B/C Remaining Pipes and Sewers Field Remediation
Subject 100-C-9:2 Waste Site Cleanup Verification 95% UCL Calculations

Date 11/14/06
Job No. 14655

Calc. No. 0100C-CA-V0031
Checked T. M. Blakley JMB

Rev. No. 0
Date 11/16/06
Sheet No. 5 of 14

100-C-9:2 (1607-B9 Influent Line) Remediation Footprint Verification Data

Sample Node	Sample Number	Sample Date	Cesium-137 pCi/g	Q	MDA	Arsenic mg/kg	Q	PQL	Barium mg/kg	Q	PQL	Beryllium mg/kg	Q	PQL	Cadmium mg/kg	Q	PQL	Chromium mg/kg	Q	PQL	Cobalt mg/kg	Q	PQL	Copper mg/kg	Q	PQL
1	J11VK9	4/5/06	0.078	U	0.078	2.8		0.61	81.6		0.02	0.45		0.02	0.14		0.07	11.0		0.13	7.6		0.14	14.7		0.12
2	J11VL0	4/5/06	0.084	U	0.084	2.6		0.61	55.4		0.02	0.38		0.02	0.07	U	0.07	9.1		0.13	6.7		0.14	13.7		0.12
3	J11VL1	4/5/06	0.134		0.082	2.3		0.63	55.7		0.02	0.48		0.02	0.07	U	0.07	7.1		0.13	7.2		0.15	14.2		0.12
4	J11VL2	4/5/06	0.066	U	0.066	2.5		0.60	55.2		0.02	0.50		0.02	0.07	U	0.07	7.8		0.13	7.5		0.14	14.4		0.12
Duplicate of J11VL2	J11VM6	4/5/06	0.082	U	0.082	2.2		0.60	66.7		0.02	0.39		0.02	0.18		0.07	6.4		0.13	10.0		0.14	14.1		0.12
5	J11VL3	4/5/06	0.079	U	0.079	3.4		0.62	61.1		0.02	0.56		0.02	0.07	U	0.07	7.9		0.13	7.6		0.14	13.6		0.12
6	J11VL4	4/5/06	0.084	U	0.084	2.4		0.60	48.7		0.02	0.38		0.02	0.24		0.07	6.5		0.13	8.1		0.14	15.5		0.12
7	J11VL5	4/5/06	0.068	U	0.068	1.6		0.59	36.4		0.02	0.33		0.02	0.22		0.07	4.0		0.13	7.0		0.14	14.9		0.12
8	J11VL6	4/5/06	0.094	U	0.094	2.9		0.59	59.9		0.02	0.37		0.02	0.26		0.07	7.9		0.12	6.8		0.13	17.1		0.12
9	J11VL7	4/5/06	0.062	U	0.062	2.7		0.61	45.9		0.02	0.37		0.02	0.22		0.07	8.2		0.13	6.8		0.14	15.5		0.12
10	J11VL8	4/5/06	0.092	U	0.092	2.9		0.59	55.6		0.02	0.35		0.02	0.41		0.07	8.0		0.12	7.0		0.13	16.2		0.12

Statistical Computation Input Data

Sample Node	Sample Number	Sample Date	Cesium-137 pCi/g	Arsenic mg/kg	Barium mg/kg	Beryllium mg/kg	Cadmium mg/kg	Chromium mg/kg	Cobalt mg/kg	Copper mg/kg
1	J11VK9	4/5/2006	0.039	2.8	81.6	0.45	0.14	11.0	7.6	14.7
2	J11VL0	4/5/2006	0.042	2.6	55.4	0.38	0.04	9.1	6.7	13.7
3	J11VL1	4/5/2006	0.134	2.3	55.7	0.48	0.04	7.1	7.2	14.2
4	J11VL2/J11VM6	4/5/2006	0.037	2.4	61.0	0.45	0.11	7.1	8.8	14.3
5	J11VL3	4/5/2006	0.040	3.4	61.1	0.56	0.04	7.9	7.6	13.6
6	J11VL4	4/5/2006	0.042	2.4	48.7	0.38	0.24	6.5	8.1	15.5
7	J11VL5	4/5/2006	0.034	1.6	36.4	0.33	0.22	4.0	7.0	14.9
8	J11VL6	4/5/2006	0.047	2.9	59.9	0.37	0.26	7.9	6.8	17.1
9	J11VL7	4/5/2006	0.031	2.7	45.9	0.37	0.22	8.2	6.8	15.5
10	J11VL8	4/5/2006	0.046	2.9	55.6	0.35	0.41	8.0	7.0	16.2

Statistical Computations

	Cesium-137	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper
95% UCL value based on	Radionuclide data set. Use nonparametric z-statistic.	Large data set (n ≥ 10), use MTCAStat normal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat normal distribution.	Large data set (n ≥ 10), use MTCAStat normal distribution.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.
N	10	10	10	10	10	10	10	10
% < Detection limit	90%	0%	0%	0%	30%	0%	0%	0%
Mean	0.049	2.6	56.1	0.41	0.17	7.7	7.4	15.0
Standard deviation	0.030	0.5	11.8	0.07	0.12	1.8	0.7	1.1
95% UCL on mean	0.065	2.9	64.3	0.46	0.24	8.7	7.7	15.6
Maximum detected value	0.134	3.4	81.6	0.56	0.41	11.0	10.0	17.1
Statistical value	0.065	2.9	64.3	0.46	0.24	8.7	7.7	15.6
Most Stringent Cleanup Limit for nonradionuclide and RAG type		20 Direct Exposure/GW & River Protection	132 BG/GW Protection	1.51 BG/GW & River Protection	0.81 BG/GW & River Protection	18.5 BG/GW & River Protection	32 GW Protection	22.0 BG/River Protection
WAC 173-340 3-PART TEST								
95% UCL > Cleanup Limit?		NA	NA	NA	NA	NA	NA	NA
> 10% above Cleanup Limit?		NA	NA	NA	NA	NA	NA	NA
Any sample > 2X Cleanup Limit?		NA	NA	NA	NA	NA	NA	NA
WAC 173-340 Compliance? Yes		Because all values are below background (6.5 mg/kg), the WAC 173-340 3-part test is not required.	Because all values are below background (132 mg/kg), the WAC 173-340 3-part test is not required.	Because all values are below background (1.51 mg/kg), the WAC 173-340 3-part test is not required.	Because all values are below background (0.81 mg/kg), the WAC 173-340 3-part test is not required.	Because all values are below background (18.5 mg/kg), the WAC 173-340 3-part test is not required.	Because all values are below background (15.7 mg/kg), the WAC 173-340 3-part test is not required.	Because all values are below background (22.0 mg/kg), the WAC 173-340 3-part test is not required.

BG = background
GW = groundwater
MDA = minimum detectable activity
NA = not applicable
PQL = practical quantitation limit
Q = qualifier
RAG = remedial action goal
U = undetected
UCL = upper confidence limit
WAC = *Washington Administrative Code*

CALCULATION SHEET

Washington Closure Hanford

Originator J. M. Capron JMC | Date 11/14/06 | Calc. No. 0100C-CA-V0031 | Rev. No. 0
Project 100-B/C Remaining Pipes and Sewers Field Remediation | Job No. 14655 | Checked T. M. Blakley TMB | Date 11/16/06
Subject 100-C-9:2 Waste Site Cleanup Verification 95% UCL Calculations | Sheet No. 6 of 14

100-C-9:2 (1607-B9 Influent Line) Remediation Footprint Verification Data (continued)

Sample Node	Sample Number	Sample Date	Hexavalent Chromium mg/kg	Q	PQL	Lead mg/kg	Q	PQL	Lithium mg/kg	Q	PQL	Manganese mg/kg	Q	PQL	Molybdenum mg/kg	Q	PQL	Nickel mg/kg	Q	PQL	Strontium mg/kg	Q	PQL	Titanium mg/kg	Q	PQL
1	J11VK9	4/5/06	0.21	U	0.21	6.0		0.31	7.0	C	0.03	370		0.03	0.37		0.29	11.8		0.24	22.5		0.01	1290		0.03
2	J11VL0	4/5/06	0.21	U	0.21	4.8		0.31	6.0	C	0.03	302		0.03	0.43		0.29	11.6		0.24	19.6		0.01	1460		0.03
3	J11VL1	4/5/06	0.22		0.22	7.7		0.32	4.9	C	0.03	333		0.03	0.34		0.30	9.1		0.25	19.7		0.01	1290		0.03
4	J11VL2	4/5/06	0.37		0.21	10.8		0.31	5.0	C	0.03	338		0.03	0.46		0.29	9.6		0.24	20.7		0.01	1560		0.03
Duplicate of J11VL2	J11VM6	4/5/06	0.25		0.21	10.6		0.31	4.4	C	0.03	334		0.03	0.33		0.29	8.6		0.24	20.9		0.01	1350		0.03
5	J11VL3	4/5/06	0.22	U	0.22	6.8		0.32	5.1	C	0.03	370		0.03	0.37		0.30	9.0		0.24	19.3		0.01	1530		0.03
6	J11VL4	4/5/06	0.50		0.21	5.6		0.31	5.1	C	0.03	332		0.03	0.34		0.29	9.5		0.24	18.5		0.01	1570		0.03
7	J11VL5	4/5/06	0.24		0.21	7.4		0.30	3.4	C	0.03	280		0.03	0.29		0.28	7.4		0.23	19.0		0.01	1920		0.03
8	J11VL6	4/5/06	0.27		0.21	14.2		0.30	8.5	C	0.03	324		0.03	0.43		0.28	10.4		0.23	24.8		0.01	1360		0.03
9	J11VL7	4/5/06	0.22	U	0.22	5.2		0.31	6.0	C	0.03	280		0.03	0.43		0.29	11.8		0.24	24.8		0.01	1300		0.03
10	J11VL8	4/5/06	0.21	U	0.21	25.9		0.30	7.6	C	0.03	304		0.03	0.46		0.28	9.7		0.23	23.0		0.01	1080		0.03

Statistical Computation Input Data

Sample Node	Sample Number	Sample Date	Hexavalent Chromium mg/kg	Lead mg/kg	Lithium mg/kg	Manganese mg/kg	Molybdenum mg/kg	Nickel mg/kg	Strontium mg/kg	Titanium mg/kg
1	J11VK9	4/5/2006	0.11	6.0	7.0	370	0.37	11.8	22.5	1290
2	J11VL0	4/5/2006	0.11	4.8	6.0	302	0.43	11.6	19.6	1460
3	J11VL1	4/5/2006	0.22	7.7	4.9	333	0.34	9.1	19.7	1290
4	J11VL2/J11VM6	4/5/2006	0.31	10.7	4.7	336	0.40	9.1	20.8	1460
5	J11VL3	4/5/2006	0.11	6.8	5.1	370	0.37	9.0	19.3	1530
6	J11VL4	4/5/2006	0.50	5.6	5.1	332	0.34	9.5	18.5	1570
7	J11VL5	4/5/2006	0.24	7.4	3.4	280	0.29	7.4	19.0	1920
8	J11VL6	4/5/2006	0.27	14.2	8.5	324	0.43	10.4	24.8	1360
9	J11VL7	4/5/2006	0.11	5.2	6.0	280	0.43	11.8	24.8	1300
10	J11VL8	4/5/2006	0.11	25.9	7.6	304	0.46	9.7	23.0	1080

Statistical Computations

	Hexavalent Chromium	Lead	Lithium	Manganese	Molybdenum	Nickel	Strontium	Titanium
95% UCL value based on	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.
N	10	10	10	10	10	10	10	10
% < Detection limit	50%	0%	0%	0%	0%	0%	0%	0%
Mean	0.21	9.4	5.8	323	0.39	9.9	21.2	1430
Standard deviation	0.13	6.5	1.5	32	0.05	1.4	2.4	230
95% UCL on mean	0.28	12.8	7.0	343	0.42	10.9	22.7	1570
Maximum detected value	0.50	25.9	8.5	370	0.46	11.8	24.8	1920
Statistical value	0.28	12.8	7.0	343	0.42	10.9	22.7	1570
Most Stringent Cleanup Limit for nonradionuclide and RAG type	2 River Protection	10.2 BG/GW & River Protection	33.5 BG/GW Protection	512 BG/GW & River Protection	8 GW Protection	19.1 BG/GW Protection	960 GW Protection	6400 GW Protection
WAC 173-340 3-PART TEST								
95% UCL > Cleanup Limit?	NO	YES	NA	NA	NO	NA	NO	NA
> 10% above Cleanup Limit?	NO	YES	NA	NA	NO	NA	NO	NA
Any sample > 2X Cleanup Limit?	NO	YES	NA	NA	NO	NA	NO	NA
WAC 173-340 Compliance? Further assessment required	The data set meets the 3-part test criteria when compared to the most stringent cleanup limit.	Because of the "yes" answers to the 3-part test, a detailed assessment using RESRAD will be performed. The data set meets the 3-part test criteria when compared to the direct exposure cleanup level.	Because all values are below background (33.5 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 cleanup limit.	Because all values are below background (19.1 mg/kg), the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent cleanup limit.	Because all values are below background (2570 mg/kg), the WAC 173-340 3-part test is not required.

BG = background
C = method blank contamination (inorganic constituents)
GW = groundwater
NA = not applicable
PQL = practical quantitation limit
Q = qualifier
RAG = remedial action goal
U = undetected
UCL = upper confidence limit
WAC = *Washington Administrative Code*

CALCULATION SHEET

Washington Closure Hanford

Originator J. M. Capron **Date** 11/14/06 **Job No.** 14655 **Calc. No.** 0100C-CA-V0031 **Rev. No.** 0
Project 100-B/C Remaining Pipes and Sewers Field Remediation **Checked** T. M. Blakley **Date** 11/6/06
Subject 100-C-9:2 Waste Site Cleanup Verification 95% UCL Calculations **Sheet No.** 7 of 14

100-C-9:2 (1607-B9 Influent Line) Remediation Footprint Verification Data (continued)

Sample Node	Sample Number	Sample Date	Vanadium mg/kg	Q	PQL	Zinc mg/kg	Q	PQL	Aroclor-1254 mg/kg	Q	PQL
1	J11VK9	4/5/06	45.6		0.09	44.6		0.16	0.0055	J	0.014
2	J11VL0	4/5/06	47.6		0.09	37.6		0.16	0.015	J	0.014
3	J11VL1	4/5/06	37.9		0.09	37.4		0.17	0.040		0.015
4	J11VL2	4/5/06	48.9		0.09	40.0		0.16	0.011	J	0.014
Duplicate of J11VL2	J11VM6	4/5/06	40.1		0.09	34.3		0.16	0.0085	J	0.014
5	J11VL3	4/5/06	49.4		0.09	43.9		0.16	0.0068	J	0.015
6	J11VL4	4/5/06	46.5		0.09	38.7		0.16	0.014	U	0.014
7	J11VL5	4/5/06	51.4		0.09	35.8		0.15	0.014	U	0.014
8	J11VL6	4/5/06	42.6		0.09	51.7		0.15	0.020		0.014
9	J11VL7	4/5/06	37.7		0.09	39.1		0.16	0.018		0.014
10	J11VL8	4/5/06	33.5		0.09	499		0.15	0.027		0.014

Statistical Computation Input Data

Sample Node	Sample Number	Sample Date	Vanadium mg/kg	Zinc mg/kg	Aroclor-1254 mg/kg
1	J11VK9	4/5/2006	45.6	44.6	0.0055
2	J11VL0	4/5/2006	47.6	37.6	0.015
3	J11VL1	4/5/2006	37.9	37.4	0.040
4	J11VL2/ J11VM6	4/5/2006	44.5	37.2	0.010
5	J11VL3	4/5/2006	49.4	43.9	0.0068
6	J11VL4	4/5/2006	46.5	38.7	0.0070
7	J11VL5	4/5/2006	51.4	35.8	0.0070
8	J11VL6	4/5/2006	42.6	51.7	0.020
9	J11VL7	4/5/2006	37.7	39.1	0.018
10	J11VL8	4/5/2006	33.5	499	0.027

Statistical Computations

	Vanadium	Zinc	Aroclor-1254
95% UCL value based on	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.
N	10	10	10
% < Detection limit	0%	0%	20%
Mean	43.7	86	0.016
Standard deviation	5.7	145	0.011
95% UCL on mean	47.5	162	0.028
Maximum detected value	51.4	499	0.040
Statistical value	47.5	162	0.028
Most Stringent Cleanup Limit for nonradionuclide and RAG type	85.1 BG/GW Protection	67.8 BG/River Protection	0.017 RDL/GW & River Protection
WAC 173-340 3-PART TEST			
95% UCL > Cleanup Limit?	NA	YES	YES
> 10% above Cleanup Limit?	NA	NO	YES
Any sample > 2X Cleanup Limit?	NA	YES	YES
WAC 173-340 Compliance? Further assessment required	Because all values are below background (85.1 mg/kg), the WAC 173-340 3-part test is not required.	Because of the "yes" answers to the 3-part test, a detailed assessment using RESRAD will be performed. The data set meets the 3-part test criteria when compared to the direct exposure cleanup level.	Because of the "yes" answers to the 3-part test, a detailed assessment using RESRAD will be performed. The data set meets the 3-part test criteria when compared to the direct exposure cleanup level.

BG = background
GW = groundwater
J = estimate
NA = not applicable
PQL = practical quantitation limit
Q = qualifier
RAG = remedial action goal
RDL = required detection limit
U = undetected
UCL = upper confidence limit
WAC = *Washington Administrative Code*

CALCULATION SHEET

Washington Closure Hanford

Originator J. M. Capron JMC **Date** 11/14/06 **Calc. No.** 0100C-CA-V0031 **Rev. No.** 0

Project 100-B/C Remaining Pipes and Sewers Field Remediation **Job No.** 14655 **Checked** T. M. Blakley TMB **Date** 11/16/06

Subject 100-C-9:2 Waste Site Cleanup Verification 95% UCL Calculations **Sheet No.** 8 of 14

Ecology Software (MTCAStat) Results

Arsenic 95% UCL Calculation

DATA	ID
2.8	J11VK9
2.6	J11VL0
2.3	J11VL1
2.4	J11VL2/J11VM6
3.4	J11VL3
2.4	J11VL4
1.6	J11VL5
2.9	J11VL6
2.7	J11VL7
2.9	J11VL8

Number of samples
Uncensored 10
Censored
Detection limit or PQL
Method detection limit
TOTAL 10

Uncensored values
Mean 2.6
Lognormal mean 2.6
Std. devn. 0.5
Median 2.7
Min. 1.6
Max. 3.4

Lognormal distribution?
r-squared is: 0.876
Recommendations:
Use normal distribution.

Normal distribution?
r-squared is: 0.930

UCL (based on t-statistic) is 2.9

Barium 95% UCL Calculation

DATA	ID
81.6	J11VK9
55.4	J11VL0
55.7	J11VL1
61.0	J11VL2/J11VM6
61.1	J11VL3
48.7	J11VL4
36.4	J11VL5
59.9	J11VL6
45.9	J11VL7
55.6	J11VL8

Number of samples
Uncensored 10
Censored
Detection limit or PQL
Method detection limit
TOTAL 10

Uncensored values
Mean 56.1
Lognormal mean 56.3
Std. devn. 11.8
Median 55.7
Min. 36.4
Max. 81.6

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

Normal distribution?
r-squared is: 0.897

UCL (Land's method) is 64.3

Beryllium 95% UCL Calculation

DATA	ID
0.45	J11VK9
0.38	J11VL0
0.48	J11VL1
0.45	J11VL2/J11VM6
0.56	J11VL3
0.38	J11VL4
0.33	J11VL5
0.37	J11VL6
0.37	J11VL7
0.35	J11VL8

Number of samples
Uncensored 10
Censored
Detection limit or PQL
Method detection limit
TOTAL 10

Uncensored values
Mean 0.41
Lognormal mean 0.41
Std. devn. 0.07
Median 0.38
Min. 0.33
Max. 0.56

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

Normal distribution?
r-squared is: 0.892

UCL (Land's method) is 0.46

Cadmium 95% UCL Calculation

DATA	ID
0.14	J11VK9
0.04	J11VL0
0.04	J11VL1
0.11	J11VL2/J11VM6
0.04	J11VL3
0.24	J11VL4
0.22	J11VL5
0.26	J11VL6
0.22	J11VL7
0.41	J11VL8

Number of samples
Uncensored 10
Censored
Detection limit or PQL
Method detection limit
TOTAL 10

Uncensored values
Mean 0.17
Lognormal mean 0.19
Std. devn. 0.12
Median 0.18
Min. 0.04
Max. 0.41

Lognormal distribution?
r-squared is: 0.870
Recommendations:
Use normal distribution.

Normal distribution?
r-squared is: 0.915

UCL (based on t-statistic) is 0.24

PQL = practical quantitation limit

UCL = upper confidence limit

CALCULATION SHEET

Washington Closure Hanford

Originator J. M. Capron **Date** 11/14/06 **Calc. No.** 0100C-CA-V0031 **Rev. No.** 0

Project 100-B/C Remaining Pipes and Sewers Field Remediation **Job No.** 14655 **Checked** T. M. Blakley **Date** 11/16/06

Subject 100-C-9:2 Waste Site Cleanup Verification 95% UCL Calculations **Sheet No.** 9 of 14

Ecology Software (MTCAStat) Results

Chromium 95% UCL Calculation

DATA	ID
11.0	J11VK9
9.1	J11VL0
7.1	J11VL1
7.1	J11VL2/J11VM6
7.9	J11VL3
6.5	J11VL4
4.0	J11VL5
7.9	J11VL6
8.2	J11VL7
8.0	J11VL8

Number of samples — Uncensored 10 — Censored — Detection limit or PQL — Method detection limit — TOTAL 10

Uncensored values

Mean	7.7
Lognormal mean	7.7
Std. devn.	1.8
Median	7.9
Min.	4.0
Max.	11.0

Lognormal distribution? r-squared is: 0.840

Normal distribution? r-squared is: 0.906

Recommendations:
Use normal distribution.

UCL (based on t-statistic) is 8.7

Cobalt 95% UCL Calculation

DATA	ID
7.6	J11VK9
6.7	J11VL0
7.2	J11VL1
8.8	J11VL2/J11VM6
7.6	J11VL3
8.1	J11VL4
7.0	J11VL5
6.8	J11VL6
6.8	J11VL7
7.0	J11VL8

Number of samples — Uncensored 10 — Censored — Detection limit or PQL — Method detection limit — TOTAL 10

Uncensored values

Mean	7.4
Lognormal mean	7.4
Std. devn.	0.7
Median	7.1
Min.	6.7
Max.	8.8

Lognormal distribution? r-squared is: 0.895

Normal distribution? r-squared is: 0.877

Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 7.7

Copper 95% UCL Calculation

DATA	ID
14.7	J11VK9
13.7	J11VL0
14.2	J11VL1
14.3	J11VL2/J11VM6
13.6	J11VL3
15.5	J11VL4
14.9	J11VL5
17.1	J11VL6
15.5	J11VL7
16.2	J11VL8

Number of samples — Uncensored 10 — Censored — Detection limit or PQL — Method detection limit — TOTAL 10

Uncensored values

Mean	15.0
Lognormal mean	15.0
Std. devn.	1.1
Median	14.8
Min.	13.6
Max.	17.1

Lognormal distribution? r-squared is: 0.964

Normal distribution? r-squared is: 0.955

Recommendations:
Use lognormal distribution.

UCL (Land's method) is 15.6

Hexavalent Chromium 95% UCL Calculation

DATA	ID
0.11	J11VK9
0.11	J11VL0
0.22	J11VL1
0.31	J11VL2/J11VM6
0.11	J11VL3
0.50	J11VL4
0.24	J11VL5
0.27	J11VL6
0.11	J11VL7
0.11	J11VL8

Number of samples — Uncensored 10 — Censored — Detection limit or PQL — Method detection limit — TOTAL 10

Uncensored values

Mean	0.21
Lognormal mean	0.21
Std. devn.	0.13
Median	0.17
Min.	0.11
Max.	0.50

Lognormal distribution? r-squared is: 0.851

Normal distribution? r-squared is: 0.806

Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 0.28

PQL = practical quantitation limit

UCL = upper confidence limit

CALCULATION SHEET

Washington Closure Hanford

Originator J. M. Capron **Date** 11/14/06 **Calc. No.** 0100C-CA-V0031 **Rev. No.** 0

Project 100-B/C Remaining Pipes and Sewers Field Remediation **Job No.** 14655 **Checked** T. M. Blakley **Date** 11/16/06

Subject 100-C-9:2 Waste Site Cleanup Verification 95% UCL Calculations **Sheet No.** 10 of 14

Ecology Software (MTCAStat) Results

Lead 95% UCL Calculation

DATA	ID
6.0	J11VK9
4.8	J11VL0
7.7	J11VL1
10.7	J11VL2/J11VM6
6.8	J11VL3
5.6	J11VL4
7.4	J11VL5
14.2	J11VL6
5.2	J11VL7
25.9	J11VL8

Number of samples		Uncensored values	
Uncensored	10	Mean	9.4
Censored		Lognormal mean	9.3
Detection limit or PQL		Std. devn.	6.5
Method detection limit		Median	7.1
TOTAL	10	Min.	4.8
		Max.	25.9

Lognormal distribution? Normal distribution?
r-squared is: 0.868 r-squared is: 0.699
Recommendations:
Reject BOTH lognormal and normal distributions.

