1223043

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

14-AMRP-0102

FEB 04 2014

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

Dear Ms. Hedges:

TRANSMITTAL OF APPROVED WASTE SITE RECLASSIFICATION FORM AND SUPPORTING DOCUMENTATION FOR THE 124-N-10, SANITARY SEWER SYSTEM NO. 10, REVISION 0

Attached for your use is the approved Waste Site Reclassification Form No. 2013-121 and supporting "Remaining Sites Verification Package for the 124-N-10, Sanitary Sewer System No. 10," Rev. 0. If you have questions, please contact me or your staff may contact Joanne Chance, of my staff, on (509) 376-0811.

Sincerely,

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

AMRP:JCC

Attachment

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

cc w/o attach:
R. D. Cantwell, WCH
S. L. Feaster, WCH
T. Q. Howell, WCH
D. L. Plung, WCH

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WASTE SITE RECLASSIFICATION FORM

Operable Unit: 100-NR-1 **Control No.:** 2013-121

Waste Site Code(s)/Subsite Code(s): 124-N-10

Reclassification Category: Interim ☒ Final ☐

Reclassification Status: Closed Out ☒ No Action ☐ Rejected ☐

RCRA Postclosure ☐ Consolidated ☐ None ☐

Approvals Needed: DOE ☒ Ecology ☒ EPA ☐

Description of current waste site condition:

The 124-N-10, 100-N Sanitary Sewer System No. 10 waste site, part of the 100-NR-1 Operable Unit, was included in the *Explanation of Significant Differences for the 100-NR-1 and 100-NR-2 Operable Units Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington* (N-Area ESD), U.S. Environmental Protection Agency, Region 10, Seattle, Washington (EPA 2011) and added to the *Interim Action Record of Decision for the 100-NR-1 and 100-NR-2 Operable Units, Hanford Site, Benton County Washington* (100-N Area ROD), U.S. Environmental Protection Agency, Region 10, Seattle, Washington (EPA 1999) as a remove, treat, and dispose (RTD) site.

The 124-N-10 waste site encompassed the footprints of the 1904-N Sanitary Sewer Lagoon facility and the 1904-NA Sanitary Sewer Lift Station No. 1. The 1904-N Sanitary Sewer Lagoon facility consisted of a lined aeration pond, a lined stabilization pond, an unlined infiltration pond, and associated sewer system instrumentation and pipelines. The three-pond sewage lagoon received domestic wastewater sewage from the 100-N Area and domestic sewage that was pumped from septic tanks throughout the Hanford Site. The system was designed for a maximum of 2,500 employees and a maximum design flow of 189,000 L (50,000 gal) per day. The 1904-NA Sanitary Sewer Lift Station No. 1 facility consisted of a below-grade concrete wet well and a below-grade concrete valve pit, and was located approximately 9 m (30 ft) west of the 1904-N Sanitary Sewer Lagoon. The site, which began operation in February 1987, was located 1.6 km (1 mi) northwest of the intersection of N Avenue and Route 4 North cutoff and is parallel with and north of the railroad tracks that intersect N Avenue.

Demolition of the 1904-N and 1904-NA facilities was performed in December 2012 through April 2013 by the Deactivation, Decontamination, Decommissioning, and Demolition (D4) project. Approximately 18,000 bank cubic meters (23,500 bank cubic yards) of soil and debris was disposed at the Environmental Restoration Disposal Facility. All physical components of the 1904-N and 1904-NA facilities were removed. Hexavalent chromium was detected in an in-process soil sample above a remedial action goal; therefore, D4 removed additional soil from the sample location. Following D4 activities, the Field Remediation (FR) project collected in-process soil samples to determine if additional soil remediation was necessary from the 124-N-10 waste site prior to initiating verification sampling activities. The sample results indicated that the waste removal conducted by D4 was sufficient; therefore, no additional material was removed by the FR project.

Verification soil samples were collected from the 124-N-10 waste site on September 10, 2013, per the *Work Instruction for Verification Sampling of the 124-N-10, Sanitary Sewer System No. 10*, 0100N-WI-G0069, Rev. 0, Washington Closure Hanford, Richland, Washington (WCH 2013c). Analytical results of those samples indicate the 124-N-10 waste site achieves remedial action objectives (RAOs) and remedial action goals (RAGs) established by the *Remedial Design Report/Remedial Action Work Plan for the 100-N Area*, DOE/RL-2005-93, Rev. 0, (100-N Area RDR/RDWP), U.S. Department of Energy, Richland Operations Office, Richland, Washington (DOE-RL 2006b), and 100-N Area ROD (EPA 1999). The selected remedy involved (1) excavating the site to the extent required to meet specified soil cleanup levels, (2) disposing of contaminated excavation materials at ERDF at the 200 Area of the Hanford Site, (3) demonstrating through verification sampling that cleanup goals have been achieved, and (4) proposing the site for reclassification as Interim Closed Out.

WASTE SITE RECLASSIFICATION FORM

Operable Unit: 100-NR-1 **Control No.:** 2013-121

Waste Site Code(s)/Subsite Code(s): 124-N-10

Basis for reclassification:

The verification sampling results for the 124-N-10 waste site demonstrate that the waste site meets the RAOs and corresponding RAGs established in the 100-N Area ROD (EPA 1999) and documented in the 100-N Area RDR/RDWP (DOE-RL 2006b). The results demonstrate that residual contaminant concentrations do not preclude any future land uses (as bounded by a rural-residential scenario), and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft]). The results also show that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Contamination above direct exposure levels was not observed in shallow zone soils and is concluded to not exist in deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone soil are not required. The basis for reclassification is described in detail in the *Remaining Sites Verification Package for the 124-N-10, Sanitary Sewer System No. 10* (attached).

Regulator Comment:

Waste Site Controls:

Engineered Controls: ☐ Yes ☒ No Institutional Controls: ☐ Yes ☒ No O&M Requirements: ☐ Yes ☒ No

If any of the Waste Site Controls are checked Yes, specify control requirements including reference to the Record of Decision, TSD Closure Letter, or other relevant documents:

J. P. Neath	[signature]	1/10/14
DOE Federal Project Director (printed)	Signature	Date
FOR N. Menard	Alicia J Boyd	1/15/14
Ecology Project Manager (printed)	Signature	Date
N/A		
EPA Project Manager (printed)	Signature	Date

REMAINING SITES VERIFICATION PACKAGE FOR THE 124-N-10, SANITARY SEWER SYSTEM NO. 10

Attachment to Waste Site Reclassification Form 2013-121

January 2014

REMAINING SITES VERIFICATION PACKAGE FOR THE 124-N-10, SANITARY SEWER SYTEM NO. 10

EXECUTIVE SUMMARY

The 124-N-10, Sanitary Sewer System No. 10 waste site, part or the 100-NR-1 Operable Unit, was included in the *Explanation of Significant Differences for the 100-NR-1 and 100-NR-2 Operable Units Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington* (N-Area ESD) (EPA 2011) and added to the *Interim Action Record of Decision for the 100-NR-1 and 100-NR-2 Operable Units, Hanford Site, Benton County Washington* (100-N Area ROD), U.S. Environmental Protection Agency, Region 10, Seattle, Washington (EPA 1999) as a remove, treat, and dispose site.

The 124-N-10 waste site encompassed the footprints of the 1904-N Sanitary Sewer Lagoon facility and the 1904-NA Sanitary Sewer Lift Station No. 1. The 1904-N Sanitary Sewer Lagoon facility consisted of a lined aeration pond, a lined stabilization pond, an unlined infiltration pond, and associated sewer system instrumentation and pipelines. The three-pond sewage lagoon received domestic wastewater sewage from the 100-N Area and domestic sewage that was pumped from septic tanks throughout the Hanford Site. The 1904-NA Sanitary Sewer Lift Station No. 1 facility consisted of a below-grade concrete wet well and a below-grade concrete valve pit, and was located approximately 9 m (30 ft) west of the 1904-N Sanitary Sewer Lagoon. The site, which began operation in February 1987, was located 1.6 m (1 mi) northwest of the intersection of N Avenue and Route 4 North cutoff, and is parallel with and north of the railroad tracks that intersect N Avenue.

Demolition of the 1904-N and 1904-NA facilities was performed in December 2012 through April 2013 by the Deactivation, Decontamination, Decommissioning, and Demolition (D4) project. Approximately 18,000 bank cubic meters (23,500 bank cubic yards) of soil and debris was disposed at the Environmental Restoration Disposal Facility. All physical components of the 1904-N and the 1904-NA facilities were removed. Hexavalent chromium was detected in an in-process soil sample above a remedial action goal; therefore, the D4 project removed additional soil from the sample location. Following D4 activities, the Field Remediation (FR) project collected in-process soil samples to determine if additional soil remediation was necessary from the 124-N-10 waste site prior to initiating verification sampling activities. The sample results indicated that the waste removal conducted by the D4 project was sufficient; therefore, no additional material was removed by the FR project. All material removed from the 124-N-10 waste site was direct loaded for disposal at the Environmental Restoration Disposal Facility.

Verification sampling was conducted on September 10, 2013, per the *Work Instruction for Verification Sampling of the 124-N-10, Sanitary Sewer System No. 10* (WCH 2013c). 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 124-N-10 waste site in accordance with the TPA-MP-14 procedure in the *Tri-Party Agreement Handbook Management Procedures* (DOE-RL 2011).

Table ES-1. Summary of Remedial Action Goals for the 124-N-10 Waste Site. (2 Pages)

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Direct Exposure – Radionuclides	Attain dose rate of <15 mrem/yr above background over 1,000 years.	Radionuclides were not COPCs for the 124-N-10 waste site.	NA
Direct Exposure – Nonradionuclides	Attain individual COPCs below RAGs.	All individual COPC concentrations are below the direct exposure criteria.	Yes
Risk Requirements – Nonradionuclides	Attain a hazard quotient of <1 for all individual noncarcinogens.	The hazard quotient for individual nonradionuclide COPCs are <1.	Yes
	Attain a cumulative hazard quotient of <1 for noncarcinogens.	The cumulative hazard quotient for all sampling areas (1.5×10^{-2}) is <1.	
	Attain an excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens.	The excess cancer risk for individual carcinogens is $<1 \times 10^{-6}$.	
	Attain a cumulative excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.	The total excess cancer risk (3.6×10^{-7}) is $<1 \times 10^{-5}$.	
Groundwater/River Protection – Radionuclides	Attain single-COPC groundwater and river protection RAGs.	Radionuclides were not COPCs for the 124-N-10 waste site.	NA
	Attain national primary drinking water standards [a]: 4 mrem/yr (beta/gamma) dose rate to target receptor/organs.	Radionuclides were not COPCs for the 124-N-10 waste site.	
	Meet drinking water standards for alpha emitters: the most stringent of the 15 pCi/L MCL or 1/25th of the derived concentration guides from DOE Order 5400.5 [b].	Radionuclides were not COPCs for the 124-N-10 waste site.	
	Meet total uranium standard of 30 µg/L (21.2 pCi/L) [c].	Radionuclides were not COPCs for the 124-N-10 waste site.	

Table ES-1. Summary of Remedial Action Goals for the 124-N-10 Waste Site. (2 Pages)

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Groundwater/River Protection – Nonradionuclides	Attain individual nonradionuclide groundwater and river cleanup requirements.	Residual concentrations of aroclor-1254 and benzo(a)pyrene exceed soil RAGs for groundwater and/or river protection. However, based on RESRAD modeling discussed in Appendix C of the 100-N Area RDR/RAWP (DOE-RL 2006b), it is predicted that these constituents will not reach groundwater (and thus the Columbia River) within 1,000 years [d].	Yes

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

[b] *Radiation Protection of the Public and 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] Based on the RESRAD modeling discussed in the 100-N Area RDR/RAWP (DOE-RL 2006b), residual concentrations of aroclor-1254 and benzo(a)pyrene are not expected to migrate more than 1 m (3.3 ft) vertically in 1,000 years (based on the lowest distribution coefficient [75.6 mL/g for aroclor-1254]). The vadose zone underlying the excavation is approximately 21 m (69 ft) thick. Therefore, residual concentrations of these contaminants are predicted to be protective of groundwater and the Columbia River.

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

In accordance with this evaluation, the verification sampling results support a reclassification of this site to Interim Closed Out. The current site conditions achieve the remedial action objectives and the corresponding remedial action goals established in the *Remedial Design Report/Remedial Action Work Plan for the 100-N Area* (DOE-RL 2006b) and the 100-N Area ROD (EPA 1999).

The verification sample results show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Contamination above direct exposure cleanup levels was not observed in shallow zone soils and is concluded not to be present in deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required.

Soil cleanup levels were established in the 100-N Area ROD (EPA 1999) based on a limited ecological risk assessment. Although not required by the 100-N Area ROD, a comparison against ecological risk screening levels has been made for the 124-N-10 waste site contaminants of potential concern and other constituents (Appendix A). The U.S. Environmental Protection Agency ecological soil screening levels were exceeded for manganese, vanadium, and zinc.

Ecological screening levels from *Washington Administrative Code* (WAC) 173-340, "Model Toxics Control Act – Cleanup," were exceeded for boron, mercury, and vanadium. Exceeding screening values is intended to trigger additional evaluation and does not necessarily indicate the existence of risk to ecological receptors. Because concentrations of manganese, mercury, vanadium, and zinc are below Hanford Site or Washington State background values (note that state background values are only used when Hanford Site background values are not available), it is believed that the presence of these constituents do not pose a risk to ecological receptors. All exceedances will be evaluated in the context of additional lines of evidence for ecological effects as a part of the final closeout decision for the Columbia River corridor portion of the Hanford Site.

REMAINING SITES VERIFICATION PACKAGE FOR THE 124-N-10, SANITARY SEWER SYSTEM NO. 10

STATEMENT OF PROTECTIVENESS

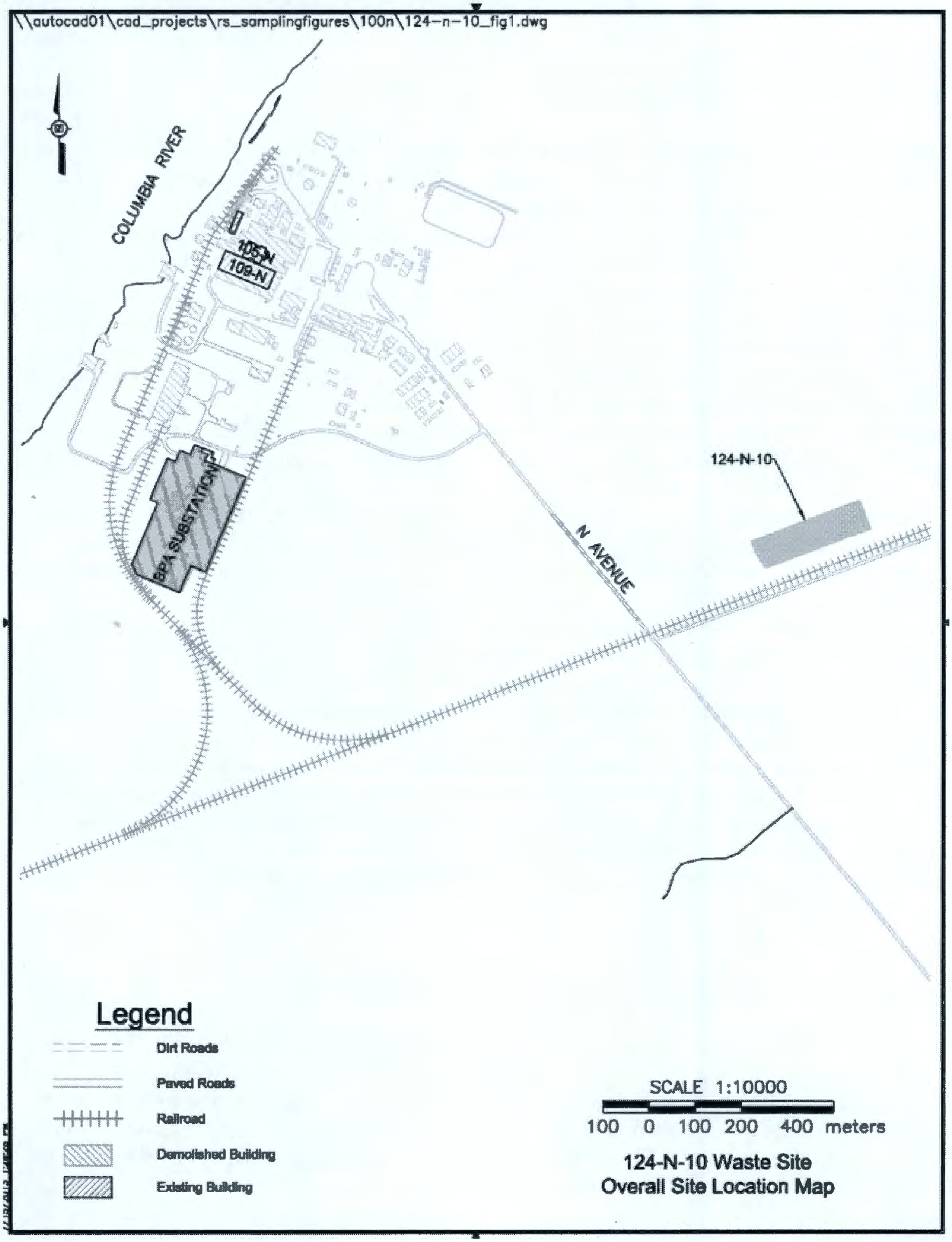
This report demonstrates that the 124-N-10, Sanitary Sewer System No. 10 waste site meets the objectives to support a reclassification of this site to Interim Closed Out as established in the *Remedial Design Report/Remedial Action Work Plan for the 100-N Area* (100-N Area RDR/RAWP) (DOE-RL 2006b) and the *Interim Action Record of Decision for the 100-NR-1 and 100-NR-2 Operable Units, Hanford Site, Benton County, Washington* (100-N Area ROD) (EPA 1999). The results of verification sampling and modeling show that residual soil concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Contamination above direct exposure cleanup levels was not observed in shallow zone soils and is concluded not to be present in deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required.

Soil cleanup levels were established in the 100-N Area ROD (EPA 1999) based on a limited ecological risk assessment. Although not required by the 100-N Area ROD, a comparison against ecological risk screening levels has been made for the 124-N-10 waste site contaminants of potential concern (COPCs), and other constituents (Appendix A). The U.S. Environmental Protection Agency ecological soil screening levels were exceeded for manganese, vanadium, and zinc. Ecological screening levels from *Washington Administrative Code* (WAC) 173-340, "Model Toxics Control Act – Cleanup," were exceeded for boron, mercury, and vanadium. Exceeding screening values is intended to trigger additional evaluation and does not necessarily indicate the existence of risk to ecological receptors. Because concentrations of manganese, mercury, vanadium, and zinc are below Hanford Site or Washington State background values (note that state background values are only used when Hanford Site background values are not available), it is believed that the presence of these constituents do not pose a risk to ecological receptors. All exceedances will be evaluated in the context of additional lines of evidence for ecological effects as a part of the final closeout decision for the Columbia River corridor portion of the Hanford Site.

GENERAL SITE INFORMATION AND BACKGROUND

The 124-N-10, 100-N Sanitary Sewer System No. 10 waste site included the 1904-N Sanitary Sewer Lagoon facility and the 1904-NA Sanitary Sewer Lift Station No. 1 within the waste site footprint. The 124-N-10, 100-N Sanitary Sewer System No. 10 waste site was located 1.6 km (1 mi) northwest of the intersection of N Avenue and Route 4 North (Figure 1). The system was designed for a maximum of 2,500 employees and a maximum design flow of 789,000 L (50,000 gal) per day. It began operation in February 1987.

Figure 1. Overall Site Location Map of the 124-N-10 Waste Site.



The 1904-N Sanitary Sewer Lagoon facility consisted of a lined aeration pond, a lined stabilization pond, an unlined infiltration pond, and associated sewer system instrumentation and pipelines. The three-pond sewage lagoon measured 251 m (823 ft) long by 67 m (220 ft) wide and processed sanitary sewage from buildings within the 100-N Area and elsewhere on the Hanford Site. Sanitary sewage would first undergo aerobic degradation of organic material in the lined aeration pond. It would then be transferred via a weir box into the lined stabilization pond where it would undergo both aerobic and anaerobic degradation of organic material. The remaining liquid would then be transferred via another weir box into the unlined infiltration pond where it would percolate into the underlying soil (WCH 2013b). Figure 2 is an aerial photograph of the 124-N-10 waste site prior to demolition and remediation activities.

Figure 2. December 2012 Aerial Photograph of the 124-N-10 Waste Site Before Demolition/Remediation.

The 1904-NA Sanitary Sewer Lift Station No. 1 facility consisted of a below-grade concrete wet well and a below-grade concrete valve pit, and was located approximately 9 m (30 ft) west of the 1904-N Sanitary Sewer Lagoon. The wet well had an interior diameter of 2 m (6 ft) and contained two submersible pumps for transferring sanitary sewage into the valve pit. The valve pit had a gravel bottom to allow for drainage and contained valves and metering equipment for controlling the system's flow rate. The 1904-NA facility was part of the collection system that transferred sanitary sewage from various facilities and buildings in the 100-N Area to the 1904-N Sanitary Sewer Lagoon (WCH 2013b).

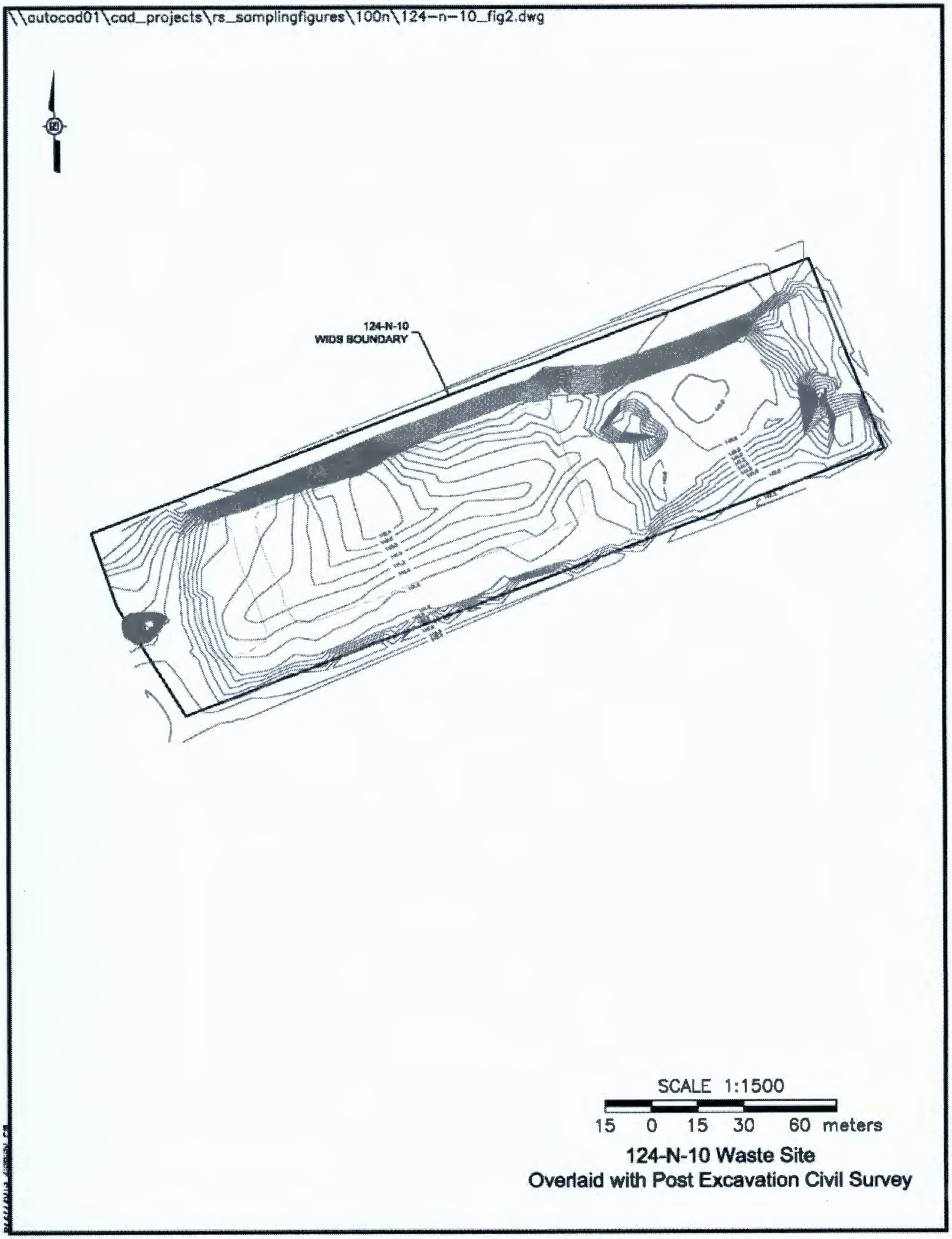
REMEDIAL ACTION SUMMARY

Demolition of the 1904-N and 1904-NA facilities was performed in December 2012 through April 2013 by the Deactivation, Decontamination, Decommissioning, and Demolition (D4) project (WCH 2013b). The depth of the excavation ranged from approximately 1 m (3 ft) to 3 m (9.8 ft) below ground surface. Approximately 18,000 bank cubic meters (23,500 bank cubic yards) of soil and debris was disposed at the Environmental Restoration Disposal Facility (ERDF). All physical components of the 1904-N and the 1904-NA facilities have been removed. Waste characterization samples and in-process soil samples were collected prior to and during the removal of the facilities and the underlying soil. Hexavalent chromium was detected in an in-process soil sample above a remedial action goal (RAG); therefore, additional soil was removed from the soil sample location. The in-process sample data is provided in Appendix B.

Following D4 activities, the Field Remediation (FR) project collected in-process soil samples to determine if additional soil remediation was necessary from the 124-N-10 waste site prior to initiating verification sampling activities. The sample results indicated that the waste removal conducted by D4 was sufficient; therefore, no additional material was removed by the FR project. No anomalies or stained soil were encountered during demolition and removal of the facilities and underlying soil (WCH 2013b). All material removed from the waste site was direct loaded for disposal at the ERDF; therefore, no staging pile areas are associated with the 124-N-10 waste site. Additionally, there is no overburden soil stockpile associated with the 124-N-10 waste site. An aerial photograph of the 124-N-10 waste site following remediation is provided in Figure 3. The post-excavation civil survey is provided in Figure 4.

Figure 3. April 2013 Aerial Photograph of the 124-N-10 Waste Site After Demolition/Remediation.

Figure 4. 124-N-10 Post-Excavation Civil Survey.



VERIFICATION SAMPLING

Verification sampling of the 124-N-10 waste site was conducted on September 10, 2013. Samples were collected to support a determination that residual contaminant concentrations at this site meet the cleanup criteria specified in the 100-N Area RDR/RAWP (DOE-RL 2006b) and the 100-N Area ROD (EPA 1999).

The verification sample results are provided in Appendix C and indicate that the waste removal action achieved compliance with the remedial action objectives (RAOs) and RAGs for the 124-N-10 waste site. The following subsections provide additional discussion of the information used to develop the verification sampling design. The statistical results of verification sampling are also summarized to support interim closure of the site. A more detailed discussion of the verification sample design can be found in the *Work Instruction for Verification Sampling of the 124-N-10, Sanitary Sewer System No. 10* (WCH 2013c).

Contaminants of Potential Concern

Because there were no previously identified COPCs listed for the 124-N-10 waste site, the COPCs were determined based on professional judgement as well as waste characterization and in-process samples collected prior to and during remediation of the site. The waste characterization and in-process sample results are provided in Appendix B.

Barium, cadmium, chromium (total), hexavalent chromium, copper, lead, manganese, molybdenum, nickel, selenium, silver, zinc, mercury, total petroleum hydrocarbons (TPH), benzo(b)fluoranthene, and aroclor-1254 were detected above RAGs in waste characterization and/or in-process samples collected from the 124-N-10 waste site; therefore, they were added as COPCs. Although nitrate was not detected above the RAG, it was included as a COPC for the 124-N-10 waste site.

The 124-N-10 is listed in the Waste Information Data System report as a nonradioactive waste site. Although in-process soil samples detected cesium-137, americium-241, and radium-226, they were detected below the Hanford Site background values for cesium-137 and radium-226 and well below the RAG for americium-241. Therefore, radionuclides were not included as COPCs.

Although not considered as COPCs, antimony, arsenic, beryllium, boron, cobalt, and vanadium were included in the expanded list of inductively coupled plasma metals. The analytical methods that were performed to evaluate the site COPCs are provided in Table 1.

Sample Design and Sampling Activities

One shallow zone decision unit was identified for the 124-N-10 waste site. Twelve statistical verification soil samples, a duplicate sample, and a split sample were collected from the waste site decision unit. Additionally, two focused samples were collected; one from the location where additional remediation was conducted because an in-process soil sample detected hexavalent chromium above a RAG, and one from the location of the former lift station.

