WASTE SITE RECLASSIFICATION FORM

Operable Unit: 100-DR-1 **Control No.:** 2009-049

Waste Site Code(s)/Subsite Code(s): 100-D-30

Reclassification Category: Interim ☒ Final ☐

Reclassification Status: Closed Out ☒ No Action ☐ Rejected ☐
RCRA Postclosure ☐ Consolidated ☐ None ☐

Approvals Needed: DOE ☒ Ecology ☒ EPA ☐

Description of current waste site condition:

The 100-D-30, 185-D Sodium Dichromate Trench, 190-D Complex, Unplanned Release waste site, part of the 100-DR-1 Operable Unit, consisted of residual sodium dichromate-contaminated soil and concrete rubble that remained after demolition of the 190-D Complex; in particular, the pipe trench and sump that was present in the 185-D Building. During demolition of the 185-D and the 189-D Buildings, sodium dichromate contamination was found in the sub-grade structures. In 1996, shortly after demolition and backfill of the site, yellow soil discoloration was observed at the surface. This residual contamination was found in the soil along the entire length of the 185-D pipe trench. Subsurface soil contamination located in the vadose zone below the former location of an acid neutralization french drain, acid storage tanks, and an outdoor sodium dichromate storage tank that was located southwest of the former 185-D Building, was identified as a discovery site, specifically waste site 100-D-104. The 100-D-30 waste site was identified as a candidate site for confirmatory sampling in the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD), U.S. Environmental Protection Agency, Region 10, Seattle, Washington (EPA 1999).

Initial remediation of the 100-D-30 waste site was performed from June 2006 through May 2007 to a maximum depth of approximately 4.6 m (15 ft) with sample results indicating remediation was complete. However, investigation boreholes drilled in 2009 identified residual hexavalent chromium present in soil below the 185-D sump at a depth of approximately 8 m (26.2 ft) below ground surface (bgs). Therefore, additional remediation was performed from October 2011 through March 2012 to a depth of 15.2 m (50 ft) bgs. Hexavalent chromium contamination exceeding cleanup criteria remained present at this depth, identifying the need for remediation to continue. Consequently, soil removal continued from February 2013 through March 2014 to a depth of approximately 24 m (78.7 ft) bgs with the base of the excavation at an elevation of approximately 119 m (390.4 ft) above mean sea level, the estimated elevation of groundwater. Due to the depth and size of this excavation, considerable layback soil and overburden soil was removed and stockpiled. Verification samples for these soil stockpiles were collected with each lift as the piles were generated with the data supporting use of the material as clean backfill. Verification samples for the staging pile areas were collected on February 28, May 6, and May 7, 2013; and May 12, May 15, July 7, and August 26, 2014. Verification samples for overburden/layback soil were collected on January 31, June 17, July 19, August 1, August 27, August 28, September 11, September 20, November 4, and November 18, 2013; and January 9, January 27, February 26, and March 20, 2014. Verification sampling of the excavation was performed from May 14, 2014, through May 27, 2014.

Remediation, verification sampling, and comparison of residual contaminant concentrations against cleanup levels have been performed in accordance with remedial action objectives and remedial action goals established by the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (100 Area RDR/RAWP), DOE/RL-96-17, Rev. 6, U.S. Department of Energy, Richland Operations Office, Richland, Washington (DOE-RL 2009c), and the Remaining Sites ROD (EPA 1999). The selected remedy involved (1) excavating the waste site to the extent required to meet specified soil cleanup levels, (2) disposing of contaminated excavation materials at the Environmental Restoration Disposal Facility at the 200 Area of the Hanford Site, (3) demonstrating through verification sampling that cleanup goals have been achieved, and (4) proposing the waste site for reclassification as Interim Closed Out.

WASTE SITE RECLASSIFICATION FORM

Operable Unit: 100-DR-1 **Control No.:** 2009-049

Waste Site Code(s)/Subsite Code(s): 100-D-30

Basis for reclassification:

Cleanup verification sampling results were evaluated in comparison to the RAGs. In accordance with this evaluation, the verification sampling results support a reclassification of this waste site to Interim Closed Out. The current site conditions achieve the remedial action objectives and the corresponding RAGs established in the 100 Area RDR/RAWP (DOE-RL 2009c) and the Remaining Sites ROD (EPA 1999). The evaluation, which may include fate-and-transport modeling, of all verification sample data collected from the 100-D-30 and 100-D-104 waste sites resulted in a determination that residual contaminant concentrations do not preclude any future uses, as bounded by the rural-residential scenario, and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. The basis for reclassification is described in detail in the *Remaining Sites Verification Package for the 100-D-30, Sodium Dichromate Soil Contamination Waste Site and the 100-D-104, Unplanned Release Near 185-D Sodium Dichromate Storage Tank and Acid Neutralization French Drain Waste Site* (attached). The site does not have residual contamination concentrations that would require any institutional controls.