UCL (based on Z-statistic) is 12.8

Lithium 95% UCL Calculation

DATA	ID
7.0	J11VK9
6.0	J11VL0
4.9	J11VL1
4.7	J11VL2/J11VM6
5.1	J11VL3
5.1	J11VL4
3.4	J11VL5
8.5	J11VL6
6.0	J11VL7
7.6	J11VL8

Number of samples		Uncensored values	
Uncensored	10	Mean	5.8
Censored		Lognormal mean	5.9
Detection limit or PQL		Std. devn.	1.5
Method detection limit		Median	5.6
TOTAL	10	Min.	3.4
		Max.	8.5

Lognormal distribution? Normal distribution?
r-squared is: 0.960 r-squared is: 0.961
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 7.0

Manganese 95% UCL Calculation

DATA	ID
370	J11VK9
302	J11VL0
333	J11VL1
336	J11VL2/J11VM6
370	J11VL3
332	J11VL4
280	J11VL5
324	J11VL6
280	J11VL7
304	J11VL8

Number of samples		Uncensored values	
Uncensored	10	Mean	323
Censored		Lognormal mean	323
Detection limit or PQL		Std. devn.	32
Method detection limit		Median	328
TOTAL	10	Min.	280
		Max.	370

Lognormal distribution? Normal distribution?
r-squared is: 0.943 r-squared is: 0.941
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 343

Molybdenum 95% UCL Calculation

DATA	ID
0.37	J11VK9
0.43	J11VL0
0.34	J11VL1
0.40	J11VL2/J11VM6
0.37	J11VL3
0.34	J11VL4
0.29	J11VL5
0.43	J11VL6
0.43	J11VL7
0.46	J11VL8

Number of samples		Uncensored values	
Uncensored	10	Mean	0.39
Censored		Lognormal mean	0.39
Detection limit or PQL		Std. devn.	0.05
Method detection limit		Median	0.38
TOTAL	10	Min.	0.29
		Max.	0.46

Lognormal distribution? Normal distribution?
r-squared is: 0.936 r-squared is: 0.950
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 0.42

PQL = practical quantitation limit

UCL = upper confidence limit

CALCULATION SHEET

Washington Closure Hanford

Originator J. M. Capron JMC **Date** 11/14/06 **Calc. No.** 0100C-CA-V0031 **Rev. No.** 0

Project 100-B/C Remaining Pipes and Sewers Field Remediation **Job No.** 14655 **Checked** T. M. Blakley TMB **Date** 11/16/06

Subject 100-C-9:2 Waste Site Cleanup Verification 95% UCL Calculations **Sheet No.** 11 of 14

Ecology Software (MTCAStat) Results

Nickel 95% UCL Calculation

DATA	ID
11.8	J11VK9
11.6	J11VL0
9.1	J11VL1
9.1	J11VL2/J11VM6
9.0	J11VL3
9.5	J11VL4
7.4	J11VL5
10.4	J11VL6
11.8	J11VL7
9.7	J11VL8

Number of samples
Uncensored 10
Censored
Detection limit or PQL
Method detection limit
TOTAL 10

Uncensored values

Mean	9.9
Lognormal mean	10.0
Std. devn.	1.4
Median	9.6
Min.	7.4
Max.	11.8

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

Normal distribution?
r-squared is: 0.920

UCL (Land's method) is 10.9

Strontium 95% UCL Calculation

DATA	ID
22.5	J11VK9
19.6	J11VL0
19.7	J11VL1
20.8	J11VL2/J11VM6
19.3	J11VL3
18.5	J11VL4
19.0	J11VL5
24.8	J11VL6
24.8	J11VL7
23.0	J11VL8

Number of samples
Uncensored 10
Censored
Detection limit or PQL
Method detection limit
TOTAL 10

Uncensored values

Mean	21.2
Lognormal mean	21.2
Std. devn.	2.4
Median	20.3
Min.	18.5
Max.	24.8

Lognormal distribution?
r-squared is: 0.909
Recommendations:
Use lognormal distribution.

Normal distribution?
r-squared is: 0.898

UCL (Land's method) is 22.7

Titanium 95% UCL Calculation

DATA	ID
1290	J11VK9
1460	J11VL0
1290	J11VL1
1460	J11VL2/J11VM6
1530	J11VL3
1570	J11VL4
1920	J11VL5
1360	J11VL6
1300	J11VL7
1080	J11VL8

Number of samples
Uncensored 10
Censored
Detection limit or PQL
Method detection limit
TOTAL 10

Uncensored values

Mean	1430
Lognormal mean	1430
Std. devn.	230
Median	1410
Min.	1080
Max.	1920

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

Normal distribution?
r-squared is: 0.904

UCL (Land's method) is 1570

Vanadium 95% UCL Calculation

DATA	ID
45.6	J11VK9
47.6	J11VL0
37.9	J11VL1
44.5	J11VL2/J11VM6
49.4	J11VL3
46.5	J11VL4
51.4	J11VL5
42.6	J11VL6
37.7	J11VL7
33.5	J11VL8

Number of samples
Uncensored 10
Censored
Detection limit or PQL
Method detection limit
TOTAL 10

Uncensored values

Mean	43.7
Lognormal mean	43.7
Std. devn.	5.7
Median	45.1
Min.	33.5
Max.	51.4

Lognormal distribution?
r-squared is: 0.939
Recommendations:
Use lognormal distribution.

Normal distribution?
r-squared is: 0.958

UCL (Land's method) is 47.5

PQL = practical quantitation limit

UCL = upper confidence limit

CALCULATION SHEET

Washington Closure Hanford

Originator J. M. Capron JMC **Date** 11/14/06 **Calc. No.** 0100C-CA-V0031 **Rev. No.** 0

Project 100-B/C Remaining Pipes and Sewers Field Remediation **Job No.** 14655 **Checked** T. M. Blakley TMB **Date** 11/16/06

Subject 100-C-9:2 Waste Site Cleanup Verification 95% UCL Calculations **Sheet No.** 12 of 14

Ecology Software (MTCAStat) Results

DATA	ID	Zinc 95% UCL Calculation			
44.6	J11VK9				
37.6	J11VL0				
37.4	J11VL1	Number of samples		Uncensored values	
37.2	J11VL2/J11VM6	Uncensored	10	Mean	86
43.9	J11VL3	Censored		Lognormal mean	72
38.7	J11VL4	Detection limit or PQL		Std. devn.	145
35.8	J11VL5	Method detection limit		Median	39
51.7	J11VL6	TOTAL	10	Min.	35.8
39.1	J11VL7			Max.	499
499	J11VL8				

Lognormal distribution? Normal distribution?
r-squared is: 0.455 r-squared is:
Recommendations:
Reject BOTH lognormal and normal distributions.
Unable to analyze probability plot for normal case.

UCL (based on Z-statistic) is 162

DATA	ID	Aroclor-1254 95% UCL Calculation			
0.0055	J11VK9				
0.015	J11VL0				
0.040	J11VL1	Number of samples		Uncensored values	
0.010	J11VL2/J11VM6	Uncensored	10	Mean	0.016
0.0068	J11VL3	Censored		Lognormal mean	0.016
0.0070	J11VL4	Detection limit or PQL		Std. devn.	0.011
0.0070	J11VL5	Method detection limit		Median	0.012
0.020	J11VL6	TOTAL	10	Min.	0.0055
0.018	J11VL7			Max.	0.040
0.027	J11VL8				

Lognormal distribution? Normal distribution?
r-squared is: 0.940 r-squared is: 0.852
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 0.028

PQL = practical quantitation limit

UCL = upper confidence limit

CALCULATION SHEET

Washington Closure Hanford

Originator J. M. Capron JMC
Project 100-B/C Remaining Pipes and Sewers Field Remediation
Subject 100-C-9:2 Waste Site Cleanup Verification 95% UCL Calculations

Date 11/14/06
Job No. 14655

Calc. No. 0100C-CA-V0031
Checked T. M. Blakley JMB

Rev. No. 0
Date 11/16/06
Sheet No. 13 of 14

Duplicate Analysis

Sample Node	Sample Number	Sample Date	Gross alpha			Gross beta			Potassium-40			Radium-226			Radium-228			Thorium-228			Thorium-232			Aluminum		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	mg/kg	Q	PQL
1607-B9 #4	J11VL2	4/5/06	4.02	U	5.5	12.8		6.0	9.84		0.53	0.424		0.10	0.775		0.18	0.475		0.092	0.775		0.18	5320		2.8
Duplicate of J11VL2	J11VM6	4/5/06	7.24		4.0	17.3		5.4	8.88		0.82	0.508		0.13	0.706		0.33	0.653		0.13	0.706		0.33	4530		2.9
1607-B11 #1	J134W8	8/3/06	--		--	--		--	9.72		1.5	0.233		0.18	0.650		0.45	0.274		0.069	0.650		0.45	4550		2.7
Duplicate of J134W8	J134X3	8/3/06	--		--	--		--	7.97		0.72	0.353		0.11	0.306		0.28	0.340		0.073	0.306		0.28	4190		2.7

Analysis:

TDL		10	15	0.5	0.1	0.2	1	1	5
Duplicate Analysis	Both > MDA/PQL?	No - evaluate difference	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**
	Both >5xTDL?		No - evaluate difference	**Yes (calc RPD)**	No - evaluate difference	No - evaluate difference	No - evaluate difference	No - evaluate difference	**Yes (calc RPD)**
	RPD			10%					16%
	Difference >2xTDL?	No - acceptable	No - acceptable	Not applicable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	Not applicable
Duplicate Analysis	Both > MDA/PQL?	Not applicable	Not applicable	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**
	Both >5xTDL?	Not applicable	Not applicable	**Yes (calc RPD)**	No - evaluate difference	No - evaluate difference	No - evaluate difference	No - evaluate difference	**Yes (calc RPD)**
	RPD	Not applicable	Not applicable	20%					8.2%
	Difference >2xTDL?	Not applicable	Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable	No - acceptable	Not applicable

Sample Node	Sample Number	Sample Date	Arsenic			Barium			Beryllium			Boron			Cadmium			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
1607-B9 #4	J11VL2	4/5/06	2.5		0.60	55.2		0.02	0.50		0.02	1.2	UJ	0.24	0.07	U	0.07	4160		1.6	7.8		0.13	7.5		0.14
Duplicate of J11VL2	J11VM6	4/5/06	2.2		0.60	66.7		0.02	0.39		0.02	1.4	UJ	0.24	0.18		0.07	4170		1.6	6.4		0.13	10.0		0.14
1607-B11 #1	J134W8	8/3/06	2.2		0.58	41.8	C	0.02	0.11		0.02	0.76	C	0.23	0.07	U	0.07	5520	C	1.5	8.0	C	0.12	5.2		0.13
Duplicate of J134W8	J134X3	8/3/06	2.1		0.58	33.9	C	0.02	0.12		0.02	0.84	C	0.23	0.07	U	0.07	5820	C	1.6	7.8	C	0.12	5.0		0.13

Analysis:

TDL		10	2	0.5	2	0.2	100	1	2
Duplicate Analysis	Both > PQL?	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	No - evaluate difference	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**
	Both >5xTDL?	No - evaluate difference	**Yes (calc RPD)**	No - evaluate difference	No - evaluate difference		**Yes (calc RPD)**	**Yes (calc RPD)**	No - evaluate difference
	RPD		19%				0.24%	20%	
	Difference >2xTDL?	No - acceptable	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable	No - acceptable
Duplicate Analysis	Both > PQL?	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	No - evaluate difference	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**
	Both >5xTDL?	No - evaluate difference	**Yes (calc RPD)**	No - evaluate difference	No - evaluate difference		**Yes (calc RPD)**	**Yes (calc RPD)**	No - evaluate difference
	RPD		21%				5.3%	2.5%	
	Difference >2xTDL?	No - acceptable	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable	No - acceptable

Sample Node	Sample Number	Sample Date	Copper			Hexavalent Chromium			Iron			Lead			Lithium			Magnesium			Manganese			Mercury		
			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
1607-B9 #4	J11VL2	4/5/06	14.4		0.12	0.37		0.21	19500		3.4	10.8		0.31	5.0	C	0.03	4020		0.96	338		0.03	0.01	U	0.01
Duplicate of J11VL2	J11VM6	4/5/06	14.1		0.12	0.25		0.21	17300		3.5	10.6		0.31	4.4	C	0.03	3450		0.96	334		0.03	0.02		0.02
1607-B11 #1	J134W8	8/3/06	14.4		0.11	0.20	U	0.20	13800		3.3	2.3		0.29	5.5	C	0.03	3780	C	0.92	241		0.03	0.02	U	0.02
Duplicate of J134W8	J134X3	8/3/06	19.1		0.11	0.20	U	0.20	12400		3.3	2.4		0.29	5.2	C	0.03	3600	C	0.92	237		0.03	0.02	U	0.02

Analysis:

TDL		1	0.5	5	5	2.5	75	5	0.2
Duplicate Analysis	Both > PQL?	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	No - evaluate difference
	Both >5xTDL?	**Yes (calc RPD)**	No - evaluate difference	**Yes (calc RPD)**	No - evaluate difference	No - evaluate difference	**Yes (calc RPD)**	**Yes (calc RPD)**	
	RPD	2.1%		12%			15%	1.2%	
	Difference >2xTDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	Not applicable	Not applicable	No - acceptable
Duplicate Analysis	Both > PQL?	**Yes (continue)**	No - evaluate difference	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	No - evaluate difference
	Both >5xTDL?	**Yes (calc RPD)**		**Yes (calc RPD)**	No - evaluate difference	No - evaluate difference	**Yes (calc RPD)**	**Yes (calc RPD)**	
	RPD	28%		11%			4.9%	1.7%	
	Difference >2xTDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	Not applicable	Not applicable	No - acceptable

-- = not reported
C = method blank contamination (inorganic constituents)
J = estimate
MDA = minimum detectable activity
PQL = practical quantitation limit
Q = qualifier
RPD = relative percent difference
TDL = target detection limit
U = undetected

CALCULATION SHEET

Washington Closure Hanford

Originator J. M. Capron JMC **Date** 11/14/06 **Calc. No.** 0100C-CA-V0031 **Rev. No.** 0

Project 100-B/C Remaining Pipes and Sewers Field Remediation **Job No.** 14655 **Checked** T. M. Blakley JMB **Date** 11/16/06

Subject 100-C-9:2 Waste Site Cleanup Verification 95% UCL Calculations **Sheet No.** 14 of 14

Duplicate Analysis (continued)

Sample Node	Sample Number	Sample Date	Molybdenum			Nickel			Phosphorus			Potassium			Silicon			Sodium			Strontium			Titanium		
			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
1607-B9 #4	J11VL2	4/5/06	0.46		0.29	9.6		0.24	841	J	0.89	944		2.2	383	J	2.2	137		0.75	20.7		0.01	1560		0.03
Duplicate of J11VL2	J11VM6	4/5/06	0.33		0.29	8.6		0.24	911	J	0.89	828		2.2	423	J	2.2	109		0.75	20.9		0.01	1350		0.03
1607-B11 #1	J134W8	8/3/06	0.31		0.27	8.8		0.23	722		2.6	598	C	2.1	534		2.1	116	C	0.72	28.4	C	0.009	838		0.03
Duplicate of J134W8	J134X3	8/3/06	0.30		0.27	9.3		0.23	690		2.6	574	C	2.1	440		2.1	102	C	0.72	26.7	C	0.009	649		0.03

Analysis:

TDL		2	4	1.3	400	2	50	1	0.5
Duplicate Analysis	Both > PQL?	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**
	Both >5xTDL?	No - evaluate difference	No - evaluate difference	**Yes (calc RPD)**	No - evaluate difference	**Yes (calc RPD)**	No - evaluate difference	**Yes (calc RPD)**	**Yes (calc RPD)**
	RPD			8.0%		10%		1.0%	14%
	Difference >2xTDL?	No - acceptable	No - acceptable	Not applicable	No - acceptable	Not applicable	No - acceptable	Not applicable	Not applicable
Duplicate Analysis	Both > PQL?	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**
	Both >5xTDL?	No - evaluate difference	No - evaluate difference	**Yes (calc RPD)**	No - evaluate difference	**Yes (calc RPD)**	No - evaluate difference	**Yes (calc RPD)**	**Yes (calc RPD)**
	RPD			4.5%		19%		6.2%	25%
	Difference >2xTDL?	No - acceptable	No - acceptable	Not applicable	No - acceptable	Not applicable	No - acceptable	Not applicable	Not applicable

Sample Node	Sample Number	Sample Date	Vanadium			Zinc			Zirconium			Aroclor-1254			Di-n-butylphthalate		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
1607-B9 #4	J11VL2	4/5/06	48.9		0.09	40.0		0.16	23.8		0.32	11	J	14	360	U	360
Duplicate of J11VL2	J11VM6	4/5/06	40.1		0.09	34.3		0.16	21.0		0.32	8.5	J	14	350	U	350
1607-B11 #1	J134W8	8/3/06	31.5		0.09	29.6		0.15	8.0		0.30	13	U	13	330	U	330
Duplicate of J134W8	J134X3	8/3/06	27.4		0.09	27.8		0.15	7.1		0.30	13	U	13	22	J	330

Analysis:

TDL		2.5	1	2.5	16.5	330
Duplicate Analysis	Both > PQL?	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	No - evaluate difference	No - evaluate difference
	Both >5xTDL?	**Yes (calc RPD)**	**Yes (calc RPD)**	**Yes (calc RPD)**		
	RPD	20%	15%	13%		
	Difference >2xTDL?	Not applicable	Not applicable	Not applicable	No - acceptable	No - acceptable
Duplicate Analysis	Both > PQL?	**Yes (continue)**	**Yes (continue)**	**Yes (continue)**	No - evaluate difference	No - evaluate difference
	Both >5xTDL?	**Yes (calc RPD)**	**Yes (calc RPD)**	No - evaluate difference		
	RPD	14%	6.3%			
	Difference >2xTDL?	Not applicable	Not applicable	No - acceptable	No - acceptable	No - acceptable

C = method blank contamination (inorganic constituents)
J = estimate
PQL = practical quantitation limit
Q = qualifier
RPD = relative percent difference
TDL = target detection limit
U = undetected

Attachment 1. 100-C-9:2 Verification Sampling Results.

Sample Location	Sample Number	Sample Date	Americium-241			Cesium-137			Cobalt-60			Europium-152			Europium-154			Europium-155		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
1607-B8 (east)	J11VM3	4/5/06	0.27	U	0.27	0.078	U	0.078	0.091	U	0.091	0.18	U	0.18	0.27	U	0.27	0.23	U	0.23
1607-B8 (center)	J11VM4	4/5/06	0.20	U	0.20	0.062	U	0.062	0.078	U	0.078	0.15	U	0.15	0.22	U	0.22	0.16	U	0.16
1607-B8 (west)	J11VM5	4/5/06	0.27	U	0.27	0.15	U	0.15	0.084	U	0.084	0.18	U	0.18	0.25	U	0.25	0.22	U	0.22
1607-B9 #1	J11VK9	4/5/06	0.41	U	0.41	0.078	U	0.078	0.079	U	0.079	0.19	U	0.19	0.27	U	0.27	0.21	U	0.21
1607-B9 #2	J11VL0	4/5/06	0.26	U	0.26	0.084	U	0.084	0.073	U	0.073	0.17	U	0.17	0.27	U	0.27	0.19	U	0.19
1607-B9 #3	J11VL1	4/5/06	0.23	U	0.23	0.134		0.082	0.081	U	0.081	0.17	U	0.17	0.20	U	0.20	0.19	U	0.19
1607-B9 #4	J11VL2	4/5/06	0.37	U	0.37	0.066	U	0.066	0.071	U	0.071	0.19	U	0.19	0.25	U	0.25	0.17	U	0.17
Duplicate of J11VL2	J11VM6	4/5/06	0.40	U	0.40	0.082	U	0.082	0.084	U	0.084	0.22	U	0.22	0.26	U	0.26	0.19	U	0.19
1607-B9 #5	J11VL3	4/5/06	0.25	U	0.25	0.079	U	0.079	0.10	U	0.10	0.18	U	0.18	0.25	U	0.25	0.19	U	0.19
1607-B9 #6	J11VL4	4/5/06	0.22	U	0.22	0.084	U	0.084	0.10	U	0.10	0.22	U	0.22	0.26	U	0.26	0.22	U	0.22
1607-B9 #7	J11VL5	4/5/06	0.21	U	0.21	0.068	U	0.068	0.082	U	0.082	0.14	U	0.14	0.21	U	0.21	0.16	U	0.16
1607-B9 #8	J11VL6	4/5/06	0.20	U	0.20	0.094	U	0.094	0.094	U	0.094	0.21	U	0.21	0.25	U	0.25	0.18	U	0.18
1607-B9 #9	J11VL7	4/5/06	0.12	U	0.12	0.062	U	0.062	0.084	U	0.084	0.18	U	0.18	0.15	U	0.15	0.16	U	0.16
1607-B9 #10	J11VL8	4/5/06	0.20	U	0.20	0.092	U	0.092	0.070	U	0.070	0.15	U	0.15	0.21	U	0.21	0.16	U	0.16
1607-B9 #11 (biased)	J11VL9	4/5/06	0.14	U	0.14	0.066	U	0.066	0.095	U	0.095	0.18	U	0.18	0.19	U	0.19	0.18	U	0.18
1607-B9 #12 (biased)	J11VM0	4/5/06	0.26	U	0.26	0.074	U	0.074	0.086	U	0.086	0.18	U	0.18	0.24	U	0.24	0.21	U	0.21
1607-B9 BCL (north)	J11VM1	4/5/06	0.10	U	0.10	0.055	U	0.055	0.069	U	0.069	0.13	U	0.13	0.12	U	0.12	0.14	U	0.14
1607-B9 BCL (south)	J11VM2	4/5/06	0.11	U	0.11	0.059	U	0.059	0.071	U	0.071	0.14	U	0.14	0.13	U	0.13	0.14	U	0.14
1607-B10 #1	J135M0	9/7/06	0.31	U	0.31	0.075	U	0.075	0.084	U	0.084	0.19	U	0.19	0.26	U	0.26	0.22	U	0.22
1607-B10 #2	J135M1	9/7/06	0.045	U	0.045	0.045	U	0.045	0.055	U	0.055	0.11	U	0.11	0.18	U	0.18	0.097	U	0.097
1607-B10 #3	J135M2	9/7/06	0.21	U	0.21	0.068	U	0.068	0.078	U	0.078	0.15	U	0.15	0.17	U	0.17	0.16	U	0.16
1607-B10 #4	J135M3	9/7/06	0.33	U	0.33	0.097	U	0.097	0.10	U	0.10	0.22	U	0.22	0.31	U	0.31	0.24	U	0.24
1607-B11 #1	J134W8	8/3/06	0.093	U	0.093	0.10	U	0.10	0.15	U	0.15	0.15	U	0.15	0.42	U	0.42	0.099	U	0.099
Duplicate of J134W8	J134X3	8/3/06	0.23	U	0.23	0.063	U	0.063	0.071	U	0.071	0.15	U	0.15	0.21	U	0.21	0.18	U	0.18
1607-B11 #2	J134X1	8/3/06	0.22	U	0.22	0.059	U	0.059	0.065	U	0.065	0.15	U	0.15	0.22	U	0.22	0.17	U	0.17
1607-B11 #3	J134X0	8/3/06	0.091	U	0.091	0.098	U	0.098	0.12	U	0.12	0.16	U	0.16	0.36	U	0.36	0.10	U	0.10
1607-B11 #4	J134W9	8/3/06	0.25	U	0.25	0.071	U	0.071	0.083	U	0.083	0.15	U	0.15	0.21	U	0.21	0.19	U	0.19

Note: The following abbreviations apply to all Attachment 1 tables.

Note: Data qualified with C, D, I and/or J are considered acceptable values.

BCL = below cleanup levels
C = method blank contamination (inorganic constituents)
D = diluted
I = interference on one analytical column
J = estimated
MDA = minimum detectable activity
PQL = practical quantitation limit
R = rejected
Q = qualifier
U = undetected

Attachment	1 JMC	Sheet No.	1 of 24
Originator	J. M. Capron	Date	01/12/07
Checked	T. M. Blakley JMB	Date	1/24/07
Calc. No.	0100C-CA-V0031	Rev. No.	1

Attachment 1. 100-C-9:2 Verification Sampling Results.