Table 1. Laboratory Analytical Methods for the 124-N-10 Waste Site.

Analytical Method	Contaminants of Potential Concern
ICP metals [a] – EPA Method 6010	Barium, cadmium, chromium, copper, lead, manganese, molybdenum, nickel, selenium, silver, zinc
Mercury – EPA Method 7471	Mercury
Hexavalent chromium – EPA Method 7196	Hexavalent chromium
NO_2/NO_3 – EPA Method 353.2	Nitrate
PAH – EPA Method 8310	Polycyclic aromatic hydrocarbons
PCB – EPA Method 8082	Polychlorinated biphenyls
TPH – NWTPH-Dx Northwest	Total petroleum hydrocarbons

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

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

All sampling was performed in accordance with ENV-1, *Environmental Monitoring & Management*, to fulfill the requirements of the *100-N Area Sampling and Analysis Plan for CERCLA Waste Sites* (DOE-RL 2006a). All samples were grab samples collected at the predetermined coordinates, unless otherwise noted. Additional information related to verification sampling can be found in the field sampling logbook (WCH 2013a). The verification sample summary is provided in Table 2. A sample location map is provided in Figure 4.

Verification Sample Results

All verification samples were analyzed using U.S. Environmental Protection Agency (EPA)-approved analytical methods. A data summary is presented in Appendix C. Evaluation of the data from the 124-N-10 verification samples was performed by direct comparison of the statistical or maximum sample results for each COPC against the cleanup criteria.

The primary statistical calculation to evaluate compliance with cleanup standards is the 95% upper confidence limit (UCL) on the arithmetic mean of the data. The 95% UCL values for each detected COPC are computed for the 124-N-10 decision unit as specified by the 100-N Area RDR/RAWP (DOE-RL 2006b). The calculations are provided in Appendix C. When a nonradionuclide COPC was detected in fewer than 50% of the verification samples collected for the decision unit, the maximum detected value was used for comparison to RAGs. If no detections for a given COPC were reported in the data set, then no statistical calculation or evaluation was performed for that COPC. The sample results for each focused sample were evaluated using the maximum detected concentration for each COPC and comparing the value directly to the RAG.

Table 2. 124-N-10 Waste Site Verification Sample Summary Table.

Sample Location	HEIS Sample Number	Washington State Plane		Sample Analysis
		Northing (m)	Easting (m)	
EXC-1	J1T0M5	148827.3	572336.5	ICP metals [a], mercury, hexavalent chromium, NO_2/NO_3, PAH, PCB, TPH
EXC-2	J1T0M6	148862.8	572327.5	
EXC-3	J1T0M7	148852.8	572362.7	
EXC-4	J1T0M8	148888.3	572353.7	
EXC-5	J1T0M9	148878.3	572388.9	
EXC-6	J1T0N0	148868.4	572424.1	
EXC-7	J1T0N1	148903.8	572415.1	
EXC-8	J1T0N2	148893.9	572450.3	
EXC-9	J1T0N3	148883.9	572485.5	
EXC-10	J1T0N4	148919.4	572476.5	
EXC-11	J1T0N5	148909.4	572511.7	
EXC-12	J1T0N6	148944.9	572502.7	
Duplicate of EXC-9	J1T0N7	148883.9	572485.5	
Split of EXC-9	J1T0P1	148883.9	572485.5	
FS-1 [b]	J1T0N8	148906.9	572453.0	
FS-2 [c]	J1T0N9	148840.4	572297.6	
Equipment blank	J1T0P0	NA	NA	ICP metals [a], mercury

[a] Analysis for the expanded list of ICP metals was performed to include antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.

[b] Focused sample located where additional remediation was conducted because an in-process sample detected hexavalent chromium above the remedial action goal.

[c] Focused sample at the location of the former lift station.

HEIS = Hanford Environmental Information System
ICP = inductively coupled plasma
NA = not applicable
PAH = polycyclic aromatic hydrocarbons
PCB = polychlorinated biphenyl
TPH = total petroleum hydrocarbons

Figure 4. Statistical and Focused Verification Sample Locations for the 124-N-10 Waste Sites.

Comparisons of the results for each COPC from the 124-N-10 waste site against the RAGs are summarized in Tables 3 and 4. Contaminants that were not detected by laboratory analysis are excluded from the table. Calculated cleanup levels are not presented in the Cleanup Levels and Risk Calculations Database (Ecology 2012) under WAC 173-340-740(3) for calcium, magnesium, potassium, silicon, and sodium. The EPA's *Risk Assessment Guidance for Superfund* (EPA 1989) recommends that aluminum and iron not be considered in site risk evaluations. Therefore, aluminum, calcium, iron, magnesium, potassium, silicon, and sodium are not considered site COPCs and are also not included in the table. The complete laboratory results for all constituents are stored in a Washington Closure Hanford (WCH) project-specific database prior to archival in the Hanford Environmental Information System (HEIS) and are presented in Attachment 1 of the 95% UCL calculations (Appendix C).

DATA EVALUATION

This section demonstrates that contaminant concentrations at the 124-N-10 waste site achieve the applicable RAGs developed to support unrestricted land use at the 100 Area as established in the 100-N Area ROD (EPA 1999) and documented in the 100-N Area RDR/RAWP (DOE-RL 2006b).

Table 3. Comparison of Contaminant Concentrations to Remedial Action Goals for the 124-N-10 Waste Site Statistical Verification Samples

COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals (mg/kg) [a]			Does the Result Exceed RAGs?	Does the Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	3.0 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	66.9 (<BG)	16,000	200	400	No	--
Beryllium	0.27 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Boron [e]	0.97	16,000	320	-- [f]	No	--
Cadmium [g]	0.19 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium	9.6 (<BG)	120,000	18.5 [c]	18.5 [c]	No	--
Cobalt	7.5 (<BG)	1,600	32	-- [f]	No	--
Copper	18.9 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [e]	0.229	2.1 [d]	4.8	2	No	--
Lead	4.3 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	311 (<BG)	11,200	512 [c]	-- [f]	No	--
Mercury	0.11 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Molybdenum [e]	0.30	400	8	-- [f]	No	--
Nickel	10.2 (<BG)	1,600	19.1 [c]	27.4	No	--
Silver	0.60 (<BG)	400	8	0.73 [c]	No	--
Vanadium	46.5 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	54.6 (<BG)	24,000	480	67.8 [c]	No	--
Nitrogen in nitrite and nitrate [h]	31.9	128,000	1,000	2,000	No	--
TPH – diesel range	46	--	200	200	No	--
TPH – diesel range, extended	136	--	200	200	No	--
Aroclor-1254	0.021	0.5	0.017 [i]	0.017 [i]	Yes	Yes [j]
Benzo(a)pyrene [h]	0.028	0.137	0.015 [i]	0.015 [i]	Yes	Yes [j]
Chrysene [h]	0.0071	137	1.2	0.10 [i]	No	--
Fluorene	0.026	3,200	64	260	No	--

[a] RAGs obtained from the 100-N Area RDR/RAWP (DOE-RL 2006b), or the 100 Area RDR/RAWP (DOE-RL 2009) where indicated.

[b] Maximum or 95% UCL, depending on data censorship, as described in the *124-N-10 Cleanup Verification 95% UCL Calculations* (Appendix C).

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (Ecology 1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.12.1 of the 100-N Area RDR/RAWP (DOE-RL 2006b).

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

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

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

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

[h] Remedial action goals obtained from the 100 Area RDR/RAWP (DOE-RL 2009).

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

[j] Based on RESRAD modeling discussed in Appendix C of the 100-N Area RDR/RAWP (DOE-RL 2006b), the residual concentrations of aroclor-1254 and benzo(a)pyrene are predicted to migrate less than 1 m (3.3 ft) vertically within 1,000 years (based on the lowest soil-partitioning coefficient of the contaminants [aroclor-1254] of 75.6 mL/g). The vadose zone beneath the 124-N-10 waste site is approximately 21 m (69 ft) thick. Therefore, the residual concentrations of aroclor-1254 and benzo(a)pyrene are predicted to be protective of groundwater and the Columbia River.

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COPC = contaminant of potential concern
Ecology = Washington State Department of Ecology
RAG = remedial action goal
RDL = required detection limit
RDR/RAWP = Remedial Design Report/Remedial Action Work Plan
RESRAD = RESidual RADioactivity (dose model)
TPH = total petroleum hydrocarbons
UCL = upper confidence limit
WAC = *Washington Administrative Code*

Table 4. Comparison of Maximum Contaminant Concentrations to Remedial Action Goals for the 124-N-10 Waste Site Focused Verification Samples.

COPC	Maximum Result [b] (mg/kg)	Remedial Action Goals (mg/kg) [a]			Does the Result Exceed RAGs?	Does the Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	2.7 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	62.1 (<BG)	16,000	200	400	No	--
Beryllium	0.25 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Cadmium [e]	0.16 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium	8.9 (<BG)	120,000	18.5 [c]	18.5 [c]	No	--
Cobalt	8.1 (<BG)	1,600	32	-- [f]	No	--
Copper	15.5 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [g]	0.182	2.1 [d]	4.8	2	No	--
Lead	4.7 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	282 (<BG)	11,200	512 [c]	-- [f]	No	--
Mercury	0.0055 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Molybdenum [g]	0.29	400	8	-- [f]	No	--
Nickel	9.6 (<BG)	1,600	19.1 [c]	27.4	No	--
Silver	0.25 (<BG)	400	8	0.73 [c]	No	--
Vanadium	50.8 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	58.9 (<BG)	24,000	480	67.8 [c]	No	--
Nitrogen in nitrite and nitrate [h]	35.4	128,000	1,000	2,000	No	--
TPH – diesel range	3.9	--	200	200	No	--
TPH – diesel range, extended	7.4	--	200	200	No	--
Aroclor-1254	0.0086	0.5	0.017 [i]	0.017 [i]	No	--

[a] RAGs obtained from the 100-N Area RDR/RAWP (DOE-RL 2006b), or the 100 Area RDR/RAWP (DOE-RL 2009) where indicated.
[b] Maximum value, as described in the *124-N-10 Cleanup Verification 95% UCL Calculations* (Appendix C).
[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (Ecology 1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.12.1 of the 100-N Area RDR/RAWP (DOE-RL 2006b).
[d] Carcinogenic cleanup level calculated based on the inhalation exposure pathway (WAC 173-340-750[3], Ecology 1996) using an airborne particulate mass-loading rate of 0.0001 g/m^3 (*Hanford Guidance for Radiological Cleanup* [WDOH 1997]).
[e] Hanford Site-specific background not available. Value is Washington State background from *Natural Background Soil Metals Concentrations in Washington State* (Ecology 1994).
[f] No parameters (bioconcentration factors or AWQC values) are available from the Ecology Cleanup Levels and Risk Calculations database or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], 1996 [Method B for surface waters]).
[g] No Hanford Site-specific or Washington State background value available.
[h] Remedial action goals obtained from the 100 Area RDR/RAWP (DOE-RL 2009).
[i] Where cleanup levels are less than RDLs, cleanup levels default to RDLs per WAC 173-340-707(2) (Ecology 1996).

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COPC = contaminant of potential concern
Ecology = Washington State Department of Ecology
RAG = remedial action goal
RDL = required detection limit
RDR/RAWP = Remedial Design Report/Remedial Action Work Plan
RESRAD = RESidual RADioactivity (dose model)
TPH = total petroleum hydrocarbons
UCL = upper confidence limit
WAC = *Washington Administrative Code*

Attainment of Nonradionuclide RAGS

Tables 3 and 4 compare the cleanup verification sample values for the 124-N-10 waste site excavation to the applicable soil RAGs for direct exposure, protection of groundwater, and protection of the Columbia River. All COPCs were quantified below direct exposure RAGs. All COPCs were quantified below groundwater and/or river protection soil RAGs with the exception of aroclor-1254 and benzo(a)pyrene. However, given the lowest soil-partitioning coefficient of these contaminants (aroclor-1254) of 75.6 mL/g , they would be expected to migrate less than 1 m (3.3 ft) vertically in 1,000 years based on RESidual RADioactivity (RESRAD) modeling discussed in Appendix C of the 100-N Area RDR/RAWP (DOE-RL 2006b). The vadose zone beneath the 124-N-10 waste site is approximately 21 m (69 ft) thick. Therefore, residual concentrations of aroclor-1254 and benzo(a)pyrene are predicted to be protective of groundwater (and thus the Columbia River).

Three-Part Test for Nonradionuclides

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

The application of the three-part test for the 124-N-10 waste site is included in the 95% UCL calculations, where half or more of the data set was detected (Appendix C). The results of this evaluation indicate that residual COPC concentrations pass the three-part test in comparison against applicable RAGs, with the exception of copper and silver, which fail one part of the three-part test to be protective of groundwater and the Columbia River. However, based on RESRAD modeling discussed in Appendix C of the 100-N Area RDR/RAWP (DOE-RL 2006b), the residual concentrations of these constituents are predicted to migrate less than 3 m (9.8 ft) vertically within 1,000 years (based on the contaminant with the lowest soil-partitioning coefficient [K_d] [copper with a K_d of 22 mL/g]). The vadose zone beneath the 124-N-10 waste site is approximately 21 m (69 ft) thick. Based on RESRAD modeling, constituents with a soil-partitioning coefficient of 3.6 mL/g or greater are not predicted to migrate through a vadose zone of this thickness and reach groundwater in 1,000 years. Therefore, the residual concentrations of these contaminants are predicted to be protective of groundwater and the Columbia River.

An additional application of the three-part test is included for the statistical data sets that default to the maximum because less than half of the data set was detected. The results of this evaluation indicate that residual COPC concentrations pass the three-part test in comparison against applicable RAGs with the exception of aroclor-1254 and benzo(a)pyrene, which fail one part of the three-part test. However, based on RESRAD modeling discussed in Appendix C of the 100-N Area RDR/RAWP (DOE-RL 2006b), the residual concentrations of these constituents are predicted to migrate less than 1 m (3.3 ft) vertically within 1,000 years (based on the contaminant with the lowest soil-partitioning coefficient [K_d] [aroclor-1254 with a K_d of 75.6 mL/g]). As stated above, the vadose zone beneath the 124-N-10 waste site is approximately 21 m (69 ft) thick. Based on RESRAD modeling, constituents with a soil-partitioning coefficient of 3.6 mL/g or greater are not predicted to migrate through a vadose zone of this thickness and reach groundwater in 1,000 years. Therefore, the residual concentrations of these contaminants are predicted to be protective of groundwater and the Columbia River.

Nonradionuclide Direct Contact Hazard Quotient and Carcinogenic Risk RAGs Attained

Nonradionuclide risk requirements include an individual hazard quotient of less than 1.0, a cumulative hazard quotient of less than 1.0, an individual contaminant carcinogenic risk of less than 1 x 10^{-6}, and a cumulative carcinogenic risk of less than 1 x 10^{-5}. For the 124-N-10 waste site, these risk values were not calculated for constituents that were either not detected or were detected at concentrations below Hanford Site or Washington State background. Although TPH (diesel range extended) were detected and no background value is available, the risk associated with TPH does not contribute to the cumulative toxicity calculation. All individual hazard quotients for noncarcinogenic constituents were less than 1.0. The cumulative hazard quotient for those noncarcinogenic constituents above background or detected levels is 1.5 x 10^{-2}. The individual carcinogenic risk values for the carcinogenic constituents detected above background are less than 1 x 10^{-6}, and the cumulative carcinogenic risk value is 3.6 x 10^{-7}, which is less than 1 x 10^{-5}. The 124-N-10 waste site meets the requirements for the direct contact hazard quotient and excess carcinogenic risk as identified in the 100-N Area RDR/RAWP (DOE-RL 2006b).

Nonradionuclide Groundwater Hazard Quotient and Carcinogenic Risk RAGs Attained

Assessment of the risk requirements for the 124-N-10 waste site included a calculation of the hazard quotient and carcinogenic (excess cancer) risk values for groundwater protection for nonradionuclides. The requirements include an individual and cumulative hazard quotient of less than 1.0, an individual excess carcinogenic risk of less than 1 x 10^{-6}, and a cumulative excess carcinogenic risk of less than 1 x 10^{-5}. Risk values were calculated for constituents that were detected at concentrations above Hanford Site or Washington State background values or for which there is no background value. In addition, the soil-partitioning coefficients for these contaminants must be less than that necessary to show no migration to groundwater in 1,000 years based on RESRAD modeling discussed in Appendix C of the 100-N Area RDR/RAWP (DOE-RL 2006b). Based on this model and a vadose zone of approximately 21 m (69 ft) in thickness, a K_d of 3.6 or greater is required to show no predicted migration to groundwater in 1,000 years. All individual hazard quotients for noncarcinogenic constituents are less than 1.0. The cumulative hazard quotient for the 124-N-10 waste site is 6.5 x 10^{-2}, which is less than 1.0. No carcinogenic soil constituents met the criteria for groundwater protection evaluation at the 124-N-10 waste site; therefore, no calculations of excess carcinogenic risk were performed and nonradionuclide risk requirements related to groundwater are met.

Attainment of Radionuclide Direct Exposure RAGs

There were no radionuclide COPCs identified for the 124-N-10 waste site; therefore, no evaluation was conducted.

DATA QUALITY ASSESSMENT

A data quality assessment (DQA) was performed to compare the verification sampling approach (WCH 2013c), the field logbook (WCH 2013a), and resulting analytical data with the sampling and data quality requirements specified by the project objectives and performance specifications. The DQA is provided in Appendix D.

The DQA for the 124-N-10 waste site established that the data are of the right type, quality, and quantity to support site closeout decisions within specified error tolerances. The evaluation verified that the sample design was sufficient for the purpose of clean site verification. The cleanup verification sample analytical data are stored in the WCH project-specific database for data evaluation prior to archival in the HEIS and are summarized in Appendix C.

SUMMARY FOR INTERIM CLOSURE

The 124-N-10 waste site has been evaluated in accordance with the 100-N Area ROD (EPA 1999) and the 100-N Area RDR/RAWP (DOE-RL 2006b). Verification sampling was performed, and the analytical results indicate that the residual concentrations of COPCs at the site meet the RAOs for direct exposure, groundwater protection, and river protection.

In accordance with this evaluation, the verification sampling results support a reclassification of the 124-N-10 waste site to Interim Closed Out. Contamination above direct exposure levels was not observed in the shallow zone soils and is concluded to not exist in deep zone soils. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the sites are not required.

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APPENDIX A

ECOLOGICAL RISK COMPARISON TABLE

Table A-1. Maximum Contaminant Concentrations that Exceed Ecological Screening Levels for the 124-N-10 Waste Site [a].

Hazardous Substance		2007 WAC 173-340 Table 749-3			EPA Ecological Soil Screening Levels [b]				Waste Site Analyses
		Plants	Soil Biota	Wildlife	Plants	Soil Biota	Avian [c]	Mammalian [c]	
Metals (mg/kg)									
	Background								
Boron	--	0.5	--	--	--	--	--	--	0.97
Manganese	512	1,100 [d]	--	1,500	220	450	4,300	4,000	311 (<BG)
Mercury	0.33	0.3	0.1	5.5	--	--	--	--	0.11 (<BG)
Vanadium	85.1	2	--	--	--	--	7.8	280	50.8 (<BG)
Zinc	67.8	86 [d]	200	360	160	120	46	79	58.9 (<BG)

NOTE: Shaded cells indicate an ecological screening level exceedance.

[a] Exceedance of screening values does not necessarily indicate the existence of risk to ecological receptors. All exceedances must be evaluated in the context of additional lines of evidence for ecological effects following a baseline risk assessment for the river corridor portion of the Hanford Site, which will include a more complete quantitative ecological risk assessment.

[b] Available on the Internet at www.epa.gov/ecotox/ecossl.

[c] Wildlife.

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

-- = no value exists
BG = background
EPA = U.S. Environmental Protection Agency
WAC = *Washington Administrative Code*

APPENDIX B

IN-PROCESS SAMPLE RESULTS

124-N-10 In-Process Sample Data. (14 pages)

Sample Number	Sample Date	Sample Location	Northing	Easting	Aluminum			Antimony			Arsenic			Barium			Beryllium		
					mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
J1R3H8	10/15/2012	1904-N			454		3.68	0.408	B	0.441	0.735	U	0.735	50.7		0.368	0.147	U	0.147
J1R461	10/22/2012	1904-N			139		4.03	0.484	U	0.484	0.806	U	0.806	15.8		0.403	0.161	U	0.161
J1R462	10/22/2012	1904-N			545		4.03	0.783		0.484	0.806	U	0.806	41.2		0.403	0.161	U	0.161
J1R463	10/22/2012	1904-N			182		3.85	0.462	U	0.462	0.769	U	0.769	28.9		0.385	0.154	U	0.154
J1R464	10/22/2012	1904-N			195		3.97	0.476	U	0.476	0.794	U	0.794	31.7		0.397	0.159	U	0.159
J1R5L5	11/14/2012	1904-NA			2260		25.9	3.91		3.11	11.7		5.18	140		2.59	1.04	U	1.04
J1R5M0	11/14/2012	1904-NA																	
J1RJD6	3/19/2013	124-N-10, # 1a	148883.4	572333.3	9330	X	1.5	0.37	U	0.37	3.1		0.64	81.8	X	0.074	0.51		0.032
J1RJD7	3/19/2013	124-N-10, # 2a	148911.2	572403.6	9200	X	1.6	0.4	U	0.4	2.7		0.7	83.4	X	0.081	0.46		0.035
J1RJD8	3/19/2013	124-N-10, # 3a	148916.2	572505.2	7240	X	1.5	0.38	U	0.38	2.9		0.65	62.6	X	0.075	0.49		0.033
J1RJD9	3/19/2013	124-N-10, # 4a	148906.9	572453.0	7970	X	2.1	1.1		0.51	1.7		0.88	558	X	0.1	0.29		0.044
J1RJF0	3/19/2013	124-N-10, # 5a	148857.1	572425.8	8100	X	1.6	0.4	U	0.4	2.1		0.69	73.6	X	0.079	0.51		0.034
J1RJF1	3/19/2013	124-N-10, # 6a	148836.7	572369.2	6220	X	1.5	0.37	U	0.37	2		0.64	51.3	X	0.074	0.46		0.032
J1RMM3	5/16/2013	124-N-10, # 1b	148922.9	572484.4	6610	X	1.3	0.33	U	0.33	2.4		0.57	57.6	X	0.066	0.34		0.029
J1RMM4	5/16/2013	124-N-10, # 2b	148906.2	572476.5	7290	X	1.4	0.34	U	0.34	2.2		0.59	53.6	X	0.069	0.34		0.03
J1RMM5	5/16/2013	124-N-10, # 3b			5640	X	1.4	0.34	U	0.34	2		0.59	46.1	X	0.068	0.33		0.029
J1RMM6	5/16/2013	124-N-10, #4b	148865.0	572447.4	8950	X	1.5	0.38	U	0.38	2.6		0.65	81	X	0.075	0.37		0.033
J1RMM7	5/16/2013	124-N-10, #5b	148885.3	572419.5	6100	X	1.4	0.35	U	0.35	2.9		0.61	54.5	X	0.07	0.25		0.031
J1RMM8	5/16/2013	124-N-10 #6b	148863.4	572405.7	5710	X	1.4	0.35	U	0.35	2.5		0.61	53.4	X	0.07	0.26		0.031
J1RMM9	5/16/2013	124-N-10, #7b	148861.8	572371.8	5540	X	1.5	0.38	U	0.38	2.5		0.65	48.7	X	0.075	0.26		0.033
J1RMN0	5/16/2013	124-N-10, #8b	148841.3	572299.2	5250	X	1.3	0.32	U	0.32	2.6		0.56	43.1	X	0.065	0.21		0.028

Sample Number	Sample Date	Sample Location	Northing	Easting	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
J1R3H8	10/15/2012	1904-N			0.911	B	1.47	0.36		0.147	1530		73.5	4.31		0.147	1.47	U	1.47
J1R461	10/22/2012	1904-N			1.61	U	1.61	0.0922	B	0.161	618		80.6	0.78		0.161	1.61	U	1.61
J1R462	10/22/2012	1904-N			0.749	B	1.61	0.246		0.161	1890		80.6	3.9		0.161	1.61	U	1.61
J1R463	10/22/2012	1904-N			1.16	B	1.54	0.105	B	0.154	2270		76.9	0.952		0.154	1.54	U	1.54
J1R464	10/22/2012	1904-N			1.33	B	1.59	0.115	B	0.159	2650		79.4	0.913		0.159	1.59	U	1.59
J1R5L5	11/14/2012	1904-NA			10.4	U	10.4	0.508	B	1.04	8690		518	79.5		1.04	10.7		10.4
J1R5M0	11/14/2012	1904-NA																	
J1RJD6	3/19/2013	124-N-10, # 1a	148883.4	572333.3	1.7	BM	0.95	0.071	B	0.04	5800	X	13.7	11.7		0.056	8.7	X	0.097
J1RJD7	3/19/2013	124-N-10, # 2a	148911.2	572403.6	1.4	B	1	0.043	U	0.043	4320	X	14.9	12.1		0.061	8.1	X	0.11
J1RJD8	3/19/2013	124-N-10, # 3a	148916.2	572505.2	0.98	B	0.97	0.076	B	0.04	6390	X	13.9	7.9		0.057	8.5	X	0.099
J1RJD9	3/19/2013	124-N-10, # 4a	148906.9	572453.0	9.4		1.3	1.2		0.055	14700	X	18.8	23.8		0.077	4.9	X	0.13
J1RJF0	3/19/2013	124-N-10, # 5a	148857.1	572425.8	1.1	B	1	0.071	B	0.043	5620	X	14.7	10		0.061	9.3	X	0.1
J1RJF1	3/19/2013	124-N-10, # 6a	148836.7	572369.2	0.95	U	0.95	0.1	B	0.04	6410	X	13.7	6.4		0.056	8.9	X	0.097
J1RMM3	5/16/2013	124-N-10, # 1b	148922.9	572484.4	0.94	BN	0.85	0.22		0.036	4870	X	12.3	7.2	X	0.051	7.4	X	0.087
J1RMM4	5/16/2013	124-N-10, # 2b	148906.2	572476.5	1	B	0.88	0.21		0.037	3950	X	12.7	8.5	X	0.052	6.8	X	0.09
J1RMM5	5/16/2013	124-N-10, # 3b			0.88	U	0.88	0.19		0.037	3550	X	12.6	5.7	X	0.052	7.4	X	0.089
J1RMM6	5/16/2013	124-N-10, #4b	148865.0	572447.4	1.8	B	0.97	0.23		0.041	3940	X	14	10.5	X	0.057	7.1	X	0.099
J1RMM7	5/16/2013	124-N-10, #5b	148885.3	572419.5	0.91	U	0.91	0.21		0.038	8880	X	13	9.6	X	0.054	5.1	X	0.092
J1RMM8	5/16/2013	124-N-10 #6b	148863.4	572405.7	0.91	U	0.91	0.2		0.038	6530	X	13.1	6.4	X	0.054	5.7	X	0.093
J1RMM9	5/16/2013	124-N-10, #7b	148861.8	572371.8	0.97	U	0.97	0.21		0.04	7280	X	13.9	7.6	X	0.057	5.8	X	0.099
J1RMN0	5/16/2013	124-N-10, #8b	148841.3	572299.2	0.84	U	0.84	0.15	B	0.035	6160	X	12	9.6	X	0.049	4.1	X	0.085