Regulator comments:

Waste Site Controls:

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

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

J. P. Neath	J. P. Neath	6/2/15
DOE Federal Project Director (printed)	Signature	Date
N. Menard	Nina M. Menard	6/3/15
Ecology Project Manager (printed)	Signature	Date
N/A		
EPA Project Manager (printed)	Signature	Date

WASTE SITE RECLASSIFICATION FORM

Operable Unit: 100-DR-1 **Control No.:** 2014-119

Waste Site Code(s)/Subsite Code(s): 100-D-104

Reclassification Category: Interim ☒ Final ☐

Reclassification Status: Closed Out ☒ No Action ☐ Rejected ☐
RCRA Postclosure ☐ Consolidated ☐ None ☐

Approvals Needed: DOE ☒ Ecology ☒ EPA ☐

Description of current waste site condition:

The 100-D-104, Unplanned Release Near 185-D Sodium Dichromate Storage Tank and Acid Neutralization French Drain waste site, part of the 100-DR-1 Operable Unit, consisted of residual sodium dichromate-contaminated soil that was discovered March 4, 2008, at a depth of approximately 4.6 m (15 ft) after the initial remediation of the 100-D-30, 185-D Sodium Dichromate Trench, 190-D Complex, Unplanned Release waste site. Hexavalent chromium and sulfate contamination found in stained soil at this depth correlated to the location of a former acid neutralization french drain, acid storage tanks, and a sodium dichromate storage tank. Based on this information, the 100-D-104 waste site was identified for remediation and added to the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD), U.S. Environmental Protection Agency, Region 10, Seattle, Washington (EPA 1999), via the Tri-Party Agreement Administrative Record Fact Sheet *100 Area "Plug-In" and Candidate Waste Sites for Fiscal Year 2010,* U. S. Department of Energy, Richland Operations Office, Richland Washington (DOE-RL 2011).

Remediation of the 100-D-104 waste site was initiated on October 2011 and proceeded through March 2012 with the remediation of the 100-D-30 Sodium Dichromate Soil Contamination waste site to a depth of 8 m (26.2 ft) below ground surface (bgs). Hexavalent chromium contamination exceeding cleanup criteria remained present at this depth, identifying the need for remediation to continue. Consequently, soil removal continued from February 2013 through March 2014 to a depth of approximately 24 m (78.7 ft) bgs with the base of the excavation at an elevation of approximately 119 m (390.4 ft) above mean sea level, the estimated elevation of groundwater. Due to the depth and size of this excavation, considerable layback soil and overburden soil was removed and stockpiled. Verification samples for these soil stockpiles were collected with each lift as the piles were generated with the data supporting use of the material as clean backfill. Verification samples for the staging pile areas were collected on February 28, May 6, and May 7, 2013; and May 12, May 15, July 7, and August 26, 2014. Verification samples for overburden/layback soil were collected on January 31, June 17, July 19, August 1, August 27, August 28, September 11, September 20, November 4, and November 18, 2013; and January 9, January 27, February 26, and March 20, 2014. Verification sampling of the excavation was performed from May 14, 2014, through May 27, 2014.

Remediation, verification sampling, and comparison of residual contaminant concentrations against cleanup levels have been performed in accordance with remedial action objectives and remedial action goals (RAGs) established by the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (100 Area RDR/RAWP), DOE/RL-96-17, Rev. 6, U.S. Department of Energy, Richland Operations Office, Richland, Washington (DOE-RL 2009c), and the Remaining Sites ROD (EPA 1999). The selected remedy involved (1) excavating the waste site to the extent required to meet specified soil cleanup levels, (2) disposing of contaminated excavation materials at the Environmental Restoration Disposal Facility at the 200 Area of the Hanford Site, (3) demonstrating through verification sampling that cleanup goals have been achieved, and (4) proposing the waste site for reclassification as Interim Closed Out.

WASTE SITE RECLASSIFICATION FORM

Operable Unit: 100-DR-1 **Control No.:** 2014-119

Waste Site Code(s)/Subsite Code(s): 100-D-104

Basis for reclassification:

Cleanup verification sampling results were evaluated in comparison to the RAGs. In accordance with this evaluation, the verification sampling results support a reclassification of this waste site to Interim Closed Out. The current site conditions achieve the remedial action objectives and the corresponding RAGs established in the 100 Area RDR/RAWP (DOE-RL 2009c) and the Remaining Sites ROD (EPA 1999). The evaluation, which may include fate-and-transport modeling, of all verification sample data collected from the 100-D-30 and 100-D-104 waste sites resulted in a determination that residual contaminant concentrations do not preclude any future uses, as bounded by the rural-residential scenario, and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. The basis for reclassification is described in detail in the *Remaining Sites Verification Package for the 100-D-30, Sodium Dichromate Soil Contamination Waste Site and the 100-D-104, Unplanned Release Near 185-D Sodium Dichromate Storage Tank and Acid Neutralization French Drain Waste Site* (attached). The site does not have residual contamination concentrations that would require any institutional controls.

Regulator comments:

Waste Site Controls:

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

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

J. P. Neath	J P Neath	6/2/15
DOE Federal Project Director (printed)	Signature	Date
N. Menard	Nina M. Menard	6/3/15
Ecology Project Manager (printed)	Signature	Date
N/A		
EPA Project Manager (printed)	Signature	Date

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-D-30, SODIUM DICHROMATE SOIL CONTAMINATION WASTE SITE AND THE 100-D-104, UNPLANNED RELEASE NEAR 185-D SODIUM DICHROMATE STORAGE TANK AND ACID NEUTRALIZATION FRENCH DRAIN WASTE SITE

Attachment to Waste Site Reclassification Forms 2009-049 and 2014-119

June 2015

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-D-30, SODIUM DICHROMATE SOIL CONTAMINATION WASTE SITE AND THE 100-D-104, UNPLANNED RELEASE NEAR 185-D SODIUM DICHROMATE STORAGE TANK AND ACID NEUTRALIZATION FRENCH DRAIN WASTE SITE

EXECUTIVE SUMMARY

The 100-D-30 Sodium Dichromate Soil Contamination waste site and the 100-D-104 Unplanned Release Near 185-D Sodium Dichromate Storage Tank and Acid Neutralization French Drain waste site are located in the 100-DR-1 Operable Unit. The 100-D-30 and 100-D-104 waste sites were releases associated with the historical use of sodium dichromate at the 190-D Complex and were added to the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD) (EPA 1999) via the *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington* (EPA 2009). The 190-D Complex included the 190-D, 189-D, 185-D, 190-DA, 195-D, and 1724-D Buildings, with the 190-D Building serving as the main pump house providing cooling water to the 105-D Reactor. Sodium dichromate was added to the cooling water as a corrosion inhibitor for the aluminum process tubes in the 105-D Reactor.