Sample Location	Sample Number	Sample Date	Gross Alpha			Gross Beta			Potassium-40			Radium-226			Radium-228			Thorium-228		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
1607-B8 (east)	J11VM3	4/5/06	8.14		5.2	17.4		11	12.2		0.63	0.305		0.17	0.696		0.32	0.432		0.090
1607-B8 (center)	J11VM4	4/5/06	9.71		5.1	17.3		5.5	8.11		0.57	0.220		0.11	0.52	U	0.52	0.437		0.096
1607-B8 (west)	J11VM5	4/5/06	8.46		5.3	11.6		6.5	9.08		0.81	0.369		0.15	0.988		0.31	0.446		0.088
1607-B9 #1	J11VK9	4/5/06	6.69		6.5	18.9		8.9	11.0		0.76	0.494		0.16	0.727		0.33	0.680		0.13
1607-B9 #2	J11VL0	4/5/06	10.6		6.7	11.0		8.7	6.92		0.74	0.348		0.13	0.588		0.33	0.496		0.081
1607-B9 #3	J11VL1	4/5/06	8.79		5.9	15.6		5.5	6.92		0.65	0.380		0.12	0.919		0.26	0.570		0.12
1607-B9 #4	J11VL2	4/5/06	4.02	U	5.5	12.8		6.0	9.84		0.53	0.424		0.10	0.775		0.18	0.475		0.092
Duplicate of J11VL2	J11VM6	4/5/06	7.24		4.0	17.3		5.4	8.88		0.82	0.508		0.13	0.706		0.33	0.653		0.13
1607-B9 #5	J11VL3	4/5/06	6.82		4.5	11.3		10	6.61		0.69	0.293		0.13	0.442		0.28	0.406		0.083
1607-B9 #6	J11VL4	4/5/06	11.0		4.9	17.0		5.5	8.98		1.1	0.491		0.13	0.711		0.37	0.508		0.15
1607-B9 #7	J11VL5	4/5/06	4.20	U	4.7	180		5.4	5.10		0.46	0.195		0.13	0.540		0.26	0.353		0.098
1607-B9 #8	J11VL6	4/5/06	11.9		4.2	18.1		5.4	9.76		0.92	0.533		0.18	0.513		0.35	0.541		0.095
1607-B9 #9	J11VL7	4/5/06	3.14	U	4.9	16.5		5.7	7.28		1.3	0.322		0.15	0.32	U	0.32	0.542		0.14
1607-B9 #10	J11VL8	4/5/06	11.2		6.4	18.1		6.0	6.46		0.66	0.347		0.11	0.65	U	0.65	0.426		0.067
1607-B9 #11 (biased)	J11VL9	4/5/06	7.02		6.5	17.7		8.9	7.28		1.6	0.370		0.18	0.447		0.33	0.758		0.16
1607-B9 #12 (biased)	J11VM0	4/5/06	6.31	U	6.9	16.6		8.7	7.94		0.79	0.325		0.15	0.597		0.35	0.508		0.12
1607-B9 BCL (north)	J11VM1	4/5/06	6.66		5.6	12.9		5.5	8.79		0.69	0.359		0.13	0.26	U	0.26	0.639		0.11
1607-B9 BCL (south)	J11VM2	4/5/06	4.33	U	5.1	16.5		5.9	11.3		0.37	0.408		0.13	0.634		0.30	0.620		0.12
1607-B10 #1	J135M0	9/7/06							8.05		2.3	0.346		0.14	0.609		0.34	0.568		0.10
1607-B10 #2	J135M1	9/7/06							9.75		0.52	0.450		0.077	0.423		0.26	0.459		0.056
1607-B10 #3	J135M2	9/7/06							9.01		0.68	0.371		0.11	0.617		0.27	0.415		0.11
1607-B10 #4	J135M3	9/7/06							11.7		2.7	0.468		0.15	0.881		0.35	0.638		0.13
1607-B11 #1	J134W8	8/3/06							9.72		1.5	0.233		0.18	0.650		0.45	0.274		0.069
Duplicate of J134W8	J134X3	8/3/06							7.97		0.72	0.353		0.11	0.306		0.28	0.340		0.073
1607-B11 #2	J134X1	8/3/06							9.77		0.73	0.384		0.12	0.503		0.26	0.419		0.10
1607-B11 #3	J134X0	8/3/06							9.54		1.3	0.250		0.19	0.56	U	0.56	0.267		0.078
1607-B11 #4	J134W9	8/3/06							9.03		0.72	0.276		0.14	0.572		0.25	0.373		0.12

Attachment	1	Sheet No.	2 of 24
Originator	J. M. Capron	Date	11/14/06
Checked	T. M. Blakley	Date	
Calc. No.	0100C-CA-V0031	Rev. No.	0

Attachment 1. 100-C-9:2 Verification Sampling Results.

Sample Location	Sample Number	Sample Date	Thorium-232			Total Beta Radiostrontium			Uranium-235			Uranium-238		
			pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
1607-B8 (east)	J11VM3	4/5/06	0.696		0.32				0.29	U	0.29	9.3	U	9.3
1607-B8 (center)	J11VM4	4/5/06	0.52	U	0.52				0.21	U	0.21	7.1	U	7.1
1607-B8 (west)	J11VM5	4/5/06	0.988		0.31				0.26	U	0.26	10	U	10
1607-B9 #1	J11VK9	4/5/06	0.727		0.33				0.30	U	0.30	9.1	U	9.1
1607-B9 #2	J11VL0	4/5/06	0.588		0.33				0.25	U	0.25	9.3	U	9.3
1607-B9 #3	J11VL1	4/5/06	0.919		0.26				0.23	U	0.23	7.6	U	7.6
1607-B9 #4	J11VL2	4/5/06	0.775		0.18				0.27	U	0.27	8.8	U	8.8
Duplicate of J11VL2	J11VM6	4/5/06	0.706		0.33				0.29	U	0.29	7.5	U	7.5
1607-B9 #5	J11VL3	4/5/06	0.442		0.28				0.25	U	0.25	8.4	U	8.4
1607-B9 #6	J11VL4	4/5/06	0.711		0.37				0.29	U	0.29	13	U	13
1607-B9 #7	J11VL5	4/5/06	0.540		0.26	18.3		0.41	0.20	U	0.20	8.2	U	8.2
1607-B9 #7 Resample	J13H31	9/29/06				0.015	U	0.17						
1607-B9 #8	J11VL6	4/5/06	0.513		0.35				0.28	U	0.28	12	U	12
1607-B9 #9	J11VL7	4/5/06	0.32	U	0.32				0.25	U	0.25	8.5	U	8.5
1607-B9 #10	J11VL8	4/5/06	0.65	U	0.65				0.20	U	0.20	7.6	U	7.6
1607-B9 #11 (biased)	J11VL9	4/5/06	0.447		0.33				0.29	U	0.29	8.6	U	8.6
1607-B9 #12 (biased)	J11VM0	4/5/06	0.597		0.35				0.26	U	0.26	8.8	U	8.8
1607-B9 BCL (north)	J11VM1	4/5/06	0.26	U	0.26				0.22	U	0.22	6.4	U	6.4
1607-B9 BCL (south)	J11VM2	4/5/06	0.634		0.30				0.23	U	0.23	6.2	U	6.2
1607-B10 #1	J135M0	9/7/06	0.609		0.34				0.31	U	0.31	9.5	U	9.5
1607-B10 #2	J135M1	9/7/06	0.423		0.26				0.26	U	0.26	5.8	U	5.8
1607-B10 #3	J135M2	9/7/06	0.617		0.27				0.25	U	0.25	7.6	U	7.6
1607-B10 #4	J135M3	9/7/06	0.881		0.35				0.41	U	0.41	11	U	11
1607-B11 #1	J134W8	8/3/06	0.650		0.45				0.15	U	0.15	13	U	13
Duplicate of J134W8	J134X3	8/3/06	0.306		0.28				0.26	U	0.26	8.6	U	8.6
1607-B11 #2	J134X1	8/3/06	0.503		0.26				0.24	U	0.24	7.2	U	7.2
1607-B11 #3	J134X0	8/3/06	0.56	U	0.56				0.18	U	0.18	14	U	14
1607-B11 #4	J134W9	8/3/06	0.572		0.25				0.26	U	0.26	8.6	U	8.6

Attachment	1	Sheet No.	3 of 24
Originator	J. M. Capron	Date	11/14/06
Checked	T. M. Blakley	Date	
Calc. No.	0100C-CA-V0031	Rev. No.	0

Attachment 1. 100-C-9:2Verification Sampling Results.

Sample Location	Sample 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
1607-B8 (east)	J11VM3	4/5/06	5680		2.8	0.43	UJ	0.43	3.4		0.60	56.9		0.02	0.51		0.02	1.2	UJ	0.24
1607-B8 (center)	J11VM4	4/5/06	4500		2.8	0.42	UJ	0.42	3.5		0.59	69.0		0.02	0.43		0.02	0.42	UJ	0.23
1607-B8 (west)	J11VM5	4/5/06	5320		2.8	0.43	UJ	0.43	4.4		0.60	56.6		0.02	0.42		0.02	5.1	C	0.24
1607-B9 #1	J11VK9	4/5/06	6580		2.9	0.44	UJ	0.44	2.8		0.61	81.6		0.02	0.45		0.02	1.5	UJ	0.24
1607-B9 #2	J11VL0	4/5/06	5570		2.9	0.44	UJ	0.44	2.6		0.61	55.4		0.02	0.38		0.02	1.4	UJ	0.24
1607-B9 #3	J11VL1	4/5/06	5080		3.0	0.46	UJ	0.46	2.3		0.63	55.7		0.02	0.48		0.02	1.9	UJ	0.25
1607-B9 #4	J11VL2	4/5/06	5320		2.8	0.43	UJ	0.43	2.5		0.60	55.2		0.02	0.50		0.02	1.2	UJ	0.24
Duplicate of J11VL2	J11VM6	4/5/06	4530		2.9	0.44	UJ	0.44	2.2		0.60	66.7		0.02	0.39		0.02	1.4	UJ	0.24
1607-B9 #5	J11VL3	4/5/06	5420		2.9	0.45	UJ	0.45	3.4		0.62	61.1		0.02	0.56		0.02	1.3	UJ	0.24
1607-B9 #6	J11VL4	4/5/06	4960		2.8	0.43	UJ	0.43	2.4		0.60	48.7		0.02	0.38		0.02	0.64	UJ	0.24
1607-B9 #7	J11VL5	4/5/06	3590		2.8	0.42	UJ	0.42	1.6		0.59	36.4		0.02	0.33		0.02	0.34	UJ	0.23
1607-B9 #8	J11VL6	4/5/06	5390		2.8	0.42	UJ	0.42	2.9		0.59	59.9		0.02	0.37		0.02	1.4	UJ	0.23
1607-B9 #9	J11VL7	4/5/06	4800		2.9	0.44	UJ	0.44	2.7		0.61	45.9		0.02	0.37		0.02	1.1	UJ	0.24
1607-B9 #10	J11VL8	4/5/06	4600		2.8	0.42	UJ	0.42	2.9		0.59	55.6		0.02	0.35		0.02	1.8	UJ	0.23
1607-B9 #11 (biased)	J11VL9	4/5/06	5760		2.9	0.97	J	0.45	3.4		0.62	64.1		0.02	0.41		0.02	1.5	UJ	0.24
1607-B9 #12 (biased)	J11VM0	4/5/06	4840		2.9	0.44	UJ	0.44	2.4		0.61	52.5		0.02	0.48		0.02	0.74	UJ	0.24
1607-B9 BCL (north)	J11VM1	4/5/06	4840		2.8	0.43	UJ	0.43	2.2		0.59	54.4		0.02	0.48		0.02	0.55	UJ	0.23
1607-B9 BCL (south)	J11VM2	4/5/06	4520		2.7	0.42	UJ	0.42	2.4		0.58	56.7		0.02	0.45		0.02	0.78	UJ	0.23
Equipment blank	J11VM7	4/5/06	37.9		2.7	0.41	UJ	0.41	0.56	U	0.56	1.2		0.02	0.05		0.02	0.36	UJ	0.22
1607-B10 #1	J135M0	9/7/06	5940		6.5	1.0	U	1.0	3.6		1.1	74.1		0.06	0.20		0.03	1.1		1.1
1607-B10 #2	J135M1	9/7/06	5010		6.5	1.0	U	1.0	3.3		1.1	57.8		0.06	0.15		0.03	1.1	U	1.1
1607-B10 #3	J135M2	9/7/06	4640		6.5	1.0	U	1.0	3.3		1.1	62.0		0.06	0.15		0.03	1.1	U	1.1
1607-B10 #4	J135M3	9/7/06	5030		6.5	1.0	U	1.0	2.6		1.1	58.8		0.06	0.12		0.03	1.1	U	1.1
1607-B11 #1	J134W8	8/3/06	4550		2.7	0.42	UJ	0.42	2.2		0.58	41.8	C	0.02	0.11		0.02	0.76	C	0.23
Duplicate of J134W8	J134X3	8/3/06	4190		2.7	0.42	UJ	0.42	2.1		0.58	33.9	C	0.02	0.12		0.02	0.84	C	0.23
1607-B11 #2	J134X1	8/3/06	3990		2.7	0.42	UJ	0.42	2.2		0.58	34.3	C	0.02	0.13		0.02	1.3	C	0.23
1607-B11 #3	J134X0	8/3/06	5220		2.7	0.42	UJ	0.42	3.6		0.58	49.0	C	0.02	0.19		0.02	1.5	C	0.23
1607-B11 #4	J134W9	8/3/06	6300		2.7	0.47	J	0.42	3.8		0.58	58.8	C	0.02	0.20		0.02	2.0	C	0.23
Equipment blank	J134X4	8/3/06	42.5		2.7	0.41	UJ	0.41	0.57	U	0.57	3.0	C	0.02	0.02	U	0.02	0.22	UC	0.22

Attachment	1	Sheet No.	4 of 24
Originator	J. M. Capron	Date	01/12/07
Checked	T. M. Blakley	Date	
Calc. No.	0100C-CA-V0031	Rev. No.	1

Attachment 1. 100-C-9:2Verification Sampling Results.

Sample Location	Sample Number	Sample Date	Cadmium			Calcium			Chromium			Cobalt			Copper			Hexavalent Chromium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
1607-B8 (east)	J11VM3	4/5/06	0.17		0.07	7320		1.6	9.6		0.13	7.7		0.14	18.8		0.12	0.33		0.21
1607-B8 (center)	J11VM4	4/5/06	0.21		0.07	6980		1.6	6.3		0.13	8.9		0.14	16.6		0.12	0.27		0.21
1607-B8 (west)	J11VM5	4/5/06	0.37		0.07	6270		1.6	16.5		0.13	7.5		0.14	66.1		0.12	0.83		0.21
1607-B9 #1	J11VK9	4/5/06	0.14		0.07	4290		1.6	11.0		0.13	7.6		0.14	14.7		0.12	0.21	U	0.21
1607-B9 #2	J11VL0	4/5/06	0.07	U	0.07	3540		1.6	9.1		0.13	6.7		0.14	13.7		0.12	0.21	U	0.21
1607-B9 #3	J11VL1	4/5/06	0.07	U	0.07	3670		1.7	7.1		0.13	7.2		0.15	14.2		0.12	0.22		0.22
1607-B9 #4	J11VL2	4/5/06	0.07	U	0.07	4160		1.6	7.8		0.13	7.5		0.14	14.4		0.12	0.37		0.21
Duplicate of J11VL2	J11VM6	4/5/06	0.18		0.07	4170		1.6	6.4		0.13	10.0		0.14	14.1		0.12	0.25		0.21
1607-B9 #5	J11VL3	4/5/06	0.07	U	0.07	4260		1.7	7.9		0.13	7.6		0.14	13.6		0.12	0.22	U	0.22
1607-B9 #6	J11VL4	4/5/06	0.24		0.07	4720		1.6	6.5		0.13	8.1		0.14	15.5		0.12	0.50		0.21
1607-B9 #7	J11VL5	4/5/06	0.22		0.07	4520		1.6	4.0		0.13	7.0		0.14	14.9		0.12	0.24		0.21
1607-B9 #8	J11VL6	4/5/06	0.26		0.07	7640		1.6	7.9		0.12	6.8		0.13	17.1		0.12	0.27		0.21
1607-B9 #9	J11VL7	4/5/06	0.22		0.07	7010		1.6	8.2		0.13	6.8		0.14	15.5		0.12	0.22	U	0.22
1607-B9 #10	J11VL8	4/5/06	0.41		0.07	7170		1.6	8.0		0.12	7.0		0.13	16.2		0.12	0.21	U	0.21
1607-B9 #11 (biased)	J11VL9	4/5/06	0.28		0.07	4100		1.7	13.5		0.13	7.4		0.14	22.5		0.12	0.22	U	0.22
1607-B9 #12 (biased)	J11VM0	4/5/06	0.12		0.07	4550		1.6	6.3		0.13	7.7		0.14	14.5		0.12	0.21	U	0.21
1607-B9 BCL (north)	J11VM1	4/5/06	0.17		0.07	5700		1.6	7.2		0.13	7.6		0.14	14.6		0.12	0.27		0.21
1607-B9 BCL (south)	J11VM2	4/5/06	0.12		0.07	4050		1.6	6.9		0.12	6.9		0.13	13.0		0.11	0.23		0.21
Equipment blank	J11VM7	4/5/06	0.06	U	0.06	19.7		1.5	0.17		0.12	0.13	U	0.13	0.11	U	0.11			
1607-B10 #1	J135M0	9/7/06	0.50		0.09	5620		2.5	11.0	C	0.20	6.9		0.14	17.6		0.23	0.20		0.20
1607-B10 #2	J135M1	9/7/06	0.36		0.09	7810		2.5	7.5	C	0.20	6.8		0.14	15.8		0.23	0.24		0.20
1607-B10 #3	J135M2	9/7/06	0.42		0.09	9820		2.5	6.6	C	0.20	6.1		0.14	15.1		0.23	0.20	U	0.20
1607-B10 #4	J135M3	9/7/06	0.46		0.09	5270		2.5	9.3	C	0.20	6.0		0.14	15.9		0.23	0.20	U	0.20
1607-B11 #1	J134W8	8/3/06	0.07	U	0.07	5520	C	1.5	8.0	C	0.12	5.2		0.13	14.4		0.11	0.20	U	0.20
Duplicate of J134W8	J134X3	8/3/06	0.07	U	0.07	5820	C	1.6	7.8	C	0.12	5.0		0.13	19.1		0.11	0.20	U	0.20
1607-B11 #2	J134X1	8/3/06	0.07	U	0.07	5670	C	1.6	7.4	C	0.12	5.2		0.13	15.1		0.11	0.20	U	0.20
1607-B11 #3	J134X0	8/3/06	0.08		0.07	7510	C	1.6	8.2	C	0.12	8.0		0.13	16.1		0.11	0.20	U	0.20
1607-B11 #4	J134W9	8/3/06	0.07		0.07	6760	C	1.6	8.8	C	0.12	8.3		0.13	16.2		0.11	0.21		0.20
Equipment blank	J134X4	8/3/06	0.07	U	0.07	21.0	C	1.5	0.20	C	0.12	0.13	U	0.13	0.11	U	0.11			

Attachment	1	Sheet No.	5 of 24
Originator	J. M. Capron	Date	11/14/06
Checked	T. M. Blakley	Date	
Calc. No.	0100C-CA-V0031	Rev. No.	0

Attachment 1. 100-C-9:2Verification Sampling Results.

Sample Location	Sample Number	Sample Date	Iron			Lead			Lithium			Magnesium			Manganese			Mercury		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
1607-B8 (east)	J11VM3	4/5/06	20300		3.4	22.3		0.30	7.1	C	0.03	4760		0.95	347		0.03	0.37		0.02
1607-B8 (center)	J11VM4	4/5/06	22900		3.4	12.3		0.30	5.3	C	0.03	4690		0.94	456		0.03	0.05		0.02
1607-B8 (west)	J11VM5	4/5/06	20100		3.4	152		0.30	5.8	C	0.03	4240		0.95	308		0.03	0.07		0.02
1607-B9 #1	J11VK9	4/5/06	19800		3.5	6.0		0.31	7.0	C	0.03	4250		0.97	370		0.03	0.01	U	0.01
1607-B9 #2	J11VL0	4/5/06	18800		3.5	4.8		0.31	6.0	C	0.03	3970		0.96	302		0.03	0.01	U	0.01
1607-B9 #3	J11VL1	4/5/06	17100		3.6	7.7		0.32	4.9	C	0.03	3710		1.0	333		0.03	0.02	U	0.02
1607-B9 #4	J11VL2	4/5/06	19500		3.4	10.8		0.31	5.0	C	0.03	4020		0.96	338		0.03	0.01	U	0.01
Duplicate of J11VL2	J11VM6	4/5/06	17300		3.5	10.6		0.31	4.4	C	0.03	3450		0.96	334		0.03	0.02		0.02
1607-B9 #5	J11VL3	4/5/06	19400		3.6	6.8		0.32	5.1	C	0.03	3850		0.99	370		0.03	0.02	U	0.02
1607-B9 #6	J11VL4	4/5/06	20100		3.4	5.6		0.31	5.1	C	0.03	3960		0.96	332		0.03	0.02	U	0.02
1607-B9 #7	J11VL5	4/5/06	20400		3.4	7.4		0.30	3.4	C	0.03	3460		0.94	280		0.03	0.01	U	0.01
1607-B9 #8	J11VL6	4/5/06	18900		3.4	14.2		0.30	8.5	C	0.03	4280		0.93	324		0.03	0.04		0.01
1607-B9 #9	J11VL7	4/5/06	18200		3.5	5.2		0.31	6.0	C	0.03	4370		0.97	280		0.03	0.02	U	0.02
1607-B9 #10	J11VL8	4/5/06	16700		3.4	25.9		0.30	7.6	C	0.03	3840		0.93	304		0.03	0.03		0.01
1607-B9 #11 (biased)	J11VL9	4/5/06	31800		3.6	55.5		0.32	6.5	C	0.03	3890		0.99	404		0.03	0.02	U	0.02
1607-B9 #12 (biased)	J11VM0	4/5/06	19600		3.5	5.0		0.31	4.5	C	0.03	3920		0.97	344		0.03	0.01	U	0.01
1607-B9 BCL (north)	J11VM1	4/5/06	20600		3.4	8.8		0.30	5.1	C	0.03	3850		0.94	345		0.03	0.02	U	0.02
1607-B9 BCL (south)	J11VM2	4/5/06	15900		3.3	7.2		0.30	4.5	C	0.03	3490		0.92	325		0.03	0.02	U	0.02
Equipment blank	J11VM7	4/5/06	798		3.2	0.29	U	0.29	0.06	UJ	0.03	6.5		0.90	8.5		0.03	0.05	U	0.05
1607-B10 #1	J135M0	9/7/06	20300		7.0	33.0	C	0.34	6.7	C	0.06	4000		2.1	311		0.06	0.85	J	0.02
1607-B10 #2	J135M1	9/7/06	17100		7.0	15.5	C	0.34	5.6	C	0.06	4050		2.1	295		0.06	0.07	J	0.01
1607-B10 #3	J135M2	9/7/06	16200		7.0	28.9	C	0.34	5.0	C	0.06	3660		2.1	274		0.06	0.29	J	0.02
1607-B10 #4	J135M3	9/7/06	16500		7.0	45.3	C	0.34	5.3	C	0.06	3480		2.1	267		0.06	0.84	J	0.01
1607-B11 #1	J134W8	8/3/06	13800		3.3	2.3		0.29	5.5	C	0.03	3780	C	0.92	241		0.03	0.02	U	0.02
Duplicate of J134W8	J134X3	8/3/06	12400		3.3	2.4		0.29	5.2	C	0.03	3600	C	0.92	237		0.03	0.02	U	0.02
1607-B11 #2	J134X1	8/3/06	12500		3.3	2.4		0.29	5.0	C	0.03	3530	C	0.92	235		0.03	0.02	U	0.02
1607-B11 #3	J134X0	8/3/06	19100		3.3	5.8		0.29	6.3	C	0.03	4290	C	0.92	333		0.03	0.01	U	0.01
1607-B11 #4	J134W9	8/3/06	21200		3.3	5.6		0.29	7.2		0.03	4660		0.92	352		0.03	0.02	U	0.02
Equipment blank	J134X4	8/3/06	105		3.3	0.29	U	0.29	1.2	C	0.03	7.8	C	0.91	3.4		0.03	0.02	U	0.02

Attachment	1	Sheet No.	6 of 24
Originator	J. M. Capron	Date	01/12/07
Checked	T. M. Blakley	Date	
Calc. No.	0100C-CA-V0031	Rev. No.	1

Attachment 1. 100-C-9:2Verification Sampling Results.