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Sample Number	Sample Date	Sample Location	Northing	Easting	Copper			Iron			Lead			Magnesium			Manganese		
					mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
J1R3H8	10/15/2012	1904-N			56.1		0.735	1810		14.7	5.45		0.368	226		55.1	15.2		3.68
J1R461	10/22/2012	1904-N			15.6		0.806	373		16.1	1.03		0.403	78.7		60.5	4.18		4.03
J1R462	10/22/2012	1904-N			39.5		0.806	1920		16.1	2.78		0.403	262		60.5	16.9		4.03
J1R463	10/22/2012	1904-N			15.5		0.769	507		15.4	1.23		0.385	180		57.7	12.4		3.85
J1R464	10/22/2012	1904-N			17.2		0.794	583		15.9	1.19		0.397	211		59.5	14.7		3.97
J1R5L5	11/14/2012	1904-NA			318		5.18	180000		104	13.3		2.59	1430		389	638		25.9
J1R5M0	11/14/2012	1904-NA																	
J1RJD6	3/19/2013	124-N-10, # 1a	148883.4	572333.3	16.3		0.21	22400	X	3.7	5		0.26	5010		3.6	388		0.097
J1RJD7	3/19/2013	124-N-10, # 2a	148911.2	572403.6	14.7		0.23	20700	X	4	5.1		0.29	4870		3.9	345		0.11
J1RJD8	3/19/2013	124-N-10, # 3a	148916.2	572505.2	15.9		0.21	22200	X	3.8	4.4		0.27	4390		3.7	320		0.099
J1RJD9	3/19/2013	124-N-10, # 4a	148906.9	572453.0	199		0.29	16100	X	5.1	48.4		0.36	4070		4.9	283		0.13
J1RJF0	3/19/2013	124-N-10, # 5a	148857.1	572425.8	18.2		0.23	23500	X	4	4.8		0.28	5110		3.9	333		0.1
J1RJF1	3/19/2013	124-N-10, # 6a	148836.7	572369.2	16.7		0.21	21300	X	3.7	3.5		0.26	4460		3.6	284		0.097
J1RMM3	5/16/2013	124-N-10, # 1b	148922.9	572484.4	17.3	X	0.19	20600	X	3.3	3		0.24	4280	X	3.2	324	X	0.087
J1RMM4	5/16/2013	124-N-10, # 2b	148906.2	572476.5	15.6	X	0.2	20300	X	3.4	3.4		0.24	4480	X	3.3	278	X	0.09
J1RMM5	5/16/2013	124-N-10, # 3b			15	X	0.19	20500	X	3.4	3.4		0.24	4550	X	3.3	279	X	0.089
J1RMM6	5/16/2013	124-N-10, #4b	148865.0	572447.4	14.8	X	0.21	20000	X	3.8	4.2		0.27	4310	X	3.7	367	X	0.099
J1RMM7	5/16/2013	124-N-10, #5b	148885.3	572419.5	14.3	X	0.2	14400	X	3.5	3		0.25	4540	X	3.4	288	X	0.092
J1RMM8	5/16/2013	124-N-10 #6b	148863.4	572405.7	17.9	X	0.2	15600	X	3.5	2.8		0.25	3750	X	3.4	251	X	0.093
J1RMM9	5/16/2013	124-N-10, #7b	148861.8	572371.8	14.9	X	0.21	16900	X	3.8	2.4		0.27	4080	X	3.7	255	X	0.099
J1RMN0	5/16/2013	124-N-10, #8b	148841.3	572299.2	10.8	X	0.19	12100	X	3.2	2.5		0.23	3570	X	3.2	205	X	0.085

Sample Number	Sample Date	Sample Location	Northing	Easting	Molybdenum			Nickel			Potassium			Selenium			Silicon		
					mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
J1R3H8	10/15/2012	1904-N			0.8	B	1.47	3.88		2.94	117	B	294	0.447		0.221	87.6		1.47
J1R461	10/22/2012	1904-N			0.253	B	1.61	1.32	B	3.23	76.4	B	323	0.242	U	0.242	71.5		1.61
J1R462	10/22/2012	1904-N			0.947	B	1.61	2.67	B	3.23	127	B	323	0.364		0.242	86.2		1.61
J1R463	10/22/2012	1904-N			1.54	U	1.54	0.822	B	3.08	183	B	308	0.275		0.231	78		1.54
J1R464	10/22/2012	1904-N			1.59	U	1.59	1.32	B	3.17	254	B	317	0.302		0.238	84.7		1.59
J1R5L5	11/14/2012	1904-NA			47.2		10.4	464		20.7	541	B	2070	1.89		1.55	684		10.4
J1R5M0	11/14/2012	1904-NA																	
J1RJD6	3/19/2013	124-N-10, # 1a	148883.4	572333.3	0.36	B	0.25	12.4	X	0.12	1710		39.9	0.84	U	0.84	276	N	5.5
J1RJD7	3/19/2013	124-N-10, # 2a	148911.2	572403.6	0.28	U	0.28	12.5	X	0.13	1890		43.4	0.91	U	0.91	291		6
J1RJD8	3/19/2013	124-N-10, # 3a	148916.2	572505.2	0.26	U	0.26	9.8	X	0.12	1370		40.5	0.85	U	0.85	225		5.6
J1RJD9	3/19/2013	124-N-10, # 4a	148906.9	572453.0	1.4	B	0.35	17.5	X	0.16	1730		54.6	2.8		1.1	244		7.5
J1RJF0	3/19/2013	124-N-10, # 5a	148857.1	572425.8	0.27	U	0.27	12.1	X	0.13	1470		42.8	0.9	U	0.9	246		5.9
J1RJF1	3/19/2013	124-N-10, # 6a	148836.7	572369.2	0.25	U	0.25	10.2	X	0.12	1020		39.9	0.84	U	0.84	168		5.5
J1RMM3	5/16/2013	124-N-10, # 1b	148922.9	572484.4	0.29	B	0.23	8.7	X	0.11	1370		35.7	0.75	U	0.75	252	XN	4.9
J1RMM4	5/16/2013	124-N-10, # 2b	148906.2	572476.5	0.25	B	0.23	10	X	0.11	1390		37	0.78	U	0.78	225	X	5.1
J1RMM5	5/16/2013	124-N-10, # 3b			0.26	B	0.23	8.2	X	0.11	1120		36.6	0.77	U	0.77	195	X	5.1
J1RMM6	5/16/2013	124-N-10, #4b	148865.0	572447.4	0.26	U	0.26	10.8	X	0.12	1930		40.6	0.85	U	0.85	358	X	5.6
J1RMM7	5/16/2013	124-N-10, #5b	148885.3	572419.5	0.28	B	0.24	9.8	X	0.11	1110		37.9	0.8	U	0.8	236	X	5.2
J1RMM8	5/16/2013	124-N-10 #6b	148863.4	572405.7	0.3	B	0.24	7.6	X	0.11	989		38	0.8	U	0.8	233	X	5.2
J1RMM9	5/16/2013	124-N-10, #7b	148861.8	572371.8	0.26	B	0.26	8.5	X	0.12	986		40.5	0.85	U	0.85	205	X	5.6
J1RMN0	5/16/2013	124-N-10, #8b	148841.3	572299.2	0.22	U	0.22	8.6	X	0.1	884		35	0.73	U	0.73	221	X	4.8

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Sample Number	Sample Date	Sample Location	Northing	Easting	Silver			Sodium			Vanadium			Zinc			Hexavalent Chromium		
					mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
J1R3H8	10/15/2012	1904-N			1.53		0.147	67		36.8	2.5		1.84	321		7.35			
J1R461	10/22/2012	1904-N			0.355		0.161	56.3		40.3	0.564	B	2.02	75.7		8.06			
J1R462	10/22/2012	1904-N			1.03		0.161	72.1		40.3	3.27		2.02	190		8.06			
J1R463	10/22/2012	1904-N			1.11		0.154	110		38.5	0.6	B	1.92	64.4		7.69			
J1R464	10/22/2012	1904-N			1.26		0.159	158		39.7	0.702	B	1.98	72.8		7.94			
J1R5L5	11/14/2012	1904-NA			1.04	U	1.04	261		259	15.6		13	799		51.8			
J1R5M0	11/14/2012	1904-NA															0.155	U	0.155
J1RJD6	3/19/2013	124-N-10, # 1a	148883.4	572333.3	0.16	U	0.16	244		57.4	49.9		0.092	46.4	X	0.39	0.155	U	0.155
J1RJD7	3/19/2013	124-N-10, # 2a	148911.2	572403.6	0.17	U	0.17	287		62.5	44.1		0.1	43.7	X	0.42	0.155	U	0.155
J1RJD8	3/19/2013	124-N-10, # 3a	148916.2	572505.2	0.16	U	0.16	275		58.2	54.8		0.093	46.6	X	0.39	0.155	U	0.155
J1RJD9	3/19/2013	124-N-10, # 4a	148906.9	572453.0	163		0.44	300		78.6	29.1		0.13	689	X	0.53	6.42		0.155
J1RJF0	3/19/2013	124-N-10, # 5a	148857.1	572425.8	0.17	U	0.17	276		61.6	55.2		0.098	49.3	X	0.42	0.155	U	0.155
J1RJF1	3/19/2013	124-N-10, # 6a	148836.7	572369.2	0.16	U	0.16	281		57.5	51.9		0.092	43.9	X	0.39	0.155	U	0.155
J1RMM3	5/16/2013	124-N-10, # 1b	148922.9	572484.4	0.14	U	0.14	189		51.4	54.3	X	0.082	44.3	X	0.35	0.155	U	0.155
J1RMM4	5/16/2013	124-N-10, # 2b	148906.2	572476.5	0.69		0.14	197		53.2	48.9	X	0.085	46.7	X	0.36	0.155	U	0.155
J1RMM5	5/16/2013	124-N-10, # 3b			0.44		0.14	227		52.7	51.9	X	0.084	59.5	X	0.36	0.155	U	0.155
J1RMM6	5/16/2013	124-N-10, #4b	148865.0	572447.4	0.16	U	0.16	193		58.4	48.1	X	0.093	43.2	X	0.39	0.155	U	0.155
J1RMM7	5/16/2013	124-N-10, #5b	148885.3	572419.5	0.19		0.15	652		54.6	35.7	X	0.087	35.4	X	0.37	0.155	U	0.155
J1RMM8	5/16/2013	124-N-10 #6b	148863.4	572405.7	0.96		0.15	312		54.7	40.3	X	0.087	55.2	X	0.37	0.155	U	0.155
J1RMM9	5/16/2013	124-N-10, #7b	148861.8	572371.8	0.33		0.16	337		58.3	42.3	X	0.093	39.9	X	0.39	0.171		0.155
J1RMN0	5/16/2013	124-N-10, #8b	148841.3	572299.2	0.14	U	0.14	149		50.3	29.2	X	0.08	26.7	X	0.34	0.155	U	0.155

Sample Number	Sample Date	Sample Location	Northing	Easting	Mercury		
					mg/kg	Q	PQL
J1R3H8	10/15/2012	1904-N			0.166		0.024
J1R461	10/22/2012	1904-N			0.0711		0.024
J1R462	10/22/2012	1904-N			2.15		0.115
J1R463	10/22/2012	1904-N			0.0919		0.026
J1R464	10/22/2012	1904-N			0.0988		0.028
J1R5L5	11/14/2012	1904-NA			0.415		0.058
J1R5M0	11/14/2012	1904-NA					
J1RJD6	3/19/2013	124-N-10, # 1a	148883.4	572333.3	0.0069	BN	0.005
J1RJD7	3/19/2013	124-N-10, # 2a	148911.2	572403.6	0.0058	U	0.006
J1RJD8	3/19/2013	124-N-10, # 3a	148916.2	572505.2	0.006	B	0.005
J1RJD9	3/19/2013	124-N-10, # 4a	148906.9	572453.0	2.8		0.08
J1RJF0	3/19/2013	124-N-10, # 5a	148857.1	572425.8	0.0085	B	0.005
J1RJF1	3/19/2013	124-N-10, # 6a	148836.7	572369.2	0.0054	U	0.005
J1RMM3	5/16/2013	124-N-10, # 1b	148922.9	572484.4	0.0061	BM	0.006
J1RMM4	5/16/2013	124-N-10, # 2b	148906.2	572476.5	0.012	B	0.005
J1RMM5	5/16/2013	124-N-10, # 3b			0.007	B	0.006
J1RMM6	5/16/2013	124-N-10, #4b	148865.0	572447.4	0.0052	U	0.005
J1RMM7	5/16/2013	124-N-10, #5b	148885.3	572419.5	0.0098	B	0.005
J1RMM8	5/16/2013	124-N-10 #6b	148863.4	572405.7	0.054		0.006
J1RMM9	5/16/2013	124-N-10, #7b	148861.8	572371.8	0.014	B	0.006
J1RMN0	5/16/2013	124-N-10, #8b	148841.3	572299.2	0.0055	U	0.006

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Sample Number	Sample Date	Sample Location	Northing	Easting	Bromide			Chloride			Fluoride			Nitrate			Nitrite		
					mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
J1R3H8	10/15/2012	1904-N																	
J1R461	10/22/2012	1904-N																	
J1R462	10/22/2012	1904-N																	
J1R463	10/22/2012	1904-N																	
J1R464	10/22/2012	1904-N																	
J1R5L5	11/14/2012	1904-NA			40.9	U	40.9	68.6	B	40.9	40.9	U	40.9	40.9	U	40.9	40.9	U	40.9
J1R5M0	11/14/2012	1904-NA																	
J1RJD6	3/19/2013	124-N-10, # 1a	148883.4	572333.3	1	B	0.4	10.3		2	1.5	B	0.85						
J1RJD7	3/19/2013	124-N-10, # 2a	148911.2	572403.6	0.4	U	0.4	5.5		2	1.3	B	0.85						
J1RJD8	3/19/2013	124-N-10, # 3a	148916.2	572505.2	0.41	U	0.41	4.8	B	2.1	0.98	B	0.87						
J1RJD9	3/19/2013	124-N-10, # 4a	148906.9	572453.0	0.58	U	0.58	10.7		3	1.2	U	1.2						
J1RJF0	3/19/2013	124-N-10, # 5a	148857.1	572425.8	0.39	U	0.39	2.7	B	2	1.1	B	0.82						
J1RJF1	3/19/2013	124-N-10, # 6a	148836.7	572369.2	0.4	U	0.4	3.6	B	2	0.95	B	0.84						
J1RMM3	5/16/2013	124-N-10, # 1b	148922.9	572484.4	0.38	U	0.38	4	B	2	0.94	B	0.81						
J1RMM4	5/16/2013	124-N-10, # 2b	148906.2	572476.5	0.38	U	0.38	4.7	B	1.9	2.2	B	0.81						
J1RMM5	5/16/2013	124-N-10, # 3b			0.39	U	0.39	14.5		2	0.83	UN	0.83						
J1RMM6	5/16/2013	124-N-10, #4b	148865.0	572447.4	0.39	U	0.39	3.7	B	2	1.8	B	0.82						
J1RMM7	5/16/2013	124-N-10, #5b	148885.3	572419.5	1.3	B	0.38	166		1.9	1.7	B	0.8						
J1RMM8	5/16/2013	124-N-10 #6b	148863.4	572405.7	0.39	U	0.39	46.4		2	1.5	B	0.82						
J1RMM9	5/16/2013	124-N-10, #7b	148861.8	572371.8	0.38	U	0.38	67.7		1.9	1.7	B	0.81						
J1RMN0	5/16/2013	124-N-10, #8b	148841.3	572299.2	0.37	U	0.37	9		1.9	1.5	B	0.79						

Sample Number	Sample Date	Sample Location	Northing	Easting	Nitrogen in Nitrate			Nitrogen in Nitrite and Nitrate			Nitrogen in Nitrite			Phosphate			Phosphorous in phosphate		
					mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
J1R3H8	10/15/2012	1904-N																	
J1R461	10/22/2012	1904-N																	
J1R462	10/22/2012	1904-N																	
J1R463	10/22/2012	1904-N																	
J1R464	10/22/2012	1904-N																	
J1R5L5	11/14/2012	1904-NA						0.26	B	0.18				81.7	U	81.7			
J1R5M0	11/14/2012	1904-NA																	
J1RJD6	3/19/2013	124-N-10, # 1a	148883.4	572333.3	18.3		0.32	19.7	N	0.32	0.35	U	0.35				1.3	U	1.3
J1RJD7	3/19/2013	124-N-10, # 2a	148911.2	572403.6	11.9		0.33	12		0.31	0.35	U	0.35				1.3	U	1.3
J1RJD8	3/19/2013	124-N-10, # 3a	148916.2	572505.2	2.6		0.33	2.2		0.32	0.36	U	0.36				1.3	U	1.3
J1RJD9	3/19/2013	124-N-10, # 4a	148906.9	572453.0	123		0.47	128		0.45	0.77	B	0.5				67.8		1.9
J1RJF0	3/19/2013	124-N-10, # 5a	148857.1	572425.8	1.7	B	0.31	0.87		0.3	0.33	U	0.33				1.2	U	1.2
J1RJF1	3/19/2013	124-N-10, # 6a	148836.7	572369.2	20		0.32	22.1		0.31	0.34	U	0.34				1.3	U	1.3
J1RMM3	5/16/2013	124-N-10, # 1b	148922.9	572484.4	1.4	B	0.31	0.88		0.3	0.33	U	0.33				1.4	B	1.2
J1RMM4	5/16/2013	124-N-10, # 2b	148906.2	572476.5	11		0.31	14.2		0.29	0.33	U	0.33				9.8		1.2
J1RMM5	5/16/2013	124-N-10, # 3b			46.7		0.32	56.2	M	0.3	0.34	U	0.34				11.6		1.2
J1RMM6	5/16/2013	124-N-10, #4b	148865.0	572447.4	5.2		0.31	6.7		0.3	0.34	U	0.34				2.4	B	1.2
J1RMM7	5/16/2013	124-N-10, #5b	148885.3	572419.5	35.3		0.31	43.3		0.29	0.33	U	0.33				1.2	U	1.2
J1RMM8	5/16/2013	124-N-10 #6b	148863.4	572405.7	36.8		0.31	46.4		0.3	0.34	U	0.34				1.2	U	1.2
J1RMM9	5/16/2013	124-N-10, #7b	148861.8	572371.8	33.2		0.31	38.9		0.3	0.33	U	0.33				1.2	U	1.2
J1RMN0	5/16/2013	124-N-10, #8b	148841.3	572299.2	3.9		0.3	4.4		0.29	0.32	U	0.32				1.2	U	1.2

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Sample Number	Sample Date	Sample Location	Northing	Easting	Sulfate			TPH - Diesel Ext			TPH - Diesel			TPH - motor oil (high boiling)		
					mg/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
J1R3H8	10/15/2012	1904-N														
J1R461	10/22/2012	1904-N														
J1R462	10/22/2012	1904-N														
J1R463	10/22/2012	1904-N														
J1R464	10/22/2012	1904-N														
J1R5L5	11/14/2012	1904-NA			389		40.9				345000	U	345000	11700000		1040000
J1R5M0	11/14/2012	1904-NA														
J1RJD6	3/19/2013	124-N-10, # 1a	148883.4	572333.3	22.1		1.8	4500	B	1000	3400	JB	690			
J1RJD7	3/19/2013	124-N-10, # 2a	148911.2	572403.6	13		1.8	1600	JB	1000	1300	JB	710			
J1RJD8	3/19/2013	124-N-10, # 3a	148916.2	572505.2	20.9		1.8	8200	B	1000	4200	B	700			
J1RJD9	3/19/2013	124-N-10, # 4a	148906.9	572453.0	94.5		2.6	2400000	BD	14000	1100000	BD	9600			
J1RJF0	3/19/2013	124-N-10, # 5a	148857.1	572425.8	15.9		1.7	25000	B	1000	12000	B	710			
J1RJF1	3/19/2013	124-N-10, # 6a	148836.7	572369.2	27.8		1.8	19000	B	1000	8600	B	700			
J1RMM3	5/16/2013	124-N-10, # 1b	148922.9	572484.4	7.4		1.7	6700	B	980	3100	JB	670			
J1RMM4	5/16/2013	124-N-10, # 2b	148906.2	572476.5	13.5		1.7	8700	B	990	3900	JB	670			
J1RMM5	5/16/2013	124-N-10, # 3b			21.1		1.7	12000	B	1000	6300	B	680			
J1RMM6	5/16/2013	124-N-10, #4b	148865.0	572447.4	10.8		1.7	3600	JB	990	2000	JB	670			
J1RMM7	5/16/2013	124-N-10, #5b	148885.3	572419.5	1110	D	8.5	9400	B	960	5300	B	650			
J1RMM8	5/16/2013	124-N-10 #6b	148863.4	572405.7	419		1.7	48000	B	990	22000	B	670			
J1RMM9	5/16/2013	124-N-10, #7b	148861.8	572371.8	399	D	8.5	17000	B	990	8400	B	680			
J1RMN0	5/16/2013	124-N-10, #8b	148841.3	572299.2	15.4		1.7	3200	JB	990	1900	JB	670			

Sample Number	Sample Date	Sample Location	Northing	Easting	Percent Solids			Percent Moisture (wet sample)			pH Measurement		
					%	Q	PQL	%	Q	PQL	pH	Q	PQL
J1R3H8	10/15/2012	1904-N											
J1R461	10/22/2012	1904-N											
J1R462	10/22/2012	1904-N											
J1R463	10/22/2012	1904-N											
J1R464	10/22/2012	1904-N											
J1R5L5	11/14/2012	1904-NA			48.2		0.1						
J1R5M0	11/14/2012	1904-NA											
J1RJD6	3/19/2013	124-N-10, # 1a	148883.4	572333.3				4.9		0	8.43		0.1
J1RJD7	3/19/2013	124-N-10, # 2a	148911.2	572403.6				5.6		0	8.65		0.1
J1RJD8	3/19/2013	124-N-10, # 3a	148916.2	572505.2				4.4		0	8.83		0.1
J1RJD9	3/19/2013	124-N-10, # 4a	148906.9	572453.0				29.9		0	6.44		0.1
J1RJF0	3/19/2013	124-N-10, # 5a	148857.1	572425.8				4.2		0	8.93		0.1
J1RJF1	3/19/2013	124-N-10, # 6a	148836.7	572369.2				4.1		0	8.72		0.1
J1RMM3	5/16/2013	124-N-10, # 1b	148922.9	572484.4				1		0	8.58		0.1
J1RMM4	5/16/2013	124-N-10, # 2b	148906.2	572476.5				0.95		0	7.17		0.1
J1RMM5	5/16/2013	124-N-10, # 3b						2.6		0	6.73		0.1
J1RMM6	5/16/2013	124-N-10, #4b	148865.0	572447.4				0.94		0	8.48		0.1
J1RMM7	5/16/2013	124-N-10, #5b	148885.3	572419.5				0.78		0	8.26		0.1
J1RMM8	5/16/2013	124-N-10 #6b	148863.4	572405.7				0.98		0	8.66		0.1
J1RMM9	5/16/2013	124-N-10, #7b	148861.8	572371.8				0.72		0	8.58		0.1
J1RMN0	5/16/2013	124-N-10, #8b	148841.3	572299.2				0.6		0	9.05		0.1

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Sample Number	Sample Date	Sample Location	Northing	Easting	Americium-241			Cesium-137			Cobalt-60		
					pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
J1RJD6	3/19/2013	124-N-10, # 1a	148883.4	572333.3	-0.0066	U	0.0479	0.00363	U	0.0292	-0.0027	U	0.0296
J1RJD7	3/19/2013	124-N-10, # 2a	148911.2	572403.6	0.028	U	0.195	0.0231	U	0.0309	0.0112	U	0.031
J1RJD8	3/19/2013	124-N-10, # 3a	148916.2	572505.2	0.0149	U	0.0327	0.00369	U	0.0255	0.0158	U	0.0298
J1RJD9	3/19/2013	124-N-10, # 4a	148906.9	572453.0	0.329		0.168	0.392		0.173	-0.0408	U	0.198
J1RJF0	3/19/2013	124-N-10, # 5a	148857.1	572425.8	0.000222	U	0.0334	0.0166	U	0.0265	0.00687	U	0.0237
J1RJF1	3/19/2013	124-N-10, # 6a	148836.7	572369.2	-0.014	U	0.0252	-0.00855	U	0.0201	0.00862	U	0.0211

Sample Number	Sample Date	Sample Location	Northing	Easting	Europium-152			Europium-154			Europium-155		
					pCi/g	Q	MDA	pCi/g	Q	MDA	pCi/g	Q	MDA
J1RJD6	3/19/2013	124-N-10, # 1a	148883.4	572333.3	-0.0341	U	0.0681	-0.0242	U	0.0912	0.0575	U	0.071
J1RJD7	3/19/2013	124-N-10, # 2a	148911.2	572403.6	-0.0264	U	0.0667	-0.0169	U	0.0889	0.0238	U	0.0827
J1RJD8	3/19/2013	124-N-10, # 3a	148916.2	572505.2	-0.0135	U	0.0507	0.028	U	0.0941	0.042	U	0.0486
J1RJD9	3/19/2013	124-N-10, # 4a	148906.9	572453.0	-0.189	U	0.423	-0.103	U	0.504	-0.0078	U	0.304
J1RJF0	3/19/2013	124-N-10, # 5a	148857.1	572425.8	0.00686	U	0.0531	0.0583	U	0.0918	0.0294	U	0.0521
J1RJF1	3/19/2013	124-N-10, # 6a	148836.7	572369.2	-0.00712	U	0.0455	-0.00037	U	0.0682	0.0264	U	0.0397

Sample Number	Sample Date	Sample Location	Northing	Easting	Potassium-40			Radium-226		
					pCi/g	Q	MDA	pCi/g	Q	MDA
J1RJD6	3/19/2013	124-N-10, # 1a	148883.4	572333.3	13.7		0.238	0.617		0.0519
J1RJD7	3/19/2013	124-N-10, # 2a	148911.2	572403.6	15.2		0.234	0.744		0.0484
J1RJD8	3/19/2013	124-N-10, # 3a	148916.2	572505.2	13		0.175	0.587		0.0369
J1RJD9	3/19/2013	124-N-10, # 4a	148906.9	572453.0	6.97		1.34	0.445	U	0.494
J1RJF0	3/19/2013	124-N-10, # 5a	148857.1	572425.8	13.9		0.216	0.541		0.0416
J1RJF1	3/19/2013	124-N-10, # 6a	148836.7	572369.2	11.4		0.178	0.53		0.0316

Sample Number	Sample Date	Sample Location	Northing	Easting	Gross alpha			Gross beta		
					pCi/g	Q	MDA	pCi/g	Q	MDA
J1RJD6	3/19/2013	124-N-10, # 1a	148883.4	572333.3	4.52	U	6.81	24.9		2.16
J1RJD7	3/19/2013	124-N-10, # 2a	148911.2	572403.6	7.31		6.95	24		2.2
J1RJD8	3/19/2013	124-N-10, # 3a	148916.2	572505.2	5.23		5.01	26.8		2.29
J1RJD9	3/19/2013	124-N-10, # 4a	148906.9	572453.0	2.82	U	7.48	23.2		2.26
J1RJF0	3/19/2013	124-N-10, # 5a	148857.1	572425.8	5.62	U	6.83	23.9		2.22
J1RJF1	3/19/2013	124-N-10, # 6a	148836.7	572369.2	2.43	U	7.85	21.8		2.53

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CONSTITUENT	CLASS	J1R5L5 1904-NA 11/14/12 10:00 AM			J1RJD6 124-N-10, #1a 03/19/13 11:37 AM			J1RJD7 124-N-10, #2a 03/19/13 11:15 AM			J1RJD8 124-N-10, #3a 03/19/13 11:03 AM		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	266	U	266	10	U	10	10	U	10	9.7	U	9.7
Acenaphthylene	PAH	266	U	266	9.3	U	9.3	9.4	U	9.4	8.7	U	8.7
Anthracene	PAH	266	U	266	3.2	U	3.2	3.2	U	3.2	3	U	3
Benzo(a)anthracene	PAH	266	U	266	3.3	U	3.3	3.3	U	3.3	3.1	U	3.1
Benzo(a)pyrene	PAH	266	U	266	6.6	U	6.6	6.7	U	6.7	6.2	U	6.2
Benzo(b)fluoranthene	PAH	266	U	266	4.3	U	4.3	4.4	U	4.4	4.1	U	4.1
Benzo(ghi)perylene	PAH	266	U	266	7.4	U	7.4	7.5	U	7.5	7	U	7
Benzo(k)fluoranthene	PAH	266	U	266	4.1	U	4.1	4.1	U	4.1	3.8	U	3.8
Chrysene	PAH	82.5	JD	266	5	U	5	5	U	5	4.7	U	4.7
Dibenz[a,h]anthracene	PAH	266	U	266	11	U	11	11	U	11	11	U	11
Fluoranthene	PAH	160	JD	266	13	U	13	14	U	14	13	U	13
Fluorene	PAH	266	U	266	5.5	U	5.5	5.5	U	5.5	5.1	U	5.1
Indeno(1,2,3-cd)pyrene	PAH	266	U	266	12	U	12	13	U	13	12	U	12
Naphthalene	PAH	266	U	266	12	U	12	13	U	13	12	U	12
Phenanthrene	PAH	87.8	JD	266	12	U	12	13	U	13	12	U	12
Pyrene	PAH	73.3	JD	266	12	U	12	13	U	13	12	U	12
Aroclor-1016	PCB	276	U	276	2.8	U	2.8	2.8	U	2.8	2.9	U	2.9
Aroclor-1221	PCB	276	U	276	8.2	U	8.2	8.2	U	8.2	8.3	U	8.3
Aroclor-1232	PCB	276	U	276	2.1	U	2.1	2.1	U	2.1	2.1	U	2.1
Aroclor-1242	PCB	276	U	276	4.8	U	4.8	4.8	U	4.8	4.8	U	4.8
Aroclor-1248	PCB	276	U	276	4.8	U	4.8	4.8	U	4.8	4.8	U	4.8
Aroclor-1254	PCB	276	U	276	2.7	U	2.7	2.7	U	2.7	2.7	U	2.7
Aroclor-1260	PCB	276	U	276	2.7	U	2.7	2.7	U	2.7	2.7	U	2.7
Aroclor-1262	PCB	276	U	276									
Aroclor-1268	PCB	276	U	276									
1,2,4-Trichlorobenzene	SVOA	6840	U	6840	29	U	29	29	U	29	29	U	29
1,2-Dichlorobenzene	SVOA	6840	U	6840	23	U	23	23	U	23	23	U	23
1,3-Dichlorobenzene	SVOA	6840	U	6840	12	U	12	13	U	13	13	U	13
1,4-Dichlorobenzene	SVOA	6840	U	6840	14	U	14	14	U	14	14	U	14
2,4,5-Trichlorophenol	SVOA	6840	U	6840	10	U	10	11	U	11	10	U	10
2,4,6-Trichlorophenol	SVOA	6840	U	6840	10	U	10	11	U	11	10	U	10
2,4-Dichlorophenol	SVOA	6840	U	6840	10	U	10	11	U	11	10	U	10
2,4-Dimethylphenol	SVOA	6840	U	6840	69	U	69	69	U	69	69	U	69
2,4-Dinitrophenol	SVOA	34200	U	34200	350	U	350	350	U	350	350	U	350
2,4-Dinitrotoluene	SVOA	6840	U	6840	69	U	69	69	U	69	69	U	69
2,6-Dinitrotoluene	SVOA	6840	U	6840	29	U	29	29	U	29	29	U	29
2-Chloronaphthalene	SVOA	6840	U	6840	10	U	10	11	U	11	10	U	10
2-Chlorophenol	SVOA	6840	U	6840	22	U	22	22	U	22	22	U	22
2-Methylnaphthalene	SVOA	6840	U	6840	20	U	20	20	U	20	20	U	20
2-Methylphenol (cresol, o-)	SVOA	6840	U	6840	14	U	14	14	U	14	14	U	14
2-Nitroaniline	SVOA	34200	U	34200	52	U	52	53	U	53	52	U	52
2-Nitrophenol	SVOA	6840	U	6840	10	U	10	11	U	11	10	U	10
3,3'-Dichlorobenzidine	SVOA	13700	U	13700	94	U	94	95	U	95	94	U	94
3+4 Methylphenol (cresol, m+p)	SVOA	6840	U	6840	34	U	34	35	U	35	35	U	35
3-Nitroaniline	SVOA	34200	U	34200	76	U	76	77	U	77	76	U	76
4,6-Dinitro-2-methylphenol	SVOA	6840	U	6840	340	U	340	350	U	350	350	U	350
4-Bromophenylphenyl ether	SVOA	6840	U	6840	20	U	20	20	U	20	20	U	20
4-Chloro-3-methylphenol	SVOA	6840	U	6840	69	U	69	69	U	69	69	U	69
4-Chloroaniline	SVOA	6840	U	6840	85	U	85	86	U	86	86	U	86
4-Chlorophenylphenyl ether	SVOA	6840	U	6840	22	U	22	22	U	22	22	U	22
4-Nitroaniline	SVOA	34200	U	34200	75	U	75	76	U	76	76	U	76
4-Nitrophenol	SVOA	34200	U	34200	100	U	100	100	U	100	100	U	100