The 190-D Complex was demolished using conventional and explosive demolition techniques. Conventional demolition was used to remove the smaller facilities and to prepare the facilities for explosive demolition. The 185-D, 189-D, and 190-D Buildings were imploded on August 17, 1995. The rubble pile left after the explosive demolition was segregated and sized using heavy equipment for recycling or disposal. The remaining slabs and foundations were removed to a least 1 m (3 ft) below grade (BHI 1996).

During demolition of the 185-D and 189-D Buildings, sodium dichromate contamination was found in the sub-grade structures and at depths greater than 1 m (3 ft) (BHI 1996). Shortly after demolition and backfill of the site, yellow soil discoloration was observed at the surface (Galbraith 1996). This residual contamination remaining in the soil and concrete rubble was located along the entire length of the demolished pipe trench at the eastern edge of the 185-D Building footprint and was documented in the Waste Information Data System (WIDS) as the 100-D-30 waste site. In 2005, an evaluation of the 100-D-30 waste site was performed to determine a No Action or Remedial Action decision for this site. Based on a review of the historical process information, the results of the geophysical survey, field observations, and photographs of surface soil staining, as well as previous sampling results documented in WIDS, the site was determined to contain residual chromium contamination at levels exceeding the remedial action goals. Based on this information, it was determined that additional confirmatory sampling was not needed and remedial action at the site was necessary (Dittmer 2005).

Initial remediation of the 100-D-30 waste site was performed from June 2006 through May 2007 and extended to a depth of 4.6 m (15 ft). Approximately 7,000 m^3 (9,160 yd^3) of stained soil, stained concrete, and construction debris were excavated, stockpiled next to the trench, and later disposed at the Environmental Restoration Disposal Facility. The 100-D-104 waste site was discovered while performing the initial remedial action at the 100-D-30 waste site. Pieces of vitrified clay pipe were encountered at the southwest corner of the 100-D-30 excavation. A review of historical drawings indicated that an acid neutralization french drain, a sulfuric acid tank, a sodium dichromate tank, and a sodium silicate tank were once located outside the southwest corner of the demolished 185-D Building. Soil staining was observed in the general area of these former facilities within the 100-D-30 excavation. On December 20, 2007, additional soil removal was performed at this location to a depth of approximately 3 m (10 ft) below ground surface (bgs) with stained soil and hexavalent chromium contamination present. Therefore, on March 4 through March 5, 2008, the excavation proceeded to a depth of 6 m (20 ft) bgs to open up the area for further evaluation. Stained soil and chromium contamination remained at this depth; however, the excavation was halted because digging any deeper required an engineering design. Subsequently, this location of sodium dichromate-contaminated soil that was excavated to a depth of 6 m (20 ft) was identified as a discovery site, 100-D-104.

From January through February 2009 and June 2009, five investigation boreholes were drilled by the CH2M Hill Plateau Remediation Company at the 100-D-30 waste site to support evaluation of the vertical distribution of chromium contamination in the vadose zone below the waste site. Chromium contamination was observed at depth in the vadose zone directly below the french drain location, indicating probable transport of contamination associated with releases from the french drain and the outdoor sodium dichromate storage tank. Based on historical information, field observations, and sample results, it appeared that the residual contamination identified in the southwestern corner of the 100-D-30 waste site was associated with the french drain, sulfuric acid tank, and sodium dichromate tank that were located outside of the 190-D Complex. Therefore, it was decided to identify this location as a discovery site (100-D-104) for further remediation because it was not associated with the 185-D Building sodium dichromate trench that was the source of the chromium contamination identified as the 100-D-30 waste site.

Based upon the residual concentrations of contamination found at depth in the 100-D-30 and 100-D-104 waste sites, additional remediation was performed from October 2011 through March 2012, at each of these waste sites to a depth of approximately 15.2 m (50 ft) below surface grade. This excavation was identified as the Tier II excavation. Hexavalent chromium concentrations exceeding cleanup criteria were present at the base of the Tier II excavations. Therefore, a 100-D-30/100-D-104 Tier III excavation continued to a depth of approximately 24 m (78.7 ft) bgs with the bottom of the excavations at an elevation of approximately 119 m (390.4 ft) above mean sea level, the estimated elevation of groundwater. Beginning with the Tier III excavation, both waste sites were combined into one excavation. The Tier III excavation began in February 2013, and excavation to groundwater was completed in March 2014. Due to the depth and size of these excavations, considerable layback and overburden soil was removed and stockpiled. Verification samples for these soil stockpiles were collected with each lift as the piles were generated and the data supported use of this material as clean backfill.

During excavation, in-process samples were collected to guide the excavation and support waste management decisions. Contaminated soil and debris associated with the 100-D-30/100-D-104 remediation was placed in waste staging pile areas prior to shipment to ERDF.

Following site remediation, verification sampling of the soil within the excavation and waste staging pile area footprints was conducted. The results indicated that the waste removal action achieved compliance with the remedial action objectives for the 100-D-30 and 100-D-104 waste sites. A summary of the cleanup evaluation for the soil results against the applicable criteria is presented in Table ES-1.