Sample Location	Sample Number	Sample Date	Molybdenum			Nickel			Phosphorus			Potassium			Selenium			Silicon		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
1607-B8 (east)	J11VM3	4/5/06	0.46		0.28	11.7		0.24	949	J	0.88	1070		2.2	0.46	U	0.46	324	J	2.2
1607-B8 (center)	J11VM4	4/5/06	0.52		0.28	11.3		0.23	1120	J	1.7	858		2.2	0.45	U	0.45	337	J	2.2
1607-B8 (west)	J11VM5	4/5/06	1.0		0.29	11.8		0.24	924	J	0.88	968		2.2	0.46	U	0.46	413	J	2.2
1607-B9 #1	J11VK9	4/5/06	0.37		0.29	11.8		0.24	872	J	0.90	1280		2.3	0.47	U	0.47	475	J	2.3
1607-B9 #2	J11VL0	4/5/06	0.43		0.29	11.6		0.24	831	J	0.89	992		2.3	0.47	U	0.4	403	J	2.3
1607-B9 #3	J11VL1	4/5/06	0.34		0.30	9.1		0.25	898	J	0.93	908		2.4	0.49	U	0.49	484	J	2.4
1607-B9 #4	J11VL2	4/5/06	0.46		0.29	9.6		0.24	841	J	0.89	944		2.2	0.46	U	0.46	383	J	2.2
Duplicate of J11VL2	J11VM6	4/5/06	0.33		0.29	8.6		0.24	911	J	0.89	828		2.2	0.47	U	0.47	423	J	2.2
1607-B9 #5	J11VL3	4/5/06	0.37		0.30	9.0		0.24	887	J	0.92	1170		2.3	0.48	U	0.48	447	J	2.3
1607-B9 #6	J11VL4	4/5/06	0.34		0.29	9.5		0.24	1020	J	0.89	876		2.2	0.46	U	0.46	376	J	2.2
1607-B9 #7	J11VL5	4/5/06	0.29		0.28	7.4		0.23	1240	J	1.7	581		2.2	0.45	U	0.45	301	J	2.2
1607-B9 #8	J11VL6	4/5/06	0.43		0.28	10.4		0.23	964	J	0.86	1170		2.2	0.45	U	0.45	428	J	2.2
1607-B9 #9	J11VL7	4/5/06	0.43		0.29	11.8		0.24	960	J	0.90	901		2.3	0.47	U	0.47	374	J	2.3
1607-B9 #10	J11VL8	4/5/06	0.46		0.28	9.7		0.23	933	J	0.86	994		2.2	0.45	U	0.45	365	J	2.2
1607-B9 #11 (biased)	J11VL9	4/5/06	1.9		0.30	22.0		0.24	867	J	0.92	1050		2.3	0.48	U	0.48	442	J	2.3
1607-B9 #12 (biased)	J11VM0	4/5/06	0.29	U	0.29	9.9		0.24	1010	J	0.90	927		2.3	0.47	U	0.47	424	J	2.3
1607-B9 BCL (north)	J11VM1	4/5/06	0.38		0.28	8.9		0.23	1120	J	0.87	898		2.2	0.46	U	0.46	347	J	2.2
1607-B9 BCL (south)	J11VM2	4/5/06	0.28	U	0.28	10.0		0.23	873	J	0.86	933		2.2	0.45	U	0.45	431	J	2.2
Equipment blank	J11VM7	4/5/06	0.27	U	0.27	0.22	U	0.22	4.3	J	0.83	15.4		2.1	0.44	U	0.44	37.6	J	2.1
1607-B10 #1	J135M0	9/7/06	0.37		0.29	12.2		0.37	899		3.7	1110		6.1	0.75	U	0.75	524	C	1.1
1607-B10 #2	J135M1	9/7/06	0.47		0.29	10.6		0.37	933		3.7	978		6.1	0.75	U	0.75	532	C	1.1
1607-B10 #3	J135M2	9/7/06	0.32		0.29	9.0		0.37	966		3.7	914		6.1	0.74	U	0.74	478	C	1.1
1607-B10 #4	J135M3	9/7/06	0.40		0.29	9.1		0.37	808		3.7	950		6.1	0.74	U	0.74	519	C	1.1
1607-B11 #1	J134W8	8/3/06	0.31		0.27	8.8		0.23	722		2.6	598	C	2.1	0.44	U	0.44	534		2.1
Duplicate of J134W8	J134X3	8/3/06	0.30		0.27	9.3		0.23	690		2.6	574	C	2.1	0.44	U	0.44	440		2.1
1607-B11 #2	J134X1	8/3/06	0.35		0.27	8.8		0.23	683		2.6	561	C	2.1	0.44	U	0.44	542		2.1
1607-B11 #3	J134X0	8/3/06	0.44		0.27	9.2		0.23	934		2.6	1140	C	2.2	0.45	U	0.45	533		2.2
1607-B11 #4	J134W9	8/3/06	0.46		0.28	11.0		0.23	919		2.6	1270	C	2.2	0.45	U	0.45	598		2.2
Equipment blank	J134X4	8/3/06	0.27	U	0.27	0.22	U	0.22	3.0		0.84	23.9	C	2.1	0.44	U	0.44	36.0		2.1

Attachment	1	Sheet No.	7 of 24
Originator	J. M. Capron	Date	11/14/06
Checked	T. M. Blakley	Date	
Calc. No.	0100C-CA-V0031	Rev. No.	0

Attachment 1. 100-C-9:2Verification Sampling Results.

Sample Location	Sample Number	Sample Date	Silver			Sodium			Strontium			Thallium			Tin			Titanium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
1607-B8 (east)	J11VM3	4/5/06	0.07	U	0.07	143		0.75	25.5		0.01	0.69	U	0.69	1.1	UC	1.1	1490		0.03
1607-B8 (center)	J11VM4	4/5/06	0.07	U	0.07	146		0.73	20.3		0.01	0.68	U	0.68	1.0	UC	1.0	1960		0.03
1607-B8 (west)	J11VM5	4/5/06	0.07	U	0.07	196		0.75	23.1		0.01	0.69	U	0.69	1.4	UJ	1.1	1580		0.03
1607-B9 #1	J11VK9	4/5/06	0.07	U	0.07	122		0.76	22.5		0.01	0.70	U	0.70	1.1	UC	1.1	1290		0.03
1607-B9 #2	J11VL0	4/5/06	0.07	U	0.07	110		0.76	19.6		0.01	0.70	U	0.70	1.1	UC	1.1	1460		0.03
1607-B9 #3	J11VL1	4/5/06	0.07	U	0.07	94.1		0.79	19.7		0.01	0.73	U	0.73	1.1	UC	1.1	1290		0.03
1607-B9 #4	J11VL2	4/5/06	0.07	U	0.07	137		0.75	20.7		0.01	0.69	U	0.69	1.1	UC	1.1	1560		0.03
Duplicate of J11VL2	J11VM6	4/5/06	0.07	U	0.07	109		0.75	20.9		0.01	0.69	U	0.69	1.1	UC	1.1	1350		0.03
1607-B9 #5	J11VL3	4/5/06	0.07	U	0.07	98.7		0.77	19.3		0.01	0.71	U	0.71	1.1	UJ	1.1	1530		0.03
1607-B9 #6	J11VL4	4/5/06	0.07	U	0.07	116		0.75	18.5		0.01	0.69	U	0.69	1.1	UC	1.1	1570		0.03
1607-B9 #7	J11VL5	4/5/06	0.07	U	0.07	99.8		0.73	19.0		0.01	0.68	U	0.68	1.0	UC	1.0	1920		0.03
1607-B9 #8	J11VL6	4/5/06	0.07	U	0.07	194		0.73	24.8		0.01	0.67	U	0.67	1.0	UC	1.0	1360		0.03
1607-B9 #9	J11VL7	4/5/06	0.07	U	0.07	137		0.76	24.8		0.01	0.70	U	0.70	1.1	UC	1.1	1300		0.03
1607-B9 #10	J11VL8	4/5/06	0.07	U	0.07	178		0.73	23.0		0.01	0.67	U	0.67	1.1	UJ	1.0	1080		0.03
1607-B9 #11 (biased)	J11VL9	4/5/06	0.07	U	0.07	109		0.77	23.4		0.01	0.71	U	0.71	1.6	UJ	1.1	1110		0.03
1607-B9 #12 (biased)	J11VM0	4/5/06	0.07	U	0.07	101		0.76	18.0		0.01	0.70	U	0.70	1.1	UC	1.1	1640		0.03
1607-B9 BCL (north)	J11VM1	4/5/06	0.07	U	0.07	118		0.74	20.6		0.01	0.68	U	0.68	1.0	UC	1.0	1720		0.03
1607-B9 BCL (south)	J11VM2	4/5/06	0.07	U	0.07	85.4		0.72	18.8		0.01	0.67	U	0.67	1.0	UC	1.0	1140		0.03
Equipment blank	J11VM7	4/5/06	0.06	U	0.06	6.0		0.70	0.19		0.009	0.65	U	0.65	0.99	UC	0.99	1.9		0.03
1607-B10 #1	J135M0	9/7/06	0.32	U	0.32	138	C	0.60	23.4		0.03	1.6	U	1.6	1.0	UC	1.0	1210	C	0.09
1607-B10 #2	J135M1	9/7/06	0.32	U	0.32	243	C	0.60	29.1		0.03	1.6	U	1.6	1.0	UC	1.0	1080	C	0.09
1607-B10 #3	J135M2	9/7/06	0.32	U	0.32	265	C	0.60	32.7		0.03	1.6	U	1.6	1.0	UC	1.0	965	C	0.09
1607-B10 #4	J135M3	9/7/06	0.31	U	0.31	118	C	0.60	21.7		0.03	1.6	U	1.6	1.0	UC	1.0	1100	C	0.09
1607-B11 #1	J134W8	8/3/06	0.07	UC	0.07	116	C	0.72	28.4	C	0.009	0.66	U	0.66	1.0	U	1.0	838		0.03
Duplicate of J134W8	J134X3	8/3/06	0.07	UC	0.07	102	C	0.72	26.7	C	0.009	0.66	U	0.66	1.0	U	1.0	649		0.03
1607-B11 #2	J134X1	8/3/06	0.07	UC	0.07	88.8	C	0.72	25.1	C	0.009	0.66	U	0.66	1.0	U	1.0	645		0.03
1607-B11 #3	J134X0	8/3/06	0.07	UC	0.07	188	C	0.72	23.7	C	0.009	0.66	U	0.66	1.0	U	1.0	1470		0.03
1607-B11 #4	J134W9	8/3/06	0.07	UC	0.07	188	C	0.72	24.9	C	0.009	0.66	U	0.66	1.0	U	1.0	1610		0.03
Equipment blank	J134X4	8/3/06	0.07	UC	0.07	10.1	C	0.71	0.22	C	0.009	0.65	U	0.65	1.0	U	1.0	1.7		0.03

Attachment	1	Sheet No.	8 of 24
Originator	J. M. Capron	Date	11/14/06
Checked	T. M. Blakley	Date	
Calc. No.	0100C-CA-V0031	Rev. No.	0

Attachment 1. 100-C-9:2 Verification Sampling Results.

Sample Location	Sample Number	Sample Date	Uranium			Vanadium			Zinc			Zirconium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
1607-B8 (east)	J11VM3	4/5/06	0.86	U	0.86	47.2		0.09	47.0		0.16	20.6		0.31
1607-B8 (center)	J11VM4	4/5/06	0.85	U	0.85	58.4		0.09	42.4		0.15	22.5		0.31
1607-B8 (west)	J11VM5	4/5/06	0.87	U	0.87	49.9		0.09	111		0.16	19.8		0.31
1607-B9 #1	J11VK9	4/5/06	0.88	U	0.88	45.6		0.09	44.6		0.16	19.5		0.32
1607-B9 #2	J11VL0	4/5/06	0.87	U	0.87	47.6		0.09	37.6		0.16	18.4		0.32
1607-B9 #3	J11VL1	4/5/06	0.91	U	0.91	37.9		0.09	37.4		0.17	23.8		0.33
1607-B9 #4	J11VL2	4/5/06	0.87	U	0.87	48.9		0.09	40.0		0.16	23.8		0.32
Duplicate of J11VL2	J11VM6	4/5/06	0.87	U	0.87	40.1		0.09	34.3		0.16	21.0		0.32
1607-B9 #5	J11VL3	4/5/06	0.90	U	0.90	49.4		0.09	43.9		0.16	26.0		0.33
1607-B9 #6	J11VL4	4/5/06	0.87	U	0.87	46.5		0.09	38.7		0.16	22.3		0.32
1607-B9 #7	J11VL5	4/5/06	0.85	U	0.85	51.4		0.09	35.8		0.15	23.6		0.31
1607-B9 #8	J11VL6	4/5/06	0.85	U	0.85	42.6		0.09	51.7		0.15	18.5		0.31
1607-B9 #9	J11VL7	4/5/06	0.88	U	0.88	37.7		0.09	39.1		0.16	17.1		0.32
1607-B9 #10	J11VL8	4/5/06	0.85	U	0.85	33.5		0.09	499		0.15	17.6		0.31
1607-B9 #11 (biased)	J11VL9	4/5/06	0.90	U	0.90	38.5		0.09	40.5		0.16	17.8		0.33
1607-B9 #12 (biased)	J11VM0	4/5/06	0.88	U	0.88	48.0		0.09	38.5		0.16	25.0		0.32
1607-B9 BCL (north)	J11VM1	4/5/06	0.85	U	0.85	50.3		0.09	43.6		0.16	23.8		0.31
1607-B9 BCL (south)	J11VM2	4/5/06	0.84	U	0.84	36.9		0.09	34.8		0.15	20.5		0.30
Equipment blank	J11VM7	4/5/06	0.81	U	0.81	0.08	U	0.08	1.3		0.15	1.1		0.30
1607-B10 #1	J135M0	9/7/06	6.1	U	6.1	42.5		0.14	52.2		0.09	17.4		2.5
1607-B10 #2	J135M1	9/7/06	6.1	U	6.1	34.4		0.14	37.7		0.09	16.7		2.5
1607-B10 #3	J135M2	9/7/06	6.1	U	6.1	31.2		0.14	40.7		0.09	15.2		2.5
1607-B10 #4	J135M3	9/7/06	6.1	U	6.1	34.8		0.14	45.6		0.09	15.0		2.5
1607-B11 #1	J134W8	8/3/06	0.83	U	0.83	31.5		0.09	29.6		0.15	8.0		0.30
Duplicate of J134W8	J134X3	8/3/06	0.83	U	0.83	27.4		0.09	27.8		0.15	7.1		0.30
1607-B11 #2	J134X1	8/3/06	0.83	U	0.83	26.9		0.09	27.6		0.15	7.2		0.30
1607-B11 #3	J134X0	8/3/06	0.83	U	0.83	42.9		0.09	40.2		0.15	19.0		0.30
1607-B11 #4	J134W9	8/3/06	0.84	U	0.84	49.2		0.09	44.6		0.15	20.4		0.30
Equipment blank	J134X4	8/3/06	0.82	U	0.82	0.08	U	0.08	0.88		0.15	0.30		0.30

Attachment	1	Sheet No.	9 of 24
Originator	J. M. Capron	Date	11/14/06
Checked	T. M. Blakley	Date	
Calc. No.	0100C-CA-V0031	Rev. No.	0

Attachment 1. 100-C-9:2 Verification Sampling Results.

Constituents	J11VK9 Location 1 Sample Date 4/5/06			J11VL0 Location 2 Sample Date 4/5/06			J11VL1 Location 3 Sample Date 4/5/06			J11VL2 Location 4 Sample Date 4/5/06		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Polychlorinated Biphenyls												
Aroclor-1016	14	U	14	14	U	14	15	U	15	14	U	14
Aroclor-1221	14	U	14	14	U	14	15	U	15	14	U	14
Aroclor-1232	14	U	14	14	U	14	15	U	15	14	U	14
Aroclor-1242	14	U	14	14	U	14	15	U	15	14	U	14
Aroclor-1248	14	U	14	14	U	14	15	U	15	14	U	14
Aroclor-1254	5.5	J	14	15	J	14	40		15	11	J	14
Aroclor-1260	14	U	14	14	U	14	15	U	15	14	U	14
Pesticides												
Aldrin	1.4	UD	1.4	1.4	UD	1.4	1.5	UD	1.5	1.4	UD	1.4
alpha-BHC	1.4	UD	1.4	1.4	UD	1.4	1.5	UD	1.5	1.4	UD	1.4
alpha-Chlordane	1.4	UD	1.4	1.4	UD	1.4	1.5	UD	1.5	1.4	UD	1.4
beta-BHC	1.4	UD	1.4	1.4	UD	1.4	1.5	UD	1.5	1.4	UD	1.4
delta-BHC	1.4	UDJ	1.4	1.4	UDJ	1.4	1.5	UDJ	1.5	1.4	UDJ	1.4
Dichlorodiphenyldichloroethane	1.4	UD	1.4	1.4	UD	1.4	1.5	UD	1.5	1.4	UD	1.4
Dichlorodiphenyldichloroethylene	1.4	UDJ	1.4	0.53	JD	1.4	1.2	JD	1.5	1.4	UDJ	1.4
Dichlorodiphenyltrichloroethane	1.4	UDJ	1.4	1.4	UDJ	1.4	1.5	UDJ	1.5	1.4	UDJ	1.4
Dieldrin	1.4	UD	1.4	1.4	UD	1.4	1.5	UD	1.5	1.4	UD	1.4
Endosulfan I	1.4	UD	1.4	1.4	UD	1.4	1.5	UD	1.5	1.4	UD	1.4
Endosulfan II	1.4	UD	1.4	1.4	UD	1.4	1.5	UD	1.5	1.4	UD	1.4
Endosulfan sulfate	1.4	UD	1.4	1.4	UD	1.4	1.5	UD	1.5	1.4	UD	1.4
Endrin	1.4	UD	1.4	1.4	UD	1.4	1.5	UD	1.5	1.4	UD	1.4
Endrin aldehyde	1.4	UD	1.4	1.4	UD	1.4	1.5	UD	1.5	1.4	UD	1.4
Endrin ketone	1.4	UD	1.4	1.4	UD	1.4	1.5	UD	1.5	1.4	UD	1.4
gamma-BHC (Lindane)	1.4	UD	1.4	1.4	UD	1.4	1.5	UD	1.5	1.4	UD	1.4
gamma-Chlordane	1.4	UD	1.4	1.4	UD	1.4	1.5	UD	1.5	1.4	UD	1.4
Heptachlor	1.4	UD	1.4	1.4	UD	1.4	1.5	UD	1.5	1.4	UD	1.4
Heptachlor epoxide	1.4	UD	1.4	1.4	UD	1.4	1.5	UD	1.5	1.4	UD	1.4
Methoxychlor	1.4	UDJ	1.4	1.4	UDJ	1.4	1.5	UDJ	1.5	1.4	UDJ	1.4
Toxaphene	14	UDJ	14	14	UDJ	14	15	UDJ	15	14	UDJ	14
Semivolatile Organic Compounds												
1,2,4-Trichlorobenzene	350	UJ	350	350	UJ	350	370	UJ	370	360	UJ	360
1,2-Dichlorobenzene	350	U	350	350	U	350	370	U	370	360	U	360
1,3-Dichlorobenzene	350	U	350	350	U	350	370	U	370	360	U	360
1,4-Dichlorobenzene	350	U	350	350	U	350	370	U	370	360	U	360
2,4,5-Trichlorophenol	880	U	880	890	U	890	920	U	920	890	U	890
2,4,6-Trichlorophenol	350	UJ	350	350	UJ	350	370	UJ	370	360	UJ	360
2,4-Dichlorophenol	350	U	350	350	U	350	370	U	370	360	U	360
2,4-Dimethylphenol	350	U	350	350	U	350	370	U	370	360	U	360
2,4-Dinitrophenol	880	UJ	880	890	UJ	890	920	UJ	920	890	UJ	890
2,4-Dinitrotoluene	350	U	350	350	U	350	370	U	370	360	U	360
2,6-Dinitrotoluene	350	U	350	350	U	350	370	U	370	360	U	360
2-Chloronaphthalene	350	U	350	350	U	350	370	U	370	360	U	360
2-Chlorophenol	350	U	350	350	U	350	370	U	370	360	U	360
2-Methylnaphthalene	350	U	350	350	U	350	370	U	370	360	U	360
2-Methylphenol (cresol, o-)	350	UJ	350	350	UJ	350	370	UJ	370	360	UJ	360
2-Nitroaniline	880	U	880	890	U	890	920	U	920	890	U	890
2-Nitrophenol	350	U	350	350	U	350	370	U	370	360	U	360

Attachment	1	Sheet No.	10 of 24
Originator	J. M. Capron	Date	11/14/06
Checked	T. M. Blakley	Date	
Calc. No.	0100C-CA-V0031	Rev. No.	0

Attachment 1. 100-C-9:2 Verification Sampling Results.

Constituents	J11VK9 Location 1 Sample Date 4/5/06			J11VL0 Location 2 Sample Date 4/5/06			J11VL1 Location 3 Sample Date 4/5/06			J11VL2 Location 4 Sample Date 4/5/06		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Semivolatile Organic Compounds (continued)												
3,3'-Dichlorobenzidine	350	U	350	350	U	350	370	U	370	360	U	360
3-Nitroaniline	880	U	880	890	U	890	920	U	920	890	U	890
4,6-Dinitro-2-methylphenol	880	U	880	890	U	890	920	U	920	890	U	890
4-Bromophenyl-phenylether	350	U	350	350	U	350	370	U	370	360	U	360
4-Chloro-3-methylphenol	350	U	350	350	U	350	370	U	370	360	U	360
4-Chloroaniline	350	U	350	350	U	350	370	U	370	360	U	360
4-Chlorophenyl-phenylether	350	U	350	350	U	350	370	U	370	360	U	360
4-Methylphenol (p-cresol)	350	UJ	350	350	UJ	350	370	UJ	370	360	UJ	360
4-Nitroaniline	880	U	880	890	U	890	920	U	920	890	U	890
4-Nitrophenol	880	U	880	890	U	890	920	U	920	890	U	890
Acenaphthene	350	U	350	350	U	350	370	U	370	360	U	360
Acenaphthylene	350	U	350	350	U	350	370	U	370	360	U	360
Anthracene	350	U	350	350	U	350	370	U	370	360	U	360
Benzo(a)anthracene	350	U	350	350	U	350	370	U	370	360	U	360
Benzo(a)pyrene	350	U	350	350	U	350	370	U	370	360	U	360
Benzo(b)fluoranthene	350	U	350	350	U	350	370	U	370	360	U	360
Benzo(g,h,i)perylene	350	U	350	350	U	350	370	U	370	360	U	360
Benzo(k)fluoranthene	350	U	350	350	U	350	370	U	370	360	U	360
bis(2-Chloro-1-methylethyl)ether	350	U	350	350	U	350	370	U	370	360	U	360
bis(2-Chloroethoxy)methane	350	U	350	350	U	350	370	U	370	360	U	360
bis(2-Chloroethyl)ether	350	U	350	350	U	350	370	U	370	360	U	360
bis(2-Ethylhexyl)phthalate	660	U	350	660	U	350	660	U	370	660	U	360
Butylbenzylphthalate	350	U	350	350	U	350	370	U	370	360	U	360
Carbazole	350	U	350	350	U	350	370	U	370	360	U	360
Chrysene	350	U	350	350	U	350	370	U	370	360	U	360
Di-n-butylphthalate	350	U	350	350	U	350	370	U	370	360	U	360
Di-n-octylphthalate	350	UJ	350	350	UJ	350	370	UJ	370	360	UJ	360
Dibenz(a,h)anthracene	350	U	350	350	U	350	370	U	370	360	U	360
Dibenzofuran	350	U	350	350	U	350	370	U	370	360	U	360
Diethylphthalate	350	U	350	350	U	350	370	U	370	360	U	360
Dimethylphthalate	350	U	350	350	U	350	370	U	370	360	U	360
Fluoranthene	350	U	350	350	U	350	370	U	370	360	U	360
Fluorene	350	U	350	350	U	350	370	U	370	360	U	360
Hexachlorobenzene	350	U	350	350	U	350	370	U	370	360	U	360
Hexachlorobutadiene	350	U	350	350	U	350	370	U	370	360	U	360
Hexachlorocyclopentadiene	350	U	350	350	U	350	370	U	370	360	U	360
Hexachloroethane	350	U	350	350	U	350	370	U	370	360	U	360
Indeno(1,2,3-cd)pyrene	350	U	350	350	U	350	370	U	370	360	U	360
Isophorone	350	U	350	350	U	350	370	U	370	360	U	360
N-Nitroso-di-n-dipropylamine	350	UJ	350	350	UJ	350	370	UJ	370	360	UJ	360
N-Nitrosodiphenylamine	350	U	350	350	U	350	370	U	370	360	U	360
Naphthalene	350	U	350	350	U	350	370	U	370	360	U	360
Nitrobenzene	350	U	350	350	U	350	370	U	370	360	U	360
Pentachlorophenol	880	UJ	880	890	UJ	890	920	UJ	920	890	UJ	890
Phenanthrene	350	U	350	350	U	350	370	U	370	360	U	360
Phenol	350	UJ	350	350	UJ	350	370	UJ	370	360	UJ	360
Pyrene	350	U	350	350	U	350	370	U	370	360	U	360

Attachment	1	Sheet No.	11 of 24
Originator	J. M. Capron	Date	11/14/06
Checked	T. M. Blakley	Date	
Calc. No.	0100C-CA-V0031	Rev. No.	0

Attachment 1. 100-C-9:2 Verification Sampling Results.