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CONSTITUENT	CLASS	J1R5L5 1904-NA 11/14/12 10:00 AM			J1RJD6 124-N-10, #1a 03/19/13 11:37 AM			J1RJD7 124-N-10, #2a 03/19/13 11:15 AM			J1RJD8 124-N-10, #3a 03/19/13 11:03 AM		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	SVOA	6840	U	6840	11	U	11	11	U	11	11	U	11
Acenaphthylene	SVOA	6840	U	6840	18	U	18	18	U	18	18	U	18
Anthracene	SVOA	6840	U	6840	18	U	18	18	U	18	18	U	18
Benzo(a)anthracene	SVOA	6840	U	6840	21	U	21	21	U	21	21	U	21
Benzo(a)pyrene	SVOA	6840	U	6840	21	U	21	21	U	21	21	U	21
Benzo(b)fluoranthene	SVOA	6840	U	6840	27	U	27	28	U	28	27	U	27
Benzo(ghi)perylene	SVOA	6840	U	6840	17	U	17	17	U	17	17	U	17
Benzo(k)fluoranthene	SVOA	6840	U	6840	42	U	42	42	U	42	42	U	42
Bis(2-chloro-1-methylethyl)ether	SVOA	6840	U	6840	24	U	24	24	U	24	24	U	24
Bis(2-Chloroethoxy)methane	SVOA	6840	U	6840	24	U	24	24	U	24	24	U	24
Bis(2-chloroethyl) ether	SVOA	6840	U	6840	17	U	17	17	U	17	17	U	17
Bis(2-ethylhexyl) phthalate	SVOA	4230	JD	6840	48	U	48	48	U	48	48	U	48
Butylbenzylphthalate	SVOA	6840	U	6840	45	U	45	45	U	45	45	U	45
Carbazole	SVOA	6840	U	6840	37	U	37	38	U	38	38	U	38
Chrysene	SVOA	6840	U	6840	28	U	28	28	U	28	28	U	28
Dibenz[a,h]anthracene	SVOA	6840	U	6840	20	U	20	20	U	20	20	U	20
Dibenzofuran	SVOA	6840	U	6840	21	U	21	21	U	21	21	U	21
Diethyl phthalate	SVOA	6840	U	6840	27	U	27	27	U	27	27	U	27
Diethylphthalate	SVOA												
Dimethyl phthalate	SVOA	6840	U	6840	24	U	24	24	U	24	24	U	24
Di-n-butylphthalate	SVOA	6840	U	6840	30	U	30	31	U	31	30	U	30
Di-n-octylphthalate	SVOA	6840	U	6840	15	U	15	15	U	15	15	U	15
Fluoranthene	SVOA	6840	U	6840	37	U	37	38	U	38	38	U	38
Fluorene	SVOA	6840	U	6840	19	U	19	19	U	19	19	U	19
Hexachlorobenzene	SVOA	6840	U	6840	30	U	30	31	U	31	30	U	30
Hexachlorobutadiene	SVOA	6840	U	6840	10	U	10	11	U	11	10	U	10
Hexachlorocyclopentadiene	SVOA	6840	U	6840	52	U	52	53	U	53	52	U	52
Hexachloroethane	SVOA	6840	U	6840	22	U	22	22	U	22	22	U	22
Indeno(1,2,3-cd)pyrene	SVOA	6840	U	6840	23	U	23	23	U	23	23	U	23
Isophorone	SVOA	6840	U	6840	18	U	18	18	U	18	18	U	18
Naphthalene	SVOA	6840	U	6840	32	U	32	33	U	33	32	U	32
Nitrobenzene	SVOA	6840	U	6840	23	U	23	23	U	23	23	U	23
N-Nitroso-di-n-dipropylamine	SVOA	6840	U	6840	32	U	32	33	U	33	32	U	32
N-Nitrosodiphenylamine	SVOA	6840	U	6840	22	U	22	22	U	22	22	U	22
Pentachlorophenol	SVOA	34200	U	34200	340	U	340	350	U	350	350	U	350
Phenanthrene	SVOA	6840	U	6840	18	U	18	18	U	18	18	U	18
Phenol	SVOA	6840	U	6840	19	U	19	19	U	19	19	U	19
Pyrene	SVOA	6840	U	6840	13	U	13	13	U	13	13	U	13

124-N-10 In-Process Sample Data. (14 pages)

CONSTITUENT	CLASS	J1RJD9 124-N-10, #4a 03/19/13 11:06 AM			J1RJF0 124-N-10, #5a 03/19/13 11:24 AM			J1RJF1 124-N-10, #6a 03/19/13 11:30 AM			J1RMM3 124-N-10, #1b 05/16/13 08:49 AM		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	71	UD	71	10	U	10	9.8	U	9.8	9.8	U	9.8
Acenaphthylene	PAH	64	UD	64	9.1	U	9.1	8.8	U	8.8	8.8	U	8.8
Anthracene	PAH	22	UD	22	3.1	U	3.1	3	U	3	3	U	3
Benzo(a)anthracene	PAH	23	UD	23	3.2	U	3.2	3.1	U	3.1	3.1	U	3.1
Benzo(a)pyrene	PAH	45	UD	45	6.5	U	6.5	6.3	U	6.3	6.3	U	6.3
Benzo(b)fluoranthene	PAH	58	JDX	30	4.3	U	4.3	4.1	U	4.1	4.1	U	4.1
Benzo(ghi)perylene	PAH	51	UD	51	7.3	U	7.3	7.1	U	7.1	7	U	7
Benzo(k)fluoranthene	PAH	28	UD	28	4	U	4	3.9	U	3.9	3.9	U	3.9
Chrysene	PAH	34	UD	34	4.9	U	4.9	4.7	U	4.7	4.7	U	4.7
Dibenz[a,h]anthracene	PAH	78	UD	78	11	U	11	11	U	11	11	U	11
Fluoranthene	PAH	92	UD	92	13	U	13	13	U	13	13	U	13
Fluorene	PAH	37	UD	37	5.4	U	5.4	5.2	U	5.2	5.2	U	5.2
Indeno(1,2,3-cd)pyrene	PAH	85	UD	85	12	U	12	12	U	12	12	U	12
Naphthalene	PAH	220	JDX	85	12	U	12	12	U	12	12	U	12
Phenanthrene	PAH	85	UD	85	12	U	12	12	U	12	12	U	12
Pyrene	PAH	100	JXD	85	12	U	12	12	U	12	12	U	12
Aroclor-1016	PCB	19	UD	19	2.9	U	2.9	2.9	U	2.9	2.6	U	2.6
Aroclor-1221	PCB	56	UD	56	8.3	U	8.3	8.3	U	8.3	7.6	U	7.6
Aroclor-1232	PCB	14	UD	14	2.1	U	2.1	2.1	U	2.1	1.9	U	1.9
Aroclor-1242	PCB	32	UD	32	4.8	U	4.8	4.8	U	4.8	4.4	U	4.4
Aroclor-1248	PCB	32	UD	32	4.8	U	4.8	4.8	U	4.8	4.4	U	4.4
Aroclor-1254	PCB	710	D	18	2.7	U	2.7	2.7	U	2.7	2.5	U	2.5
Aroclor-1260	PCB	330	D	18	2.7	U	2.7	2.7	U	2.7	2.5	U	2.5
Aroclor-1262	PCB												
Aroclor-1268	PCB												
1,2,4-Trichlorobenzene	SVOA	390	UD	390	29	U	29	28	U	28	28	U	28
1,2-Dichlorobenzene	SVOA	310	UD	310	23	U	23	22	U	22	22	U	22
1,3-Dichlorobenzene	SVOA	170	UD	170	13	U	13	12	U	12	12	U	12
1,4-Dichlorobenzene	SVOA	190	UD	190	14	U	14	14	U	14	13	U	13
2,4,5-Trichlorophenol	SVOA	140	UD	140	10	U	10	10	U	10	9.9	U	9.9
2,4,6-Trichlorophenol	SVOA	140	UD	140	10	U	10	10	U	10	9.9	U	9.9
2,4-Dichlorophenol	SVOA	140	UD	140	10	U	10	10	U	10	9.9	U	9.9
2,4-Dimethylphenol	SVOA	930	UD	930	69	U	69	66	U	66	65	U	65
2,4-Dinitrophenol	SVOA	4700	UD	4700	350	U	350	330	U	330	330	UX	330
2,4-Dinitrotoluene	SVOA	930	UD	930	69	U	69	66	U	66	65	U	65
2,6-Dinitrotoluene	SVOA	390	UD	390	29	U	29	28	U	28	28	U	28
2-Chloronaphthalene	SVOA	140	UD	140	10	U	10	10	U	10	9.9	U	9.9
2-Chlorophenol	SVOA	290	UD	290	22	U	22	21	U	21	21	U	21
2-Methylnaphthalene	SVOA	270	UD	270	20	U	20	19	U	19	19	U	19
2-Methylphenol (cresol, o-)	SVOA	180	UD	180	14	U	14	13	U	13	13	U	13
2-Nitroaniline	SVOA	700	UD	700	52	U	52	50	U	50	49	U	49
2-Nitrophenol	SVOA	140	UD	140	10	U	10	10	U	10	9.9	U	9.9
3,3'-Dichlorobenzidine	SVOA	1300	UD	1300	94	U	94	90	U	90	89	U	89
3+4 Methylphenol (cresol, m+p)	SVOA	460	UD	460	34	U	34	33	U	33	33	U	33
3-Nitroaniline	SVOA	1000	UD	1000	76	U	76	73	U	73	72	U	72
4,6-Dinitro-2-methylphenol	SVOA	4600	UD	4600	340	U	340	330	U	330	330	UX	330
4-Bromophenylphenyl ether	SVOA	270	UD	270	20	U	20	19	U	19	19	U	19
4-Chloro-3-methylphenol	SVOA	930	UD	930	69	U	69	66	U	66	65	U	65
4-Chloroaniline	SVOA	1100	UD	1100	85	U	85	82	U	82	81	U	81
4-Chlorophenylphenyl ether	SVOA	290	UD	290	22	U	22	21	U	21	21	U	21
4-Nitroaniline	SVOA	1000	UD	1000	76	U	76	73	U	73	72	U	72
4-Nitrophenol	SVOA	1400	UD	1400	100	U	100	97	U	97	96	U	96

124-N-10 In-Process Sample Data. (14 pages)

CONSTITUENT	CLASS	J1RJD9 124-N-10, #4a 03/19/13 11:06 AM			J1RJF0 124-N-10, #5a 03/19/13 11:24 AM			J1RJF1 124-N-10, #6a 03/19/13 11:30 AM			J1RMM3 124-N-10, #1b 05/16/13 08:49 AM		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	SVOA	140	UD	140	11	U	11	10	U	10	10	U	10
Acenaphthylene	SVOA	240	UD	240	18	U	18	17	U	17	17	U	17
Anthracene	SVOA	240	UD	240	18	U	18	17	U	17	17	U	17
Benzo(a)anthracene	SVOA	280	UD	280	21	U	21	20	U	20	20	U	20
Benzo(a)pyrene	SVOA	280	UD	280	21	U	21	20	U	20	20	U	20
Benzo(b)fluoranthene	SVOA	370	UD	370	27	U	27	26	U	26	26	U	26
Benzo(ghi)perylene	SVOA	220	UD	220	17	U	17	16	U	16	16	U	16
Benzo(k)fluoranthene	SVOA	560	UD	560	42	U	42	40	U	40	39	U	39
Bis(2-chloro-1-methylethyl)ether	SVOA	320	UD	320	24	U	24	23	U	23	23	U	23
Bis(2-Chloroethoxy)methane	SVOA	320	UD	320	24	U	24	23	U	23	23	U	23
Bis(2-chloroethyl) ether	SVOA	230	UD	230	17	U	17	17	U	17	16	U	16
Bis(2-ethylhexyl) phthalate	SVOA	6000	D	650	48	U	48	46	U	46	45	U	45
Butylbenzylphthalate	SVOA	1600	JD	600	45	U	45	43	U	43	42	U	42
Carbazole	SVOA	500	UD	500	38	U	38	36	U	36	36	U	36
Chrysene	SVOA	380	UD	380	28	U	28	27	U	27	27	U	27
Dibenz[a,h]anthracene	SVOA	270	UD	270	20	U	20	19	U	19	19	U	19
Dibenzofuran	SVOA	280	UD	280	21	U	21	20	U	20	20	U	20
Diethyl phthalate	SVOA	360	UD	360	27	U	27	26	U	26			
Diethylphthalate	SVOA										26	U	26
Dimethyl phthalate	SVOA	320	UD	320	24	U	24	23	U	23	23	U	23
Di-n-butylphthalate	SVOA	410	UD	410	30	U	30	29	U	29	29	U	29
Di-n-octylphthalate	SVOA	200	UD	200	15	U	15	14	U	14	14	U	14
Fluoranthene	SVOA	500	UD	500	38	U	38	36	U	36	36	U	36
Fluorene	SVOA	250	UD	250	19	U	19	18	U	18	18	U	18
Hexachlorobenzene	SVOA	410	UD	410	30	U	30	29	U	29	29	U	29
Hexachlorobutadiene	SVOA	140	UD	140	10	U	10	10	U	10	9.9	U	9.9
Hexachlorocyclopentadiene	SVOA	700	UD	700	52	U	52	50	U	50	49	U	49
Hexachloroethane	SVOA	300	UD	300	22	U	22	21	U	21	21	U	21
Indeno(1,2,3-cd)pyrene	SVOA	310	UD	310	23	U	23	22	U	22	22	U	22
Isophorone	SVOA	240	UD	240	18	U	18	17	U	17	17	U	17
Naphthalene	SVOA	430	UD	430	32	U	32	31	U	31	31	U	31
Nitrobenzene	SVOA	310	UD	310	23	U	23	22	U	22	22	U	22
N-Nitroso-di-n-dipropylamine	SVOA	430	UD	430	32	U	32	31	U	31	31	U	31
N-Nitrosodiphenylamine	SVOA	290	UD	290	22	U	22	21	U	21	21	U	21
Pentachlorophenol	SVOA	4600	UD	4600	340	U	340	330	U	330	330	U	330
Phenanthrene	SVOA	240	UD	240	18	U	18	17	U	17	17	U	17
Phenol	SVOA	250	UD	250	19	U	19	18	U	18	18	U	18
Pyrene	SVOA	170	UD	170	13	U	13	12	U	12	12	U	12

124-N-10 In-Process Sample Data. (14 pages)

CONSTITUENT	CLASS	J1RMM4 124-N-10, #2b 05/16/13 09:00 AM			J1RMM5 124-N-10, #3b 05/16/13 09:05 AM			J1RMM6 124-N-10, #4b 05/16/13 09:14 AM			J1RMM7 124-N-10, #5b 05/16/13 09:20 AM		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	9.8	U	9.8	9.8	U	9.8	9.8	U	9.8	9.7	U	9.7
Acenaphthylene	PAH	8.8	U	8.8	8.8	U	8.8	8.8	U	8.8	8.7	U	8.7
Anthracene	PAH	3	U	3	3	U	3	3	U	3	3	U	3
Benzo(a)anthracene	PAH	3.1	U	3.1	3.1	U	3.1	3.1	U	3.1	3.1	U	3.1
Benzo(a)pyrene	PAH	6.3	U	6.3	6.3	U	6.3	6.3	U	6.3	6.2	U	6.2
Benzo(b)fluoranthene	PAH	4.1	U	4.1	4.1	U	4.1	4.1	U	4.1	4.1	U	4.1
Benzo(ghi)perylene	PAH	7	U	7	7	U	7	7.1	U	7.1	7	U	7
Benzo(k)fluoranthene	PAH	3.8	U	3.8	3.9	U	3.9	3.9	U	3.9	3.8	U	3.8
Chrysene	PAH	4.7	U	4.7	4.7	U	4.7	4.8	U	4.8	4.7	U	4.7
Dibenz[a,h]anthracene	PAH	11	U	11	11	U	11	11	U	11	11	U	11
Fluoranthene	PAH	13	U	13	13	U	13	13	U	13	13	U	13
Fluorene	PAH	5.2	U	5.2	5.2	U	5.2	5.2	U	5.2	5.1	U	5.1
Indeno(1,2,3-cd)pyrene	PAH	12	U	12	12	U	12	12	U	12	12	U	12
Naphthalene	PAH	12	U	12	12	U	12	12	U	12	12	U	12
Phenanthrene	PAH	12	U	12	12	U	12	12	U	12	12	U	12
Pyrene	PAH	12	U	12	12	U	12	12	U	12	12	U	12
Aroclor-1016	PCB	2.8	U	2.8	2.7	U	2.7	2.7	U	2.7	2.8	U	2.8
Aroclor-1221	PCB	8	U	8	7.9	U	7.9	7.7	U	7.7	8	U	8
Aroclor-1232	PCB	2	U	2	2	U	2	1.9	U	1.9	2	U	2
Aroclor-1242	PCB	4.6	U	4.6	4.6	U	4.6	4.5	U	4.5	4.6	U	4.6
Aroclor-1248	PCB	4.6	U	4.6	4.6	U	4.6	4.5	U	4.5	4.6	U	4.6
Aroclor-1254	PCB	2.6	U	2.6	5	J	2.6	2.5	U	2.5	2.6	U	2.6
Aroclor-1260	PCB	2.6	U	2.6	2.6	U	2.6	2.5	U	2.5	2.6	U	2.6
Aroclor-1262	PCB												
Aroclor-1268	PCB												
1,2,4-Trichlorobenzene	SVOA	27	U	27	28	U	28	27	U	27	28	U	28
1,2-Dichlorobenzene	SVOA	21	U	21	22	U	22	22	U	22	22	U	22
1,3-Dichlorobenzene	SVOA	12	U	12	12	U	12	12	U	12	12	U	12
1,4-Dichlorobenzene	SVOA	13	U	13	13	U	13	13	U	13	14	U	14
2,4,5-Trichlorophenol	SVOA	9.8	U	9.8	9.9	U	9.9	9.8	U	9.8	10	U	10
2,4,6-Trichlorophenol	SVOA	9.8	U	9.8	9.9	U	9.9	9.8	U	9.8	10	U	10
2,4-Dichlorophenol	SVOA	9.8	U	9.8	9.9	U	9.9	9.8	U	9.8	10	U	10
2,4-Dimethylphenol	SVOA	64	U	64	65	U	65	65	U	65	67	U	67
2,4-Dinitrophenol	SVOA	330	U	330	330	U	330	330	U	330	340	U	340
2,4-Dinitrotoluene	SVOA	64	U	64	65	U	65	65	U	65	67	U	67
2,6-Dinitrotoluene	SVOA	27	U	27	28	U	28	27	U	27	28	U	28
2-Chloronaphthalene	SVOA	9.8	U	9.8	9.9	U	9.9	9.8	U	9.8	10	U	10
2-Chlorophenol	SVOA	21	U	21	21	U	21	21	U	21	21	U	21
2-Methylnaphthalene	SVOA	19	U	19	19	U	19	19	U	19	19	U	19
2-Methylphenol (cresol, o-)	SVOA	13	U	13	13	U	13	13	U	13	13	U	13
2-Nitroaniline	SVOA	49	U	49	50	U	50	49	U	49	50	U	50
2-Nitrophenol	SVOA	9.8	U	9.8	9.9	U	9.9	9.8	U	9.8	10	U	10
3,3'-Dichlorobenzidine	SVOA	88	U	88	89	U	89	88	U	88	91	U	91
3+4 Methylphenol (cresol, m+p)	SVOA	32	U	32	33	U	33	32	U	32	33	U	33
3-Nitroaniline	SVOA	71	U	71	72	U	72	72	U	72	74	U	74
4,6-Dinitro-2-methylphenol	SVOA	320	U	320	330	U	330	320	U	320	330	U	330
4-Bromophenylphenyl ether	SVOA	19	U	19	19	U	19	19	U	19	19	U	19
4-Chloro-3-methylphenol	SVOA	64	U	64	65	U	65	65	U	65	67	U	67
4-Chloroaniline	SVOA	80	U	80	81	U	81	80	U	80	83	U	83
4-Chlorophenylphenyl ether	SVOA	21	U	21	21	U	21	21	U	21	21	U	21
4-Nitroaniline	SVOA	71	U	71	72	U	72	71	U	71	73	U	73
4-Nitrophenol	SVOA	95	U	95	96	U	96	95	U	95	98	U	98

124-N-10 In-Process Sample Data. (14 pages)

CONSTITUENT	CLASS	J1RMM4 124-N-10, #2b 05/16/13 09:00 AM			J1RMM5 124-N-10, #3b 05/16/13 09:05 AM			J1RMM6 124-N-10, #4b 05/16/13 09:14 AM			J1RMM7 124-N-10, #5b 05/16/13 09:20 AM		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	SVOA	10	U	10	10	U	10	10	U	10	10	U	10
Acenaphthylene	SVOA	17	U	17	17	U	17	17	U	17	17	U	17
Anthracene	SVOA	17	U	17	17	U	17	17	U	17	17	U	17
Benzo(a)anthracene	SVOA	20	U	20	20	U	20	20	U	20	20	U	20
Benzo(a)pyrene	SVOA	20	U	20	20	U	20	20	U	20	20	U	20
Benzo(b)fluoranthene	SVOA	26	U	26	26	U	26	26	U	26	26	U	26
Benzo(ghi)perylene	SVOA	16	U	16	16	U	16	16	U	16	16	U	16
Benzo(k)fluoranthene	SVOA	39	U	39	40	U	40	39	U	39	40	U	40
Bis(2-chloro-1-methylethyl)ether	SVOA	22	U	22	23	U	23	23	U	23	23	U	23
Bis(2-Chloroethoxy)methane	SVOA	22	U	22	23	U	23	23	U	23	23	U	23
Bis(2-chloroethyl) ether	SVOA	16	U	16	16	U	16	16	U	16	17	U	17
Bis(2-ethylhexyl) phthalate	SVOA	45	U	45	46	U	46	45	U	45	46	U	46
Butylbenzylphthalate	SVOA	42	U	42	43	U	43	42	U	42	43	U	43
Carbazole	SVOA	35	U	35	36	U	36	35	U	35	36	U	36
Chrysene	SVOA	26	U	26	27	U	27	26	U	26	27	U	27
Dibenz[a,h]anthracene	SVOA	19	U	19	19	U	19	19	U	19	19	U	19
Dibenzofuran	SVOA	20	U	20	20	U	20	20	U	20	20	U	20
Diethyl phthalate	SVOA												
Diethylphthalate	SVOA	25	U	25	26	U	26	25	U	25	26	U	26
Dimethyl phthalate	SVOA	22	U	22	23	U	23	23	U	23	23	U	23
Di-n-butylphthalate	SVOA	28	U	28	29	U	29	28	U	28	29	U	29
Di-n-octylphthalate	SVOA	14	U	14	14	U	14	14	U	14	15	U	15
Fluoranthene	SVOA	35	U	35	36	U	36	35	U	35	36	U	36
Fluorene	SVOA	18	U	18	18	U	18	18	U	18	18	U	18
Hexachlorobenzene	SVOA	28	U	28	29	U	29	28	U	28	29	U	29
Hexachlorobutadiene	SVOA	9.8	U	9.8	9.9	U	9.9	9.8	U	9.8	10	U	10
Hexachlorocyclopentadiene	SVOA	49	U	49	50	U	50	49	U	49	50	U	50
Hexachloroethane	SVOA	21	U	21	21	U	21	21	U	21	21	U	21
Indeno(1,2,3-cd)pyrene	SVOA	21	U	21	22	U	22	22	U	22	22	U	22
Isophorone	SVOA	17	U	17	17	U	17	17	U	17	17	U	17
Naphthalene	SVOA	30	U	30	31	U	31	30	U	30	31	U	31
Nitrobenzene	SVOA	21	U	21	22	U	22	22	U	22	22	U	22
N-Nitroso-di-n-dipropylamine	SVOA	30	U	30	31	U	31	30	U	30	31	U	31
N-Nitrosodiphenylamine	SVOA	21	U	21	21	U	21	21	U	21	21	U	21
Pentachlorophenol	SVOA	320	U	320	330	U	330	320	U	320	330	U	330
Phenanthrene	SVOA	17	U	17	17	U	17	17	U	17	17	U	17
Phenol	SVOA	18	U	18	18	U	18	18	U	18	18	U	18
Pyrene	SVOA	12	U	12	12	U	12	12	U	12	12	U	12

124-N-10 In-Process Sample Data. (14 pages)