Table ES-1. Summary of Remedial Action Goals for the 100-D-30/100-D-104 Waste Sites. (2 Pages)

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Direct Exposure – Radionuclides	Attain 15-mrem/yr dose rate above background over 1,000 years.	Radionuclides were not COCs/COPCs for the 100-D-30 and 100-D-104 waste sites.	NA
Direct Exposure – Nonradionuclides	Attain individual COC/COPC direct exposure RAGs.	All individual COC/COPC concentrations are below the direct-exposure criteria.	Yes
Risk Requirements – Nonradionuclides	Attain a hazard quotient of <1 for all individual noncarcinogens.	All individual hazard quotients are <1.	Yes
	Attain a cumulative hazard quotient of <1 for noncarcinogens.	The cumulative hazard quotient as evaluated using the highest calculated value for all decision units (1.9×10^{-1}) is <1.	
	Attain an excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens.	All individual carcinogen risk values are $<1 \times 10^{-6}$.	
	Attain a cumulative excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.	The total excess cancer risk for the combined 100-D-30 and 100-D-104 waste sites as evaluated using the highest calculated value for all decision units (6.5×10^{-7}) is $<1 \times 10^{-5}$.	
Groundwater/River Protection – Radionuclides	Attain single-COC/COPC groundwater and river protection RAGs.	Radionuclides are not COCs/COPCs for the 100-D-30 and 100-D-104 waste sites.	NA
	Attain national primary drinking water standards [a]: 4 mrem/yr (beta/gamma) dose rate to target receptor/organs.		
	Meet drinking water standards for alpha emitters: the most stringent of 15 pCi/L MCL or 1/25th of the derived concentration guides from DOE Order 5400.5 [b].		
	Meet total uranium standard of 30 µg/L (21.2 pCi/L [c]).		

Table ES-1. Summary of Remedial Action Goals for the 100-D-30/100-D-104 Waste Sites. (2 Pages)

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?
Groundwater/River Protection – Nonradionuclides	Attain individual nonradionuclide groundwater and river cleanup requirements.	All COPCs were quantified below groundwater and/or river protection soil RAGs with the exception of lead, DDE, and DDT that was detected in one sample from a Tier II SPA (0100D-CA-V0502); vanadium detected in one overburden/layback soil stockpile (0100D-CA-V0537); and selenium detected in three decision units (0100D-CA-V0537). In all instances, RESRAD modeling discussed in Appendix C of the 100 Area RDR/RAWP (DOE-RL 2009c), predicts residual concentrations of these constituents are protective of groundwater and the Columbia River. Specifically: • Lead, DDE, and DDT detected in one of the Tier II SPAs are associated with the 100-D-83:5 waste site and are not expected to migrate more than 2 m (6.6 ft) vertically in 1,000 years (based on the contaminant having the lowest K_d, lead with a K_d of 30 mL/g). The vadose zone beneath this SPA is approximately 24 m (72 ft) thick. • Vanadium detected in one of the overburden/layback soil stockpiles has a K_d of 1,000 mL/g and is not predicted to migrate vertically in 1,000 years. Therefore, this soil may be used for waste site backfill at any depth above the groundwater table. • Selenium having a K_d of 5 mL/g was detected in one SPA and two excavation decision units and is not expected to migrate more than 15 m (49.2 ft) vertically in 1,000 years. In all instances, the vadose zone below these selenium detections is 15.5 m (50.9 ft) thick or greater. Therefore, residual concentrations of lead, selenium, vanadium, DDE, and DDT are predicted to be protective of groundwater and the Columbia River.	Yes

[a] "National Primary Drinking Water Regulations" (*40 Code of Federal Regulations 141*).
[b] *Radiation Protection of the Public and the Environment* (DOE Order 5400.5).
[c] Based on the isotopic distribution of uranium in the 100 Area, the 30 µg/L MCL corresponds to 21.2 pCi/L. Concentration-to-activity calculations are documented in *Calculation of Total Uranium Activity Corresponding to a Maximum Contaminant Level for Total Uranium of 30 Micrograms per Liter in Groundwater* (BHI 2001).

COC = contaminant of concern
COPC = contaminant of potential concern
DDE = dichlorodiphenyldichloroethylene
DDT = dichlorodiphenyltrichloroethane
K_d = distribution coefficient
MCL = maximum contaminant level
NA = not applicable
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work
RESRAD = RESidual RADioactivity
SPA = staging pile area

The results of the verification sampling are used to make reclassification decisions for the 100-D-30 and 100-D-104 waste sites in accordance with the TPA-MP-14 procedure in *Tri-Party Agreement Handbook Management Procedures* (DOE-RL 2011).

In accordance with this evaluation, the verification sampling results support a reclassification of the 100-D-30 and 100-D-104 waste sites to Interim Closed Out. The current site conditions achieve the remedial action objectives and the corresponding RAGs established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2009c) and the Remaining Sites ROD (EPA 1999). The results of verification sampling show that residual contaminant concentrations do not preclude any future uses, as bounded by the rural-residential scenario, and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. The sites do not have residual contaminant concentrations that would require any institutional controls.