Constituents	J11VM6 Duplicate of J11VL2 Sample Date 4/5/06			J11VL3 Location 5 Sample Date 4/5/06			J11VL4 Location 6 Sample Date 4/5/06			J11VL5 Location 7 Sample Date 4/5/06		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Polychlorinated Biphenyls												
Aroclor-1016	14	U	14	15	U	15	14	U	14	14	U	14
Aroclor-1221	14	U	14	15	U	15	14	U	14	14	U	14
Aroclor-1232	14	U	14	15	U	15	14	U	14	14	U	14
Aroclor-1242	14	U	14	15	U	15	14	U	14	14	U	14
Aroclor-1248	14	U	14	15	U	15	14	U	14	14	U	14
Aroclor-1254	8.5	J	14	6.8	J	15	14	U	14	14	U	14
Aroclor-1260	14	U	14	15	U	15	14	U	14	14	U	14
Pesticides												
Aldrin	1.4	UD	1.4	1.5	UD	1.5	1.4	UD	1.4	1.4	UD	1.4
alpha-BHC	1.4	UD	1.4	1.5	UD	1.5	1.4	UD	1.4	1.4	UD	1.4
alpha-Chlordane	1.4	UD	1.4	1.5	UD	1.5	1.4	UD	1.4	1.4	UD	1.4
beta-BHC	1.4	UD	1.4	1.5	UD	1.5	1.4	UD	1.4	1.4	UD	1.4
delta-BHC	1.4	UDJ	1.4	1.5	UDJ	1.5	1.4	UDJ	1.4	1.4	UDJ	1.4
Dichlorodiphenyldichloroethane	1.4	UD	1.4	1.5	UD	1.5	1.4	UD	1.4	1.4	UD	1.4
Dichlorodiphenyldichloroethylene	1.4	UDJ	1.4	1.5	UDJ	1.5	1.4	UDJ	1.4	1.4	UDJ	1.4
Dichlorodiphenyltrichloroethane	1.4	UDJ	1.4	1.5	UDJ	1.5	1.4	UDJ	1.4	1.4	UDJ	1.4
Dieldrin	1.4	UD	1.4	1.5	UD	1.5	1.4	UD	1.4	1.4	UD	1.4
Endosulfan I	1.4	UD	1.4	1.5	UD	1.5	1.4	UD	1.4	1.4	UD	1.4
Endosulfan II	1.4	UD	1.4	1.5	UD	1.5	1.4	UD	1.4	1.4	UD	1.4
Endosulfan sulfate	1.4	UD	1.4	1.5	UD	1.5	1.4	UD	1.4	1.4	UD	1.4
Endrin	1.4	UD	1.4	1.5	UD	1.5	1.4	UD	1.4	1.4	UD	1.4
Endrin aldehyde	1.4	UD	1.4	1.5	UD	1.5	1.4	UD	1.4	1.4	UD	1.4
Endrin ketone	1.4	UD	1.4	1.5	UD	1.5	1.4	UD	1.4	1.4	UD	1.4
gamma-BHC (Lindane)	1.4	UD	1.4	1.5	UD	1.5	1.4	UD	1.4	1.4	UD	1.4
gamma-Chlordane	1.4	UD	1.4	1.5	UD	1.5	1.4	UD	1.4	1.4	UD	1.4
Heptachlor	1.4	UD	1.4	1.5	UD	1.5	1.4	UD	1.4	1.4	UD	1.4
Heptachlor epoxide	1.4	UD	1.4	1.5	UD	1.5	1.4	UD	1.4	1.4	UD	1.4
Methoxychlor	1.4	UDJ	1.4	1.5	UDJ	1.5	1.4	UDJ	1.4	1.4	UDJ	1.4
Toxaphene	14	UDJ	14	15	UDJ	15	14	UDJ	14	14	UDJ	14
Semivolatile Organic Compounds												
1,2,4-Trichlorobenzene	350	UJ	350	370	UJ	370	350	UJ	350	350	UJ	350
1,2-Dichlorobenzene	350	U	350	370	U	370	350	U	350	350	U	350
1,3-Dichlorobenzene	350	U	350	370	U	370	350	U	350	350	U	350
1,4-Dichlorobenzene	350	U	350	370	U	370	350	U	350	350	U	350
2,4,5-Trichlorophenol	880	U	880	920	U	920	890	U	890	870	U	870
2,4,6-Trichlorophenol	350	UJ	350	370	UJ	370	350	UJ	350	350	UJ	350
2,4-Dichlorophenol	350	U	350	370	U	370	350	U	350	350	U	350
2,4-Dimethylphenol	350	U	350	370	U	370	350	U	350	350	U	350
2,4-Dinitrophenol	880	UJ	880	920	UJ	920	890	UJ	890	870	UJ	870
2,4-Dinitrotoluene	350	U	350	370	U	370	350	U	350	350	U	350
2,6-Dinitrotoluene	350	U	350	370	U	370	350	U	350	350	U	350
2-Chloronaphthalene	350	U	350	370	U	370	350	U	350	350	U	350
2-Chlorophenol	350	U	350	370	U	370	350	U	350	350	U	350
2-Methylnaphthalene	350	U	350	370	U	370	350	U	350	350	U	350
2-Methylphenol (cresol, o-)	350	UJ	350	370	UJ	370	350	UJ	350	350	UJ	350
2-Nitroaniline	880	U	880	920	U	920	890	U	890	870	U	870
2-Nitrophenol	350	U	350	370	U	370	350	U	350	350	U	350

Attachment	1	Sheet No.	12 of 24
Originator	J. M. Capron	Date	11/14/06
Checked	T. M. Blakley	Date	
Calc. No.	0100C-CA-V0031	Rev. No.	0

Attachment 1. 100-C-9:2 Verification Sampling Results.

Constituents	J11VM6 Duplicate of J11VL2 Sample Date 4/5/06			J11VL3 Location 5 Sample Date 4/5/06			J11VL4 Location 6 Sample Date 4/5/06			J11VL5 Location 7 Sample Date 4/5/06		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Semivolatile Organic Compounds (continued)												
3,3'-Dichlorobenzidine	350	U	350	370	U	370	350	U	350	350	U	350
3-Nitroaniline	880	U	880	920	U	920	890	U	890	870	U	870
4,6-Dinitro-2-methylphenol	880	U	880	920	U	920	890	U	890	870	U	870
4-Bromophenyl-phenylether	350	U	350	370	U	370	350	U	350	350	U	350
4-Chloro-3-methylphenol	350	U	350	370	U	370	350	U	350	350	U	350
4-Chloroaniline	350	U	350	370	U	370	350	U	350	350	U	350
4-Chlorophenyl-phenylether	350	U	350	370	U	370	350	U	350	350	U	350
4-Methylphenol (p-cresol)	350	UJ	350	370	UJ	370	350	UJ	350	350	UJ	350
4-Nitroaniline	880	U	880	920	U	920	890	U	890	870	U	870
4-Nitrophenol	880	U	880	920	U	920	890	U	890	870	U	870
Acenaphthene	350	U	350	370	U	370	350	U	350	350	U	350
Acenaphthylene	350	U	350	370	U	370	350	U	350	350	U	350
Anthracene	350	U	350	370	U	370	350	U	350	350	U	350
Benzo(a)anthracene	350	U	350	370	U	370	350	U	350	350	U	350
Benzo(a)pyrene	350	U	350	370	U	370	350	U	350	350	U	350
Benzo(b)fluoranthene	350	U	350	370	U	370	350	U	350	350	U	350
Benzo(g,h,i)perylene	350	U	350	370	U	370	350	U	350	350	U	350
Benzo(k)fluoranthene	350	U	350	370	U	370	350	U	350	350	U	350
bis(2-Chloro-1-methylethyl)ether	350	U	350	370	U	370	350	U	350	350	U	350
bis(2-Chloroethoxy)methane	350	U	350	370	U	370	350	U	350	350	U	350
bis(2-Chloroethyl)ether	350	U	350	370	U	370	350	U	350	350	U	350
bis(2-Ethylhexyl)phthalate	660	U	350	660	U	370	660	U	350	660	U	350
Butylbenzylphthalate	350	U	350	370	U	370	350	U	350	350	U	350
Carbazole	350	U	350	370	U	370	350	U	350	350	U	350
Chrysene	350	U	350	370	U	370	350	U	350	350	U	350
Di-n-butylphthalate	350	U	350	370	U	370	350	U	350	350	U	350
Di-n-octylphthalate	350	UJ	350	370	UJ	370	350	UJ	350	350	UJ	350
Dibenz(a,h)anthracene	350	U	350	370	U	370	350	U	350	350	U	350
Dibenzofuran	350	U	350	370	U	370	350	U	350	350	U	350
Diethylphthalate	350	U	350	370	U	370	350	U	350	350	U	350
Dimethylphthalate	350	U	350	370	U	370	350	U	350	350	U	350
Fluoranthene	350	U	350	370	U	370	350	U	350	350	U	350
Fluorene	350	U	350	370	U	370	350	U	350	350	U	350
Hexachlorobenzene	350	U	350	370	U	370	350	U	350	350	U	350
Hexachlorobutadiene	350	U	350	370	U	370	350	U	350	350	U	350
Hexachlorocyclopentadiene	350	U	350	370	U	370	350	U	350	350	U	350
Hexachloroethane	350	U	350	370	U	370	350	U	350	350	U	350
Indeno(1,2,3-cd)pyrene	350	U	350	370	U	370	350	U	350	350	U	350
Isophorone	350	U	350	370	U	370	350	U	350	350	U	350
N-Nitroso-di-n-dipropylamine	350	UJ	350	370	UJ	370	350	UJ	350	350	UJ	350
N-Nitrosodiphenylamine	350	U	350	370	U	370	350	U	350	350	U	350
Naphthalene	350	U	350	370	U	370	350	U	350	350	U	350
Nitrobenzene	350	U	350	370	U	370	350	U	350	350	U	350
Pentachlorophenol	880	UJ	880	920	UJ	920	890	UJ	890	870	UJ	870
Phenanthrene	350	U	350	370	U	370	350	U	350	350	U	350
Phenol	350	UJ	350	370	UJ	370	350	UJ	350	350	UJ	350
Pyrene	350	U	350	370	U	370	350	U	350	350	U	350

Attachment	1	Sheet No.	13 of 24
Originator	J. M. Capron	Date	11/14/06
Checked	T. M. Blakley	Date	
Calc. No.	0100C-CA-V0031	Rev. No.	0

Attachment 1. 100-C-9:2 Verification Sampling Results.

Constituents	J11VL6 Location 8 Sample Date 4/5/06			J11VL7 Location 9 Sample Date 4/5/06			J11VL8 Location 10 Sample Date 4/5/06			J11VL9 Location 11 (biased) Sample Date 4/5/06		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Polychlorinated Biphenyls												
Aroclor-1016	14	U	14	14	U	14	14	U	14	15	U	15
Aroclor-1221	14	U	14	14	U	14	14	U	14	15	U	15
Aroclor-1232	14	U	14	14	U	14	14	U	14	15	U	15
Aroclor-1242	14	U	14	14	U	14	14	U	14	15	U	15
Aroclor-1248	14	U	14	14	U	14	14	U	14	15	U	15
Aroclor-1254	20		14	18	J	14	27		14	7.4	J	15
Aroclor-1260	14	U	14	14	U	14	14	U	14	15	U	15
Pesticides												
Aldrin	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4	1.5	UDJ	1.5
alpha-BHC	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4	1.5	UDJ	1.5
alpha-Chlordane	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4	1.5	UDJ	1.5
beta-BHC	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4	1.5	UDJ	1.5
delta-BHC	1.4	UDJ	1.4	1.4	UDJ	1.4	1.4	UDJ	1.4	1.5	UDJ	1.5
Dichlorodiphenyldichloroethane	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4	3.5	DJ	1.5
Dichlorodiphenyldichloroethylene	1.4	UDJ	1.4	1.4	UDJ	1.4	1.4	UDJ	1.4	14	DJ	1.5
Dichlorodiphenyltrichloroethane	1.4	UDJ	1.4	1.4	UDJ	1.4	1.4	UDJ	1.4	5.1	DJ	1.5
Dieldrin	1.4	UD	1.4	1.4	UD	1.4	1.7	D	1.4	1.5	UDJ	1.5
Endosulfan I	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4	1.5	UDJ	1.5
Endosulfan II	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4	1.5	UDJ	1.5
Endosulfan sulfate	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4	1.5	UDJ	1.5
Endrin	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4	3.6	DJ	1.5
Endrin aldehyde	1.4	UD	1.4	1.4	UD	1.4	0.97	JD	1.4	2.9	DJ	1.5
Endrin ketone	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4	1.5	UDJ	1.5
gamma-BHC (Lindane)	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4	1.5	UDJ	1.5
gamma-Chlordane	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4	1.5	UDJ	1.5
Heptachlor	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4	1.5	UDJ	1.5
Heptachlor epoxide	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4	1.5	UDJ	1.5
Methoxychlor	1.4	UDJ	1.4	1.4	UDJ	1.4	1.4	UDJ	1.4	1.5	UDJ	1.5
Toxaphene	14	UDJ	14	14	UDJ	14	14	UDJ	14	15	UDJ	15
Semivolatile Organic Compounds												
1,2,4-Trichlorobenzene	350	UJ	350	360	UJ	360	350	UJ	350	1500	UDJ	1500
1,2-Dichlorobenzene	350	U	350	360	U	360	350	U	350	1500	UD	1500
1,3-Dichlorobenzene	350	U	350	360	U	360	350	U	350	1500	UD	1500
1,4-Dichlorobenzene	350	U	350	360	U	360	350	U	350	1500	UD	1500
2,4,5-Trichlorophenol	860	U	860	900	U	900	870	U	870	3700	UD	3700
2,4,6-Trichlorophenol	350	UJ	350	360	UJ	360	350	UJ	350	1500	UDJ	1500
2,4-Dichlorophenol	350	U	350	360	U	360	350	U	350	1500	UD	1500
2,4-Dimethylphenol	350	U	350	360	U	360	350	U	350	1500	UD	1500
2,4-Dinitrophenol	860	UJ	860	900	UJ	900	870	UJ	870	3700	UDJ	3700
2,4-Dinitrotoluene	350	U	350	360	U	360	350	U	350	1500	UD	1500
2,6-Dinitrotoluene	350	U	350	360	U	360	350	U	350	1500	UD	1500
2-Chloronaphthalene	350	U	350	360	U	360	350	U	350	1500	UD	1500
2-Chlorophenol	350	U	350	360	U	360	350	U	350	1500	UD	1500
2-Methylnaphthalene	350	U	350	360	U	360	350	U	350	1500	UD	1500
2-Methylphenol (cresol, o-)	350	UJ	350	360	UJ	360	350	UJ	350	1500	UDJ	1500
2-Nitroaniline	860	U	860	900	U	900	870	U	870	3700	UD	3700
2-Nitrophenol	350	U	350	360	U	360	350	U	350	1500	UD	1500

Attachment	1	Sheet No.	14 of 24
Originator	J. M. Capron	Date	11/14/06
Checked	T. M. Blakley	Date	
Calc. No.	0100C-CA-V0031	Rev. No.	0

Attachment 1. 100-C-9:2 Verification Sampling Results.

Constituents	J11VL6 Location 8 Sample Date 4/5/06			J11VL7 Location 9 Sample Date 4/5/06			J11VL8 Location 10 Sample Date 4/5/06			J11VL9 Location 11 (biased) Sample Date 4/5/06		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Semivolatile Organic Compounds (continued)												
3,3'-Dichlorobenzidine	350	U	350	360	U	360	350	U	350	1500	UD	1500
3-Nitroaniline	860	U	860	900	U	900	870	U	870	3700	UD	3700
4,6-Dinitro-2-methylphenol	860	U	860	900	U	900	870	U	870	3700	UD	3700
4-Bromophenyl-phenylether	350	U	350	360	U	360	350	U	350	1500	UD	1500
4-Chloro-3-methylphenol	350	U	350	360	U	360	350	U	350	1500	UD	1500
4-Chloroaniline	350	U	350	360	U	360	350	U	350	1500	UD	1500
4-Chlorophenyl-phenylether	350	U	350	360	U	360	350	U	350	1500	UD	1500
4-Methylphenol (p-cresol)	350	UJ	350	360	UJ	360	350	UJ	350	1500	UDJ	1500
4-Nitroaniline	860	U	860	900	U	900	870	U	870	3700	UD	3700
4-Nitrophenol	860	U	860	900	U	900	870	U	870	3700	UD	3700
Acenaphthene	350	U	350	360	U	360	350	U	350	1500	UD	1500
Acenaphthylene	350	U	350	360	U	360	350	U	350	1500	UD	1500
Anthracene	350	U	350	360	U	360	350	U	350	1500	UD	1500
Benzo(a)anthracene	37	J	350	21	J	360	41	J	350	1500	UD	1500
Benzo(a)pyrene	38	J	350	27	J	360	48	J	350	1500	UD	1500
Benzo(b)fluoranthene	32	J	350	26	J	360	41	J	350	1500	UD	1500
Benzo(g,h,i)perylene	23	J	350	33	J	360	37	J	350	1500	UD	1500
Benzo(k)fluoranthene	32	J	350	24	J	360	45	J	350	1500	UD	1500
bis(2-Chloro-1-methylethyl)ether	350	U	350	360	U	360	350	U	350	1500	UD	1500
bis(2-Chloroethoxy)methane	350	U	350	360	U	360	350	U	350	1500	UD	1500
bis(2-Chloroethyl)ether	350	U	350	360	U	360	350	U	350	1500	UD	1500
bis(2-Ethylhexyl)phthalate	660	U	350	660	U	360	660	U	350	660	U	1500
Butylbenzylphthalate	350	U	350	360	U	360	350	U	350	1500	UD	1500
Carbazole	350	U	350	360	U	360	350	U	350	1500	UD	1500
Chrysene	46	J	350	33		360	55	J	350	1500	UD	1500
Di-n-butylphthalate	350	U	350	360	U	360	350	U	350	1500	UD	1500
Di-n-octylphthalate	350	UJ	350	360	UJ	360	350	UJ	350	1500	UDJ	1500
Dibenz(a,h)anthracene	350	U	350	360	U	360	350	U	350	1500	UD	1500
Dibenzofuran	350	U	350	360	U	360	350	U	350	1500	UD	1500
Diethylphthalate	350	U	350	360	U	360	350	U	350	1500	UD	1500
Dimethylphthalate	350	U	350	360	U	360	350	U	350	1500	UD	1500
Fluoranthene	74	J	350	24	J	360	81	J	350	1500	UD	1500
Fluorene	350	U	350	360	U	360	350	U	350	1500	UD	1500
Hexachlorobenzene	350	U	350	360	U	360	350	U	350	1500	UD	1500
Hexachlorobutadiene	350	U	350	360	U	360	350	U	350	1500	UD	1500
Hexachlorocyclopentadiene	350	U	350	360	U	360	350	U	350	1500	UD	1500
Hexachloroethane	350	U	350	360	U	360	350	U	350	1500	UD	1500
Indeno(1,2,3-cd)pyrene	20	J	350	20	J	360	30	J	350	1500	UD	1500
Isophorone	350	U	350	360	U	360	350	U	350	1500	UD	1500
N-Nitroso-di-n-dipropylamine	350	UJ	350	360	UJ	360	350	UJ	350	1500	UDJ	1500
N-Nitrosodiphenylamine	350	U	350	360	U	360	350	U	350	1500	UD	1500
Naphthalene	350	U	350	360	U	360	350	U	350	1500	UD	1500
Nitrobenzene	350	U	350	360	U	360	350	U	350	1500	UD	1500
Pentachlorophenol	860	UJ	860	900	UJ	900	870	UJ	870	3700	UDJ	3700
Phenanthrene	49	J	350	360	U	360	56	J	350	1500	UD	1500
Phenol	350	UJ	350	360	UJ	360	350	UJ	350	1500	UDJ	1500
Pyrene	73	J	350	43	J	360	94	J	350	1500	UD	1500

Attachment	1	Sheet No.	15 of 24
Originator	J. M. Capron	Date	11/14/06
Checked	T. M. Blakley	Date	
Calc. No.	0100C-CA-V0031	Rev. No.	0

Attachment 1. 100-C-9:2 Verification Sampling Results.

Constituents	J11VM0 Location 12 (biased) Sample Date 4/5/06			J11VM1 1607-B9 BCL (north) Sample Date 4/5/06			J11VM2 1607-B9 BCL (south) Sample Date 4/5/06			J11VM7 Equipment Blank Sample Date 4/5/06		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Polychlorinated Biphenyls												
Aroclor-1016	14	U	14	14	U	14	14	U	14			
Aroclor-1221	14	U	14	14	U	14	14	U	14			
Aroclor-1232	14	U	14	14	U	14	14	U	14			
Aroclor-1242	14	U	14	14	U	14	14	U	14			
Aroclor-1248	14	U	14	14	U	14	14	U	14			
Aroclor-1254	14	U	14	39		14	4.2	J	14			
Aroclor-1260	14	U	14	14	U	14	14	U	14			
Pesticides												
Aldrin	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4			
alpha-BHC	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4			
alpha-Chlordane	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4			
beta-BHC	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4			
delta-BHC	1.4	UDJ	1.4	1.4	UDJ	1.4	1.4	UDJ	1.4			
Dichlorodiphenyldichloroethane	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4			
Dichlorodiphenyldichloroethylene	1.4	UDJ	1.4	0.70	JD	1.4	1.4	UDJ	1.4			
Dichlorodiphenyltrichloroethane	1.0	JD	1.4	1.4	UDJ	1.4	1.4	UDJ	1.4			
Dieldrin	1.4	UD	1.4	9.9	D	1.4	1.4	UD	1.4			
Endosulfan I	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4			
Endosulfan II	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4			
Endosulfan sulfate	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4			
Endrin	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4			
Endrin aldehyde	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4			
Endrin ketone	0.43	JD	1.4	1.4	UD	1.4	1.4	UD	1.4			
gamma-BHC (Lindane)	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4			
gamma-Chlordane	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4			
Heptachlor	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4			
Heptachlor epoxide	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4			
Methoxychlor	1.4	UDJ	1.4	1.4	UDJ	1.4	1.4	UDJ	1.4			
Toxaphene	14	UDJ	14	14	UDJ	14	14	UDJ	14			
Semivolatile Organic Compounds												
1,2,4-Trichlorobenzene	360	UJ	360	350	UJ	350	350	UJ	350	330	UJ	330
1,2-Dichlorobenzene	360	U	360	350	U	350	350	U	350	330	U	330
1,3-Dichlorobenzene	360	U	360	350	U	350	350	U	350	330	U	330
1,4-Dichlorobenzene	360	U	360	350	U	350	350	U	350	330	U	330
2,4,5-Trichlorophenol	890	U	890	870	U	870	870	U	870	830	U	830
2,4,6-Trichlorophenol	360	UJ	360	350	UJ	350	350	UJ	350	330	UJ	330
2,4-Dichlorophenol	360	U	360	350	U	350	350	U	350	330	U	330
2,4-Dimethylphenol	360	U	360	350	U	350	350	U	350	330	U	330
2,4-Dinitrophenol	890	UJ	890	870	UJ	870	870	UJ	870	830	UJ	830
2,4-Dinitrotoluene	360	U	360	350	U	350	350	U	350	330	U	330
2,6-Dinitrotoluene	360	U	360	350	U	350	350	U	350	330	U	330
2-Chloronaphthalene	360	U	360	350	U	350	350	U	350	330	U	330
2-Chlorophenol	360	U	360	350	U	350	350	U	350	330	U	330
2-Methylnaphthalene	360	U	360	350	U	350	350	U	350	330	U	330
2-Methylphenol (cresol, o-)	360	UJ	360	350	UJ	350	350	UJ	350	330	UJ	330
2-Nitroaniline	890	U	890	870	U	870	870	U	870	830	U	830
2-Nitrophenol	360	U	360	350	U	350	350	U	350	330	U	330

Attachment	1	Sheet No.	16 of 24
Originator	J. M. Capron	Date	11/14/06
Checked	T. M. Blakley	Date	
Calc. No.	0100C-CA-V0031	Rev. No.	0

Attachment 1. 100-C-9:2 Verification Sampling Results.

Constituents	J11VM0 Location 12 (biased) Sample Date 4/5/06			J11VM1 1607-B9 BCL (north) Sample Date 4/5/06			J11VM2 1607-B9 BCL (south) Sample Date 4/5/06			J11VM7 Equipment Blank Sample Date 4/5/06		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Semivolatile Organic Compounds (continued)												
3,3'-Dichlorobenzidine	360	U	360	350	U	350	350	U	350	330	U	330
3-Nitroaniline	890	U	890	870	U	870	870	U	870	830	U	830
4,6-Dinitro-2-methylphenol	890	U	890	870	U	870	870	U	870	830	U	830
4-Bromophenyl-phenylether	360	U	360	350	U	350	350	U	350	330	U	330
4-Chloro-3-methylphenol	360	U	360	350	U	350	350	U	350	330	U	330
4-Chloroaniline	360	U	360	350	U	350	350	U	350	330	U	330
4-Chlorophenyl-phenylether	360	U	360	350	U	350	350	U	350	330	U	330
4-Methylphenol (p-cresol)	360	UJ	360	350	UJ	350	350	UJ	350	330	UJ	330
4-Nitroaniline	890	U	890	870	U	870	870	U	870	830	U	830
4-Nitrophenol	890	U	890	870	U	870	870	U	870	830	U	830
Acenaphthene	360	U	360	350	U	350	350	U	350	330	U	330
Acenaphthylene	360	U	360	350	U	350	350	U	350	330	U	330
Anthracene	360	U	360	350	U	350	350	U	350	330	U	330
Benzo(a)anthracene	360	U	360	350	U	350	350	U	350	330	U	330
Benzo(a)pyrene	360	U	360	18	J	350	350	U	350	330	U	330
Benzo(b)fluoranthene	360	U	360	350	U	350	350	U	350	330	U	330
Benzo(g,h,i)perylene	360	U	360	18	J	350	350	U	350	330	U	330
Benzo(k)fluoranthene	360	U	360	350	U	350	350	U	350	330	U	330
bis(2-Chloro-1-methylethyl)ether	360	U	360	350	U	350	350	U	350	330	U	330
bis(2-Chloroethoxy)methane	360	U	360	350	U	350	350	U	350	330	U	330
bis(2-Chloroethyl)ether	360	U	360	350	U	350	350	U	350	330	U	330
bis(2-Ethylhexyl)phthalate	660	U	360	660	U	280	660	U	350	660	U	330
Butylbenzylphthalate	360	U	360	350	U	350	350	U	350	330	U	330
Carbazole	360	U	360	350	U	350	350	U	350	330	U	330
Chrysene	360	U	360	19	J	350	20	J	350	330	U	330
Di-n-butylphthalate	360	U	360	350	U	350	350	U	350	51	J	330
Di-n-octylphthalate	360	UJ	360	350	UJ	350	350	UJ	350	330	UJ	330
Dibenz(a,h)anthracene	360	U	360	350	U	350	350	U	350	330	U	330
Dibenzofuran	360	U	360	350	U	350	350	U	350	330	U	330
Diethylphthalate	360	U	360	350	U	350	350	U	350	330	U	330
Dimethylphthalate	360	U	360	350	U	350	350	U	350	330	U	330
Fluoranthene	360	U	360	24	J	350	24	J	350	330	U	330
Fluorene	360	U	360	350	U	350	350	U	350	330	U	330
Hexachlorobenzene	360	U	360	350	U	350	350	U	350	330	U	330
Hexachlorobutadiene	360	U	360	350	U	350	350	U	350	330	U	330
Hexachlorocyclopentadiene	360	U	360	350	U	350	350	U	350	330	U	330
Hexachloroethane	360	U	360	350	U	350	350	U	350	330	U	330
Indeno(1,2,3-cd)pyrene	360	U	360	350	U	350	350	U	350	330	U	330
Isophorone	360	U	360	350	U	350	350	U	350	330	U	330
N-Nitroso-di-n-dipropylamine	360	UJ	360	350	UJ	350	350	UJ	350	330	UJ	330
N-Nitrosodiphenylamine	360	U	360	350	U	350	350	U	350	330	U	330
Naphthalene	360	U	360	350	U	350	350	U	350	330	U	330
Nitrobenzene	360	U	360	350	U	350	350	U	350	330	U	330
Pentachlorophenol	890	UJ	890	870	UJ	870	870	UJ	870	830	UJ	830
Phenanthrene	360	U	360	350	U	350	350	U	350	330	U	330
Phenol	360	UJ	360	350	UJ	350	350	UJ	350	330	UJ	330
Pyrene	360	U	360	23		350	24	J	350	330	U	330

Attachment	1	Sheet No.	17 of 24
Originator	J. M. Capron	Date	11/14/06
Checked	T. M. Blakley	Date	
Calc. No.	0100C-CA-V0031	Rev. No.	0

Attachment 1. 100-C-9:2 Verification Sampling Results.