CONSTITUENT	CLASS	J1RMM8 124-N-10, #6b 05/16/13 09:28 AM			J1RMM9 124-N-10, #7b 05/16/13 09:37 AM			J1RMN0 124-N-10, #8b 05/16/13 09:40 AM		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	9.8	U	9.8	10	U	10	9.6	U	9.6
Acenaphthylene	PAH	8.9	U	8.9	9	U	9	8.7	U	8.7
Anthracene	PAH	3	U	3	3.1	U	3.1	2.9	U	2.9
Benzo(a)anthracene	PAH	3.1	U	3.1	3.2	U	3.2	3.1	U	3.1
Benzo(a)pyrene	PAH	6.3	U	6.3	6.4	U	6.4	6.2	U	6.2
Benzo(b)fluoranthene	PAH	4.1	U	4.1	4.2	U	4.2	4	U	4
Benzo(ghi)perylene	PAH	7.1	U	7.1	7.2	U	7.2	6.9	U	6.9
Benzo(k)fluoranthene	PAH	3.9	U	3.9	4	U	4	3.8	U	3.8
Chrysene	PAH	4.8	U	4.8	4.9	U	4.9	4.7	U	4.7
Dibenz[a,h]anthracene	PAH	11	U	11	11	U	11	11	U	11
Fluoranthene	PAH	13	U	13	13	U	13	12	U	12
Fluorene	PAH	5.2	U	5.2	5.3	U	5.3	5.1	U	5.1
Indeno(1,2,3-cd)pyrene	PAH	12	U	12	12	U	12	12	U	12
Naphthalene	PAH	12	U	12	12	U	12	12	U	12
Phenanthrene	PAH	12	U	12	12	U	12	12	U	12
Pyrene	PAH	12	U	12	12	U	12	12	U	12
Aroclor-1016	PCB	2.8	U	2.8	2.8	U	2.8	2.8	U	2.8
Aroclor-1221	PCB	8.1	U	8.1	8	U	8	8	U	8
Aroclor-1232	PCB	2	U	2	2	U	2	2	U	2
Aroclor-1242	PCB	4.7	U	4.7	4.6	U	4.6	4.6	U	4.6
Aroclor-1248	PCB	4.7	U	4.7	4.6	U	4.6	4.6	U	4.6
Aroclor-1254	PCB	8.3	J	2.6	2.6	U	2.6	2.6	U	2.6
Aroclor-1260	PCB	2.6	U	2.6	2.6	U	2.6	2.6	U	2.6
Aroclor-1262	PCB									
Aroclor-1268	PCB									
1,2,4-Trichlorobenzene	SVOA	27	U	27	27	U	27	28	U	28
1,2-Dichlorobenzene	SVOA	21	U	21	22	U	22	22	U	22
1,3-Dichlorobenzene	SVOA	12	U	12	12	U	12	12	U	12
1,4-Dichlorobenzene	SVOA	13	U	13	13	U	13	14	U	14
2,4,5-Trichlorophenol	SVOA	9.6	U	9.6	9.8	U	9.8	9.9	U	9.9
2,4,6-Trichlorophenol	SVOA	9.6	U	9.6	9.8	U	9.8	9.9	U	9.9
2,4-Dichlorophenol	SVOA	9.6	U	9.6	9.8	U	9.8	9.9	U	9.9
2,4-Dimethylphenol	SVOA	63	U	63	65	U	65	66	U	66
2,4-Dinitrophenol	SVOA	320	U	320	330	U	330	330	U	330
2,4-Dinitrotoluene	SVOA	63	U	63	65	U	65	66	U	66
2,6-Dinitrotoluene	SVOA	27	U	27	27	U	27	28	U	28
2-Chloronaphthalene	SVOA	9.6	U	9.6	9.8	U	9.8	9.9	U	9.9
2-Chlorophenol	SVOA	20	U	20	21	U	21	21	U	21
2-Methylnaphthalene	SVOA	18	U	18	19	U	19	19	U	19
2-Methylphenol (cresol, o-)	SVOA	12	U	12	13	U	13	13	U	13
2-Nitroaniline	SVOA	48	U	48	49	U	49	50	U	50
2-Nitrophenol	SVOA	9.6	U	9.6	9.8	U	9.8	9.9	U	9.9
3,3'-Dichlorobenzidine	SVOA	86	U	86	88	U	88	89	U	89
3+4 Methylphenol (cresol, m+p)	SVOA	32	U	32	32	U	32	33	U	33
3-Nitroaniline	SVOA	70	U	70	72	U	72	72	U	72
4,6-Dinitro-2-methylphenol	SVOA	320	U	320	320	U	320	330	U	330
4-Bromophenylphenyl ether	SVOA	18	U	18	19	U	19	19	U	19
4-Chloro-3-methylphenol	SVOA	63	U	63	65	U	65	66	U	66
4-Chloroaniline	SVOA	79	U	79	80	U	80	81	U	81
4-Chlorophenylphenyl ether	SVOA	20	U	20	21	U	21	21	U	21
4-Nitroaniline	SVOA	70	U	70	71	U	71	72	U	72
4-Nitrophenol	SVOA	93	U	93	95	U	95	96	U	96

124-N-10 In-Process Sample Data. (14 pages)

CONSTITUENT	CLASS	J1RMM8 124-N-10, #6b 05/16/13 09:28 AM			J1RMM9 124-N-10, #7b 05/16/13 09:37 AM			J1RMN0 124-N-10, #8b 05/16/13 09:40 AM		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	SVOA	9.9	U	9.9	10	U	10	10	U	10
Acenaphthylene	SVOA	16	U	16	17	U	17	17	U	17
Anthracene	SVOA	16	U	16	17	U	17	17	U	17
Benzo(a)anthracene	SVOA	19	U	19	20	U	20	20	U	20
Benzo(a)pyrene	SVOA	19	U	19	20	U	20	20	U	20
Benzo(b)fluoranthene	SVOA	25	U	25	26	U	26	26	U	26
Benzo(ghi)perylene	SVOA	15	U	15	16	U	16	16	U	16
Benzo(k)fluoranthene	SVOA	38	U	38	39	U	39	40	U	40
Bis(2-chloro-1-methylethyl)ether	SVOA	22	U	22	23	U	23	23	U	23
Bis(2-Chloroethoxy)methane	SVOA	22	U	22	23	U	23	23	U	23
Bis(2-chloroethyl) ether	SVOA	16	U	16	16	U	16	16	U	16
Bis(2-ethylhexyl) phthalate	SVOA	150	J	44	94	J	45	46	U	46
Butylbenzylphthalate	SVOA	41	U	41	42	U	42	43	U	43
Carbazole	SVOA	35	U	35	35	U	35	36	U	36
Chrysene	SVOA	26	U	26	26	U	26	27	U	27
Dibenz[a,h]anthracene	SVOA	18	U	18	19	U	19	19	U	19
Dibenzofuran	SVOA	19	U	19	20	U	20	20	U	20
Diethyl phthalate	SVOA									
Diethylphthalate	SVOA	25	U	25	26	U	26	26	U	26
Dimethyl phthalate	SVOA	22	U	22	23	U	23	23	U	23
Di-n-butylphthalate	SVOA	28	U	28	28	U	28	29	U	29
Di-n-octylphthalate	SVOA	14	U	14	14	U	14	14	U	14
Fluoranthene	SVOA	35	U	35	35	U	35	36	U	36
Fluorene	SVOA	17	U	17	18	U	18	18	U	18
Hexachlorobenzene	SVOA	28	U	28	28	U	28	29	U	29
Hexachlorobutadiene	SVOA	9.6	U	9.6	9.8	U	9.8	9.9	U	9.9
Hexachlorocyclopentadiene	SVOA	48	U	48	49	U	49	50	U	50
Hexachloroethane	SVOA	20	U	20	21	U	21	21	U	21
Indeno(1,2,3-cd)pyrene	SVOA	21	U	21	22	U	22	22	U	22
Isophorone	SVOA	16	U	16	17	U	17	17	U	17
Naphthalene	SVOA	30	U	30	30	U	30	31	U	31
Nitrobenzene	SVOA	21	U	21	22	U	22	22	U	22
N-Nitroso-di-n-dipropylamine	SVOA	30	U	30	30	U	30	31	U	31
N-Nitrosodiphenylamine	SVOA	20	U	20	21	U	21	21	U	21
Pentachlorophenol	SVOA	320	U	320	320	U	320	330	U	330
Phenanthrene	SVOA	16	U	16	17	U	17	17	U	17
Phenol	SVOA	17	U	17	18	U	18	18	U	18
Pyrene	SVOA	12	U	12	12	U	12	12	U	12

APPENDIX C

CALCULATIONS

APPENDIX C

CALCULATIONS

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

124-N-10 Waste Site Cleanup Verification 95% UCL Calculations, 0100N-CA-V0236, Rev. 0, Washington Closure Hanford, Richland, Washington.

124-N-10 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculations, 0100N-CA-V0237, Rev. 0, Washington Closure Hanford, Richland, Washington.

124-N-10 Hazard Quotient and Carcinogenic Risk Calculation for Protection of Groundwater, 0100N-CA-V0238, Rev. 0, Washington Closure Hanford, Richland, Washington.

DISCLAIMER FOR CALCULATIONS

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

Acrobat 8.0

CALCULATION COVER SHEET

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

Area: 100-N

Discipline: Environmental *Calculation No: 0100N-CA-V0236

Subject: 124-N-10 Waste Site Cleanup Verification 95% UCL Calculation

Computer Program: Excel Program No: Excel 2003

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

Committed Calculation ☒ Preliminary ☐ Superseded ☐ Voided ☐

Rev.	Sheet Numbers	Originator	Checker	Reviewer	Approval	Date
0	Cover = 1 Sheets = 13 Attm. 1 = 5 Total = 19	J. D. Skoglie	N. K. Schiffern	I. B. Berezovskiy	D. F. Obenauer	1/27/14

SUMMARY OF REVISION

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

Washington Closure Hanford CALCULATION SHEET

Originator	J. D. Skoglie	Date	10/23/13	Calc. No.	0100N-CA-V0236	Rev. No.	0
Project	100-N Field Remediation	Job No.	14655	Checked	N. K. Schiffern	Date	10/23/13
Subject	124-N-10 Waste Site Cleanup Verification 95% UCL Calculations					Sheet No.	1 of 13

Summary

Purpose:

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

Table of Contents:

Given/References:

1) Sample Results (Attachment 1).
2) DOE-RL, 2006a, 100-N Area Sampling and Analysis Plan for CERCLA Waste Sites, DOE/RL-2005-92, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
3) DOE-RL, 2006b, Remedial Design Report/Remedial Action Work Plan for the 100-N Area, DOE/RL-2005-93, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
4) Ecology, 1992, Statistical Guidance for Ecology Site Managers, Publication #92-54, Washington Department of Ecology, Olympia, Washington.
5) Ecology, 1993, Statistical Guidance for Ecology Site Managers, Supplement S-6, Analyzing Site or Background Data with Below-detection Limit or Below-PQL Values (Censored Data Sets), Publication #92-54, Washington Department of Ecology, Olympia, Washington.
6) Ecology, 2011, Cleanup Levels and Risk Calculations (CLARC) Database, Washington State Department of Ecology, Olympia, Washington, <https://fortress.wa.gov/ecy/clarc/CLARCHome.aspx>.
7) EPA, 1989, Risk Assessment Guidance for Superfund: Volume 1, Human Health Evaluation Manual, Part A; Interim Final, EPA/540/1-89/002, U.S. Environmental Protection Agency, Washington, D. C.
8) WAC 173-340, 1996, "Model Toxic Control Act - Cleanup," Washington Administrative Code.

Solution:

Calculation methodology is described in Ecology Pub. #92-54 (Ecology 1992, 1993), below, and in the RDR/RAWP (DOE-RL 2006b). Use data from attached worksheets to perform the 95% UCL calculation for each analyte, the WAC 173-340-740(7)(e) 3-part test for nonradionuclides, and the RPD calculations for each COC/COPC. The hazard quotient and carcinogenic risk calculations are located in a separate calculation brief as an appendix to the Remaining Sites Verification Package (RSVP).

Calculation Description:

The subject calculations were performed on statistical data from soil verification samples (Attachment 1) from the 124-N-10 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 2006b) is documented by this calculation. Duplicate and split RPD results are used in evaluation of data quality within the RSVP for this site.

Methodology:

The 124-N-10 waste site underwent statistical sampling at one decision unit for verification sampling consisting of an excavation decision unit. Also taken were two focused samples, a duplicate, and a split sample.

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

Washington Closure Hanford **CALCULATION SHEET**

Originator J. D. Skoglie	**Date** 10/23/13	**Calc. No.** 0100N-CA-V0236	**Rev. No.** 0
Project 100-N Field Remediation	**Job No.** 14655	**Checked** N. K. Schiffern	**Date** 10/23/13
Subject 124-N-10 Waste Site Cleanup Verification 95% UCL Calculations			**Sheet No.** 2 of 13

Summary (continued)

Methodology, continued:

For nonradioactive analytes with ≤ 50% of the data below detection limits, the statistical value calculated to evaluate the effectiveness of cleanup is the 95% UCL. For nonradioactive analytes with >50% of the data below detection limits, as determined by direct inspection of the sample results (Attachment 1), the maximum detected value for the data set (which includes primary and duplicate samples) is used instead of the 95% UCL, and no further calculations are performed for those data sets. For convenience, these maximum detected values are included in the summary tables that follow. The 95% UCL was not calculated for data sets with no reported detections. Calculated cleanup levels are not available in Ecology (2011) under WAC 173-340-740(3) for calcium, magnesium, potassium, silicon, and sodium. The EPA's *Risk Assessment Guidance for Superfund* (EPA 1989) recommends that aluminum and iron not be considered in site risk evaluations. Therefore, aluminum, calcium, iron, magnesium, potassium, silicon, and sodium are not considered site COCs/COPCs and are also not included in these calculations.

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

For nonradionuclides, the WAC 173-340 statistical guidance suggests that a test for distributional form be performed on the data and the 95% UCL calculated on the appropriate distribution using Ecology software. For nonradionuclide small data sets (n < 10), the calculations are performed assuming nonparametric distribution, so no tests for distribution are performed. For nonradionuclide data sets of ten or greater, as for the subject site, distributional testing is done using Ecology's MTCAStat software (Ecology 1993). Due to differences in addressing censored data between the RDR/RAWP (DOE-RL 2006b) and MTCAStat coding and due to a limitation in the MTCAStat coding (no direct capability to address variable quantitation limits within a data set), substitutions for censored data are performed before software input and the resulting data set treated as uncensored.

The WAC 173-340-740(7)(e) 3-part test is performed for nonradionuclide analytes only and determines if:
1) the 95% UCL exceeds the most stringent cleanup limit for each COC/COPC,
2) greater than 10% of the raw data exceed the most stringent cleanup limit for each COC/COPC,
3) the maximum value of the raw data set exceeds two times the most stringent cleanup limit for each COC/COPC.

The RPD is calculated when both the primary value and either the duplicate or split value for a given analyte are above detection limits and are greater than 5 times the target detection limit (TDL). The TDL is a laboratory detection limit pre-determined for each analytical method and is listed in Table 2-1 of the SAP (DOE-RL 2006a) for certain constituents. All other constituents will have their own pre-determined TDL's based on the laboratory and method used. Where direct evaluation of the attached sample data showed that a given analyte was not detected in the primary and/or duplicate sample, further evaluation of the RPD value was not performed. The RPD calculations use the following formula:

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

where, M = Main Sample Value S = Split (or duplicate) Sample Value

For quality assurance/quality control (QA/QC) duplicate RPD calculations, a value less than 30% indicates the data compare favorably. If the RPD is greater than 30%, further investigation regarding the usability of the data is performed. To assist in the identification of anomalous sample pairs, when an analyte is detected in the primary or duplicate/split sample, but was quantified at less than 5 times the TDL in one or both samples, an additional parameter is evaluated. In this case, if the difference between the primary and duplicate/split result exceeds a control limit of 2 times the TDL, further assessment regarding the usability of the data is performed. Additional discussion as necessary is provided in the data quality assessment section of the applicable RSVP.

Washington Closure Hanford **CALCULATION SHEET**

Originator	J. D. Skoglie	**Date**	10/23/13	**Calc. No.**	0100N-CA-V0236	**Rev. No.**	0
Project	100-N Field Remediation	**Job No.**	14655	**Checked**	N. K. Schiffern	**Date**	10/23/13
Subject	124-N-10 Waste Site Cleanup Verification 95% UCL Calculations					**Sheet No.**	3 of 13

Summary (continued)

QUALIFIER LIST

B = estimate
J = estimate
M = sample duplicate precision not met.
N = recovery exceeds upper and lower control limit.
P = this flag is used for an aroclor target analyte where there is greater than 25% difference for detected concentrations between the two GC columns.
U = undetected
X (metals) = serial dilution in the analytical batch indicates that physical and chemical interferences are present.
X (organics) = more than 40% difference between columns, lower result reported.

ACRONYM LIST

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

Washington Closure Hanford — **CALCULATION SHEET**

Originator J. D. Skoglie	**Date** 10/23/13	**Calc. No.**	0100N-CA-V0236	**Rev. No.**	0
Project 100-N Field Remediation	**Job No.** 14655	**Checked**	N. K. Schiffern	**Date**	10/23/13
Subject 124-N-10 Waste Site Cleanup Verification 95% UCL Calculations				**Sheet No.**	4 of 13

Summary (continued)

Results:

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

Results Summary - 124-N-10 Waste Site

Analyte	Excavation 95% UCL Result	Excavation Maximum Result	Focused	Unit
Arsenic	3.0	--	2.7	mg/kg
Barium	66.9	--	62.1	mg/kg
Beryllium	0.27	--	0.25	mg/kg
Boron	0.97	--	--	mg/kg
Cadmium	0.19	--	0.16	mg/kg
Chromium	9.6	--	8.9	mg/kg
Cobalt	7.5	--	8.1	mg/kg
Copper	18.9	--	15.5	mg/kg
Hexavalent Chromium	0.229	--	0.182	mg/kg
Lead	4.3	--	4.7	mg/kg
Manganese	311	--	282	mg/kg
Mercury	0.11	--	0.0055	mg/kg
Molybdenum	0.30	--	0.29	mg/kg
Nickel	10.2	--	9.6	mg/kg
Silver	0.60	--	0.25	mg/kg
Vanadium	46.5	--	50.8	mg/kg
Zinc	54.6	--	58.9	mg/kg
Nitrogen in Nitrite and Nitrate	31.9	--	35.4	mg/kg
TPH - Diesel Range	46	--	3.9	mg/kg
TPH - Diesel Range EXT	136	--	7.4	mg/kg
Benzo(a)pyrene	--	0.028	--	mg/kg
Chrysene	--	0.0071	--	mg/kg
Fluorene	--	0.026	--	mg/kg
Aroclor-1254	--	0.021	0.0086	mg/kg
3-Part Test Evaluation:				
95% UCL or maximum[a] > Cleanup Limit?	NO	YES		
> 10% above Cleanup Limit?	YES	NO		
Any sample > 2x Cleanup Limit?	NO	NO		

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

Washington Closure Hanford **CALCULATION SHEET**

Originator J. D. Skoglie **Date** 10/23/13 **Calc. No.** 0100N-CA-V0236 **Rev. No.** 0
Project 100-N Field Remediation **Job No.** 14655 **Checked** N. K. Schiffern **Date** 10/23/13
Subject 124-N-10 Waste Site Cleanup Verification 95% UCL Calculations **Sheet No.** 5 of 13

Summary (continued)

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

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

Analyte	Excavation Zone	
	Duplicate	**Split**
Aluminum	4.3%	12.0%
Barium	1.3%	9.5%
Calcium	7.8%	3.7%
Chromium	5.4%	23.5%
Copper	0.7%	2.9%
Iron	3.6%	17.2%
Magnesium	0.0%	9.5%
Manganese	2.7%	15.4%
Silicon	1.4%	***113.4%***
Vanadium	11.8%	21.6%
Zinc	7.4%	8.2%

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

Washington Closure Hanford

CALCULATION SHEET

Originator J. D. Skoglie — Date 10/23/13 — Calc. No. 0100N-CA-V0236 — Rev. No. 0
Project 100-N Field Remediation — Job No. 14655 — Checked N. K. Schiffern — Date 10/23/13
Subject 124-N-10 Waste Site Cleanup Verification 95% UCL Calculations — Sheet No. 6 of 13

124-N-10 Waste Site Statistical Calculations
Verification Data - Excavation (EXC)

Sample Area	Sample Number	Sample Date	Arsenic mg/kg	Q	PQL	Barium mg/kg	Q	PQL	Beryllium mg/kg	Q	PQL	Boron mg/kg	Q	PQL	Cadmium mg/kg	Q	PQL	Chromium mg/kg	Q	PQL	Cobalt mg/kg	Q	PQL	Copper mg/kg	Q	PQL	Hexavalent Chromium mg/kg	Q	PQL
EXC-9	J1T0N3	9/10/13	2.7		0.65	78.3	X	0.075	0.32		0.032	1.0	B	0.96	0.18	B	0.040	10.9	X	0.057	8.4	X	0.098	13.7		0.21	0.155	UJ	0.155
Duplicate of J1T0N3	J1T0N7	9/10/13	2.8		0.65	79.3	X	0.075	0.33		0.033	1.1	B	0.97	0.19	B	0.041	11.5	X	0.058	7.5	X	0.099	13.6		0.22	0.155	UJ	0.155
EXC-1	J1T0M5	9/10/13	2.8		0.62	63.4	X	0.072	0.26		0.031	1.3	BN	0.92	0.19		0.039	9.1	X	0.055	7.4	X	0.094	18.0		0.20	0.155	UJ	0.155
EXC-2	J1T0M6	9/10/13	1.4		0.63	65.0	X	0.073	0.15	B	0.032	0.94	U	0.94	0.12	B	0.039	6.6	X	0.055	6.4	X	0.096	13.3		0.21	0.309	J	0.155
EXC-3	J1T0M7	9/10/13	2.3		0.60	53.7	X	0.069	0.19		0.030	0.88	U	0.88	0.19		0.037	7.7	X	0.052	6.3	X	0.090	22.4		0.20	0.295	J	0.155
EXC-4	J1T0M8	9/10/13	2.0		0.69	41.7	X	0.079	0.20	B	0.034	1.0	U	1.0	0.12	B	0.043	3.4	X	0.060	8.1	X	0.10	12.6		0.23	0.318	J	0.155
EXC-5	J1T0M9	9/10/13	2.9		0.59	54.9	X	0.068	0.24		0.029	0.87	U	0.87	0.19		0.037	9.4	X	0.052	7.7	X	0.089	22.9		0.19	0.155	UJ	0.155
EXC-6	J1T0N0	9/10/13	3.1		0.61	66.0	X	0.070	0.24		0.030	0.99	B	0.90	0.21		0.038	10.7	X	0.054	7.0	X	0.092	20.5		0.20	0.178	J	0.155
EXC-7	J1T0N1	9/10/13	2.5		0.60	59.6	X	0.069	0.23		0.030	0.88	B	0.88	0.17	B	0.037	8.8	X	0.052	6.8	X	0.090	16.4		0.20	0.155	UJ	0.155
EXC-8	J1T0N2	9/10/13	4.0		0.63	60.6	X	0.073	0.25		0.032	1.1	B	0.94	0.20		0.039	9.8	X	0.056	7.4	X	0.096	17.7		0.21	0.155	UJ	0.155
EXC-10	J1T0N4	9/10/13	2.5		0.65	57.4	X	0.074	0.25		0.032	0.96	B	0.96	0.18	B	0.040	7.6	X	0.057	7.4	X	0.098	15.6		0.21	0.350	J	0.155
EXC-11	J1T0N5	9/10/13	2.9		0.62	74.2	X	0.071	0.29		0.031	1.2	B	0.92	0.18	B	0.038	10.1	X	0.054	7.1	X	0.094	15.6		0.20	0.155	UJ	0.155
EXC-12	J1T0N6	9/10/13	2.3		0.59	57.2	X	0.068	0.23		0.030	0.88	U	0.88	0.15	B	0.037	7.9	X	0.052	6.5	X	0.090	14.2		0.19	0.194	J	0.155

Statistical Computation Input Data

Sample Area	Sample Number	Sample Date	Arsenic mg/kg	Barium mg/kg	Beryllium mg/kg	Boron mg/kg	Cadmium mg/kg	Chromium mg/kg	Cobalt mg/kg	Copper mg/kg	Hexavalent Chromium mg/kg
EXC-9	J1T0N3/J1T0N7	9/10/13	2.8	78.8	0.33	1.1	0.19	11.2	8.0	13.7	0.0775
EXC-1	J1T0M5	9/10/13	2.8	63.4	0.26	1.3	0.19	9.1	7.4	18.0	0.0775
EXC-2	J1T0M6	9/10/13	1.4	65.0	0.15	0.47	0.12	6.6	6.4	13.3	0.309
EXC-3	J1T0M7	9/10/13	2.3	53.7	0.19	0.44	0.19	7.7	6.3	22.4	0.295
EXC-4	J1T0M8	9/10/13	2.0	41.7	0.20	0.50	0.12	3.4	8.1	12.6	0.318
EXC-5	J1T0M9	9/10/13	2.9	54.9	0.24	0.44	0.19	9.4	7.7	22.9	0.0775
EXC-6	J1T0N0	9/10/13	3.1	66.0	0.24	0.99	0.21	10.7	7.0	20.5	0.178
EXC-7	J1T0N1	9/10/13	2.5	59.6	0.23	0.88	0.17	8.8	6.8	16.4	0.0775
EXC-8	J1T0N2	9/10/13	4.0	60.6	0.25	1.1	0.20	9.8	7.4	17.7	0.0775
EXC-10	J1T0N4	9/10/13	2.5	57.4	0.25	1.0	0.18	7.6	7.4	15.6	0.350
EXC-11	J1T0N5	9/10/13	2.9	74.2	0.29	1.2	0.18	10.1	7.1	15.6	0.0775
EXC-12	J1T0N6	9/10/13	2.3	57.2	0.23	0.44	0.15	7.9	6.5	14.2	0.194

Statistical Computations

	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Hexavalent Chromium
95% UCL based on	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), use MTCAStat normal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.
N	12	12	12	12	12	12	12	12	12
% < Detection limit	0%	0%	0%	42%	0%	0%	0%	0%	50%
Mean	2.6	61.0	0.24	0.81	0.17	8.5	7.2	16.9	0.176
Standard deviation	0.64	9.7	0.045	0.33	0.029	2.1	0.59	3.5	0.113
95% UCL on mean	3.0	66.9	0.27	0.97	0.19	9.6	7.5	18.9	0.229
Maximum value	4.0	79.3	0.33	1.3	0.21	11.5	8.4	22.9	0.350
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)	20 DE, GW & River Protection	200 GW Protection	1.51 GW & River Protection	320 GW Protection	0.81 GW & River Protection	18.5 GW & River Protection	32 GW Protection	22.0 River Protection	2 River Protection
WAC 173-340 3-PART TEST									
95% UCL > Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	NO	NO
> 10% above Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	YES	NO
Any sample > 2X Cleanup Limit?	NA	NA	NA	NO	NA	NA	NA	NO	NO
WAC 173-340 Compliance?	Because all values are below background (6.5 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (132 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (1.51 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	Because all values are below background (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.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.

Qualifiers and acronyms are defined on page 3.