Soil cleanup levels were established in the Remaining Sites ROD (EPA 1999) based on a limited ecological risk assessment. Although not required by the Remaining Sites ROD, a comparison against ecological risk screening levels has been made for the 100-D-30 and 100-D-104 waste sites contaminants of concern and other constituents and is presented in Appendix A. The U.S. Environmental Protection Agency ecological soil screening levels were exceeded for antimony, manganese, selenium, vanadium, and zinc. Ecological screening levels from *Washington Administrative Code* (WAC) 173-340, "Model Toxics Control Act – Cleanup," were exceeded for barium, boron, selenium, and vanadium. A summary table showing the maximum contaminant concentration for constituents that exceed ecological screening levels for the 100-D-30/100-D-104 waste sites is provided in Appendix A. Because concentrations of antimony, barium, manganese, and zinc are below Hanford Site (DOE-RL 2001) or Washington State (Ecology 1994) background values (note that state background values are only used when Hanford Site background values are not available), it is believed that the presence of these constituents does not pose a risk to ecological receptors. No established background values are available for boron; a final cleanup level for boron, including consideration of background, will be established through the final remedial investigation/feasibility study process. Exceedance of screening values is intended to trigger additional evaluation and does not necessarily indicate the existence of risk to ecological receptors. All exceedances (including boron, selenium, and vanadium) will be evaluated in the context of additional lines of evidence for risk to ecological receptors as part of the final closeout decision for these sites.

REMAINING SITES VERIFICATION PACKAGE FOR THE 100-D-30, SODIUM DICHROMATE SOIL CONTAMINATION WASTE SITE AND THE 100-D-104, UNPLANNED RELEASE NEAR 185-D SODIUM DICHROMATE STORAGE TANK AND ACID NEUTRALIZATION FRENCH DRAIN WASTE SITE

STATEMENT OF PROTECTIVENESS

The cleanup verification sampling data, site evaluations, and supporting documentation presented in this document demonstrate that the remediated 100-D-30 and the 100-D-104 waste sites meet the objectives for interim closure as established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (100 Area RDR/RAWP) (DOE-RL 2009c) and the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD) (EPA 1999). The results of verification sampling and modeling 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. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required.

Soil cleanup levels were established in the Remaining Sites ROD (EPA 1999) based on a limited ecological risk assessment. Although not required by the Remaining Sites ROD, a comparison against ecological risk screening levels has been made for the 100-D-30 and 100-D-104 waste sites contaminants of concern (COCs) and other constituents and is presented in Appendix A. The U.S. Environmental Protection Agency (EPA) ecological soil screening levels were exceeded for antimony, manganese, selenium, vanadium, and zinc. Ecological screening levels from *Washington Administrative Code* (WAC) 173-340, "Model Toxics Control Act – Cleanup," were exceeded for barium, boron, selenium, and vanadium. A summary table showing the maximum contaminant concentration for constituents that exceed ecological screening levels for the 100-D-30/100-D-104 waste sites is provided in Appendix A. Because concentrations of antimony, barium, manganese, and zinc are below Hanford Site (DOE-RL 2001) or Washington State (Ecology 1994) background values (note that state background values are only used when Hanford Site background values are not available), it is believed that the presence of these constituents does not pose a risk to ecological receptors. No established background values are available for boron; a final cleanup level for boron, including consideration of background, will be established through the final remedial investigation/feasibility study process. Exceedance of screening values is intended to trigger additional evaluation and does not necessarily indicate the existence of risk to ecological receptors. All exceedances (including boron, selenium, and vanadium) will be evaluated in the context of additional lines of evidence for risk to ecological receptors as part of the final closeout decision for these sites.

GENERAL SITE INFORMATION AND BACKGROUND

The 100-D-30, 185-D Sodium Dichromate Trench, 190-D Complex, Unplanned Release waste site and the 100-D-104, Unplanned Release Near 185-D Sodium Dichromate Storage Tank and Acid Neutralization French Drain waste site are located in the 100-DR-1 Operable Unit, approximately 160 m (525 ft) west of the 105-D Reactor (Figure 1).

The 100-D-30 and 100-D-104 waste sites were releases associated with the historical use of sodium dichromate at the 190-D Complex. The 190-D Complex included the 190-D, 189-D, 185-D, 190-DA, 195-D, and 1724-D Buildings, with the 190-D Building serving as the main pump house providing cooling water to the 105-D Reactor. Sodium dichromate was added to the cooling water and used as a corrosion inhibitor.

The 190-D Complex was demolished using conventional and explosive demolition techniques. Conventional demolition was used to remove the smaller facilities and to prepare the facilities for explosive demolition. The 185-D, 189-D, and 190-D Buildings were imploded on August 17, 1995. The rubble pile left after the explosive demolition was segregated and sized using heavy equipment for recycling or disposal. The remaining slabs and foundations were removed to a least 1 m (3 ft) below grade (BHI 1996).

During demolition of the 185-D and 189-D Buildings at the 190-D Complex, sodium dichromate contamination was found in the sub-grade structures and at depths greater than 1 m (3 ft) (BHI 1996). Shortly after demolition and backfill of the site, yellow soil discoloration was observed at the surface (Galbraith 1996). This residual contamination remaining in the soil and concrete rubble was located along the entire length of the demolished pipe trench at the eastern edge of the 185-D Building footprint and was documented in the Waste Information Data System (WIDS) as the 100-D-30 waste site. In 2005, an evaluation of the 100-D-30 waste site was performed to determine a No Action or Remedial Action decision for this site. Based on a review of the historical process information, the results of the geophysical survey, field observations, and photographs of surface soil staining, as well as previous sampling results documented in WIDS, the site was determined to contain residual total chromium and hexavalent chromium contamination at concentrations of 458 mg/kg and 500 mg/kg, respectively, exceeding the remedial action goals (RAGs). Based on this information, it was determined that additional confirmatory sampling was not needed and remedial action at the site was necessary (Dittmer 2005).