Constituents	J11VM3 1607-B8 (east) Sample Date 4/5/06			J11VM4 1607-B8 (center) Sample Date 4/5/06			J11VM5 1607-B8 (west) Sample Date 4/5/06			J135M0 1607-B10 #1 Sample Date 9/7/06		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Polychlorinated Biphenyls												
Aroclor-1016	14	U	14	14	U	14	14	U	14	13	U	13
Aroclor-1221	14	U	14	14	U	14	14	U	14	13	U	13
Aroclor-1232	14	U	14	14	U	14	14	U	14	13	U	13
Aroclor-1242	14	U	14	14	U	14	14	U	14	13	U	13
Aroclor-1248	14	U	14	14	U	14	14	U	14	13	U	13
Aroclor-1254	100		14	13	J	14	120		14	13	U	13
Aroclor-1260	14	U	14	14	U	14	14	U	14	11	J	13
Pesticides												
Aldrin	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4	1.3	UD	1.3
alpha-BHC	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4	1.3	UD	1.3
alpha-Chlordane	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4	1.3	UD	1.3
beta-BHC	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4	1.3	UD	1.3
delta-BHC	1.4	UDJ	1.4	1.4	UDJ	1.4	1.4	UDJ	1.4	1.3	UD	1.3
Dichlorodiphenyldichloroethane	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4	1.3	UD	1.3
Dichlorodiphenyldichloroethylene	4.5	JD	1.4	1.4	UDJ	1.4	2.6	JD	1.4	0.97	JD	1.3
Dichlorodiphenyltrichloroethane	1.4	UDJ	1.4	1.4	UDJ	1.4	1.4	UDJ	1.4	0.67	JD	1.3
Dieldrin	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4	1.3	UD	1.3
Endosulfan I	0.64	JD	1.4	1.4	UD	1.4	1.4	UD	1.4	1.3	UD	1.3
Endosulfan II	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4	1.3	UD	1.3
Endosulfan sulfate	3.7	JD	1.4	1.4	UD	1.4	3.6	D	1.4	0.87	JD	1.3
Endrin	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4	1.3	UD	1.3
Endrin aldehyde	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4	1.3	UD	1.3
Endrin ketone	1.4	UD	1.4	1.4	UD	1.4	0.74	JD	1.4	1.3	UD	1.3
gamma-BHC (Lindane)	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4	1.3	UD	1.3
gamma-Chlordane	1.5	JD	1.4	1.4	UD	1.4	1.6	D	1.4	1.3	UD	1.3
Heptachlor	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4	1.3	UD	1.3
Heptachlor epoxide	1.4	UD	1.4	1.4	UD	1.4	1.4	UD	1.4	1.3	UD	1.3
Methoxychlor	1.4	UDJ	1.4	1.4	UDJ	1.4	1.4	UDJ	1.4	1.5	ID	1.3
Toxaphene	14	UDJ	14	14	UDJ	14	14	UDJ	14	13	UD	13
Semivolatile Organic Compounds												
1,2,4-Trichlorobenzene	350	UJ	350	350	UJ	350	1400	UDJ	1400	670	UDJ	670
1,2-Dichlorobenzene	350	U	350	350	U	350	1400	UD	1400	670	UD	670
1,3-Dichlorobenzene	350	U	350	350	U	350	1400	UD	1400	670	UD	670
1,4-Dichlorobenzene	350	U	350	350	U	350	1400	UD	1400	670	UD	670
2,4,5-Trichlorophenol	880	U	880	870	U	870	3500	UD	3500	1700	UD	1700
2,4,6-Trichlorophenol	350	UJ	350	350	UJ	350	1400	UDJ	1400	670	UD	670
2,4-Dichlorophenol	350	U	350	350	U	350	1400	UD	1400	670	UD	670
2,4-Dimethylphenol	350	U	350	350	U	350	1400	UD	1400	670	UD	670
2,4-Dinitrophenol	880	UJ	880	870	UJ	870	3500	UDJ	3500	1700	UDR	1700
2,4-Dinitrotoluene	350	U	350	350	U	350	1400	UD	1400	670	UD	670
2,6-Dinitrotoluene	350	U	350	350	U	350	1400	UD	1400	670	UD	670
2-Chloronaphthalene	350	U	350	350	U	350	1400	UD	1400	670	UD	670
2-Chlorophenol	350	U	350	350	U	350	1400	UD	1400	670	UD	670
2-Methylnaphthalene	350	U	350	350	U	350	1400	UD	1400	670	UD	670
2-Methylphenol (cresol, o-)	350	UJ	350	350	UJ	350	1400	UDJ	1400	670	UD	670
2-Nitroaniline	880	U	880	870	U	870	3500	UD	3500	1700	UD	1700
2-Nitrophenol	350	U	350	350	U	350	1400	UD	1400	670	UD	670

Attachment 1 Sheet No. 18 of 24
Originator J. M. Capron Date 01/12/07
Checked T. M. Blakley Date
Calc. No. 0100C-CA-V0031 Rev. No. 1

Attachment 1. 100-C-9:2 Verification Sampling Results.

Constituents	J11VM3 1607-B8 (east) Sample Date 4/5/06			J11VM4 1607-B8 (center) Sample Date 4/5/06			J11VM5 1607-B8 (west) Sample Date 4/5/06			J135M0 1607-B10 #1 Sample Date 9/7/06		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Semivolatile Organic Compounds (continued)												
3,3'-Dichlorobenzidine	350	U	350	350	U	350	1400	UD	1400	670	UD	670
3-Nitroaniline	880	U	880	870	U	870	3500	UD	3500	1700	UD	1700
4,6-Dinitro-2-methylphenol	880	U	880	870	U	870	3500	UD	3500	1700	UDJ	1700
4-Bromophenyl-phenylether	350	U	350	350	U	350	1400	UD	1400	670	UD	670
4-Chloro-3-methylphenol	350	U	350	350	U	350	1400	UD	1400	670	UDJ	670
4-Chloroaniline	350	U	350	350	U	350	1400	UD	1400	670	UD	670
4-Chlorophenyl-phenylether	350	U	350	350	U	350	1400	UD	1400	670	UD	670
4-Methylphenol (p-cresol)	350	UJ	350	350	UJ	350	1400	UDJ	1400	670	UD	670
4-Nitroaniline	880	U	880	870	U	870	3500	UD	3500	1700	UD	1700
4-Nitrophenol	880	U	880	870	U	870	3500	UD	3500	1700	UD	1700
Acenaphthene	350	U	350	350	U	350	1400	UD	1400	670	UD	670
Acenaphthylene	350	U	350	350	U	350	1400	UD	1400	670	UD	670
Anthracene	350	U	350	350	U	350	1400	UD	1400	670	UD	670
Benzo(a)anthracene	350	U	350	350	U	350	1400	UD	1400	670	UD	670
Benzo(a)pyrene	350	U	350	22	J	350	1400	UD	1400	670	UD	670
Benzo(b)fluoranthene	350	U	350	24	J	350	73	JD	1400	670	UD	670
Benzo(g,h,i)perylene	350	U	350	23	J	350	1400	UD	1400	670	UD	670
Benzo(k)fluoranthene	19	J	350	23	J	350	1400	UD	1400	670	UD	670
bis(2-Chloro-1-methylethyl)ether	350	U	350	350	U	350	1400	UD	1400	670	UD	670
bis(2-Chloroethoxy)methane	350	U	350	350	U	350	1400	UD	1400	670	UD	670
bis(2-Chloroethyl)ether	350	U	350	350	U	350	1400	UD	1400	670	UD	670
bis(2-Ethylhexyl)phthalate	660	U	350	660	U	350	660	U	1400	71	JD	670
Butylbenzylphthalate	350	U	350	350	U	350	1400	UD	1400	670	UD	670
Carbazole	350	U	350	350	U	350	1400	UD	1400	670	UD	670
Chrysene	19	J	350	21	J	350	82	JD	1400	670	UD	670
Di-n-butylphthalate	350	U	350	350	U	350	1400	UD	1400	40	JD	670
Di-n-octylphthalate	350	UJ	350	350	UJ	350	1400	UDJ	1400	670	UD	670
Dibenz(a,h)anthracene	350	U	350	350	U	350	1400	UD	1400	670	UD	670
Dibenzofuran	350	U	350	350	U	350	1400	UD	1400	670	UD	670
Diethylphthalate	350	U	350	350	U	350	1400	UD	1400	670	UD	670
Dimethylphthalate	350	U	350	350	U	350	1400	UD	1400	670	UD	670
Fluoranthene	350	U	350	350	U	350	1400	UD	1400	670	UD	670
Fluorene	350	U	350	350	U	350	1400	UD	1400	670	UD	670
Hexachlorobenzene	350	U	350	350	U	350	1400	UD	1400	670	UD	670
Hexachlorobutadiene	350	U	350	350	U	350	1400	UD	1400	670	UD	670
Hexachlorocyclopentadiene	350	U	350	350	U	350	1400	UD	1400	670	UDJ	670
Hexachloroethane	350	U	350	350	U	350	1400	UD	1400	670	UD	670
Indeno(1,2,3-cd)pyrene	350	U	350	350	U	350	1400	UD	1400	670	UD	670
Isophorone	350	U	350	350	U	350	1400	UD	1400	670	UDJ	670
N-Nitroso-di-n-dipropylamine	350	UJ	350	350	UJ	350	1400	UDJ	1400	670	UD	670
N-Nitrosodiphenylamine	350	U	350	350	U	350	1400	UD	1400	670	UD	670
Naphthalene	350	U	350	350	U	350	1400	UD	1400	670	UD	670
Nitrobenzene	350	U	350	350	U	350	1400	UD	1400	670	UD	670
Pentachlorophenol	880	UJ	880	870	UJ	870	3500	UDJ	3500	1700	UD	1700
Phenanthrene	350	U	350	350	U	350	1400	UD	1400	670	UD	670
Phenol	350	UJ	350	350	UJ	350	1400	UDJ	1400	670	UD	670
Pyrene	350	U	350	350	U	350	1400	UD	1400	670	UD	670

Attachment	1	Sheet No.	19 of 24
Originator	J. M. Capron	Date	01/12/07
Checked	T. M. Blakley	Date	
Calc. No.	0100C-CA-V0031	Rev. No.	1

Attachment 1. 100-C-9:2 Verification Sampling Results.

Constituents	J135M1 1607-B10 #2 Sample Date 9/7/06			J135M2 1607-B10 #3 Sample Date 9/7/06			J135M3 1607-B10 #4 Sample Date 9/7/06			J134W8 1607-B11 #1 Sample Date 8/3/06		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Polychlorinated Biphenyls												
Aroclor-1016	13	U	13	13	U	13	13	U	13	13	U	13
Aroclor-1221	13	U	13	13	U	13	13	U	13	13	U	13
Aroclor-1232	13	U	13	13	U	13	13	U	13	13	U	13
Aroclor-1242	13	U	13	13	U	13	13	U	13	13	U	13
Aroclor-1248	13	U	13	13	U	13	13	U	13	13	U	13
Aroclor-1254	13	U	13	4.2	J	13	15		13	13	U	13
Aroclor-1260	13	U	13	13	U	13	13	U	13	13	U	13
Pesticides												
Aldrin	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
alpha-BHC	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
alpha-Chlordane	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
beta-BHC	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
delta-BHC	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
Dichlorodiphenyldichloroethane	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
Dichlorodiphenyldichloroethylene	1.3	UD	1.3	1.3	UD	1.3	1.4	D	1.3	1.3	UD	1.3
Dichlorodiphenyltrichloroethane	1.3	UD	1.3	0.67	JID	1.3	1.9	D	1.3	1.3	UD	1.3
Dieldrin	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
Endosulfan I	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
Endosulfan II	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
Endosulfan sulfate	1.3	UD	1.3	1.1	JD	1.3	1.3	UD	1.3	1.3	UD	1.3
Endrin	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
Endrin aldehyde	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
Endrin ketone	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
gamma-BHC (Lindane)	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
gamma-Chlordane	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
Heptachlor	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
Heptachlor epoxide	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
Methoxychlor	1.3	UD	1.3	2.9	D	1.3	2.3	D	1.3	1.3	UD	1.3
Toxaphene	13	UD	13	13	UD	13	13	UD	13	13	UD	13
Semivolatile Organic Compounds												
1,2,4-Trichlorobenzene	670	UDJ	670	670	UDJ	670	670	UDJ	670	330	U	330
1,2-Dichlorobenzene	670	UD	670	670	UD	670	670	UD	670	330	U	330
1,3-Dichlorobenzene	670	UD	670	670	UD	670	670	UD	670	330	U	330
1,4-Dichlorobenzene	670	UD	670	670	UD	670	670	UD	670	330	U	330
2,4,5-Trichlorophenol	1700	UD	1700	1700	UD	1700	1700	UD	1700	840	U	840
2,4,6-Trichlorophenol	670	UD	670	670	UD	670	670	UD	670	330	U	330
2,4-Dichlorophenol	670	UD	670	670	UD	670	670	UD	670	330	U	330
2,4-Dimethylphenol	670	UD	670	670	UD	670	670	UD	670	330	U	330
2,4-Dinitrophenol	1700	UDR	1700	1700	UDR	1700	1700	UDR	1700	840	UR	840
2,4-Dinitrotoluene	670	UD	670	670	UD	670	670	UD	670	330	U	330
2,6-Dinitrotoluene	670	UD	670	670	UD	670	670	UD	670	330	U	330
2-Chloronaphthalene	670	UD	670	670	UD	670	670	UD	670	330	U	330
2-Chlorophenol	670	UD	670	670	UD	670	670	UD	670	330	U	330
2-Methylnaphthalene	670	UD	670	670	UD	670	670	UD	670	330	U	330
2-Methylphenol (cresol, o-)	670	UD	670	670	UD	670	670	UD	670	330	U	330
2-Nitroaniline	1700	UD	1700	1700	UD	1700	1700	UD	1700	840	U	840
2-Nitrophenol	670	UD	670	670	UD	670	670	UD	670	330	U	330

1

Attachment 1 Sheet No. 20 of 24
Originator J. M. Capron Date 01/12/07
Checked T. M. Blakley Date
Calc. No. 0100C-CA-V0031 Rev. No. 1

Attachment 1. 100-C-9:2 Verification Sampling Results.

Constituents	J135M1 1607-B10 #2 Sample Date 9/7/06			J135M2 1607-B10 #3 Sample Date 9/7/06			J135M3 1607-B10 #4 Sample Date 9/7/06			J134W8 1607-B11 #1 Sample Date 8/3/06		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Semivolatile Organic Compounds (continued)												
3,3'-Dichlorobenzidine	670	UD	670	670	UD	670	670	UD	670	330	U	330
3-Nitroaniline	1700	UD	1700	1700	UD	1700	1700	UD	1700	840	U	840
4,6-Dinitro-2-methylphenol	1700	UDJ	1700	1700	UDJ	1700	1700	UDJ	1700	840	UJ	840
4-Bromophenyl-phenylether	670	UD	670	670	UD	670	670	UD	670	330	U	330
4-Chloro-3-methylphenol	670	UDJ	670	670	UDJ	670	670	UDJ	670	330	U	330
4-Chloroaniline	670	UD	670	670	UD	670	670	UD	670	330	U	330
4-Chlorophenyl-phenylether	670	UD	670	670	UD	670	670	UD	670	330	U	330
4-Methylphenol (p-cresol)	670	UD	670	670	UD	670	670	UD	670	330	U	330
4-Nitroaniline	1700	UD	1700	1700	UD	1700	1700	UD	1700	840	U	840
4-Nitrophenol	1700	UD	1700	1700	UD	1700	1700	UD	1700	840	U	840
Acenaphthene	670	UD	670	670	UD	670	670	UD	670	330	U	330
Acenaphthylene	670	UD	670	670	UD	670	670	UD	670	330	U	330
Anthracene	670	UD	670	670	UD	670	670	UD	670	330	U	330
Benzo(a)anthracene	670	UD	670	670	UD	670	670	UD	670	330	U	330
Benzo(a)pyrene	670	UD	670	670	UD	670	670	UD	670	330	U	330
Benzo(b)fluoranthene	670	UD	670	670	UD	670	670	UD	670	330	U	330
Benzo(g,h,i)perylene	670	UD	670	670	UD	670	670	UD	670	330	U	330
Benzo(k)fluoranthene	670	UD	670	670	UD	670	670	UD	670	330	U	330
bis(2-Chloro-1-methylethyl)ether	670	UD	670	670	UD	670	670	UD	670	330	U	330
bis(2-Chloroethoxy)methane	670	UD	670	670	UD	670	670	UD	670	330	U	330
bis(2-Chloroethyl)ether	670	UD	670	670	UD	670	670	UD	670	330	U	330
bis(2-Ethylhexyl)phthalate	70	JD	670	51	JD	670	250	JD	670	330	U	330
Butylbenzylphthalate	670	UD	670	670	UD	670	670	UD	670	330	U	330
Carbazole	670	UD	670	670	UD	670	670	UD	670	330	U	330
Chrysene	670	UD	670	670	UD	670	670	UD	670	330	U	330
Di-n-butylphthalate	670	UD	670	670	UD	670	670	UD	670	330	U	330
Di-n-octylphthalate	670	UD	670	670	UD	670	670	UD	670	330	U	330
Dibenz(a,h)anthracene	670	UD	670	670	UD	670	670	UD	670	330	U	330
Dibenzofuran	670	UD	670	670	UD	670	670	UD	670	330	U	330
Diethylphthalate	670	UD	670	670	UD	670	670	UD	670	330	U	330
Dimethylphthalate	670	UD	670	670	UD	670	670	UD	670	330	U	330
Fluoranthene	670	UD	670	670	UD	670	670	UD	670	330	U	330
Fluorene	670	UD	670	670	UD	670	670	UD	670	330	U	330
Hexachlorobenzene	670	UD	670	670	UD	670	670	UD	670	330	U	330
Hexachlorobutadiene	670	UDJ	670	670	UDJ	670	670	UDJ	670	330	U	330
Hexachlorocyclopentadiene	670	UD	670	670	UD	670	670	UD	670	330	U	330
Hexachloroethane	670	UD	670	670	UD	670	670	UD	670	330	U	330
Indeno(1,2,3-cd)pyrene	670	UDJ	670	670	UDJ	670	670	UDJ	670	330	U	330
Isophorone	670	UD	670	670	UD	670	670	UD	670	330	U	330
N-Nitroso-di-n-dipropylamine	670	UD	670	670	UD	670	670	UD	670	330	U	330
N-Nitrosodiphenylamine	670	UD	670	670	UD	670	670	UD	670	330	U	330
Naphthalene	670	UD	670	670	UD	670	670	UD	670	330	U	330
Nitrobenzene	670	UD	670	670	UD	670	670	UD	670	330	U	330
Pentachlorophenol	1700	UD	1700	1700	UD	1700	1700	UD	1700	840	U	840
Phenanthrene	670	UD	670	670	UD	670	670	UD	670	330	U	330
Phenol	670	UD	670	670	UD	670	670	UD	670	330	U	330
Pyrene	670	UD	670	670	UD	670	670	UD	670	330	U	330

Attachment	1	Sheet No.	21 of 24
Originator	J. M. Capron	Date	01/12/07
Checked	T. M. Blakley	Date	
Calc. No.	0100C-CA-V0031	Rev. No.	1

Attachment 1. 100-C-9:2 Verification Sampling Results.

Constituents	J134X3 Duplicate of J134W8 Sample Date 8/3/06			J134X1 1607-B11 #2 Sample Date 8/3/06			J134X0 1607-B11 #3 Sample Date 8/3/06			J134W9 1607-B11 #4 Sample Date 8/3/06		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Polychlorinated Biphenyls												
Aroclor-1016	13	U	13	13	U	13	13	U	13	13	U	13
Aroclor-1221	13	U	13	13	U	13	13	U	13	13	U	13
Aroclor-1232	13	U	13	13	U	13	13	U	13	13	U	13
Aroclor-1242	13	U	13	13	U	13	13	U	13	13	U	13
Aroclor-1248	13	U	13	13	U	13	13	U	13	13	U	13
Aroclor-1254	13	U	13	13	U	13	13	U	13	13	U	13
Aroclor-1260	13	U	13	13	U	13	13	U	13	13	U	13
Pesticides												
Aldrin	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
alpha-BHC	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
alpha-Chlordane	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
beta-BHC	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
delta-BHC	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
Dichlorodiphenyldichloroethane	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
Dichlorodiphenyldichloroethylene	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
Dichlorodiphenyltrichloroethane	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
Dieldrin	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
Endosulfan I	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
Endosulfan II	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
Endosulfan sulfate	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
Endrin	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
Endrin aldehyde	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
Endrin ketone	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
gamma-BHC (Lindane)	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
gamma-Chlordane	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
Heptachlor	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3
Heptachlor epoxide	1.3	UD	1.3	1.3	UD	1.3	1.3	UD	1.3	7.3		1.3
Methoxychlor	13	UD	13	13	UD	13	13	UD	13	13	UD	13
Toxaphene												
Semivolatile Organic Compounds												
1,2,4-Trichlorobenzene	330	U	330	330	U	330	330	U	330	340	U	340
1,2-Dichlorobenzene	330	U	330	330	U	330	330	U	330	340	U	340
1,3-Dichlorobenzene	330	U	330	330	U	330	330	U	330	340	U	340
1,4-Dichlorobenzene	330	U	330	330	U	330	330	U	330	340	U	340
2,4,5-Trichlorophenol	840	U	840	840	U	840	840	U	840	840	U	840
2,4,6-Trichlorophenol	330	U	330	330	U	330	330	U	330	340	U	340
2,4-Dichlorophenol	330	U	330	330	U	330	330	U	330	340	U	340
2,4-Dimethylphenol	330	U	330	330	U	330	330	U	330	340	U	340
2,4-Dinitrophenol	840	UR	840	840	UR	840	840	UR	840	840	UR	840
2,4-Dinitrotoluene	330	U	330	330	U	330	330	U	330	340	U	340
2,6-Dinitrotoluene	330	U	330	330	U	330	330	U	330	340	U	340
2-Chloronaphthalene	330	U	330	330	U	330	330	U	330	340	U	340
2-Chlorophenol	330	U	330	330	U	330	330	U	330	340	U	340
2-Methylnaphthalene	330	U	330	330	U	330	330	U	330	340	U	340
2-Methylphenol (cresol, o-)	330	U	330	330	U	330	330	U	330	340	U	340
2-Nitroaniline	840	U	840	840	U	840	840	U	840	840	U	840
2-Nitrophenol	330	U	330	330	U	330	330	U	330	340	U	340

Attachment 1
Originator J. M. Capron
Checked T. M. Blakley
Calc. No. 0100C-CA-V0031

Sheet No. 22 of 24
Date 01/12/07
Date
Rev. No. 1

Attachment 1. 100-C-9:2 Verification Sampling Results.