Washington Closure Hanford
Originator J. D. Skoglie
Project 100-N Field Remediation
Subject 124-N-10 Waste Site Cleanup Verification 95% UCL Calculations

CALCULATION SHEET
Date 10/23/13
Job No. 14655

Calc. No. 0100N-CA-V0236
Checked N. K. Schiffern

Rev. No. 0
Date 10/23/13
Sheet No. 7 of 13

124-N-10 Waste Site Statistical Calculations
Verification Data - Excavation (EXC)

Sample Area	Sample Number	Sample Date	Lead			Manganese			Mercury			Molybdenum			Nickel			Silver			Vanadium			Zinc			Nitrogen in Nitrate and Nitrite		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-9	J1T0N3	9/10/13	4.4		0.26	359	X	0.098	0.0058	U	0.0058	0.25	U	0.25	10.4	X	0.12	0.16	U	0.16	45.9		0.092	41.9	X	0.39	2.6	J	0.31
Duplicate of J1T0N3	J1T0N7	9/10/13	4.5		0.27	369	X	0.099	0.0060	U	0.0060	0.26	U	0.26	10.6	X	0.12	0.16	U	0.16	40.8		0.093	38.9	X	0.39	3.2	J	0.30
EXC-1	J1T0M5	9/10/13	4.1		0.25	305	X	0.094	0.0076	BNM	0.0050	0.26	B	0.24	10.1	X	0.12	0.21		0.15	44.6		0.088	46.7	X	0.37	4.8	JNM	0.30
EXC-2	J1T0M6	9/10/13	2.8		0.26	228	X	0.096	0.0051	U	0.0051	0.29	B	0.25	6.0	X	0.12	0.15	U	0.15	51.5		0.090	36.4	X	0.38	56.4	J	0.29
EXC-3	J1T0M7	9/10/13	3.7		0.24	248	X	0.090	0.13		0.0067	0.39	B	0.23	9.1	X	0.11	1.3		0.14	37.1		0.085	68.7	X	0.36	35.5	J	0.29
EXC-4	J1T0M8	9/10/13	3.0		0.28	217	X	0.10	0.0063	U	0.0063	0.28	B	0.27	6.3	X	0.13	0.17	U	0.17	35.1		0.098	35.8	X	0.41	9.0	J	0.30
EXC-5	J1T0M9	9/10/13	4.5		0.24	324	X	0.089	0.058		0.0056	0.33	B	0.23	10.3	X	0.11	1.0		0.14	45.7		0.084	64.9	X	0.35	3.1	J	0.31
EXC-6	J1T0N0	9/10/13	4.6		0.25	287	X	0.092	0.041		0.0062	0.41	B	0.24	11.0	X	0.11	1.0		0.15	45.4		0.087	63.9	X	0.37	87.8	J	0.30
EXC-7	J1T0N1	9/10/13	3.6		0.24	282	X	0.090	0.0089	B	0.0064	0.23	B	0.23	9.7	X	0.11	0.14	U	0.14	46.1		0.085	42.2	X	0.36	3.3	J	0.31
EXC-8	J1T0N2	9/10/13	4.1		0.26	292	X	0.096	0.017		0.0051	0.25	U	0.25	11.3	X	0.12	0.52		0.15	48.5		0.090	49.7	X	0.38	8.7	J	0.31
EXC-10	J1T0N4	9/10/13	4.2		0.26	313	X	0.098	0.016	B	0.0063	0.30	B	0.25	9.0	X	0.12	0.18	B	0.16	46.8		0.092	47.9	X	0.39	9.7	J	0.31
EXC-11	J1T0N5	9/10/13	4.5		0.25	315	X	0.094	0.0054	U	0.0054	0.24	U	0.24	10.8	X	0.12	0.15	U	0.15	41.2		0.088	38.0	X	0.37	2.5	JN	0.31
EXC-12	J1T0N6	9/10/13	3.3		0.24	262	X	0.090	0.0062	U	0.0062	0.23	U	0.23	8.7	X	0.11	0.14	U	0.14	38.6		0.084	33.1	X	0.36	3.8	J	0.30

Statistical Computation Input Data

Sample Area	Sample Number	Sample Date	Lead mg/kg	Manganese mg/kg	Mercury mg/kg	Molybdenum mg/kg	Nickel mg/kg	Silver mg/kg	Vanadium mg/kg	Zinc mg/kg	Nitrogen in Nitrate and Nitrite mg/kg
EXC-9	J1T0N3/J1T0N7	9/10/13	4.5	364	0.0030	0.13	10.5	0.080	43.4	40.4	2.9
EXC-1	J1T0M5	9/10/13	4.1	305	0.0076	0.26	10.1	0.21	44.6	46.7	4.8
EXC-2	J1T0M6	9/10/13	2.8	228	0.0026	0.29	6.0	0.075	51.5	36.4	56.4
EXC-3	J1T0M7	9/10/13	3.7	248	0.13	0.39	9.1	1.3	37.1	68.7	35.5
EXC-4	J1T0M8	9/10/13	3.0	217	0.0032	0.28	6.3	0.085	35.1	35.8	9.0
EXC-5	J1T0M9	9/10/13	4.5	324	0.058	0.33	10.3	1.0	45.7	64.9	3.1
EXC-6	J1T0N0	9/10/13	4.6	287	0.041	0.41	11.0	1.0	45.4	63.9	87.8
EXC-7	J1T0N1	9/10/13	3.6	282	0.0089	0.23	9.7	0.070	46.1	42.2	3.3
EXC-8	J1T0N2	9/10/13	4.1	292	0.017	0.13	11.3	0.52	48.5	49.7	8.7
EXC-10	J1T0N4	9/10/13	4.2	313	0.016	0.30	9.0	0.18	46.8	47.9	9.7
EXC-11	J1T0N5	9/10/13	4.5	315	0.0027	0.12	10.8	0.075	41.2	38.0	2.5
EXC-12	J1T0N6	9/10/13	3.3	262	0.0031	0.12	8.7	0.070	38.6	33.1	3.8

Statistical Computations

	Lead	Manganese	Mercury	Molybdenum	Nickel	Silver	Vanadium	Zinc	Nitrogen in Nitrate and Nitrite
95% UCL based on	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat normal distribution.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), use MTCAStat lognormal distribution.	Large data set (n ≥ 10), lognormal and normal distribution rejected, use z-statistic.
N	12	12	12	12	12	12	12	12	12
% < Detection limit	0%	0%	42%	33%	0%	50%	0%	0%	0%
Mean	3.9	286	0.024	0.25	9.4	0.39	43.7	47.3	19.0
Standard deviation	0.62	42.3	0.038	0.11	1.7	0.45	4.8	12.3	27.2
95% UCL on mean	4.3	311	0.11	0.30	10.2	0.60	46.5	54.6	31.9
Maximum value	4.6	369	0.13	0.41	11.3	1.3	51.5	68.7	87.8
Most Stringent Cleanup Limit for nonradionuclide and RAG type (mg/kg)	10.2 GW & River Protection	512 GW Protection	0.33 GW & River Protection	8 GW Protection	19.1 GW Protection	0.73 River Protection	85.1 GW Protection	67.8 River Protection	1000 GW Protection
WAC 173-340 3-PART TEST									
95% UCL > Cleanup Limit?	NA	NA	NA	NO	NA	NO	NA	NO	NO
> 10% above Cleanup Limit?	NA	NA	NA	NO	NA	YES	NA	NO	NO
Any sample > 2X Cleanup Limit?	NA	NA	NA	NO	NA	NO	NA	NO	NO
WAC 173-340 Compliance?	Because all values are below background (10.2 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (512 mg/kg) the WAC 173-340 3-part test is not required.	Because all values are below background (0.33 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	Because all values are below background (19.1 mg/kg) the WAC 173-340 3-part test is not required.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	Because all values are below background (85.1 mg/kg) the WAC 173-340 3-part test is not required.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.

Qualifiers and acronyms are defined on page 3.

Washington Closure Hanford
Originator J. D. Skoglie
Project 100-N Field Remediation
Subject 124-N-10 Waste Site Cleanup Verification 95% UCL Calculations

CALCULATION SHEET
Date 10/23/13
Job No. 14655

Calc. No. 0100N-CA-V0236
Checked N. K. Schiffern

Rev. No. 0
Date 10/23/13
Sheet No. 8 of 13

124-N-10 Waste Site Statistical Calculations
Verification Data - Excavation (EXC)

Sample Area	Sample Number	Sample Date	TPH - Diesel Range ug/kg	Q	PQL	TPH - Diesel Range EXT ug/kg	Q	PQL
EXC-9	J1T0N3	9/10/13	1500	J	690	2800	J	1000
Duplicate of J1T0N3	J1T0N7	9/10/13	700	U	700	1000	U	1000
EXC-1	J1T0M5	9/10/13	31000		680	64000		1000
EXC-2	J1T0M6	9/10/13	3700	J	670	6900		980
EXC-3	J1T0M7	9/10/13	38000		680	87000		1000
EXC-4	J1T0M8	9/10/13	1600	J	670	2900	J	980
EXC-5	J1T0M9	9/10/13	15000		690	32000		1000
EXC-6	J1T0N0	9/10/13	13000		680	28000		1000
EXC-7	J1T0N1	9/10/13	3300	J	680	7300		1000
EXC-8	J1T0N2	9/10/13	5900		690	13000		1000
EXC-10	J1T0N4	9/10/13	10000		680	36000		1000
EXC-11	J1T0N5	9/10/13	1500	J	690	3100	J	1000
EXC-12	J1T0N6	9/10/13	1100	J	680	1900	J	1000

Statistical Computation Input Data

Sample Area	Sample Number	Sample Date	TPH - Diesel Range ug/kg	TPH - Diesel Range EXT ug/kg
EXC-9	J1T0N3/J1T0N7	9/10/13	925	1650
EXC-1	J1T0M5	9/10/13	31000	64000
EXC-2	J1T0M6	9/10/13	3700	6900
EXC-3	J1T0M7	9/10/13	38000	87000
EXC-4	J1T0M8	9/10/13	1600	2900
EXC-5	J1T0M9	9/10/13	15000	32000
EXC-6	J1T0N0	9/10/13	13000	28000
EXC-7	J1T0N1	9/10/13	3300	7300
EXC-8	J1T0N2	9/10/13	5900	13000
EXC-10	J1T0N4	9/10/13	10000	36000
EXC-11	J1T0N5	9/10/13	1500	3100
EXC-12	J1T0N6	9/10/13	1100	1900

Statistical Computations

	TPH - Diesel Range		TPH - Diesel Range EXT	
95% UCL based on	Large data set (n ≥ 10), use MTCAStat lognormal distribution.		Large data set (n ≥ 10), use MTCAStat lognormal distribution.	
N	12		12	
% < Detection limit	0%		0%	
Mean	10419		23646	
Standard deviation	12294		27558	
95% UCL on mean	45678		135655	
Maximum value	38000		87000	
Most Stringent Cleanup Limit for nonradionuclide and RAG type (ug/kg)	200000	GW & River Protection	200000	GW & River Protection
WAC 173-340 3-PART TEST				
95% UCL > Cleanup Limit?	NO		NO	
> 10% above Cleanup Limit?	NO		NO	
Any sample > 2X Cleanup Limit?	NO		NO	
WAC 173-340 Compliance?	The data set meets the 3-part test criteria when compared to the most stringent RAG.		The data set meets the 3-part test criteria when compared to the most stringent RAG.	

Qualifiers and acronyms are defined on page 3.

CALCULATION SHEET

Washington Closure Hanford

Originator	J. D. Skoglie	**Date**	10/23/13	**Calc. No.**	0100N-CA-V0236
Project	100-N Field Remediation	**Job No.**	14655	**Checked**	N. K. Schiffern
Subject	124-N-10 Waste Site Cleanup Verification 95% UCL Calculations	**Rev. No.**	0	**Date**	10/23/13
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124-N-10 Waste Site Maximum Calculations

Verification Data - Excavation (EXC)

Sample Area	Sample Number	Sample Date	Benzo(a)pyrene ug/kg	Q	PQL	Chrysene ug/kg	Q	PQL	Fluorene ug/kg	Q	PQL	Aroclor-1254 ug/kg	Q	PQL
EXC-9	J1T0N3	9/10/13	6.5	U	6.5	4.9	U	4.9	5.4	U	5.4	2.7	U	2.7
Duplicate of J1T0N3	J1T0N7	9/10/13	6.6	U	6.6	5.0	U	5.0	5.4	U	5.4	2.6	U	2.6
EXC-1	J1T0M5	9/10/13	6.4	U	6.4	4.8	U	4.8	5.2	U	5.2	3.2	JP	2.4
EXC-2	J1T0M6	9/10/13	7.2	JX	6.4	4.8	U	4.8	5.3	U	5.3	2.6	U	2.6
EXC-3	J1T0M7	9/10/13	28		6.5	4.9	U	4.9	26	J	5.4	21		2.6
EXC-4	J1T0M8	9/10/13	6.6	U	6.6	5.0	U	5.0	5.4	U	5.4	2.7	U	2.7
EXC-5	J1T0M9	9/10/13	6.4	U	6.4	4.8	U	4.8	5.3	U	5.3	15	JP	2.6
EXC-6	J1T0N0	9/10/13	6.5	U	6.5	4.9	U	4.9	5.3	U	5.3	11	JP	2.6
EXC-7	J1T0N1	9/10/13	6.4	U	6.4	4.8	U	4.8	5.2	U	5.2	2.6	UJ	2.6
EXC-8	J1T0N2	9/10/13	6.4	U	6.4	4.9	U	4.9	5.3	U	5.3	6.7	JP	2.6
EXC-10	J1T0N4	9/10/13	6.5	U	6.5	7.1	J	4.9	5.3	U	5.3	2.6	UJ	2.6
EXC-11	J1T0N5	9/10/13	6.2	U	6.2	4.7	U	4.7	5.1	U	5.1	2.6	U	2.6
EXC-12	J1T0N6	9/10/13	6.2	U	6.2	4.7	U	4.7	5.1	U	5.1	2.6	U	2.6

Statistical Computation Input Data

	Benzo(a)pyrene	Chrysene	Fluorene	Aroclor-1254
% < Detection limit	83%	92%	92%	58%
Maximum value	28	7.1	26	21
Most Stringent Cleanup Limit for nonradionuclide and RAG type (ug/kg)	15 GW and River Protection	100 River Protection	64000 GW Protection	17 GW and River Protection
3-PART TEST				
Maximum > Cleanup Limit?	YES	NO	NO	YES
> 10% above Cleanup Limit?	NO	NO	NO	NO
Any sample > 2X Cleanup Limit?	NO	NO	NO	NO
3-Part Test Compliance?	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	The data set meets the 3-part test criteria when compared to the most stringent RAG.	A detailed assessment will be performed. The data set meets the 3-part test criteria when compared to the direct exposure RAG.

Qualifiers and acronyms are defined on page 3.

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie	**Date** 10/23/13	**Calc. No.** 0100N-CA-V0236	**Rev. No.** 0
Project 100-N Field Remediation	**Job No.** 14655	**Checked** N. K. Schiffern	**Date** 10/23/13
Subject 124-N-10 Waste Site Cleanup Verification 95% UCL Calculations			**Sheet No.** 10 of 13

Ecology Software (MTCAStat) Results, 124-N-10 Waste Site Excavation (EXC)

DATA	ID	Arsenic 95% UCL Calculation			
2.8	J1T0N3/J1T0N7				
2.8	J1T0M5				
1.4	J1T0M6	Number of samples		Uncensored values	
2.3	J1T0M7	Uncensored	12	Mean	2.6
2.0	J1T0M8	Censored		Lognormal mean	2.6
2.9	J1T0M9	Detection limit or PQL		Std. devn.	0.64
3.1	J1T0N0	Method detection limit		Median	2.6
2.5	J1T0N1	TOTAL	12	Min.	1.4
4.0	J1T0N2			Max.	4.0
2.5	J1T0N4				
2.9	J1T0N5				
2.3	J1T0N6				

Lognormal distribution? r-squared is: 0.909 — Normal distribution? r-squared is: 0.931
Recommendations:
Use lognormal distribution.
UCL (Land's method) is 3.0

DATA	ID	Barium 95% UCL Calculation			
78.8	J1T0N3/J1T0N7				
63.4	J1T0M5				
65.0	J1T0M6	Number of samples		Uncensored values	
53.7	J1T0M7	Uncensored	12	Mean	61.0
41.7	J1T0M8	Censored		Lognormal mean	61.1
54.9	J1T0M9	Detection limit or PQL		Std. devn.	9.7
66.0	J1T0N0	Method detection limit		Median	60.1
59.6	J1T0N1	TOTAL	12	Min.	41.7
60.6	J1T0N2			Max.	78.8
57.4	J1T0N4				
74.2	J1T0N5				
57.2	J1T0N6				

Lognormal distribution? r-squared is: 0.934 — Normal distribution? r-squared is: 0.953
Recommendations:
Use lognormal distribution.
UCL (Land's method) is 66.9

DATA	ID	Beryllium 95% UCL Calculation			
0.33	J1T0N3/J1T0N7				
0.26	J1T0M5				
0.15	J1T0M6	Number of samples		Uncensored values	
0.19	J1T0M7	Uncensored	12	Mean	0.24
0.20	J1T0M8	Censored		Lognormal mean	0.24
0.24	J1T0M9	Detection limit or PQL		Std. devn.	0.045
0.24	J1T0N0	Method detection limit		Median	0.24
0.23	J1T0N1	TOTAL	12	Min.	0.15
0.25	J1T0N2			Max.	0.33
0.25	J1T0N4				
0.29	J1T0N5				
0.23	J1T0N6				

Lognormal distribution? r-squared is: 0.930 — Normal distribution? r-squared is: 0.954
Recommendations:
Use lognormal distribution.
UCL (Land's method) is 0.27

DATA	ID	Boron 95% UCL Calculation			
1.1	J1T0N3/J1T0N7				
1.3	J1T0M5				
0.47	J1T0M6	Number of samples		Uncensored values	
0.44	J1T0M7	Uncensored	12	Mean	0.81
0.50	J1T0M8	Censored		Lognormal mean	0.82
0.44	J1T0M9	Detection limit or PQL		Std. devn.	0.33
0.99	J1T0N0	Method detection limit		Median	0.92
0.88	J1T0N1	TOTAL	12	Min.	0.44
1.1	J1T0N2			Max.	1.3
0.96	J1T0N4				
1.2	J1T0N5				
0.44	J1T0N6				

Lognormal distribution? r-squared is: 0.848 — Normal distribution? r-squared is: 0.880
Recommendations:
Reject BOTH lognormal and normal distributions.
UCL (Z-statistics) is 0.97

DATA	ID	Cadmium 95% UCL Calculation			
0.19	J1T0N3/J1T0N7				
0.19	J1T0M5				
0.12	J1T0M6	Number of samples		Uncensored values	
0.19	J1T0M7	Uncensored	12	Mean	0.17
0.12	J1T0M8	Censored		Lognormal mean	0.17
0.19	J1T0M9	Detection limit or PQL		Std. devn.	0.029
0.21	J1T0N0	Method detection limit		Median	0.18
0.17	J1T0N1	TOTAL	12	Min.	0.12
0.20	J1T0N2			Max.	0.21
0.18	J1T0N4				
0.18	J1T0N5				
0.15	J1T0N6				

Lognormal distribution? r-squared is: 0.818 — Normal distribution? r-squared is: 0.863
Recommendations:
Reject BOTH lognormal and normal distributions.
UCL (Z-statistics) is 0.19

DATA	ID	Chromium 95% UCL Calculation			
11.2	J1T0N3/J1T0N7				
9.1	J1T0M5				
6.6	J1T0M6	Number of samples		Uncensored values	
7.7	J1T0M7	Uncensored	12	Mean	8.5
3.4	J1T0M8	Censored		Lognormal mean	8.6
9.4	J1T0M9	Detection limit or PQL		Std. devn.	2.1
10.7	J1T0N0	Method detection limit		Median	9.0
8.8	J1T0N1	TOTAL	12	Min.	3.4
9.8	J1T0N2			Max.	11.2
7.6	J1T0N4				
10.1	J1T0N5				
7.9	J1T0N6				

Lognormal distribution? r-squared is: 0.767 — Normal distribution? r-squared is: 0.904
Recommendations:
Use normal distribution.
UCL (based on t-statistic) is 9.6

DATA	ID	Cobalt 95% UCL Calculation			
8.0	J1T0N3/J1T0N7				
7.4	J1T0M5				
6.4	J1T0M6	Number of samples		Uncensored values	
6.3	J1T0M7	Uncensored	12	Mean	7.2
8.1	J1T0M8	Censored		Lognormal mean	7.2
7.7	J1T0M9	Detection limit or PQL		Std. devn.	0.59
7.0	J1T0N0	Method detection limit		Median	7.3
6.8	J1T0N1	TOTAL	12	Min.	6.3
7.4	J1T0N2			Max.	8.1
7.4	J1T0N4				
7.1	J1T0N5				
6.5	J1T0N6				

Lognormal distribution? r-squared is: 0.968 — Normal distribution? r-squared is: 0.970
Recommendations:
Use lognormal distribution.
UCL (Land's method) is 7.5

DATA	ID	Copper 95% UCL Calculation			
13.7	J1T0N3/J1T0N7				
18.0	J1T0M5				
13.3	J1T0M6	Number of samples		Uncensored values	
22.4	J1T0M7	Uncensored	12	Mean	16.9
12.6	J1T0M8	Censored		Lognormal mean	16.9
22.9	J1T0M9	Detection limit or PQL		Std. devn.	3.5
20.5	J1T0N0	Method detection limit		Median	16.0
16.4	J1T0N1	TOTAL	12	Min.	12.6
17.7	J1T0N2			Max.	22.9
15.6	J1T0N4				
15.6	J1T0N5				
14.2	J1T0N6				

Lognormal distribution? r-squared is: 0.959 — Normal distribution? r-squared is: 0.935
Recommendations:
Use lognormal distribution.
UCL (Land's method) is 18.9

DATA	ID	Hexavalent Chromium 95% UCL Calculation			
0.0775	J1T0N3/J1T0N7				
0.0775	J1T0M5				
0.309	J1T0M6	Number of samples		Uncensored values	
0.295	J1T0M7	Uncensored	12	Mean	0.176
0.318	J1T0M8	Censored		Lognormal mean	0.180
0.0775	J1T0M9	Detection limit or PQL		Std. devn.	0.113
0.178	J1T0N0	Method detection limit		Median	0.128
0.0775	J1T0N1	TOTAL	12	Min.	0.0775
0.0775	J1T0N2			Max.	0.350
0.350	J1T0N4				
0.0775	J1T0N5				
0.194	J1T0N6				

Lognormal distribution? r-squared is: 0.792 — Normal distribution? r-squared is: 0.808
Recommendations:
Reject BOTH lognormal and normal distributions.
UCL (Z-statistics) is 0.229

Qualifiers and acronyms are defined on page 3.

CALCULATION SHEET

Washington Closure Hanford			
Originator: J. D. Skoglie	Date: 10/23/13	Calc. No.: 0100N-CA-V0236	Rev. No.: 0
Project: 100-N Field Remediation	Job No.: 14655	Checked: N. K. Schiffern	Date: 10/23/13
Subject: 124-N-10 Waste Site Cleanup Verification 95% UCL Calculations			Sheet No.: 11 of 13

Ecology Software (MTCAStat) Results, 124-N-10 Waste Site Excavation (EXC)

Lead 95% UCL Calculation

DATA	ID				
4.5	J1T0N3/J1T0N7				
4.1	J1T0M5				
2.8	J1T0M6	Number of samples		Uncensored values	
3.7	J1T0M7	Uncensored	12	Mean	3.9
3.0	J1T0M8	Censored		Lognormal mean	3.9
4.5	J1T0M9	Detection limit or PQL		Std. devn.	0.62
4.6	J1T0N0	Method detection limit		Median	4.1
3.6	J1T0N1	TOTAL	12	Min.	2.8
4.1	J1T0N2			Max.	4.6
4.2	J1T0N4				
4.5	J1T0N5				
3.3	J1T0N6				

Lognormal distribution? r-squared is: 0.902
Normal distribution? r-squared is: 0.921
Recommendations:
Use lognormal distribution.
UCL (Land's method) is 4.3

Manganese 95% UCL Calculation

DATA	ID				
364	J1T0N3/J1T0N7				
305	J1T0M5				
228	J1T0M6	Number of samples		Uncensored values	
248	J1T0M7	Uncensored	12	Mean	286
217	J1T0M8	Censored		Lognormal mean	287
324	J1T0M9	Detection limit or PQL		Std. devn.	42.3
287	J1T0N0	Method detection limit		Median	290
282	J1T0N1	TOTAL	12	Min.	217
292	J1T0N2			Max.	364
313	J1T0N4				
315	J1T0N5				
262	J1T0N6				

Lognormal distribution? r-squared is: 0.969
Normal distribution? r-squared is: 0.977
Recommendations:
Use lognormal distribution.
UCL (Land's method) is 311

Mercury 95% UCL Calculation

DATA	ID				
0.0030	J1T0N3/J1T0N7				
0.0076	J1T0M5				
0.0026	J1T0M6	Number of samples		Uncensored values	
0.13	J1T0M7	Uncensored	12	Mean	0.024
0.0032	J1T0M8	Censored		Lognormal mean	0.025
0.058	J1T0M9	Detection limit or PQL		Std. devn.	0.038
0.041	J1T0N0	Method detection limit		Median	0.0083
0.0089	J1T0N1	TOTAL	12	Min.	0.0026
0.017	J1T0N2			Max.	0.13
0.016	J1T0N4				
0.0027	J1T0N5				
0.0031	J1T0N6				

Lognormal distribution? r-squared is: 0.903
Normal distribution? r-squared is: 0.634
Recommendations:
Use lognormal distribution.
UCL (Land's method) is 0.11

Molybdenum 95% UCL Calculation

DATA	ID				
0.13	J1T0N3/J1T0N7				
0.26	J1T0M5				
0.29	J1T0M6	Number of samples		Uncensored values	
0.39	J1T0M7	Uncensored	12	Mean	0.25
0.28	J1T0M8	Censored		Lognormal mean	0.25
0.33	J1T0M9	Detection limit or PQL		Std. devn.	0.11
0.41	J1T0N0	Method detection limit		Median	0.27
0.23	J1T0N1	TOTAL	12	Min.	0.12
0.13	J1T0N2			Max.	0.41
0.30	J1T0N4				
0.12	J1T0N5				
0.12	J1T0N6				

Lognormal distribution? r-squared is: 0.881
Normal distribution? r-squared is: 0.924
Recommendations:
Use normal distribution.
UCL (t-statistic) is 0.30

Nickel 95% UCL Calculation

DATA	ID				
10.5	J1T0N3/J1T0N7				
10.1	J1T0M5				
6.0	J1T0M6	Number of samples		Uncensored values	
9.1	J1T0M7	Uncensored	12	Mean	9.4
6.3	J1T0M8	Censored		Lognormal mean	9.4
10.3	J1T0M9	Detection limit or PQL		Std. devn.	1.7
11.0	J1T0N0	Method detection limit		Median	9.9
9.7	J1T0N1	TOTAL	12	Min.	6.0
11.3	J1T0N2			Max.	11.3
9.0	J1T0N4				
10.8	J1T0N5				
8.7	J1T0N6				

Lognormal distribution? r-squared is: 0.819
Normal distribution? r-squared is: 0.874
Recommendations:
Reject BOTH lognormal and normal distributions.
UCL (Z-statistics) is 10.2

Silver 95% UCL Calculation

DATA	ID				
0.080	J1T0N3/J1T0N7				
0.21	J1T0M5				
0.075	J1T0M6	Number of samples		Uncensored values	
1.3	J1T0M7	Uncensored	12	Mean	0.39
0.085	J1T0M8	Censored		Lognormal mean	0.41
1.0	J1T0M9	Detection limit or PQL		Std. devn.	0.45
1.0	J1T0N0	Method detection limit		Median	0.13
0.070	J1T0N1	TOTAL	12	Min.	0.070
0.52	J1T0N2			Max.	1.3
0.18	J1T0N4				
0.075	J1T0N5				
0.070	J1T0N6				

Lognormal distribution? r-squared is: 0.831
Normal distribution? r-squared is: 0.742
Recommendations:
Reject BOTH lognormal and normal distributions.
UCL (Z-statistics) is 0.60

Vanadium 95% UCL Calculation

DATA	ID				
43.4	J1T0N3/J1T0N7				
44.6	J1T0M5				
51.5	J1T0M6	Number of samples		Uncensored values	
37.1	J1T0M7	Uncensored	12	Mean	43.7
35.1	J1T0M8	Censored		Lognormal mean	43.7
45.7	J1T0M9	Detection limit or PQL		Std. devn.	4.8
45.4	J1T0N0	Method detection limit		Median	45.0
46.1	J1T0N1	TOTAL	12	Min.	35.1
48.5	J1T0N2			Max.	51.5
46.8	J1T0N4				
41.2	J1T0N5				
38.6	J1T0N6				

Lognormal distribution? r-squared is: 0.951
Normal distribution? r-squared is: 0.964
Recommendations:
Use lognormal distribution.
UCL (Land's method) is 46.5

Zinc 95% UCL Calculation

DATA	ID				
40.4	J1T0N3/J1T0N7				
46.7	J1T0M5				
36.4	J1T0M6	Number of samples		Uncensored values	
68.7	J1T0M7	Uncensored	12	Mean	47.3
35.8	J1T0M8	Censored		Lognormal mean	47.4
64.9	J1T0M9	Detection limit or PQL		Std. devn.	12.3
63.9	J1T0N0	Method detection limit		Median	44.5
42.2	J1T0N1	TOTAL	12	Min.	33.1
49.7	J1T0N2			Max.	68.7
47.9	J1T0N4				
38.0	J1T0N5				
33.1	J1T0N6				

Lognormal distribution? r-squared is: 0.935
Normal distribution? r-squared is: 0.899
Recommendations:
Use lognormal distribution.
UCL (Land's method) is 54.6

Nitrogen in nitrate and nitrite 95% UCL Calculation

DATA	ID				
2.9	J1T0N3/J1T0N7				
4.8	J1T0M5				
56.4	J1T0M6	Number of samples		Uncensored values	
35.5	J1T0M7	Uncensored	12	Mean	19.0
9.0	J1T0M8	Censored		Lognormal mean	18.5
3.1	J1T0M9	Detection limit or PQL		Std. devn.	27.2
87.8	J1T0N0	Method detection limit		Median	6.8
3.3	J1T0N1	TOTAL	12	Min.	2.5
8.7	J1T0N2			Max.	87.8
9.7	J1T0N4				
2.5	J1T0N5				
3.8	J1T0N6				

Lognormal distribution? r-squared is: 0.871
Normal distribution? r-squared is: 0.658
Recommendations:
Reject BOTH lognormal and normal distributions.
UCL (Z-statistics) is 31.9

Qualifiers and acronyms are defined on page 3.

CALCULATION SHEET

Washington Closure Hanford			
Originator J. D. Skoglie	**Date** 10/23/13	**Calc. No.** 0100N-CA-V0236	**Rev. No.** 0
Project 100-N Field Remediation	**Job No.** 14655	**Checked** N. K. Schiffern	**Date** 10/23/13
Subject 124-N-10 Waste Site Cleanup Verification 95% UCL Calculations			**Sheet No.** 12 of 13

Ecology Software (MTCAStat) Results, 124-N-10 Waste Site Excavation (EXC)

DATA	**ID**	**TPH - Diesel Range 95% UCL Calculation**			
925	J1T0N3/J1T0N7				
31000	J1T0M5				
3700	J1T0M6	Number of samples		Uncensored values	
38000	J1T0M7	Uncensored	12	Mean	10419
1600	J1T0M8	Censored		Lognormal mean	11926
15000	J1T0M9	Detection limit or PQL		Std. devn.	12294
13000	J1T0N0	Method detection limit		Median	4800
3300	J1T0N1	TOTAL	12	Min.	925
5900	J1T0N2			Max.	38000
10000	J1T0N4				
1500	J1T0N5				
1100	J1T0N6				

Lognormal distribution? Normal distribution?
r-squared is: 0.960 r-squared is: 0.778
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 45678

DATA	**ID**	**TPH - Diesel Range EXT 95% UCL Calculation**			
1650	J1T0N3/J1T0N7				
64000	J1T0M5				
6900	J1T0M6	Number of samples		Uncensored values	
87000	J1T0M7	Uncensored	12	Mean	23646
2900	J1T0M8	Censored		Lognormal mean	29063
32000	J1T0M9	Detection limit or PQL		Std. devn.	27558
28000	J1T0N0	Method detection limit		Median	10150
7300	J1T0N1	TOTAL	12	Min.	1650
13000	J1T0N2			Max.	87000
36000	J1T0N4				
3100	J1T0N5				
1900	J1T0N6				

Lognormal distribution? Normal distribution?
r-squared is: 0.952 r-squared is: 0.805
Recommendations:
Use lognormal distribution.