The 100-D-104 waste site was discovered while performing remedial action at the 100-D-30 waste site. Pieces of vitrified clay pipe were encountered at the southwest corner of the 100-D-30 excavation. A review of historical drawings indicated that an acid neutralization french drain, a sulfuric acid tank, a sodium dichromate tank, and a sodium silicate tank were once located outside the southwest corner of the demolished 185-D Building. Soil staining was observed in the general area of these former facilities within the 100-D-30 excavation.

Figure 2 provides a timeline showing the dates of historical operations and remedial actions associated with the 100-D-30 and 100-D-104 waste sites.

Figure 1. 100-D-30/100-D-104 Waste Site Location Map.

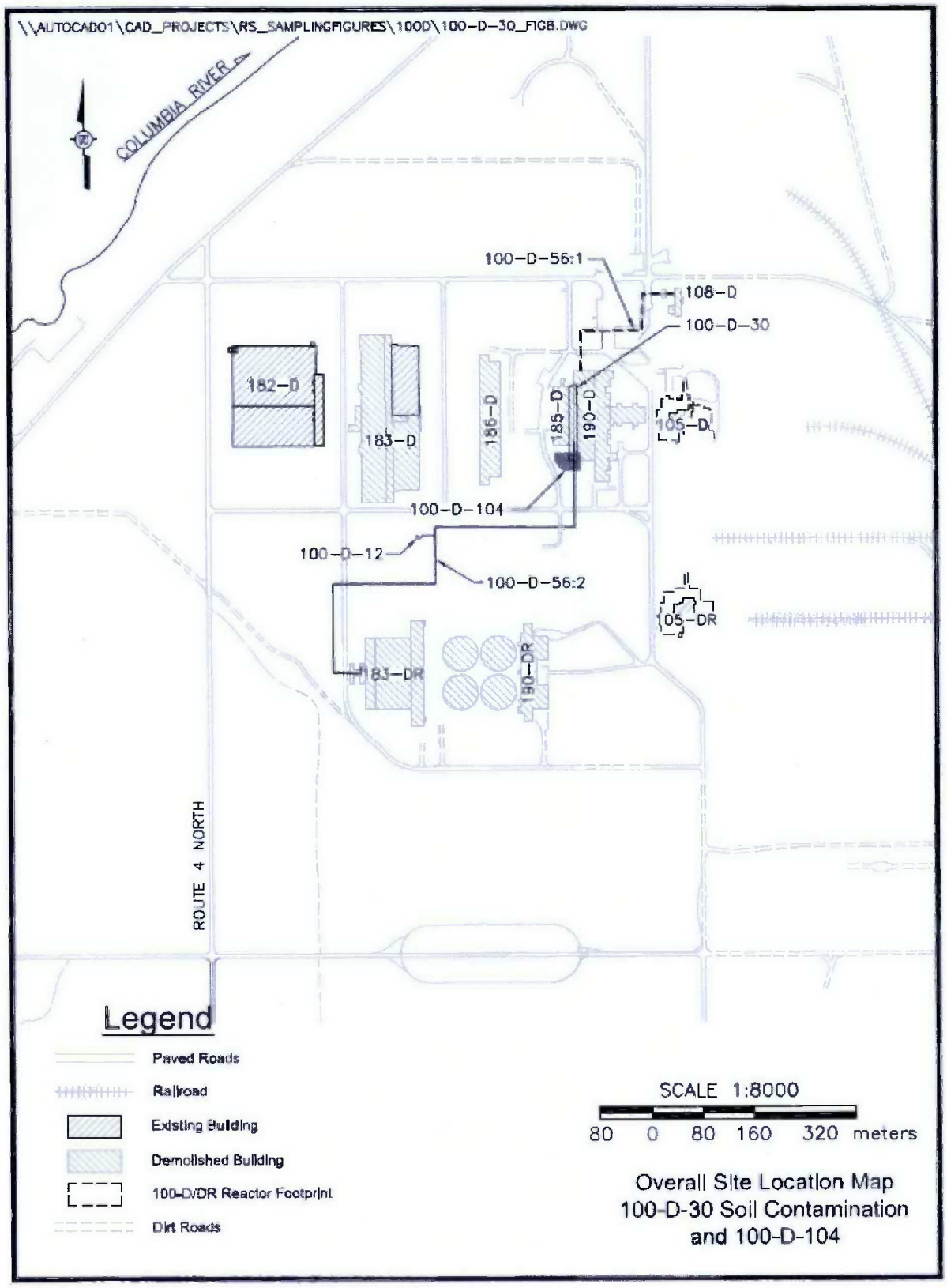
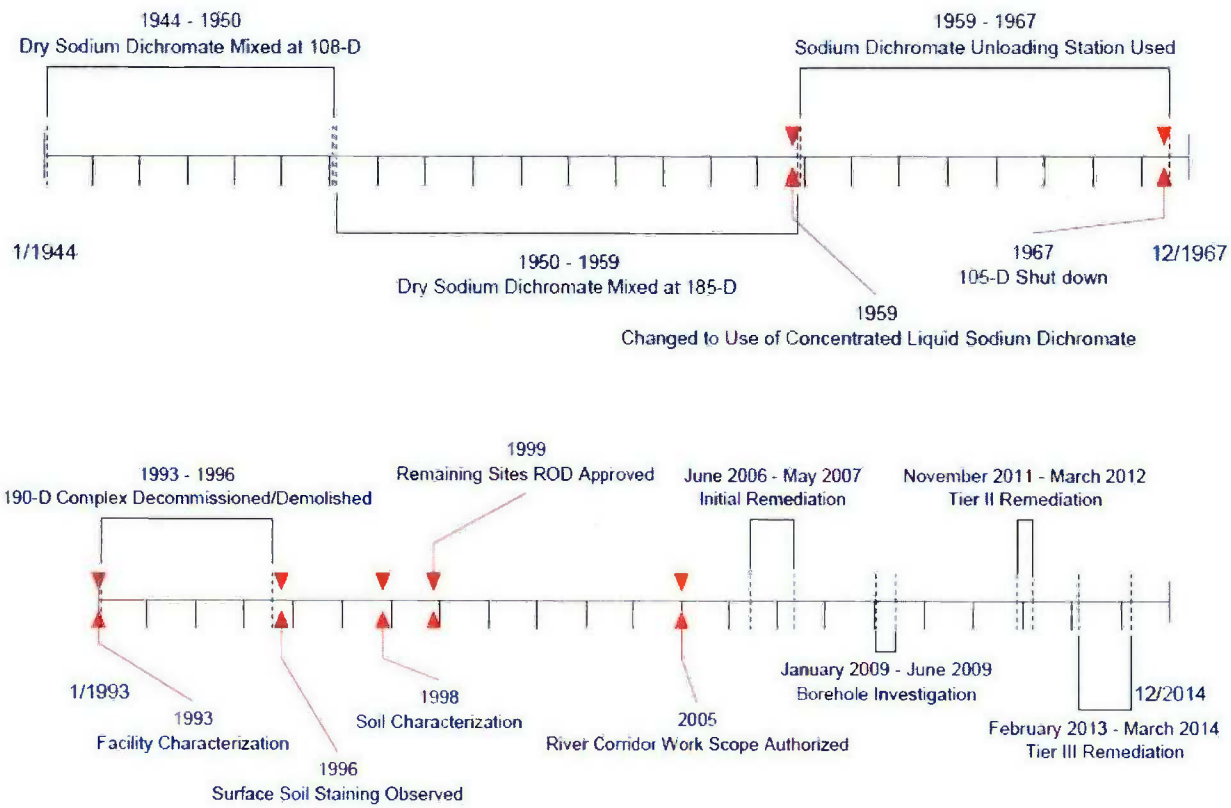