Constituents	J134X3 Duplicate of J134W8 Sample Date 8/3/06			J134X1 1607-B11 #2 Sample Date 8/3/06			J134X0 1607-B11 #3 Sample Date 8/3/06			J134W9 1607-B11 #4 Sample Date 8/3/06		
	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL	µg/kg	Q	PQL
Semivolatile Organic Compounds (continued)												
3,3'-Dichlorobenzidine	330	U	330	330	U	330	330	U	330	340	U	340
3-Nitroaniline	840	U	840	840	U	840	840	U	840	840	U	840
4,6-Dinitro-2-methylphenol	840	UJ	840	840	UJ	840	840	UJ	840	840	UJ	840
4-Bromophenyl-phenylether	330	U	330	330	U	330	330	U	330	340	U	340
4-Chloro-3-methylphenol	330	U	330	330	U	330	330	U	330	340	U	340
4-Chloroaniline	330	U	330	330	U	330	330	U	330	340	U	340
4-Chlorophenyl-phenylether	330	U	330	330	U	330	330	U	330	340	U	340
4-Methylphenol (p-cresol)	330	U	330	330	U	330	330	U	330	340	U	340
4-Nitroaniline	840	U	840	840	U	840	840	U	840	840	U	840
4-Nitrophenol	840	U	840	840	U	840	840	U	840	840	U	840
Acenaphthene	330	U	330	330	U	330	330	U	330	340	U	340
Acenaphthylene	330	U	330	330	U	330	330	U	330	340	U	340
Anthracene	330	U	330	330	U	330	330	U	330	340	U	340
Benzo(a)anthracene	330	U	330	330	U	330	330	U	330	340	U	340
Benzo(a)pyrene	330	U	330	330	U	330	330	U	330	340	U	340
Benzo(b)fluoranthene	330	U	330	330	U	330	330	U	330	340	U	340
Benzo(g,h,i)perylene	330	U	330	330	U	330	330	U	330	340	U	340
Benzo(k)fluoranthene	330	U	330	330	U	330	330	U	330	340	U	340
bis(2-Chloro-1-methylethyl)ether	330	U	330	330	U	330	330	U	330	340	U	340
bis(2-Chloroethoxy)methane	330	U	330	330	U	330	330	U	330	340	U	340
bis(2-Chloroethyl)ether	330	U	330	330	U	330	330	U	330	340	U	340
bis(2-Ethylhexyl)phthalate	330	U	330	330	U	330	330	U	330	340	U	340
Butylbenzylphthalate	330	U	330	330	U	330	330	U	330	340	U	340
Carbazole	330	U	330	330	U	330	330	U	330	340	U	340
Chrysene	22	J	330	22	J	330	22	J	330	34	J	340
Di-n-butylphthalate	330	U	330	330	U	330	330	U	330	340	U	340
Di-n-octylphthalate	330	U	330	330	U	330	330	U	330	340	U	340
Dibenz(a,h)anthracene	330	U	330	330	U	330	330	U	330	340	U	340
Dibenzofuran	330	U	330	330	U	330	330	U	330	340	U	340
Diethylphthalate	330	U	330	330	U	330	330	U	330	340	U	340
Dimethylphthalate	330	U	330	330	U	330	330	U	330	340	U	340
Fluoranthene	330	U	330	330	U	330	330	U	330	340	U	340
Fluorene	330	U	330	330	U	330	330	U	330	340	U	340
Hexachlorobenzene	330	U	330	330	U	330	330	U	330	340	U	340
Hexachlorobutadiene	330	U	330	330	U	330	330	U	330	340	U	340
Hexachlorocyclopentadiene	330	U	330	330	U	330	330	U	330	340	U	340
Hexachloroethane	330	U	330	330	U	330	330	U	330	340	U	340
Indeno(1,2,3-cd)pyrene	330	U	330	330	U	330	330	U	330	340	U	340
Isophorone	330	U	330	330	U	330	330	U	330	340	U	340
N-Nitroso-di-n-dipropylamine	330	U	330	330	U	330	330	U	330	340	U	340
N-Nitrosodiphenylamine	330	U	330	330	U	330	330	U	330	340	U	340
Naphthalene	330	U	330	330	U	330	330	U	330	340	U	340
Nitrobenzene	840	U	840	840	U	840	840	U	840	840	U	840
Pentachlorophenol	330	U	330	330	U	330	330	U	330	340	U	340
Phenanthrene	330	U	330	330	U	330	330	U	330	340	U	340
Phenol	330	U	330	330	U	330	330	U	330	340	U	340
Pyrene	330	U	330	330	U	330	330	U	330	340	U	340

Attachment	1	Sheet No.	23 of 24
Originator	J. M. Capron	Date	01/12/07
Checked	T. M. Blakley	Date	
Calc. No.	0100C-CA-V0031	Rev. No.	1

Attachment 1. 100-C-9:2 Verification Sampling Results.

Constituents	J134X4 Equipment Blank Sample Date 8/3/06		
	µg/kg	Q	PQL
Semivolatile Organic Compounds			
1,2,4-Trichlorobenzene	330	U	330
1,2-Dichlorobenzene	330	U	330
1,3-Dichlorobenzene	330	U	330
1,4-Dichlorobenzene	330	U	330
2,4,5-Trichlorophenol	840	U	840
2,4,6-Trichlorophenol	330	U	330
2,4-Dichlorophenol	330	U	330
2,4-Dimethylphenol	330	U	330
2,4-Dinitrophenol	840	UR	840
2,4-Dinitrotoluene	330	U	330
2,6-Dinitrotoluene	330	U	330
2-Chloronaphthalene	330	U	330
2-Chlorophenol	330	U	330
2-Methylnaphthalene	330	U	330
2-Methylphenol (cresol, o-)	330	U	330
2-Nitroaniline	840	U	840
2-Nitrophenol	330	U	330
3,3'-Dichlorobenzidine	330	U	330
3-Nitroaniline	840	U	840
4,6-Dinitro-2-methylphenol	840	UJ	840
4-Bromophenyl-phenylether	330	U	330
4-Chloro-3-methylphenol	330	U	330
4-Chloroaniline	330	U	330
4-Chlorophenyl-phenylether	330	U	330
4-Methylphenol (p-cresol)	330	U	330
4-Nitroaniline	840	U	840
4-Nitrophenol	840	U	840
Acenaphthene	330	U	330
Acenaphthylene	330	U	330
Anthracene	330	U	330
Benzo(a)anthracene	330	U	330
Benzo(a)pyrene	330	U	330
Benzo(b)fluoranthene	330	U	330
Benzo(g,h,i)perylene	330	U	330
Benzo(k)fluoranthene	330	U	330
bis(2-Chloro-1-methylethyl)ether	330	U	330
bis(2-Chloroethoxy)methane	330	U	330
bis(2-Chloroethyl)ether	330	U	330
bis(2-Ethylhexyl)phthalate	330	U	330
Butylbenzylphthalate	330	U	330
Carbazole	330	U	330
Chrysene	330	U	330
Di-n-butylphthalate	53	J	330
Di-n-octylphthalate	330	U	330
Dibenz(a,h)anthracene	330	U	330
Dibenzofuran	330	U	330
Diethylphthalate	330	U	330

Constituents	J134X4 Equipment Blank Sample Date 8/3/06		
	µg/kg	Q	PQL
Semivolatile Organic Compounds (continued)			
Dimethylphthalate	330	U	330
Fluoranthene	330	U	330
Fluorene	330	U	330
Hexachlorobenzene	330	U	330
Hexachlorobutadiene	330	U	330
Hexachlorocyclopentadiene	330	U	330
Hexachloroethane	330	U	330
Indeno(1,2,3-cd)pyrene	330	U	330
Isophorone	330	U	330
N-Nitroso-di-n-dipropylamine	330	U	330
N-Nitrosodiphenylamine	330	U	330
Naphthalene	330	U	330
Nitrobenzene	330	U	330
Pentachlorophenol	840	U	840
Phenanthrene	330	U	330
Phenol	330	U	330
Pyrene	330	U	330

Attachment	1	Sheet No.	24 of 24
Originator	J. M. Capron	Date	01/12/07
Checked	T. M. Blakley	Date	
Calc. No.	0100C-CA-V0031	Rev. No.	1

APPENDIX C

CALCULATION OF HAZARD QUOTIENTS AND EXCESS CARCINOGENIC RISK VALUES

CALCULATION COVER SHEET

Project Title 100-B/C Remaining Pipes and Sewers Field Remediation **Job No.** 14655
Area 100-B/C
Discipline Environmental *Calc. No. 0100C-CA-V0032
Subject 100-C-9:2 Waste Site 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 = 7 Total = 8	J. M. Capron 11/14/06	T. M. Blakley 11/16/06	N/A	D. N. Strom 11-21-06	11-21-06

SUMMARY OF REVISION

WCH-DE-018 (9/01/2006) * Obtain Calc. No. from R&DC and Form from Intranet

Washington Closure Hanford CALCULATION SHEET

Originator:	J. M. Capron JMC	Date:	11/14/06	Calc. No.:	0100C-CA-V0032	Rev.:	0
Project:	100-B/C RPAS Field Remediation	Job No:	14655	Checked:	T. M. Blakley JMB	Date:	11/16/06
Subject:	100-C-9:2 Waste Site Hazard Quotient and Carcinogenic Risk Calculations					Sheet No.	1 of 7

PURPOSE:

Provide documentation to support the calculation of the hazard quotient (HQ) and excess carcinogenic risk values for the 100-C-9:2 remediation verification sampling results. This subsite is inclusive of discrete feeder lines for the former 1607-B8, 1607-B9, 1607-B10, and 1607-B11 septic systems. In accordance with the remedial action goals (RAGs) in the remedial design report/remedial action work plan (RDR/RAWP) (DOE-RL 2005), 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 carcinogenic risk of $<1 \times 10^{-6}$ for individual carcinogens
4) A cumulative excess carcinogenic risk of $<1 \times 10^{-5}$ for carcinogens.

GIVEN/REFERENCES:

1) DOE-RL, 2005, *Remedial Design Report/Remedial Action Work Plan for the 100 Areas,* DOE/RL-96-17, Rev. 5, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

2) Ecology, 2005, *Cleanup Levels and Risk Calculations (CLARC) Database*, Washington State Department of Ecology, Olympia, Washington, <https://fortress.wa.gov/ecy/clarc/CLARCHome.aspx>.

3) EPA, 1989, *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A)*, EPA/540/1-89/002, U.S. Environmental Protection Agency, Washington, D.C.

4) EPA, 1994, *Guidance Manual for the Integrated Exposure Uptake Biokinetic Model for Lead in Children*, EPA/540/R-93/081, Publication No. 9285.7-15-1, U.S. Environmental Protection Agency, Washington, D.C.

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

6) WCH, 2006, *100-C-9:2 Waste Site Cleanup Verification 95% UCL Calculations*, Calculation No. 0100C-CA-V0031, Washington Closure Hanford, Richland, Washington.

SOLUTION:

1) Calculate an HQ for each noncarcinogenic constituent detected above background and compare to the individual HQ of <1.0 (DOE-RL 2005).

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

3) Calculate an excess carcinogenic risk value for each carcinogenic constituent detected above background and compare to the individual excess carcinogenic risk criterion of $<1 \times 10^{-6}$ (DOE-RL 2005).

Washington Closure Hanford		CALCULATION SHEET					
Originator:	J. M. Capron JMC	Date:	11/14/06	Calc. No.:	0100C-CA-V0032	Rev.:	0
Project:	100-B/C RPAS Field Remediation	Job No:	14655	Checked:	T. M. Blakley TMB	Date:	11/16/06
Subject:	100-C-9:2 Waste Site Hazard Quotient and Carcinogenic Risk Calculations					Sheet No.	2 of 7

4) Sum the excess carcinogenic risk values and compare to the cumulative excess carcinogenic risk criterion of $<1 \times 10^{-5}$.

METHODOLOGY:

Hazard quotient and carcinogenic risk calculations were performed separately for each feeder line included in the 100-C-9:2 subsite, as these sewers are not spatially related. Calculations for the 1607-B9 feeder line remediation were conservatively performed using the highest of the remediation footprint statistical value, remediation footprint biased sample values, and overburden/below cleanup level (BCL) material values for each analyte detected above background. Of the contaminants of concern (COCs) and contaminants of potential concern (COPCs) for the site, boron, molybdenum, and strontium require the HQ calculations (except for boron at the 1607-B9 feeder line) because they were detected and Washington State or Hanford Site background values are not available. Additional metals (as listed in Tables 1 through 4) are included because they were quantified above their respective Hanford Site background values. Hexavalent chromium and multiple organic COCs/COPCs (as listed in Tables 1 through 4) are included because they were detected by laboratory analysis and cannot be attributed to natural occurrence. All other site nonradionuclide COCs and COPCs were not detected or were detected below background levels.

Parameters to calculate RAGs for aluminum, calcium, iron, magnesium, phosphorus, potassium, silicon, sodium, and zirconium are not available from the *Cleanup Levels and Risk Calculations (CLARC) Database* (Ecology 2005) or other reference databases. These analytes are also essential nutrients and can be eliminated from evaluation as human health concerns per EPA guidance (EPA 1989). Therefore, these constituents are not considered COPCs and are not included in the calculations. An example of the HQ and risk calculations is presented below:

1) For example, the maximum value for boron at the 1607-B8 feeder line remediation footprint is 5.1 mg/kg, divided by the noncarcinogenic RAG value of 16,000 mg/kg (calculated in accordance with the noncarcinogenic toxics effects formula in WAC 173-340-740[3]), is 3.2×10^{-4}. Comparing this value, and all other individual values, to the requirement of <1.0, this criterion is met.

2) After the HQ calculations are completed for the appropriate analytes, the cumulative HQ is 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 sums of the HQ values for the 1607-B8, 1607-B9, 1607-B10, and 1607-B11 feeder lines are 5.5×10^{-1}, 2.2×10^{-1}, 1.8×10^{-1}, 2.8×10^{-3}, respectively. Comparing these values to the requirement of <1.0, this criterion is met.

3) To calculate the excess carcinogenic risk, the 95% upper confidence limit or maximum value is divided by the carcinogenic RAG value, then multiplied by 1×10^{-6}. For example, the maximum value for hexavalent chromium at the 1607-B8 feeder line remediation footprint is 0.83 mg/kg; divided by 2.1 mg/kg and multiplied as indicated is 3.5×10^{-3}. 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 carcinogenic risk is obtained by summing the individual values. (To avoid errors due to intermediate

Washington Closure Hanford CALCULATION SHEET

Originator:	J. M. Capron	Date:	11/14/06	Calc. No.:	0100C-CA-V0032	Rev.:	0
Project:	100-B/C RPAS Field Remediation	Job No:	14655	Checked:	T. M. Blakley	Date:	11/16/06
Subject:	100-C-9:2 Waste Site Hazard Quotient and Carcinogenic Risk Calculations					Sheet No.	3 of 7

rounding, the individual values prior to rounding are used for this calculation.) The sums of the excess carcinogenic risk values for the 1607-B8, 1607-B9, 1607-B10, and 1607-B11 feeder lines are 8.5×10^{-7}, 8.1×10^{-7}, 1.7×10^{-7}, and 1.0×10^{-7}, respectively. Comparing these values 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.

Tables 1 through 4 show the results of the calculations for each component of the 100-C-9:2 subsite.

CONCLUSION:

This calculation demonstrates that the 100-C-9:2 subsite meets the requirements for hazard quotient and excess carcinogenic risk as identified in the RDR/RAWP (DOE-RL 2005).

Washington Closure Hanford CALCULATION SHEET

Originator:	J. M. Capron	Date:	11/14/06	Calc. No.:	0100C-CA-V0032	Rev.:	0
Project:	100-B/C RPAS Field Remediation	Job No:	14655	Checked:	T. M. Blakley	Date:	11/16/06
Subject:	100-C-9:2 Waste Site Hazard Quotient and Carcinogenic Risk Calculations					Sheet No.	4 of 7

Table 1. Hazard Quotient and Excess Cancer Risk Results for the 100-C-9:2 Subsite (1607-B8 Feeder Line).

Contaminants of Concern/ Contaminants of Potential Concern	Maximum Value[a] (mg/kg)	Noncarcinogen RAG[b] (mg/kg)	Hazard Quotient	Carcinogen RAG[b] (mg/kg)	Carcinogen Risk
Metals					
Boron	5.1	16,000	3.2E-04	--	--
Chromium, hexavalent[c]	0.83	240	3.5E-03	2.1	4.0E-07
Copper	66.1	2,960	2.2E-02	--	--
Lead[d]	152	353	4.3E-01	--	--
Mercury	0.37	24	1.5E-02	--	--
Molybdenum	1.0	400	2.5E-03	--	--
Strontium	25.5	48,000	5.3E-04	--	--
Zinc	111	24,000	4.6E-03	--	--
Semivolatiles					
Benzo(a)pyrene	0.022	--	--	0.137	1.6E-07
Benzo(b)fluoranthene	0.073	--	--	1.37	5.3E-08
Benzo(k)fluoranthene	0.023	--	--	13.7	1.7E-09
Benzo(g,h,i)perylene[e]	0.023	2,400	9.6E-06	--	--
Chrysene	0.082	--	--	137	6.0E-10
Pesticides					
gamma-Chlordane	0.0016	40	4.0E-05	2.86	5.6E-10
DDE, 4,4'-	0.0045	--	--	2.94	1.5E-09
Endosulfan I	0.0006	480	1.3E-06	--	--
Endosulfan sulfate	0.0037	480	7.7E-06	--	--
Endrin ketone	0.0007	24	3.1E-05	--	--
Polychlorinated Biphenyls					
Aroclor-1254	0.120	1.6	7.5E-02	0.5	2.4E-07
Totals					
Cumulative Hazard Quotient:			**5.5E-01**		
Cumulative Excess Cancer Risk:					**8.5E-07**

Notes:

[a] = From WCH (2006).

[b] = Value obtained from *Washington Administrative Code* (WAC) 173-340-740(3), Method B, 1996, unless otherwise noted.

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

[d] = Value for the noncarcinogen RAG obtained from EPA (1994).

[e] = Toxicity data are not available for this constituent. RAGs for benzo(g,h,i)perylene are based on the surrogate chemical pyrene.

-- = not applicable

RAG = remedial action goal

Washington Closure Hanford		CALCULATION SHEET					
Originator:	J. M. Capron	Date:	11/14/06	Calc. No.:	0100C-CA-V0032	Rev.:	0
Project:	100-B/C RPAS Field Remediation	Job No:	14655	Checked:	T. M. Blakley	Date:	11/16/06
Subject:	100-C-9:2 Waste Site Hazard Quotient and Carcinogenic Risk Calculations					Sheet No.	5 of 7

Table 2. Hazard Quotient and Excess Cancer Risk Results for the 100-C-9:2 Subsite (1607-B9 Feeder Line).

Contaminants of Concern/ Contaminants of Potential Concern	Maximum or Statistical Value[a] (mg/kg)	Noncarcinogen RAG[b] (mg/kg)	Hazard Quotient	Carcinogen RAG[b] (mg/kg)	Carcinogen Risk
Metals					
Chromium, hexavalent[c]	0.28	240	1.2E-03	2.1	1.3E-07
Copper	22.5	2,960	7.6E-03	--	--
Lead[d]	55.5	353	1.6E-01	--	--
Molybdenum	1.9	400	4.8E-03	--	--
Nickel	22.0	1,600	1.4E-02	--	--
Strontium	23.4	48,000	4.9E-04	--	--
Zinc	162	24,000	6.8E-03	--	--
Semivolatiles					
Benzo(a)anthracene	0.041	--	--	1.37	3.0E-08
Benzo(a)pyrene	0.048	--	--	0.137	3.5E-07
Benzo(b)fluoranthene	0.041	--	--	1.37	3.0E-08
Benzo(k)fluoranthene	0.045	--	--	13.7	3.3E-09
Benzo(g,h,i)perylene[e]	0.037	2,400	1.5E-05	--	--
Chrysene	0.055	--	--	137	4.0E-10
Fluoranthene	0.081	3,200	2.5E-05	--	--
Indeno(1,2,3-cd) pyrene	0.030	--	--	1.37	2.2E-08
Phenanthrene[d]	0.056	24,000	2.3E-06	--	--
Pyrene	0.094	2,400	3.9E-05	--	--
Pesticides					
DDD, 4,4'-	0.0035	--	--	4.17	8.4E-10
DDE, 4,4'-	0.014	--	--	2.94	4.8E-09
DDT, 4,4'-	0.0051	40	1.3E-04	2.94	1.7E-09
Dieldrin	0.0099	4	2.5E-03	0.0625	1.6E-07
Endrin	0.0036	24	1.5E-04	--	--
Endrin aldehyde	0.0029	24	1.2E-04	--	--
Endrin ketone	0.0004	24	1.8E-05	--	--
Polychlorinated Biphenyls					
Aroclor-1254	0.039	1.6	2.4E-02	0.5	7.8E-08
Totals					
Cumulative Hazard Quotient:			**2.2E-01**		
Cumulative Excess Cancer Risk:					**8.1E-07**

Notes:

[a] = From WCH (2006).

[b] = Value obtained from *Washington Administrative Code* (WAC) 173-340-740(3), Method B, 1996, unless otherwise noted.

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

[d] = Value for the noncarcinogen RAG obtained from EPA (1994).

[e] = Toxicity data are not available for this constituent. RAGs for benzo(g,h,i)perylene and phenanthrene are based on the surrogate chemicals pyrene and anthracene, respectively.

-- = not applicable

RAG = remedial action goal

Washington Closure Hanford CALCULATION SHEET

Originator:	J. M. Capron	Date:	11/14/06	Calc. No.:	0100C-CA-V0032	Rev.:	0
Project:	100-B/C RPAS Field Remediation	Job No:	14655	Checked:	T. M. Blakley	Date:	11/16/06
Subject:	100-C-9:2 Waste Site Hazard Quotient and Carcinogenic Risk Calculations					Sheet No.	6 of 7

Table 3. Hazard Quotient and Excess Cancer Risk Results for the 100-C-9:2 Subsite (1607-B10 Feeder Line).

Contaminants of Concern/ Contaminants of Potential Concern	Maximum Value[a] (mg/kg)	Noncarcinogen RAG[b] (mg/kg)	Hazard Quotient	Carcinogen RAG[b] (mg/kg)	Carcinogen Risk
Metals					
Boron	1.1	16,000	6.9E-05	--	--
Chromium, hexavalent[c]	0.24	240	1.0E-03	2.1	1.1E-07
Lead[d]	45.3	353	1.3E-01	--	--
Mercury	0.85	24	3.5E-02	--	--
Molybdenum	0.5	400	1.2E-03	--	--
Strontium	32.7	48,000	6.8E-04	--	--
Semivolatiles					
bis(2-Ethylhexyl) phthalate	0.25	1,600	1.6E-04	71.4	3.5E-09
Di-n-butylphthalate	0.040	8,000	5.0E-06	--	--
Pesticides					
DDE, 4,4'-	0.0014	--	--	2.94	4.8E-10
DDT, 4,4'-	0.0019	40	4.8E-05	2.94	6.5E-10
Endosulfan sulfate	0.0011	480	2.3E-06	--	--
Methoxychlor	0.003	400	7.3E-06	--	--
Polychlorinated Biphenyls					
Aroclor-1254	0.015	1.6	9.4E-03	0.5	3.0E-08
Aroclor-1260	0.011	--	--	0.5	2.2E-08
Totals					
Cumulative Hazard Quotient:			**1.8E-01**		
Cumulative Excess Cancer Risk:					**1.7E-07**

Notes:

[a] = From WCH (2006).

[b] = Value obtained from *Washington Administrative Code* (WAC) 173-340-740(3), Method B, 1996, unless otherwise noted.

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

[d] = Value for the noncarcinogen RAG obtained from EPA (1994).

-- = not applicable

RAG = remedial action goal

Washington Closure Hanford CALCULATION SHEET

Originator:	J. M. Capron JMC	Date:	11/14/06	Calc. No.:	0100C-CA-V0032	Rev.:	0
Project:	100-B/C RPAS Field Remediation	Job No:	14655	Checked:	T. M. Blakley TMB	Date:	11/16/06
Subject:	100-C-9:2 Waste Site Hazard Quotient and Carcinogenic Risk Calculations					Sheet No.	7 of 7

Table 4. Hazard Quotient and Excess Cancer Risk Results for the 100-C-9:2 Subsite (1607-B11 Feeder Line).

Contaminants of Concern/ Contaminants of Potential Concern	Maximum or Statistical Value[a] (mg/kg)	Noncarcinogen RAG[b] (mg/kg)	Hazard Quotient	Carcinogen RAG[b] (mg/kg)	Carcinogen Risk
Metals					
Boron	2.0	16,000	1.3E-04	--	--
Chromium, hexavalent[c]	0.21	240	8.8E-04	2.1	1.0E-07
Molybdenum	0.46	400	1.2E-03	--	--
Strontium	28.4	48,000	5.9E-04	--	--
Semivolatiles					
Di-n-butylphthalate	0.034	8,000	4.3E-06	--	--
Pesticides					
Methoxychlor	0.007	400	1.8E-05	--	--
Totals					
Cumulative Hazard Quotient:			**2.8E-03**		
Cumulative Excess Cancer Risk:					**1.0E-07**

Notes:

[a] = From WCH (2006).

[b] = Value obtained from *Washington Administrative Code* (WAC) 173-340-740(3), Method B, 1996, unless otherwise noted.

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

-- = not applicable

RAG = remedial action goal

APPENDIX D
DATA QUALITY ASSESSMENTS

CONFIRMATORY SAMPLING DATA QUALITY ASSESSMENT

A data quality assessment (DQA) was performed to compare the confirmatory sampling approach and resulting analytical data with the sampling and data requirements specified by the project objectives and performance specifications. 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 2005a).

A review of the sample design (BHI 2003) and applicable analytical data packages has been performed as part of this DQA. All samples were collected per the sample design with the exception of the sample from location A1. There was insufficient material at location A1 to perform the requested analyses; therefore, a decision was made to collect material from a manhole located approximately 30.5 m (100 ft) northwest of location A1 for a composite sample. Material from both A1 sample locations was thoroughly mixed before placement into sample jars.