UCL (Land's method) is 135655

CALCULATION SHEET

Washington Closure Hanford

Originator J. D. Skoglie	**Date** 10/23/13	**Calc. No.** 0100N-CA-V0236	**Rev. No.** 0
Project 100-N Field Remediation	**Job No.** 14655	**Checked** N. K. Schiffern	**Date** 10/23/13
Subject 124-N-10 Waste Site Cleanup Verification 95% UCL Calculations			**Sheet No.** 13 of 13

Duplicate/Split Analysis - Excavation (EXC)

Sampling Area	Sample Number	Sample Date	Aluminum mg/kg	Q	PQL	Arsenic mg/kg	Q	PQL	Barium mg/kg	Q	PQL	Beryllium mg/kg	Q	PQL
EXC-9	J1T0N3	9/10/13	8490	X	1.5	2.7		0.65	78.3	X	0.075	0.32		0.032
Duplicate of J1T0N3	J1T0N7	9/10/13	8860	X	1.5	2.8		0.65	79.3	X	0.075	0.33		0.033
Split of J1T0N3	J1T0P1	9/10/13	9570		6.62	2.04	BC	0.487	86.1		0.0974	0.442	B	0.0974

Sampling Area	Boron mg/kg	Q	PQL	Cadmium mg/kg	Q	PQL	Calcium mg/kg	Q	PQL	Chromium mg/kg	Q	PQL	Cobalt mg/kg	Q	PQL
EXC-9	1.0	B	0.96	0.18	B	0.040	3320	X	13.8	10.9	X	0.057	8.4	X	0.098
Duplicate of J1T0N3	1.1	B	0.97	0.19	B	0.041	3070	X	14.0	11.5	X	0.058	7.5	X	0.099
Split of J1T0N3	2.17	B	0.974	0.501		0.0974	3200		7.79	13.8		0.146	8.88	D	0.73

Analysis:

		Aluminum	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt
TDL		5	10	2	0.2	2	0.2	100	1	2
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)
	RPD	4.3%		1.3%				7.8%	5.4%	
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable	No - acceptable
Split Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)
	RPD	12.0%		9.5%				3.7%	23.5%	
	Difference > 2 TDL?	Not applicable	No - acceptable	Not applicable	No - acceptable	No - acceptable	No - acceptable	Not applicable	Not applicable	No - acceptable

Duplicate/Split Analysis - Excavation (EXC)

Sampling Area	Sample Number	Sample Date	Copper mg/kg	Q	PQL	Iron mg/kg	Q	PQL	Lead mg/kg	Q	PQL	Magnesium mg/kg	Q	PQL
EXC-9	J1T0N3	9/10/13	13.7		0.21	19700	X	3.7	4.4		0.26	3890	X	3.6
Duplicate of J1T0N3	J1T0N7	9/10/13	13.6		0.22	19000	X	3.8	4.5		0.27	3890	X	3.7
Split of J1T0N3	J1T0P1	9/10/13	14.1		0.292	23400	X	7.79	5.80	D	1.61	4280		8.28

Sampling Area	Manganese mg/kg	Q	PQL	Nickel mg/kg	Q	PQL	Potassium mg/kg	Q	PQL	Silicon mg/kg	Q	PQL	Sodium mg/kg	Q	PQL
EXC-9	359	X	0.098	10.4	X	0.12	1880		40.2	362		5.5	188		57.8
Duplicate of J1T0N3	369	X	0.099	10.6	X	0.12	1930		40.7	357		5.6	201		58.5
Split of J1T0N3	419		0.195	11.5		0.146	2240		6.23	1310	N	1.46	223		6.82

Analysis:

		Copper	Iron	Lead	Magnesium	Manganese	Nickel	Potassium	Silicon	Sodium
TDL		1	5	5	75	5	4	400	2	50
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)
	RPD	0.7%	3.6%		0.0%	2.7%			1.4%	
	Difference > 2 TDL?	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable	Not applicable	No - acceptable
Split Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)	No-Stop (acceptable)	Yes (calc RPD)	No-Stop (acceptable)
	RPD	2.9%	17.2%		9.5%	15.4%			*113.4%*	
	Difference > 2 TDL?	Not applicable	Not applicable	No - acceptable	Not applicable	Not applicable	No - acceptable	No - acceptable	Not applicable	No - acceptable

Duplicate/Split Analysis - Excavation (EXC)

Sampling Area	HEIS Number	Sample Date	Vanadium mg/kg	Q	PQL	Zinc mg/kg	Q	PQL	Nitrogen in Nitrate and Nitrite mg/kg	Q	PQL
EXC-9	J1T0N3	9/10/13	45.9		0.092	41.9	X	0.39	2.6		0.31
Duplicate of J1T0N3	J1T0N7	9/10/13	40.8		0.093	38.9	X	0.39	3.2		0.30
Split of J1T0N3	J1T0P1	9/10/13	57.0	D	0.487	45.5	D	1.95	5.13		0.175

Analysis:

		Vanadium	Zinc	Nitrogen in Nitrate and Nitrite
TDL		2.5	1	0.75
Duplicate Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)
	RPD	11.8%	7.4%	
	Difference > 2 TDL?	Not applicable	Not applicable	No - acceptable
Split Analysis	Both > PQL?	Yes (continue)	Yes (continue)	Yes (continue)
	Both >5xTDL?	Yes (calc RPD)	Yes (calc RPD)	No-Stop (acceptable)
	RPD	21.6%	8.2%	
	Difference > 2 TDL?	Not applicable	Not applicable	Yes - assess further

Qualifiers and acronyms are defined on page 3.

Attachment 1. 124-N-10 Waste Site Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Aluminum			Antimony			Arsenic			Barium			Beryllium			Boron		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-9	J1T0N3	9/10/13	8490	X	1.5	0.37	UJ	0.37	2.7		0.65	78.3	X	0.075	0.32		0.032	1.0	B	0.96
Duplicate of J1T0N3	J1T0N7	9/10/13	8860	X	1.5	0.38	UJ	0.38	2.8		0.65	79.3	X	0.075	0.33		0.033	1.1	B	0.97
EXC-1	J1T0M5	9/10/13	6900	X	1.5	0.36	UJ	0.36	2.8		0.62	63.4	X	0.072	0.26		0.031	1.3	BN	0.92
EXC-2	J1T0M6	9/10/13	4390	X	1.5	0.36	UJ	0.36	1.4		0.63	65.0	X	0.073	0.15	B	0.032	0.94	U	0.94
EXC-3	J1T0M7	9/10/13	4710	X	1.4	0.34	UJ	0.34	2.3		0.60	53.7	X	0.069	0.19		0.030	0.88	U	0.88
EXC-4	J1T0M8	9/10/13	3980	X	1.6	0.40	UJ	0.40	2.0		0.69	41.7	X	0.079	0.20	B	0.034	1.0	U	1.0
EXC-5	J1T0M9	9/10/13	5920	X	1.4	0.34	UJ	0.34	2.9		0.59	54.9	X	0.068	0.24		0.029	0.87	U	0.87
EXC-6	J1T0N0	9/10/13	6720	X	1.4	0.35	UJ	0.35	3.1		0.61	66.0	X	0.070	0.24		0.030	0.99	B	0.90
EXC-7	J1T0N1	9/10/13	5980	X	1.4	0.34	UJ	0.34	2.5		0.60	59.6	X	0.069	0.23		0.030	0.88	B	0.88
EXC-8	J1T0N2	9/10/13	6590	X	1.5	0.37	UJ	0.37	4.0		0.63	60.6	X	0.073	0.25		0.032	1.1	B	0.94
EXC-10	J1T0N4	9/10/13	6080	X	1.5	0.37	UJ	0.37	2.5		0.65	57.4	X	0.074	0.25		0.032	0.96	B	0.96
EXC-11	J1T0N5	9/10/13	7620	X	1.5	0.36	UJ	0.36	2.9		0.62	74.2	X	0.071	0.29		0.031	1.2	B	0.92
EXC-12	J1T0N6	9/10/13	5870	X	1.4	0.34	UJ	0.34	2.3		0.59	57.2	X	0.068	0.23		0.030	0.88	U	0.88
FS-1	J1T0N8	9/10/13	5670	X	1.4	0.34	UJ	0.34	2.6		0.59	54.3	X	0.068	0.25		0.029	0.88	U	0.88
FS-2	J1T0N9	9/10/13	6590	X	1.7	0.41	UJ	0.41	2.7		0.72	62.1	X	0.083	0.25		0.036	1.1	U	1.1
Split of J1T0N3	J1T0P1	9/10/13	9570		6.62	1.61	DU	1.61	2.04	BC	0.487	86.1		0.0974	0.442	B	0.0974	2.17	B	0.974
Equipmant Blank	J1T0P0	9/10/13	184	X	1.5	0.37	U	0.37	0.64	U	0.64	3.0	X	0.074	0.058	B	0.032	0.95	U	0.95

Sample Location	HEIS Number	Sample Date	Cadmium			Calcium			Chromium			Cobalt			Copper			Hexavalent Chromium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-9	J1T0N3	9/10/13	0.18	B	0.040	3320	X	13.8	10.9	X	0.057	8.4	X	0.098	13.7		0.21	0.155	UJ	0.155
Duplicate of J1T0N3	J1T0N7	9/10/13	0.19	B	0.041	3070	X	14.0	11.5	X	0.058	7.5	X	0.099	13.6		0.22	0.155	UJ	0.155
EXC-1	J1T0M5	9/10/13	0.19		0.039	7000	X	13.3	9.1	X	0.055	7.4	X	0.094	18.0		0.20	0.155	UJ	0.155
EXC-2	J1T0M6	9/10/13	0.12	B	0.039	4510	X	13.5	6.6	X	0.055	6.4	X	0.096	13.3		0.21	0.309	J	0.155
EXC-3	J1T0M7	9/10/13	0.19		0.037	8140	X	12.7	7.7	X	0.052	6.3	X	0.090	22.4		0.20	0.295	J	0.155
EXC-4	J1T0M8	9/10/13	0.12	B	0.043	4590	X	14.7	3.4	X	0.060	8.1	X	0.10	12.6		0.23	0.318	J	0.155
EXC-5	J1T0M9	9/10/13	0.19		0.037	6350	X	12.6	9.4	X	0.052	7.7	X	0.089	22.9		0.19	0.155	UJ	0.155
EXC-6	J1T0N0	9/10/13	0.21		0.038	7550	X	13.0	10.7	X	0.054	7.0	X	0.092	20.5		0.20	0.178	J	0.155
EXC-7	J1T0N1	9/10/13	0.17	B	0.037	5650	X	12.7	8.8	X	0.052	6.8	X	0.090	16.4		0.20	0.155	UJ	0.155
EXC-8	J1T0N2	9/10/13	0.20		0.039	8260	X	13.6	9.8	X	0.056	7.4	X	0.096	17.7		0.21	0.155	UJ	0.155
EXC-10	J1T0N4	9/10/13	0.18	B	0.040	4280	X	13.8	7.6	X	0.057	7.4	X	0.098	15.6		0.21	0.350	J	0.155
EXC-11	J1T0N5	9/10/13	0.18	B	0.038	4020	X	13.2	10.1	X	0.054	7.1	X	0.094	15.6		0.20	0.155	UJ	0.155
EXC-12	J1T0N6	9/10/13	0.15	B	0.037	4610	X	12.7	7.9	X	0.052	6.5	X	0.090	14.2		0.19	0.194	J	0.155
FS-1	J1T0N8	9/10/13	0.14	B	0.037	3390	X	12.6	7.1	X	0.052	8.1	X	0.089	14.8		0.19	0.182	J	0.155
FS-2	J1T0N9	9/10/13	0.16	B	0.045	5150	X	15.4	8.9	X	0.063	6.9	X	0.11	15.5		0.24	0.155	UJ	0.155
Split of J1T0N3	J1T0P1	9/10/13	0.501		0.0974	3200		7.79	13.8		0.146	8.88	D	0.73	14.1		0.292	0.164	U	0.164
Equipmant Blank	J1T0P0	9/10/13	0.040	U	0.040	39.0	BX	13.7	0.25	X	0.056	0.25	BX	0.097	0.41	B	0.21			

Grey cells indicate not applicable or data will not be used.

Acronyms and notes apply to all of the tables in this attachment.

Note: Data qualified with B, C, D, J, M, N, P, and/or X are considered acceptable values.

B = blank contamination (inorganic constituents)

C = target analyte was detected in the sample and the associated blank, and the sample concentrations was ≤5x the blank concentration.

D = reported from a dilution

EXC = excavation

FS = focused sample

HEIS = Hanford Environmental Information System

J = estimate

M = sample duplicate precision not met.

N= recovery exceeds upper and lower control limit.

P = this flag is used for an aroclor target analyte where there is greater than 25% difference for detected concentrations between the two GC columns.

PAH = polycyclic aromatic hydrocarbons

PCB = polychlorinated biphenyls

PQL = practical quantitation limit

Q = qualifier

RAG = remedial action goal

TPH = total petroleum hydrocarbons

U = undetected

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

X (organics) = more than 40% difference between columns, lower result reported.

Attachment	1	Sheet No.	1 of 5
Originator	J. D. Skoglie	Date	10/23/13
Checked	N. K. Schiffern	Date	10/23/13
Calc. No.	0100N-CA-V0236	Rev. No.	0

Attachment 1. 124-N-10 Waste Site Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Iron			Lead			Magnesium			Manganese			Mercury			Molybdenum		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-9	J1T0N3	9/10/13	19700	X	3.7	4.4		0.26	3890	X	3.6	359	X	0.098	0.0058	U	0.0058	0.25	U	0.25
Duplicate of J1T0N3	J1T0N7	9/10/13	19000	X	3.8	4.5		0.27	3890	X	3.7	369	X	0.099	0.0060	U	0.0060	0.26	U	0.26
EXC-1	J1T0M5	9/10/13	19300	X	3.6	4.1		0.25	4410	X	3.5	305	X	0.094	0.0076	BNM	0.0050	0.26	B	0.24
EXC-2	J1T0M6	9/10/13	16900	X	3.6	2.8		0.26	2960	X	3.5	228	X	0.096	0.0051	U	0.0051	0.29	B	0.25
EXC-3	J1T0M7	9/10/13	16200	X	3.4	3.7		0.24	3690	X	3.3	248	X	0.090	0.13		0.0067	0.39	B	0.23
EXC-4	J1T0M8	9/10/13	16300	X	4.0	3.0		0.28	3480	X	3.9	217	X	0.10	0.0063	U	0.0063	0.28	B	0.27
EXC-5	J1T0M9	9/10/13	20300	X	3.4	4.5		0.24	4350	X	3.3	324	X	0.089	0.058		0.0056	0.33	B	0.23
EXC-6	J1T0N0	9/10/13	18000	X	3.5	4.6		0.25	4250	X	3.4	287	X	0.092	0.041		0.0062	0.41	B	0.24
EXC-7	J1T0N1	9/10/13	18100	X	3.4	3.6		0.24	4040	X	3.3	282	X	0.090	0.0089	B	0.0064	0.23	B	0.23
EXC-8	J1T0N2	9/10/13	19100	X	3.7	4.1		0.26	4460	X	3.6	292	X	0.096	0.017		0.0051	0.25	U	0.25
EXC-10	J1T0N4	9/10/13	19100	X	3.7	4.2		0.26	4020	X	3.6	313	X	0.098	0.016	B	0.0063	0.30	B	0.25
EXC-11	J1T0N5	9/10/13	18100	X	3.6	4.5		0.25	4180	X	3.5	315	X	0.094	0.0054	U	0.0054	0.24	U	0.24
EXC-12	J1T0N6	9/10/13	16200	X	3.4	3.3		0.24	3570	X	3.3	262	X	0.090	0.0062	U	0.0062	0.23	U	0.23
FS-1	J1T0N8	9/10/13	20400	X	3.4	4.7		0.24	4430	X	3.3	270	X	0.089	0.0055	B	0.0053	0.29	B	0.23
FS-2	J1T0N9	9/10/13	18200	X	4.1	4.5		0.29	3960	X	4.0	282	X	0.11	0.0057	U	0.0057	0.28	U	0.28
Split of J1T0N3	J1T0P1	9/10/13	23400	X	7.79	5.80	D	1.61	4280		8.28	419		0.195	0.00397	U	0.00397	0.195	U	0.195
Equipmant Blank	J1T0P0	9/10/13	894	X	3.7	0.61		0.26	19.7	X	3.6	18.2	X	0.097	0.0057	U	0.0057	0.25	U	0.25

Sample Location	HEIS Number	Sample Date	Nickel			Potassium			Selenium			Silicon			Silver			Sodium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-9	J1T0N3	9/10/13	10.4	X	0.12	1880		40.2	0.84	U	0.84	362	J	5.5	0.16	U	0.16	188		57.8
Duplicate of J1T0N3	J1T0N7	9/10/13	10.6	X	0.12	1930		40.7	0.85	U	0.85	357	J	5.6	0.16	U	0.16	201		58.5
EXC-1	J1T0M5	9/10/13	10.1	X	0.12	1300		38.6	0.81	U	0.81	358	JN	5.3	0.21		0.15	241		55.5
EXC-2	J1T0M6	9/10/13	6.0	X	0.12	787		39.2	0.82	U	0.82	320	J	5.4	0.15	U	0.15	322		56.4
EXC-3	J1T0M7	9/10/13	9.1	X	0.11	894		37.0	0.78	U	0.78	256	J	5.1	1.3		0.14	252		53.2
EXC-4	J1T0M8	9/10/13	6.3	X	0.13	702		42.7	0.89	U	0.89	280	J	5.9	0.17	U	0.17	474		61.4
EXC-5	J1T0M9	9/10/13	10.3	X	0.11	1090		36.6	0.77	U	0.77	310	J	5.0	1.0		0.14	230		52.6
EXC-6	J1T0N0	9/10/13	11.0	X	0.11	1320		37.8	0.79	U	0.79	277	J	5.2	1.0		0.15	309		54.4
EXC-7	J1T0N1	9/10/13	9.7	X	0.11	1250		37.0	0.78	U	0.78	257	J	5.1	0.14	U	0.14	184		53.2
EXC-8	J1T0N2	9/10/13	11.3	X	0.12	1210		39.4	0.83	U	0.83	249	J	5.4	0.52		0.15	206		56.7
EXC-10	J1T0N4	9/10/13	9.0	X	0.12	1370		40.1	0.84	U	0.84	247	J	5.5	0.18	B	0.16	143		57.7
EXC-11	J1T0N5	9/10/13	10.8	X	0.12	1640		38.5	0.81	U	0.81	361	J	5.3	0.15	U	0.15	168		55.4
EXC-12	J1T0N6	9/10/13	8.7	X	0.11	1060		36.8	0.77	U	0.77	346	J	5.1	0.14	U	0.14	147		52.9
FS-1	J1T0N8	9/10/13	8.3	X	0.11	1220		36.6	0.77	U	0.77	190	J	5.1	0.25		0.14	194		52.7
FS-2	J1T0N9	9/10/13	9.6	X	0.13	1400		44.7	0.94	U	0.94	294	J	6.2	0.17	U	0.17	161		64.4
Split of J1T0N3	J1T0P1	9/10/13	11.5		0.146	2240		6.23	0.330	DU	0.330	1310	N	1.46	0.0974	U	0.0974	223		6.82
Equipmant Blank	J1T0P0	9/10/13	0.27	BX	0.12	47.2	B	39.8	0.84	U	0.84	78.6		5.5	0.16	U	0.16	57.3	U	57.3

Attachment	1	Sheet No.	2 of 5
Originator	J. D. Skoglie	Date	10/23/13
Checked	N. K. Schiffern	Date	10/23/13
Calc. No.	0100N-CA-V0236	Rev. No.	0

Attachment 1. 124-N-10 Waste Site Verification Sample Results (Metals).

Sample Location	HEIS Number	Sample Date	Vanadium			Zinc		
			mg/kg	Q	PQL	mg/kg	Q	PQL
EXC-9	J1T0N3	9/10/13	45.9		0.092	41.9	X	0.39
Duplicate of J1T0N3	J1T0N7	9/10/13	40.8		0.093	38.9	X	0.39
EXC-1	J1T0M5	9/10/13	44.6		0.088	46.7	X	0.37
EXC-2	J1T0M6	9/10/13	51.5		0.090	36.4	X	0.38
EXC-3	J1T0M7	9/10/13	37.1		0.085	68.7	X	0.36
EXC-4	J1T0M8	9/10/13	35.1		0.098	35.8	X	0.41
EXC-5	J1T0M9	9/10/13	45.7		0.084	64.9	X	0.35
EXC-6	J1T0N0	9/10/13	45.4		0.087	63.9	X	0.37
EXC-7	J1T0N1	9/10/13	46.1		0.085	42.2	X	0.36
EXC-8	J1T0N2	9/10/13	48.5		0.090	49.7	X	0.38
EXC-10	J1T0N4	9/10/13	46.8		0.092	47.9	X	0.39
EXC-11	J1T0N5	9/10/13	41.2		0.088	38.0	X	0.37
EXC-12	J1T0N6	9/10/13	38.6		0.084	33.1	X	0.36
FS-1	J1T0N8	9/10/13	50.8		0.084	58.9	X	0.36
FS-2	J1T0N9	9/10/13	44.4		0.10	39.5	X	0.43
Split of J1T0N3	J1T0P1	9/10/13	57.0	D	0.487	45.5	D	1.95
Equipmant Blank	J1T0P0	9/10/13	0.53	B	0.091	1.9	X	0.39

Attachment	1	Sheet No.	3 of 5
Originator	J. D. Skoglie	Date	10/23/13
Checked	N. K. Schiffern	Date	10/23/13
Calc. No.	0100N-CA-V0236	Rev. No.	0

Attachment 1. 124-N-10 Waste Site Verification Sample Results (Anion, TPH, and Physical).

Sample Location	HEIS Number	Sample Date	Nitrogen in Nitrate and Nitrite			TPH - Motor Oil (high boiling)			TPH - Diesel Range			TPH - Diesel Range EXT			Percent moisture (wet sample)		
			mg/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	%	Q	PQL
EXC-9	J1T0N3	9/10/13	2.6	J	0.31				1500	J	690	2800	J	1000	2.9		0.10
Duplicate of J1T0N3	J1T0N7	9/10/13	3.2	J	0.30				700	U	700	1000	U	1000	3.1		0.10
EXC-1	J1T0M5	9/10/13	4.8	JNM	0.30				31000		680	64000		1000	1.6		0.10
EXC-2	J1T0M6	9/10/13	56.4	J	0.29				3700	J	670	6900		980	1.3		0.10
EXC-3	J1T0M7	9/10/13	35.5	J	0.29				38000		680	87000		1000	2.7		0.10
EXC-4	J1T0M8	9/10/13	9.0	J	0.30				1600	J	670	2900	J	980	3.9		0.10
EXC-5	J1T0M9	9/10/13	3.1	J	0.31				15000		690	32000		1000	2.5		0.10
EXC-6	J1T0N0	9/10/13	87.8	J	0.30				13000		680	28000		1000	1.4		0.10
EXC-7	J1T0N1	9/10/13	3.3	J	0.31				3300	J	680	7300		1000	1.9		0.10
EXC-8	J1T0N2	9/10/13	8.7	J	0.31				5900		690	13000		1000	2.8		0.10
EXC-10	J1T0N4	9/10/13	9.7	J	0.31				10000		680	36000		1000	2.6		0.10
EXC-11	J1T0N5	9/10/13	2.5	JN	0.31				1500	J	690	3100	J	1000	3.2		0.10
EXC-12	J1T0N6	9/10/13	3.8	J	0.30				1100	J	680	1900	J	1000	1.4		0.10
FS-1	J1T0N8	9/10/13	35.4	J	0.31				3900		670	7400		980	4.3		0.10
FS-2	J1T0N9	9/10/13	6.7	J	0.35				1500	J	790	3000	J	1200	14.3		0.10
Split of J1T0N3	J1T0P1	9/10/13	5.13		0.175	5530	BJ	2200	2200	U	2200						
Equipmant Blank	J1T0P0	9/10/13													0.10	U	0.10

Attachment	1	Sheet No.	4 of 5
Originator	J. D. Skoglie	Date	10/23/13
Checked	N. K. Schiffern	Date	10/23/13
Calc. No.	0100N-CA-V0236	Rev. No.	0

Attachment 1. 124-N-10 Waste Site Verification Sample Results (Organics).