Figure 2. Timeline of Historical Operations and Remedial Activities Associated with the 100-D-30 and 100-D-104 Waste Sites.



HISTORICAL INFORMATION

Historical research indicates that several buildings and waste sites were associated with sodium dichromate use in the 100-D Area. Originally, from about 1944 until 1950 the receiving, mixing, and transfer of sodium dichromate and other water treatment chemicals occurred in the 108-D Building. The chemicals were unloaded from railcars in either bags or barrels. Sodium dichromate was received in crystalline form, dissolved in water, and diluted to a 10 to 15% dichromate solution then transferred to feed tanks in the 105-D and 185-D Buildings (Sharpe 2006). Sufficient sodium dichromate was added to reactor cooling water so that the instantaneous concentration was 2.0 parts per million, as required by the reactor cooling water specifications (GE 1953).

In 1950, the mixing of sodium dichromate was relocated from the 108-D Building to the 185-D Building. Initially, solid dichromate was received in dry form and unloaded and stored on pallets in the 185-D Building prior to usage. Later, in 1959, the use of dry material handling was replaced with use of concentrated liquid sodium dichromate that was delivered by railcar and truck to an unloading facility/pumping station (100-D-12) (WCH 2008). The sodium dichromate pumping station was located south of the 183-D Building, next to the railroad tracks. A 7.6-cm

(3-in.)-diameter underground pipeline (100-D-56) provided the means to pump stock solution to storage tanks in the 185-D Building. The 100-D-12 site was remediated in April 2000, and interim closed out through a cleanup verification package (BHI 2000). The 100-D-56 pipelines consisting of the 100-D-56:1 and 100-D-56:2 pipeline subsites were remediated from June 2006 through January 2007 and interim closed out through a remaining sites verification package (WCH 2012a, WCH 2012b).

Facility Decommissioning

The 190-D Complex (Figure 3) was demolished from 1994 through 1996, with sub-grade foundations removed to at least 1 m (3 ft) below grade. Underground utilities (e.g., active water lines) were isolated and left in place. Other underground piping and sewer lines were capped and covered or folded back (small bore pipe) and left in place. Sodium dichromate contamination was found at depths greater than 1 m (3 ft) under the 185-D trench sump and under equipment pads at the southern end of the trench during decommissioning activities (BHI 1996).

Prior to performing decommissioning of the 190-D Complex, radiological and chemical characterization of the facility was performed in 1993 to allow for the proper disposal of waste and demolition debris associated with the decommissioning. Samples of sludge, concrete, and suspect hazardous materials were collected for laboratory analysis to support waste characterization and designation (BHI 1994). Samples collected from the 185-D pipe trench and sump, also known as the sodium dichromate trench and sump, were found to contain chromium at concentrations requiring disposal of the piping, sludge, and associated stained concrete as hazardous waste. Loose sodium dichromate (not stained concrete) was removed using vacuums equipped with high-efficiency particulate air filters. Residual stains on the concrete were encapsulated with a fixative paint. The above-grade encapsulated stained concrete was removed with heavy equipment prior to the building demolition. The below-grade contaminated concrete was cut out and removed after the building was demolished during the subgrade demolition (BHI 1996). Figure 4 is a photograph of the sodium dichromate pipe trench taken during decommissioning of the 185-D Building.

During the October 1995 excavation of the pipe trench, samples of stained concrete and soil were collected at depths of 0.6 to 1.5 m (2 to 5 ft) below grade and found to be contaminated with hexavalent chromium. Demolition and removal of the pipe trench and sump concrete continued until the facility decommissioning work scope was completed in January 1996. At that time, the site was entered into WIDS as the 100-D-30 waste site due to the presence of residual soil contamination and contaminated concrete rubble that were not removed as part of the facility decommissioning work scope. After the conclusion of decontamination activities in the 185-D and 189-D Buildings, the final sub-grade demolition and backfill of the site was performed (BHI 1996).