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

Data from confirmatory samples collected at the 1607-B9 100-C-9:2 waste site were provided by the laboratories in three sample delivery groups (SDGs): SDG W04127, SDG H2346, and SDG H2347. SDG H2346 was submitted for third-party validation. A major deficiency was identified in SDG W04127. Major and minor deficiencies identified in the analytical data sets are discussed below.

SDG W04127

This SDG comprises four field samples: Sample J00Y95 from location 1A (and alternate location), sample J00Y96 from location A2, sample J00Y97 from location A3, and sample J00Y98 from location 4. These samples were analyzed for hexavalent chromium.

The holding time of 24 hours for hexavalent chromium analysis was exceeded by three weeks. As the holding time was exceeded by greater than two times the limit, all detected results in SDG W04127 are considered estimated and flagged as "J". For undetected results the hold time exceedance is considered a major deficiency. The undetected result for sample J00Y95 is rejected and flagged as "UR". Hexavalent chromium will be retained for verification sampling.

SDG H2346

This SDG comprises three field samples: one field duplicate pair (J00YB3/J00YB4) from location A5, and one equipment blank (J00YB5). These samples were analyzed for

inductively coupled plasma (ICP) metals, mercury, hexavalent chromium, polychlorinated biphenyls (PCBs), semivolatile organic analytes (SVOAs), pesticides, gross alpha and gross beta by proportional counting, and by gamma spectroscopy. Nickel-63 and total strontium analyses were added to the list because gross alpha and gross beta results exceeded background levels. SDG H2346 was submitted for third-party validation. Major and minor deficiencies found in SDG H2346 are as follows:

In the pesticides analysis, all surrogates, matrix spikes, and matrix spike duplicates are reported as diluted out. All pesticide results for the samples in SDG H2346 are qualified as estimates and flagged "J" by third-party validation. The data are useable for decision-making purposes.

All of the toxaphene data in SDG H2346 was qualified by third-party validation as estimated with "J" flags, due to lack of a matrix spike (MS), matrix spike duplicate (MSD), or LSC analysis for the analyte. Estimated, or "J"-flagged, data are acceptable for decision making purposes.

In the PCB analysis, matrix spikes, and matrix spike duplicates are reported as diluted out. All pesticide results for the samples in SDG H2346, with the exception of aroclor-1016, are qualified as estimates and flagged "J" by third-party validation. The data are useable for decision-making purposes.

In the ICP metals analysis, the MS recoveries for six ICP metals (aluminum, iron, mercury, antimony, silicon, and zinc) are out of the acceptance criteria. For aluminum, iron, mercury, silicon, and zinc, the spiking concentration was insignificant compared to the native concentration in the sample from which the MS was prepared. For these analytes, 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. To confirm quantitation, post-digestion spikes (PDSs) and serial dilutions were prepared for all five analytes with acceptable results ranging between 103.7% and 130.4%. Antimony did not have mismatched spike and native concentrations in the original MS. All antimony results for the samples in SDG H2346 are qualified as estimates and flagged "J" by third-party validation. The data are useable for decision-making purposes.

In the ICP metals analysis, the MB result for barium, magnesium, sodium, and silicon are greater than the practical quantitation limit. The sample concentrations for these analytes are greater than five times the MB concentration. The data are useable for decision-making purposes.

The relative percent differences (RPDs) calculated for silver and mercury in the laboratory duplicate pair (sample J00YP7, and J00YP7 [duplicate]), are above the acceptance criteria with values of 55% and 47%, respectively. All silver and mercury results for the samples in SDG H2346 are qualified as estimates and flagged "J" by third-party validation. The data are useable for decision-making purposes.

The RPDs calculated for two radionuclides (cesium-137 and radium-228) in the laboratory duplicate pair were above the acceptance criteria of 30%: at 60% and 41%, respectively. Elevated RPDs in environmental soil samples are attributed to natural heterogeneities in the soil matrix from which the sample and duplicate are prepared. The data are useable for decision-making purposes.

SDG H2347

This SDG comprises four field samples: Sample J00Y99 from location 1A (and alternate location), sample J00YB0 from location A2, sample J00YB1 from location A3, and sample J00YB2 from location 4. These samples were analyzed for ICP metals, mercury, PCBs, SVOAs, pesticides, gross alpha and gross beta by proportional counting, and by gamma spectroscopy. Nickel-63 and total strontium analyses were added to the list because gross alpha and gross beta results exceeded background levels. No major or minor deficiencies were noted for SDG H2347.

FIELD QUALITY ASSURANCE/QUALITY CONTROL

RPD evaluations of main sample(s) versus the laboratory duplicate(s) are routinely performed and reported by the laboratory. Any deficiencies in those calculations were reported by SDG in the previous sections.

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 that were collected at the 100-C-9:2 waste site (J00YB3/J00YB4) are reported in SDG H2346. The field duplicates are evaluated by calculating the RPD of the duplicate samples for each COC. Only analytes with values above five times the detection limits for both the main and duplicate samples are compared. The data are suitable for the intended purpose of cleanup verification.

Radionuclides: None of the RPDs calculated for radionuclide field duplicates are above the acceptance criteria (30%). The data are useable for decision-making purposes.

Nonradionuclides: The RPDs calculated for silver, chromium and mercury in the field duplicate pair (sample J00YB3, and J00YB4), are above the acceptance criteria with values of 92%, 70%, and 62%, respectively. The aroclor-1254 field duplicate RPD is above the acceptance criteria of 30%, at 42%. Elevated RPDs in environmental soil samples are attributed to natural heterogeneities in the soil matrix from which the sample and duplicate are prepared. The data are useable for decision-making purposes.

RPDs for the remaining radionuclides and nonradionuclide analytes are not calculated because an evaluation of the data shows that the analytes are not detected in both the main and duplicate sample at more than five times the target detection limit. RPDs of analytes detected at low concentrations (less than five times the detection limit) are not

considered indicative of the analytical system performance. The data are useable for decision-making purposes.

Summary

Limited, random, or sample matrix-specific influenced batch quality control (QC) issues such as those discussed above, are a potential issue for any analysis. The number and types seen in these data sets are within expectations for the matrix types and analyses performed. The DQA review of the 100-C-9:2 confirmation 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 the 100-C-9:2 waste site concludes that the reviewed data are of the right type, quality, and quantity to support the intended use. Detection limits, precision, accuracy, and sampling data group completeness were assessed to determine if any analytical results should be rejected as a result of QA and QC deficiencies. The analytical data were found acceptable for decision-making purposes, with the exception of the hexavalent chromium result for sample J00Y95. Sample results reported for hexavalent chromium in SDG W04127 indicate that hexavalent chromium will need to be retained for verification sampling purposes. The confirmation sample analytical data are stored in the Environmental Restoration (ENRE) project-specific database prior to being submitted for inclusion in the Hanford Environment Information System (HEIS) database. The confirmation sample analytical data are also summarized in Appendix A of this document.

VERIFICATION SAMPLING DATA QUALITY ASSESSMENT

A 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 designs (WCH 2006d, WCH 2006e). This DQA was performed in accordance with site specific data quality objectives found in the SAP (DOE-RL 2005).

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

Verification sample data collected at the 100-C-9:2 subsite were provided by the laboratories in three SDGs: SDG K0288, SDG K0503, and SDG K0548. SDG K0288 was submitted for third-party validation. A discrepancy in the global positioning system (GPS) coordinates for samples at locations 1 and 3 was identified between the work instruction and the field logbook (WCH 2006a). The actual GPS coordinates for sample

J11VL9 are 143818N, 565389E, and the actual coordinates for sample J11MV0 are 143847N, 565380E. The two locations had been reversed in the work instruction, and were staked based on visual inspection. Major deficiencies were identified in the analytical data set, rendering some data unacceptable for decision-making purposes. Major and minor deficiencies are discussed below.

The 100-C-9:2 waste site comprises multiple sampling areas. Samples from several sampling areas may compose any one SDG. Unless otherwise noted, deficiencies listed below are specific to the individual SDG, but apply to all samples within that SDG.

SDG K0288

This SDG comprises 18 field samples: One from each of three sections of the 1607-B8 trench; 10 collected from the 1607-B9 pipeline excavation; plus one from each of two undocumented pipeline intersections with the 1607-B9 pipeline; two from the overburden stockpile; and one equipment blank. One field duplicate pair is included in this SDG (J11VL2/J11VM6). These samples were analyzed for ICP metals, mercury, hexavalent chromium, PCBs, SVOAs, pesticides, gross alpha and gross beta by proportional counting, and by gamma spectroscopy. SDG K0288 was submitted for formal third-party validation. No major deficiencies were found in SDG K0288. Minor deficiencies are as follows:

The third-party validation calculated the field duplicates (J11VL2/J11VM6) RPD for thorium-228 at 31%. This RPD exceeds the criteria (30%); however, there is no requirement to qualify the data and no qualifier flags were assigned. Elevated RPDs are attributed to heterogeneity naturally occurring in the soil matrix, and thorium-228 is not a COC/COPC for the 100-C-9:2 waste site. The data are useable for decision-making purposes.

In the SVOA analysis, the MS recovery for 2-methylphenol is 57%, for 4-methylphenol is 58%, and for 1,2,4-trichlorobenzene is 58%: each out of acceptance criteria. Third-party validation qualified all results for these analytes in the SDG K0288 as estimates and flagged "J". The data are useable for decision-making purposes.

Di-n-butylphthalate was detected in the equipment blank (J11VM7), but was not qualified by third-party validation, as it is not required.

The common laboratory contaminant bis(2-ethylhexyl)phthalate was detected in the MB at 420 µg/kg; bis(2-ethylhexyl)phthalate was also detected in the field samples in the range of 21-1100 µg/kg. Third-party validation raised the reported values in the field samples to the required quantitation limit of 660 µg/kg and qualified the results as nondetected and the flagged the results "U". The data are useable for decision-making purposes.

Third-party validation assigned a "J" flag to all 2,4-dinitrophenol results in SDG K0288, as the laboratory control spike (LCS) recovery was outside QC limits at 17%. The data are useable for decision-making purposes.

The RPDs for six analytes (phenol, 4-methylphenol, n-nitroso-di-n-propylamine, 2,4,6-trichlorophenol, pentachlorophenol, and di-n-octylphthalate) were above the acceptance

criteria of 30%. Elevated RPDs in environmental soil samples are generally attributed to natural heterogeneities in the soil matrix from which the sample and duplicate are prepared. However, all of the data for these analytes in SDG K0288 were qualified as estimated, with "J" flags, by third-party validation. The data are useable for decision-making purposes.

Also in the SVOA analysis, 6 of 44 surrogate recoveries are outside the acceptance criteria with values ranging from 124% to 128%. However, the secondary criterion for surrogate recoveries is met for samples J11VK9, J11VK9 MS, J11VL4, and J11VM3, as there is no more than one outlier per sample. For the sample J11VL3, both surrogate recoveries are high, with results of 119% and 127%. The high surrogate recovery values suggest a high bias in the data. However, all the sample results are below the practical quantitation limit (PQL). The data are useable for decision-making purposes.

The RPDs for four chlorinated pesticides (delta-BHC, 4,4-DDE, 4,4-DDT, and methoxychlor) were above the acceptance criteria of 30%. Elevated RPDs in environmental soil samples are generally attributed to natural heterogeneities in the soil matrix from which the sample and duplicate are prepared. However, all of the data for these analytes in SDG K0288 were qualified as estimated, with "J" flags, by third-party validation. Estimated, or "J" flagged, data are considered acceptable for the intended use of the data. The data are useable for decision-making purposes.

All of the toxaphene data in SDG K0288 was qualified by third-party validation as estimated with "J" flags, due to lack of a MS, MSD, or LSC analysis for the analyte. Estimated, or "J"-flagged, data are considered acceptable for the intended use of the data. The data are useable for decision-making purposes.

Surrogates in the PCB analysis for samples J11VK9, J11VL3, J11VL4 and J11VL9 were above the acceptance criteria. This suggests a high bias in the data. However, most of the data is listed as nondetected and a high bias has no affect on nondetected analytical data. The detected concentrations of aroclor-1254 in samples J11VK9, J11VL3, and J11VL9 were qualified as estimated with "J" flags by third-party validation. The data are useable for decision-making purposes.

Surrogates in the chlorinated pesticide analysis for samples J11VK9, J11VL3, J11VL4, and J11VM3 were above the acceptance criteria in the field samples. This suggests a high bias in the data. However, most of the data is listed as nondetected and a high bias has no affect on nondetected analytical data. The detected pesticide results in sample J11VM3 were qualified as estimated with "J" flags by third-party validation. The data are useable for decision-making purposes.

Third-party validation qualified all pesticide sample results for sample J11VL9 as estimated with a "J" flag due to surrogate interference in the sample. Estimated, or "J" flagged, data are considered acceptable for the intended use of the data. The data are useable for decision-making purposes.

In the ICP metals analysis, the MS recoveries for seven ICP metals (aluminum, iron, manganese, phosphorus, antimony, silicon, and titanium) are out of acceptance criteria. For most of these analytes, the spiking concentration was insignificant compared to the native concentration in the sample from which the MS was prepared. For these analytes, the deficiency in the MS is a reflection of the analytical variability of the native concentration rather than a measure of the method performance from the sample. To confirm quantitation, PDSs, and serial dilutions were prepared for all eight analytes with acceptable results. The analytes, antimony and phosphorus, did not have mismatched spike and native concentrations in the original MS. These two analytes have been qualified by third-party validation as estimates with "J" flags for all samples in SDG K0288. The original MS recoveries for antimony and phosphorus were 55.9% and 59.4%, respectively. Estimated, or "J" flagged, data are considered acceptable for the intended use of the data.

The analytes boron, tin, and lithium were reported in the MB at concentrations that were below the contract-required quantitation limits (CRQLs) but not less than $1/5^{th}$ of some of the concentrations reported in the field samples (i.e., the field sample concentrations were low enough that the MB concentration is of similar magnitude). Third-party validation has qualified the analytical data for lithium in sample J11VM7 (the equipment blank); for tin in samples J11VL3, J11VL8, J11VL9, and J11VM5; and for boron in all samples (except J11VM5); as estimated nondetections with "UJ" flags.

Also, in the ICP metals analysis, the LCS recovery for silicon is below the acceptance criteria at 43.9%. Silicon has been qualified by third-party validation as estimates with "J" flags for all samples in SDG K0288. Estimated, or "J" flagged, data are considered acceptable for the intended use of the data.

The RPD calculated for chromium in the laboratory duplicate pair (sample J11VK9, and J11VK9 duplicate), is above the acceptance criteria at 60%. Elevated RPDs in environmental soil samples are generally attributed to heterogeneities in the sample matrix and not to deficiencies in the laboratory procedures. The data are useable for decision-making purposes.

In the primary result for sample J11VL2, the analyte hexavalent chromium is detected just above the detection limit. In the laboratory duplicate for the sample, hexavalent chromium is non-detected. The laboratory reported an RPD value for these results of 75.1%. However, when one of the two samples is non-detected or when the duplicate pair is near the detection limit, analysis of RPDs is not considered useful in the precision determination. The data are useable for decision-making purposes.

SDG K0503

This SDG comprises four field samples: one collected from each of four segments of the 1607-B11 trench. These samples were analyzed for ICP metals, mercury, hexavalent chromium, semivolatile organic compounds (SVOCs), PCBs, pesticides, and by gamma

spectroscopy. One field duplicate pair is included in this SDG (J134W8/J134X3). Major and minor deficiencies found in SDG K0503 are as follows:

In the SVOA analysis, the MS recovery for 2,4-dinitrophenol is 17%, which is out of acceptance criteria. The MSD is within the Environmental Protection Agency (EPA) Contract Laboratory Program (CLP) criteria, with a result of 30%. However, the LCS recovery result for 2,4-dinitrophenol is 1%. The sample results reported for 2,4-dinitrophenol within this SDG are flagged as rejected with "R" flags by the project for decision-making purposes, as the LCS recovery is less than 10%.

The LCS recovery result for 4,6-dinitro-2-methylphenol is 37%. The low recoveries for 2,4-dinitrophenol and for 4,6-dinitro-2-methylphenol are attributed to the highly erratic chromatographic behavior of these compounds. The sample results for 4,6-dinitro-2-methylphenol are flagged as estimated with "J" flags applied to the data because the LCS recovery is greater than 10%, but falls outside the EPA CLP QC limits. The data remain useable for decision-making purposes.

In the pesticides analysis, the MS recoveries for endosulfan I and endusulfan II are 122%, the MS for 4,4,'-DDE is 124%, and the MSD for gamma-chlordane is 134%, all outside of acceptance criteria. The values are high, which suggests the sample results are biased high. The sample results are all below the PQL, and the matrix spike recoveries have no significant impact to the data.

For decachlorobiphenyl surrogate recoveries, 7 of 20 are outside the acceptance criteria with values ranging from 126% to 136%. However, the secondary criterion for surrogate recoveries is met, as there is no more than one outlier per sample. The high surrogate recovery values suggest that the sample results are biased high. The data remain useable for decision-making purposes.

In the ICP metals analysis, the MB for potassium is greater than the PQL. Sample J134X4, the equipment blank, read less than 20 times the MB concentration, at 23.9 mg/kg. However, the equipment blank is greater than five times the MB concentration requirement for the program, and the data is useable for decision-making purposes.

In addition, the MS recoveries for six ICP metals (aluminum, iron, manganese, antimony, silicon, and titanium) are out of acceptance criteria. For most of these analytes, the spiking concentration was insignificant compared to the native concentration in the sample from which the MS was prepared. For these analytes, the deficiency in the MS is a reflection of the analytical variability of the native concentration rather than a measure of the method performance from the sample. To confirm quantitation, PDSs and serial dilutions were prepared for all eight analytes with acceptable results. Antimony did not have mismatched spike and native concentrations in the original MS. This analyte has been qualified as estimated with "J" flags for all samples in SDG K0503. The original MS recoveries for antimony were 71.2%. Estimated, or "J" flagged, data are considered acceptable for the intended use of the data. The data are useable for decision-making purposes.

Also in the ICP metals analysis, the LCS recovery for silicon is below the acceptance criteria at 21.8%. Associated sample results for silicon are likely biased low. Silicon is not a contaminant of concern (COC) or contaminant of potential concern (COPC) for the 100-C-9:2 subsite.

In the gamma spectroscopy analysis, the RPDs calculated for radium-226, radium-228, and thorium-232 in the laboratory duplicate pair (sample J134X1, and J134X1 duplicate), are above the acceptance criteria at 50%, 49%, and 49%, respectively. Elevated RPDs in environmental soil samples are generally attributed to heterogeneities in the sample matrix and not to deficiencies in the laboratory procedures. The data are useable for decision-making purposes.

SDG K0548

This SDG comprises four field samples, one collected from each of four segments of the 1607-B10 trench. These samples were analyzed for ICP metals, mercury, hexavalent chromium, SVOCs, PCBs, pesticides, and by gamma spectroscopy. Major deficiencies and minor deficiencies found in SDG K0548 are as follows:

In the PCB analysis, both surrogate recoveries for sample J135M3 are outside the acceptance criteria, with values of 148% and 156% for tetrachloro-m-xylene and decachlorobiphenyl, respectively. All results for the sample are below the PQL, with the exception of aroclor-1254, which is reported as 15 µg/kg, above the PQL of 13 µg/kg. The sample result is likely biased high as indicated by the high surrogate recoveries. The data remain useable for decision-making purposes.

In the SVOA, the MS and MSD recoveries for 2,4-dinitrophenol are both 5%, which is out of acceptance criteria. The MS and MSD recoveries for 1,2,4-trichlorobenzene are 54% and 56%, respectively: both out of acceptance criteria. The MS and MSD recoveries for 4,6-dinitro-2-methylphenol are 21% and 18%, respectively: both out of acceptance criteria. The MSD for hexachlorocyclopentadiene is 14%; however, the MS for the constituent is within the criteria, with a result of 25%. All sample results for these constituents were below the PQL. The low recoveries were attributed to the highly erratic chromatographic behavior of these compounds. The sample results reported for 2,4-dinitrophenol within this SDG are flagged as rejected with "R" flags by the program (for decision-making purposes), as the MS and MSD recoveries are less than 10%. The sample results reported for 1,2,4-trichlorobenzene, 4,6-dinitro-2-methylphenol, and hexachlorocyclopentadiene are flagged as estimated, as the MS and/or MSD recoveries are greater than 10%, but fall outside the EPA CLP QC limits. The data remain useable for decision-making purposes.

The LCS recovery result for isophorone is 59%, the result for 2,4-dimethylphenol is 40%, the result for 1,2,4-trichlorobenzene is 50%, the result for 4-chloro-3-methylphenol is 58%, and the MB for 2-methylnaphthalene is 56%. The low recoveries are attributed to the highly erratic chromatographic behavior of these compounds. The sample results

reported for 4-chloro-3-methylphenol and isophorone are flagged as estimated, as the MS and/or MSD recoveries are greater than 10%, but fall outside the EPA CLP QC limits. The data remain useable for decision-making purposes.

In the pesticide analysis, interference is reported on the primary column for the 4,4'-Dichlorodiphenyldichloroethylene (4,4'-DDE) result for sample J135M0, and for the methoxychlor result for sample J135M2. The associated results are reported from the confirmatory column. The data are useable for decision-making purposes.

In the ICP metals analysis, the MB for tin is greater than the PQL. All sample results are less than the PQL, and are useable for decision-making purposes.

In addition, the MS recoveries for six ICP metals (aluminum, iron, mercury, antimony, silicon, and titanium) are out of project acceptance criteria. For 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 method performance from the sample. To confirm quantitation, PDSs and serial dilutions were prepared for each analyte (except mercury) with acceptable results. As no post-digestion spike was prepared for mercury, the data is qualified as estimated, with a "J" flag. The data are useable for decision-making purposes.

Also in the ICP metals analysis, the LCS recovery for silicon is below the acceptance criteria at 41%. Associated sample results for silicon may be biased low. Silicon is not a COPC for the 100-C-9:2 waste site.

Finally, the RPD values for arsenic, mercury, lead, and strontium are outside the laboratory acceptance criteria at 28.6%, 108%, 63.8%, and 27.6%, respectively. The initial result for molybdenum and boron is detected while the replicate fell below the PQL. When one of the two samples is non-detected or when the duplicate pair is near the detection limit, analysis of RPDs is not considered useful in the precision determination. The data are useable for decision-making purposes. Elevated RPDs are attributed to natural heterogeneity of the sample matrices. The data are usable for decision-making purposes.

In the analysis of the laboratory duplicate for sample J135M3, the analyte hexavalent chromium is detected just above the detection limit. In the primary sample, hexavalent chromium is non-detected. The laboratory reported an RPD value for these results of 67%. However, when one of the two samples is non-detected or when the duplicate pair is near the detection limit, analysis of RPDs is not considered useful in the precision determination. The data are useable for decision-making purposes.

FIELD QUALITY ASSURANCE/QUALITY CONTROL

RPD 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 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 2006a, WCH 2006c), are summarized in Table D-1, with results presented in Appendix B.

Table D-1. Summary of Field Quality Control Samples.

Sample	Main	Duplicate
1607-B11 #1	J134W8	J134X3
1607-B9 #4	J11VL2	J11VM6

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 duplicate samples for each COC. Only analytes with values above five times the detection limits for both the main and duplicate samples are compared. The 95% upper confidence limit (UCL) calculation brief in Appendix B provides details on duplicate pair evaluation and RPD calculation. The data are suitable for the intended purpose of cleanup verification.

Radionuclides. Third party validation calculated the RPD for thorium-228 in the field duplicate pair (sample J11VL2 and J11VM6) as above the acceptance criteria (30%), with a value of 31%. Elevated RPDs in environmental soil samples are attributed to natural heterogeneities in the soil matrix from which the sample and duplicate are prepared. The data are useable for decision-making purposes.

Nonradionuclides. None of the RPDs calculated for nonradionuclide field duplicates or splits are above the acceptance criteria. The data are useable for decision-making purposes.

RPDs for the remaining radionuclides and nonradionuclide analytes are not calculated because an evaluation of the data shows that the analytes are not detected in both the main and duplicate sample at more than five times the target detection limit. RPDs of analytes detected at low concentrations (less than five times the detection limit) are not considered indicative of the analytical system performance. The data are useable for decision-making purposes.

A secondary check of the data variability is used when one or both of the samples being evaluated (main and duplicate) is less than five times the target detection limit (TDL),

including undetected analytes. In these cases, a control limit of ± 2 times the TDL is used (Appendix B) to indicate that a visual check of the data is required by the reviewer. The visual check was not required for any results, as shown in Appendix B, all results were all found to be acceptable. A visual inspection of all of the data is also performed. No additional major or minor deficiencies are noted. The data are useable for decision-making purposes.

Summary

Limited, random, or sample matrix-specific influenced batch QC issues such as those discussed above, are a potential issue for any analysis. The number and types observed in these data sets are within expectations for the matrix types and analyses performed. The DQA review of the 100-C-9:2 verification sampling data found that the analytical results are accurate within the standard errors associated with the analytical methods, sampling, and sample handling. The DQA review for 100-C-9:2 waste site concludes that the reviewed data are of the right type, quality, and quantity for decision-making purposes. Detection limits, precision, accuracy, and sampling data group completeness were assessed to determine if any analytical results should be rejected as a result of QA and QC deficiencies. The analytical data were found acceptable for decision-making purposes, with the exception of the sample results reported for 2,4-dinitrophenol within SDG K0503 and SDG K0548. The verification sample analytical data are stored in the ENRE project-specific database prior to being submitted for inclusion in the HEIS database. The verification sample analytical data are also summarized in Appendix B.

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