CONSTITUENT	CLASS	EXC-9 - J1T0N3			Duplicate of J1T0N3 - J1T0N7			EXC-1 - J1T0M5			EXC-2 - J1T0M6			EXC-3 - J1T0M7			EXC-4 - J1T0M8			EXC-5 - J1T0M9			EXC-6 - J1T0N0		
		9/10/13			9/10/13			9/10/13			9/10/13			9/10/13			9/10/13			9/10/13			9/10/13		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	10	U	10	10	U	10	9.9	U	9.9	10	U	10	10	U	10	10	U	10	10	U	10	10	U	10
Acenaphthylene	PAH	9.2	U	9.2	9.2	U	9.2	8.9	U	8.9	9.0	U	9.0	9.2	U	9.2	9.3	U	9.3	9.0	U	9.0	9.1	U	9.1
Anthracene	PAH	3.1	U	3.1	3.1	U	3.1	3.0	U	3.0	3.0	U	3.0	3.1	U	3.1	3.1	U	3.1	3.0	U	3.0	3.1	U	3.1
Benzo(a)anthracene	PAH	3.3	U	3.3	3.3	U	3.3	3.2	U	3.2	3.2	U	3.2	3.3	U	3.3	3.3	U	3.3	3.2	U	3.2	3.2	U	3.2
Benzo(a)pyrene	PAH	6.5	U	6.5	6.6	U	6.6	6.4	U	6.4	7.2	JX	6.4	28		6.5	6.6	U	6.6	6.4	U	6.4	6.5	U	6.5
Benzo(b)fluoranthene	PAH	4.3	U	4.3	4.3	U	4.3	4.2	U	4.2	4.2	U	4.2	4.3	U	4.3	4.3	U	4.3	4.2	U	4.2	4.2	U	4.2
Benzo(ghi)perylene	PAH	7.3	U	7.3	7.4	U	7.4	7.1	U	7.1	7.2	U	7.2	7.4	U	7.4	7.4	U	7.4	7.2	U	7.2	7.3	U	7.3
Benzo(k)fluoranthene	PAH	4.0	U	4.0	4.0	U	4.0	3.9	U	3.9	3.9	U	3.9	4.0	U	4.0	4.1	U	4.1	3.9	U	3.9	4.0	U	4.0
Chrysene	PAH	4.9	U	4.9	5.0	U	5.0	4.8	U	4.8	4.8	U	4.8	4.9	U	4.9	5.0	U	5.0	4.8	U	4.8	4.9	U	4.9
Dibenz[a,h]anthracene	PAH	11	U	11	11	U	11	11	U	11	11	U	11	11	U	11	11	U	11	11	U	11	11	U	11
Fluoranthene	PAH	13	U	13	13	U	13	13	U	13	13	U	13	13	U	13	13	U	13	13	U	13	13	U	13
Fluorene	PAH	5.4	U	5.4	5.4	U	5.4	5.2	U	5.2	5.3	U	5.3	26	J	5.4	5.4	U	5.4	5.3	U	5.3	5.3	U	5.3
Indeno(1,2,3-cd)pyrene	PAH	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12
Naphthalene	PAH	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12
Phenanthrene	PAH	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12
Pyrene	PAH	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12
Aroclor-1016	PCB	2.8	UJ	2.8	2.8	UJ	2.8	2.6	UJ	2.6	2.8	UJ	2.8	2.8	UJN	2.8	2.8	UJ	2.8	2.8	UJ	2.8	2.8	UJ	2.8
Aroclor-1221	PCB	8.2	U	8.2	8.1	U	8.1	7.5	UJ	7.5	8.0	U	8.0	8.1	UJ	8.1	8.2	U	8.2	8.1	UJ	8.1	8.1	UJ	8.1
Aroclor-1232	PCB	2.1	U	2.1	2.0	U	2.0	1.9	U	1.9	2.0	U	2.0	2.0	U	2.0	2.0	U	2.0	2.0	U	2.0	2.0	U	2.0
Aroclor-1242	PCB	4.8	U	4.8	4.7	U	4.7	4.3	U	4.3	4.7	U	4.7	4.7	U	4.7	4.8	U	4.8	4.7	U	4.7	4.7	U	4.7
Aroclor-1248	PCB	4.8	U	4.8	4.7	U	4.7	4.3	U	4.3	4.7	U	4.7	4.7	U	4.7	4.8	U	4.8	4.7	U	4.7	4.7	U	4.7
Aroclor-1254	PCB	2.7	U	2.7	2.6	U	2.6	3.2	JP	2.4	2.6	U	2.6	21		2.6	2.7	U	2.7	15	JP	2.6	11	JP	2.6
Aroclor-1260	PCB	2.7	U	2.7	2.6	U	2.6	2.4	U	2.4	2.6	U	2.6	2.6	U	2.6	2.7	U	2.7	2.6	U	2.6	2.6	U	2.6

CONSTITUENT	CLASS	EXC-7 - J1T0N1			EXC-8 - J1T0N2			EXC-10 - J1T0N4			EXC-11 - J1T0N5			EXC-12 - J1T0N6			FS-1 - J1T0N8			FS-2 - J1T0N9			Split of J1T0N3 - J1T0P1		
		9/10/13			9/10/13			9/10/13			9/10/13			9/10/13			9/10/13			9/10/13			9/10/13		
		ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL	ug/kg	Q	PQL
Acenaphthene	PAH	9.9	U	9.9	10	U	10	10	U	10	9.7	U	9.7	9.6	U	9.6	10	U	10	12	U	12	5.12	U	5.12
Acenaphthylene	PAH	8.9	U	8.9	9.0	U	9.0	9.1	U	9.1	8.7	U	8.7	8.7	U	8.7	9.3	U	9.3	10	U	10	5.12	U	5.12
Anthracene	PAH	3.0	U	3.0	3.1	U	3.1	3.1	U	3.1	3.0	U	3.0	2.9	U	2.9	3.1	U	3.1	3.5	U	3.5	1.71	U	1.71
Benzo(a)anthracene	PAH	3.2	U	3.2	3.2	U	3.2	3.2	U	3.2	3.1	U	3.1	3.1	U	3.1	3.3	U	3.3	3.7	U	3.7	0.546	U	0.546
Benzo(a)pyrene	PAH	6.4	U	6.4	6.4	U	6.4	6.5	U	6.5	6.2	U	6.2	6.2	U	6.2	6.6	U	6.6	7.5	U	7.5	0.546	U	0.546
Benzo(b)fluoranthene	PAH	4.2	U	4.2	4.2	U	4.2	4.2	U	4.2	4.1	U	4.1	4.0	U	4.0	4.3	U	4.3	4.9	U	4.9	0.546	U	0.546
Benzo(ghi)perylene	PAH	7.2	U	7.2	7.2	U	7.2	7.3	U	7.3	7.0	U	7.0	6.9	U	6.9	7.4	U	7.4	8.4	U	8.4	0.546	U	0.546
Benzo(k)fluoranthene	PAH	3.9	U	3.9	4.0	U	4.0	4.0	U	4.0	3.8	U	3.8	3.8	U	3.8	4.1	U	4.1	4.6	U	4.6	0.273	U	0.273
Chrysene	PAH	4.8	U	4.8	4.9	U	4.9	7.1	J	4.9	4.7	U	4.7	4.7	U	4.7	5.0	U	5.0	5.6	U	5.6	0.546	U	0.546
Dibenz[a,h]anthracene	PAH	11	U	11	11	U	11	11	U	11	11	U	11	11	U	11	11	U	11	13	U	13	0.546	U	0.546
Fluoranthene	PAH	13	U	13	13	U	13	13	U	13	13	U	13	13	U	13	13	U	13	15	U	15	0.546	U	0.546
Fluorene	PAH	5.2	U	5.2	5.3	U	5.3	5.3	U	5.3	5.1	U	5.1	5.1	U	5.1	5.4	U	5.4	6.1	U	6.1	5.12	U	5.12
Indeno(1,2,3-cd)pyrene	PAH	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12	14	U	14	0.546	U	0.546
Naphthalene	PAH	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12	14	U	14	5.12	U	5.12
Phenanthrene	PAH	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12	14	U	14	5.12	U	5.12
Pyrene	PAH	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12	12	U	12	14	U	14	0.546	U	0.546
Aroclor-1016	PCB	2.8	UJ	2.8	2.8	UJ	2.8	2.8	UJ	2.8	2.8	UJ	2.8	2.8	UJ	2.8	2.8	UJ	2.8	3.1	UJ	3.1	1.13	U	1.13
Aroclor-1221	PCB	8.0	UJ	8.0	8.1	UJ	8.1	8.0	UJ	8.0	8.2	U	8.2	8.1	U	8.1	8.0	UJ	8.0	9.1	U	9.1	1.13	U	1.13
Aroclor-1232	PCB	2.0	U	2.0	2.0	U	2.0	2.0	U	2.0	2.0	U	2.0	2.0	U	2.0	2.0	U	2.0	2.3	U	2.3	1.13	U	1.13
Aroclor-1242	PCB	4.6	U	4.6	4.7	U	4.7	4.6	U	4.6	4.7	U	4.7	4.7	U	4.7	4.7	U	4.7	5.3	U	5.3	1.13	U	1.13
Aroclor-1248	PCB	4.6	U	4.6	4.7	U	4.7	4.6	U	4.6	4.7	U	4.7	4.7	U	4.7	4.7	U	4.7	5.3	U	5.3	1.13	U	1.13
Aroclor-1254	PCB	2.6	UJ	2.6	6.7	JP	2.6	2.6	UJ	2.6	2.6	U	2.6	2.6	U	2.6	8.6	J	2.6	3.0	U	3.0	1.13	U	1.13
Aroclor-1260	PCB	2.6	U	2.6	2.6	U	2.6	2.6	U	2.6	2.6	U	2.6	2.6	U	2.6	2.6	U	2.6	3.0	U	3.0	1.13	U	1.13

Attachment 1 | Sheet No. 5 of 5
Originator J. D. Skoglie | Date 10/23/13
Checked N. K. Schiffern | Date 10/23/13
Calc. No. 0100N-CA-V0236 | Rev. No. 0

Acrobat 8.0

CALCULATION COVER SHEET

Project Title: 100-N Field Remediation Job No. 14655

Area: 100-N

Discipline: Environmental Calculation No: 0100N-CA-V0237

Subject: 124-N-10 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculations

Computer Program: Excel Program No: Excel 2003

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

Committed Calculation ☒ Preliminary ☐ Superseded ☐ Voided ☐

Rev.	Sheet Numbers	Originator	Checker	Reviewer	Approval	Date
0	Cover = 1 Summary = 3 Total = 4	J. D. Skoglie	I. B. Berezovskiy	N. K. Schiffern	D. F. Obenauer	1/27/14

SUMMARY OF REVISION

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

DE01-437.03

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	10/24/2013	Calc. No.:	0100N-CA-V0237	Rev.:	0
Project:	100-N Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	10/24/2013
Subject:	124-N-10 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 1 of 3	

PURPOSE:

Provide documentation to support the calculation of the direct contact hazard quotient (HQ) and excess carcinogenic risk for the 124-N-10 waste site. In accordance with the remedial action goals (RAGs) in the remedial design report/remedial action work plan (RDR/RAWP) (DOE-RL 2006b), the following criteria must be met:

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

GIVEN/REFERENCES:

1) DOE-RL, 2006a, *100-N Area Sampling and Analysis Plan for CERCLA Waste Sites*, DOE/RL-2005-92, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

2) DOE-RL, 2006b, *Remedial Design Report/Remedial Action Work Plan for the 100-N Area*, DOE/RL-2005-93, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

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

4) WCH, 2013, *Remaining Sites Verification Package for the 124-N-10, Sanitary Sewer System No. 10*, Attachment to Waste Site Reclassification Form 2013-121, Washington Closure Hanford, Inc., Richland, Washington.

SOLUTION:

1) Generate an HQ for each noncarcinogenic constituent detected above background or required detection limit/practical quantitation limit and compare it to the individual HQ of <1.0 (DOE-RL 2006b).

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

3) Generate an excess cancer risk value for each carcinogenic constituent detected above background or required detection limit/practical quantitation limit and compare it to the excess cancer risk of $<1 \times 10^{-6}$ (DOE-RL 2006b).

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

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	10/24/2013	Calc. No.:	0100N-CA-V0237	Rev.:	0
Project:	100-N Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	10/24/2013
Subject:	124-N-10 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 2 of 3	

METHODOLOGY:

The 124-N-10 waste site is comprised of one decision unit for verification sampling consisting of the excavation. In addition to performing statistical sampling, two focused soil samples, a duplicate, and a split sample were collected. The direct contact hazard quotient and carcinogenic risk calculations for the 124-N-10 waste site was conservatively calculated for the entire waste site using the statistical or maximum verification soil sample results (WCH 2013). Of the contaminants of potential concern (COPCs) for this site, boron, hexavalent chromium, molybdenum, aroclor-1254, and the detected polycyclic aromatic hydrocarbons (PAHs) require HQ and risk calculations because these analytes were detected and a Washington State or Hanford Site background value is not available. Nitrogen in nitrate and nitrite requires HQ and risk calculations because this analyte was detected above a Washington State or Hanford Site background value. Although total petroleum hydrocarbons (diesel range extended) were detected and no background value is available, the risk associated with total petroleum hydrocarbons do not contribute to the cumulative toxicity calculation. All other site nonradionuclide COPCs were not detected or were quantified below background levels. An example of the HQ and risk calculations is presented below:

1) For example, the statistical value for boron is 0.97 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 6.1×10^{-5}. Comparing this value, and all other individual values, to the requirement of <1.0, this criterion is met.

2) After the HQ calculation is completed for the appropriate analytes, the cumulative HQ can be obtained by summing the individual values. To avoid errors due to intermediate rounding, the individual HQ values prior to rounding are used for this calculation. The sum of the HQ values is 1.5×10^{-2}. Comparing this value to the requirement of <1.0, this criterion is met.

3) To calculate the excess cancer risk, the maximum or statistical value is divided by the carcinogenic RAG value, then multiplied by 1.0×10^{-6}. For example, the maximum value for benzo(a)pyrene is 0.028 mg/kg, divided by 0.137 mg/kg, and multiplied as indicated, is 2.0×10^{-7}. Comparing this value, and all other individual values, to the requirement of $<1 \times 10^{-6}$, this criterion is met.

4) After these calculations are completed for the carcinogenic analytes, the cumulative excess cancer risk can be obtained by summing the individual values. To avoid errors due to intermediate rounding, the individual cancer risk values prior to rounding are used for this calculation. The sum of the excess cancer risk values is 3.6×10^{-7}. Comparing this value to the requirement of $<1 \times 10^{-5}$, this criterion is met.

RESULTS:

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

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	10/24/2013	Calc. No.:	0100N-CA-V0237	Rev.:	0
Project:	100-N Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	10/24/2013
Subject:	124-N-10 Waste Site Direct Contact Hazard Quotient and Carcinogenic Risk Calculations					Sheet No. 3 of 3	

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

Table 1. Direct Contact Hazard Quotient and Excess Cancer Risk Results for the 124-N-10 Waste Site

Contaminants of Potential Concern	Maximum or Statistical Value[a] (mg/kg)	Noncarcinogen RAG[b] (mg/kg)	Hazard Quotient	Carcinogen RAG[b] (mg/kg)	Carcinogen Risk
Metals					
Boron	0.97	16,000	6.1E-05	--	--
Chromium, hexavalent[c]	0.229	240	9.5E-04	2.1	1.1E-07
Molybdenum	0.30	400	7.5E-04	--	--
Anions					
Nitrogen in Nitrate and Nitrite	35.4	128,000	2.8E-04	--	--
Polycyclic Aromatic Hydrocarbons					
Benzo(a)pyrene	0.028	--	--	0.137	2.0E-07
Chrysene	0.0071	--	--	137	5.2E-11
Fluorene	0.026	3,200	8.1E-06	--	--
Polychlorinated Biphenyls					
Aroclor-1254	0.021	1.6	1.3E-02	0.5	4.2E-08
Total Petroleum Hydrocarbons					
Diesel Range EXT[d]	136	200	--	--	--
Totals					
Cumulative Hazard Quotient:			**1.5E-02**		
Cumulative Excess Cancer Risk:					**3.6E-07**

Notes:

[a] = From WCH (2013).

[b] = Value obtained from the RDR/RAWP (DOE-RL 2006b) or *Washington Administrative Code* (WAC) 173-340-740(3), Method B, 1996, unless otherwise noted.

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

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

-- = not applicable

RAG = remedial action goal

CONCLUSION:

The calculations in Table 1 demonstrate that the 124-N-10 waste site meets the requirements for the direct contact hazard quotients and carcinogenic (excess cancer) risk, respectively, as identified in the RDR/RAWP (DOE-RL 2006b) and SAP (DOE-RL 2006a). The direct contact hazard quotients and carcinogenic (excess cancer) risk calculations are for use in the RSVP for this site.

Acrobat 8.0

CALCULATION COVER SHEET

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

Area: 100-N

Discipline: Environmental *Calculation No: 0100N-CA-V0238

Subject: 124-N-10 Waste Site Hazard Quotient and Carcinogenic Risk Calculation for Protection of Groundwater

Computer Program: Excel Program No: Excel 2003

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

Committed Calculation ☒ Preliminary ☐ Superseded ☐ Voided ☐

Rev.	Sheet Numbers	Originator	Checker	Reviewer	Approval	Date
0	Cover = 1 Sheets = 3 Total = 4	J. D. Skoglie	I. B. Berezovskiy	N. K. Schiffern	D. F. Obenauer	1/27/14

SUMMARY OF REVISION

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

Washington Closure Hanford Inc. CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	10/24/13	Calc. No.:	0100N-CA-V0238	Rev.:	0
Project:	100-N Area Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	10/24/13
Subject:	124-N-10 Hazard Quotient and Carcinogenic Risk Calculation for Protection of Groundwater					Sheet No. 1 of 3	

PURPOSE:

Provide documentation to support the calculation of the hazard quotient (HQ) and excess carcinogenic risk associated with soil contaminant levels compared to soil cleanup levels for protection of groundwater for the 124-N-10 waste site. In accordance with the remedial action goals (RAGs) in the remedial design report/remedial action work plan (RDR/RAWP) for the 100-N Area (DOE-RL 2006), the following criteria must be met:

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

GIVEN/REFERENCES:

1) DOE-RL, 2006, *Remedial Design Report/Remedial Action Work Plan for the 100-N Area,* DOE/RL-2005-93, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

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

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

4) WCH, 2013, *Remaining Sites Verification Package for the 124-N-10, Sanitary Sewer System No. 10 Waste Site,* Attachment to Waste Site Reclassification Form 2013-121, Rev 0, Washington Closure Hanford, Inc., Richland, Washington.

SOLUTION:

1) Generate a HQ for each noncarcinogenic constituent detected above background in soil and with a K_d less than that required to show no migration to groundwater in 1,000 years using the RESRAD generic site model (DOE-RL 2006).

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

3) Generate an excess cancer risk value for each carcinogenic constituent detected above background in soil and with a K_d less than that required to show no migration to groundwater in 1,000 years using the RESRAD generic site model (DOE-RL 2006).

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

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	10/24/13	Calc. No.:	0100N-CA-V0238	Rev.:	0
Project:	100-N Area Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	10/24/13
Subject:	124-N-10 Hazard Quotient and Carcinogenic Risk Calculation for Protection of Groundwater					Sheet No. 2 of 3	

METHODOLOGY:

The 124-N-10 waste site is comprised of one decision unit for verification sampling, consisting of the excavation. In addition to performing statistical sampling, two focused samples were collected. The protection of groundwater hazard quotient and carcinogenic risk calculations for the 124-N-10 waste site was conservatively calculated for the entire waste site using the statistical or maximum value for each analyte (WCH 2013). Based on the generic site RESRAD model (DOE-RL 2006) and a vadose zone of approximately 21 m (69 ft) thickness, a K_d of 3.6 or greater is required to show no predicted migration to groundwater in 1,000 years. Nitrogen in nitrate and nitrite requires HQ and risk calculations because it is detected above a Washington State or Hanford Site background value, and has a K_d of less than 3.6. Boron and hexavalent chromium are included because they have a K_d of less than 3.6, and no Hanford background value has been established. All other site nonradionuclide COPCs were undetected, quantified below background levels, or have a K_d greater than or equal to 3.6. An example of the HQ and risk calculations for soil constituents with a potential impact to groundwater is presented below:

1) The hazard quotient is defined as the ratio of the dose of a substance obtained over a specified time (mg/kg/day) to a reference dose for the same substance derived over the same specified time (mg/kg/day). The hazard quotient can also be calculated as the ratio of the concentration in soil (maximum or statistical value) (mg/kg) to the soil RAG (mg/kg) for protection of groundwater, where the RAG is the groundwater cleanup level (µg/L) (calculated with, and related to the hazard quotient through, WAC 173-340-720 (3)(a)(ii)(A), (1996) x 100 x 1 mg/1000 µg (conversion factor). This is based on the "100 times rule" of WAC 173-340-740(3)(a)(ii) (A) (1996). For example, the statistical value for boron of 0.97 mg/kg, divided by the noncarcinogenic RAG value of 320 mg/kg is 3.0×10^{-3}. Comparing this value to the requirement of <1.0, this criterion is met.

2) After the HQ calculation is completed for the appropriate analytes, the cumulative HQ can be obtained by summing the individual values. (To avoid errors due to intermediate rounding, the individual HQ values prior to rounding are used for this calculation.) The cumulative HQ for the 124-N-10 waste site is 6.5×10^{-2}. Comparing this value to the requirement of <1.0, this criterion is met. There were not any constituents with a carcinogenic RAG, therefore, the criterion for individual and cumulative excess cancer risk for carcinogens is met.

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

Washington Closure Hanford, Inc. CALCULATION SHEET

Originator:	J. D. Skoglie	Date:	10/24/13	Calc. No.:	0100N-CA-V0238	Rev.:	0
Project:	100-N Area Field Remediation	Job No:	14655	Checked:	I. B. Berezovskiy	Date:	10/24/13
Subject:	124-N-10 Hazard Quotient and Carcinogenic Risk Calculation for Protection of Groundwater					Sheet No. 3 of 3	

RESULTS:

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

Table 1 shows the results of the calculations.

Table 1. Hazard Quotient and Excess Cancer Risk Results for the 124-N-10 Waste Site.

Contaminants of Potential Concern	Maximum or Statistical Value[a] (mg/kg)	Noncarcinogen RAG[b] (mg/kg)	Hazard Quotient	Carcinogen RAG[b] (mg/kg)	Carcinogen Risk
Metals					
Boron	0.97	320	3.0E-03	--	--
Chromium, hexavalent	0.229	4.8	4.8E-02	--	--
Anions					
Nitrogen in Nitrate and Nitrite	35.4	2,560	1.4E-02	--	--
Totals					
Cumulative Hazard Quotient:			**6.5E-02**		
Cumulative Excess Cancer Risk:					**0.0E+00**

Notes:
[a] = From WCH (2013).
[b] = Value obtained from the Cleanup Levels and Risk Calculations (CLARC) database using Groundwater, Method B, results and the "100 times" model.
-- = not applicable
RAG = remedial action goal

CONCLUSION:

This calculation demonstrates that the 124-N-10 waste site meets the requirements for the hazard quotients and excess carcinogenic risk for protection of groundwater as identified in the RDR/RAWP (DOE-RL 2006).

APPENDIX D

DATA QUALITY ASSESSMENT

APPENDIX D

DATA QUALITY ASSESSMENT

VERIFICATION SAMPLING

A data quality assessment (DQA) was performed to compare the verification sampling approach and resulting analytical data with the sampling and data requirements specified in the site-specific sample design (WCH 2013a). This DQA was performed in accordance with site-specific data quality objectives found in the *100-N Area Sampling and Analysis Plan for CERCLA Waste Sites* (100-N Area SAP) (DOE-RL 2006).

A review of the sample design (WCH 2013a), the field logbook (WCH 2013b), and the applicable analytical data packages has been performed as part of this DQA. All samples were collected and analyzed per the sample design.

To ensure quality data, the 100-N Area SAP (DOE-RL 2006) data assurance requirements and the data validation procedures for chemical analysis (BHI 2000) are used as appropriate. This review involves evaluation of the data to determine if they are of the right type, quality, and quantity to support the intended use (i.e., closeout decisions). The DQA completes the data life cycle (i.e., planning, implementation, and assessment) that was initiated by the data quality objectives process (EPA 2006).

Verification data from samples collected at the 124-N-10 waste site were provided by the laboratories in two sample delivery groups (SDG) (JP0631 and XP0012). SDG JP0631 was submitted for third-party validation. No major deficiencies were noted. Minor deficiencies are discussed for the 124-N-10 data set, as follows below. If no comments are made about a specific analysis, it should be assumed that no deficiencies affecting the quality of the data were found.

MINOR DEFICIENCIES

SDG JP0631

This SDG comprises 13 statistical verification samples (J1T0M5 through J1T0M9, J1T0N0 through J1T0N7) and two focused soil samples (J1T0N8 and J1T0N9) from the 124-N-10 waste site excavation. This SDG also includes one field duplicate pair (J1T0N3/J1T0N7) and a split (J1T0P1). All of these samples were analyzed for inductively coupled plasma (ICP) metals, mercury, hexavalent chromium, nitrate/nitrite, polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCBs), and total petroleum hydrocarbons (TPH). In addition, one equipment blank sample (J1T0P0) was collected and analyzed for ICP metals and mercury. The SDG JP0631 was submitted for third-party validation. Minor deficiencies are as follows.

In the PCB analysis, in order to achieve acceptable primary and confirmatory data for aroclor-1221 and aroclor-1254 the laboratory analyzed samples J1T0M5, J1T0M9, J1T0N0, J1T0N1, J1T0N2, and J1T0N4 on a separate analytical system. However, the matrix spike (MS) and matrix spike duplicate (MSD) samples were not run on the second system. Due to a lack of MS and MSD analysis, third-party validation qualified the aroclor-1221 and aroclor-1254 for these samples as estimated with "J" flags. Similarly, the aroclor-1221 results in samples J1T0M7 and J1T0N8 were also qualified as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the PCB analysis, aroclor-1016 was not included in the laboratory control sample (LCS) analysis. Third-party validation qualified all aroclor-1016 results in SDG JP0631 as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the PCB analysis, aroclor-1254 and aroclor-1260 were not completely resolved from each other in the chromatography. The laboratory determined that aroclor-1254 was the predominant peak and has reported the result as aroclor-1254 in samples J1T0M5, J1T0M7, J1T0M9, and J1T0N0. These results should be considered estimated with a probable high bias to the aroclor-1254 data. Estimated or high biased data are usable for decision-making purposes.

In the PCB analysis, the relative percent difference (RPD) calculated for aroclor-1254 exceeds 25% in samples J1T0M5, J1T0M9, J1T0N0, and J1T0N2. It is probable that this result is related to the lack of complete resolution between aroclor-1254 and aroclor-1260.

In the hexavalent chromium analysis, an MS recovery (69%) was reported outside the quality control (QC) limits. Third-party validation qualified all hexavalent chromium results in SDG JP0631 as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the method 353.2 nitrate/nitrite analysis, the MS and MSD recoveries were outside the acceptance criteria at 2 and 3% respectively. Third party validation qualified all nitrate/nitrite results in SDG JP0631 as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, MS recoveries for antimony (34%) and silicon (6%) were outside the quality control limits. Third-party validation qualified all antimony and silicon results in SDG JP0631 as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the LCS recovery for silicon (43%) is outside the quality control limits. Third-party validation qualified all silicon results in SDG JP0631 as estimated with "J" flags. Estimated data are usable for decision-making purposes.

SDG XP0012

This SDG comprises one split sample (J1TP01) from the 124-N-10 waste site excavation. This sample was analyzed for the same analytes as SDG JP0631 (ICP metals, mercury, hexavalent chromium, nitrate/nitrite, PAH, PCBs, and TPH). Minor deficiencies are as follows.

In the PAH analysis, the LCS recovery for anthracene (93%) is above the laboratories acceptance range (49-91%), indicating a possible high bias in the field sample data. The laboratory has qualified the impacted data with a "T" flag. High biased data are usable for decision-making purposes.

In the PCB analysis, a continuing calibration verification sample did not meet the laboratory acceptance criteria, suggesting a possible high bias in the field sample data. However, because the associated field sample data was nondetected there is no impact due to the high bias. The data are usable for decision-making purposes.

In the PCB analysis, surrogate recoveries in the standards did not meet the acceptance criteria. However, surrogate recovery in the field sample did meet the acceptance criteria. There is no impact on the field sample data. The data are usable for decision-making purposes.

In the ICP metals analysis, the MS recovery for silicon (1.67%) is outside the quality control limits. A post-digestion spike was prepared for silicon, which also recovered outside the control limits. Acceptable results in the LCS indicate that the analytical system was operating within control. The laboratory concluded that a matrix interference exists for silicon and qualified the associated data with an "N" flag. Silicon is not a regulated compound for the 124-N-10 waste site. There is no impact to the evaluation of the waste site. The data are usable for decision-making purposes.

In the hexavalent chromium analysis, the MS recovery (67.6%) and the MSD recovery (74.6%) are below the laboratories acceptance criteria. A second MS and MSD were prepared with similar results. The laboratory attributed these results to matrix interference. In this case the spiked hexavalent chromium appears to be reacting with the sample matrix suggesting that no hexavalent chromium exists in the field sample. The field sample data was nondetected for hexavalent chromium. The data are usable for decision-making purposes.

FIELD QUALITY ASSURANCE/QUALITY CONTROL

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

Field quality assurance (QA) measurements 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 2013b), are shown in Table D-1. The main and QA/QC sample results are presented in Appendix C.

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

Sample Area	Main Sample	Duplicate Sample	Split Sample
Excavation	J1T0N3	J1T0N7	J1T0P1

Field duplicate samples are collected to provide a relative measure of the degree of local heterogeneity in the sampling medium, unlike laboratory duplicates that are used to evaluate precision in the analytical process. The field duplicates are evaluated by computing the RPD of the sample/duplicate pair(s) for each contaminant of potential concern. Relative percent differences are not calculated for analytes that are not detected in both the main and duplicate sample at more than five times the target detection limit. Relative percent differences of analytes detected at low concentrations (less than five times the detection limit) are not considered to be indicative of the analytical system performance. The calculation brief in Appendix C provides details on duplicate pair evaluation and RPD calculation.

Field split samples are used to determine systematic differences (bias) between laboratories. A statistical determination of systematic differences would require larger data sets than are presented here. Such a determination is complicated by variability introduced by the natural heterogeneities inherent in field soil samples and the analytical variability that each individual laboratory experiences. Therefore, when evaluating limited field split data, relatively large RPDs are expected. No major deficiencies in the RPD calculations were found for the split sample. Minor deficiencies for the field duplicates and split samples are as follows.

The calculated RPDs for iron (182.6 %) and silicon (113.4%) for the 124-N-10 waste site duplicate are above the acceptance criteria of 30%. Elevated RPDs in environmental samples are generally attributed to natural heterogeneities in the sample matrix. There is no indication that the analytical system was operating out of control. The data are usable for decision-making purposes.

A secondary check of the data variability is used when one or both of the samples being evaluated (main and duplicate) is less than five times the target detection limit, including undetected analytes. In these cases, a control limit of ±2 times the target detection limit is used (Appendix C) to indicate that a visual check of the data is required by the reviewer. No sample required this check. A visual inspection of all of the data is also performed. No additional major or minor deficiencies are noted. The data are usable for decision-making purposes.

Summary

Limited, random, or sample matrix-specific influenced batch QC issues, such as those discussed above, are a potential for any analysis. The number and types seen in these data sets are within expectations for the matrix types and analyses performed. The DQA review of the 124-N-10 and waste site verification sampling data found that the analytical results are accurate within the standard errors associated with the analytical methods, sampling, and sample handling. The DQA review for the 124-N-10 data set concludes that the reviewed data are of the right type, quality, and quantity to support the intended use. The analytical data were found acceptable for decision-making purposes.

The verification sample analytical data are stored in the Washington Closure Hanford project-specific database prior to being submitted for inclusion in the Hanford Environmental Information System database. The verification sample analytical data are also summarized in Appendix C.

REFERENCES

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

DOE-RL, 2006, *100-N Area Sampling and Analysis Plan for CERCLA Waste Sites,* DOE/RL-2005-92, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

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

WCH, 2013a, *Work Instruction for Verification Sampling of the 124-N-10, Sanitary Sewer System No. 10,* 0100N-WI-G0069, Rev. 0, Washington Closure Hanford, Richland, Washington.

WCH, 2013b, *100-N Field Remediation Sampling*, Logbook EL-1652-10, pp. 40-42, Washington Closure Hanford, Richland, Washington.