Figure 3. Aerial View of the 190-D Complex (January 1, 1945).

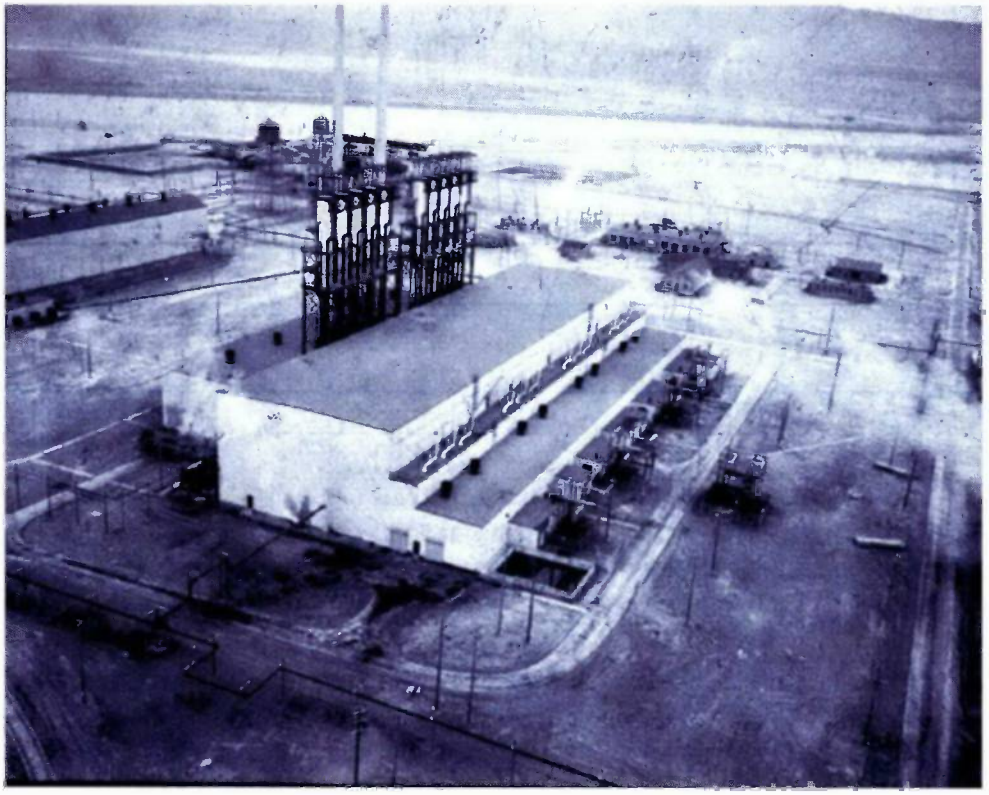


Figure 4. 185-D Sodium Dichromate Pipe Trench Removal (1995).

Sodium Dichromate Soil Investigations

On June 14, 1996, yellow-stained surface soil in the vicinity of the demolished 190-D Complex was observed. A grab sample of the stained soil was collected for field analysis of chromium and found to have a concentration of approximately 480 mg/kg hexavalent chromium (McCain 1996). Subsequently, in November 1996, a large visible discolored soil area was seen at the location of the demolished 190-D Complex (Galbraith 1996). The approximate sizes of the most prominent stained areas, including locations of greenish-yellow sand and rocks, were determined using a measuring tape and Brunton™ compass and documented in a sketch of the area (Figure 5). The discolored soil was believed to be a result of residual chromium contamination that was associated with the demolition of the 190-D Complex. The discolored soil was identified as being part of the 100-D-30 waste site.

Site Geophysical Survey Information

A geophysical survey was performed over the 100-D-30 waste site in June 2004. Electromagnetic survey data were collected to locate and map the trench that was documented as being located along the eastern edge of the 185-D Building. A notable zone of concentrated anomalies was detected that was characteristic of buried debris (Figure 6). The area located immediately to the east of the concentrated zone of anomalies was observed to be relatively free of anomalies. The concentrated zone of anomalies appeared to be the eastern edge of the 185-D Building, with the trench located in an area that was relatively free of anomalies (Bergstrom and Mitchell 2004).

REMEDIAL ACTION SUMMARY

Initial remediation of the 100-D-30 waste site was performed from June 2006 through May 2007. Approximately 7,000 m^3 (9,160 yd^3) of stained soil, stained concrete, and construction debris were excavated, stockpiled next to the trench, and later disposed to the Environmental Restoration Disposal Facility (ERDF). Waste characterization and in-process samples were collected, as necessary, to support waste designation and to assist in guiding the excavation. Stained concrete (Figure 7) observed at the site was sampled (J12XP5) to support waste designation. The laboratory results for these samples are provided in Appendix B. Figures 8, 9, and 10 are photographs showing the 100-D-30 excavation and the waste stockpiles. Figure 11 is an aerial photograph that shows the 100-D-30 excavation and the southern portion of the 100-D-56 sodium dichromate pipeline excavation. Figure 12 is a photograph of the waste staging piles being loaded for shipment to ERDF. The depth of this excavation, as shown in Figure 9, was approximately 3.5 m (12 ft) below ground surface.

During the 100-D-30 waste site excavation, pieces of vitrified clay pipe were encountered at the southwestern corner of the 100-D-30 site (Figure 13).

Figure 5. Location of the Visible Sodium Dichromate Stains (November 1996).

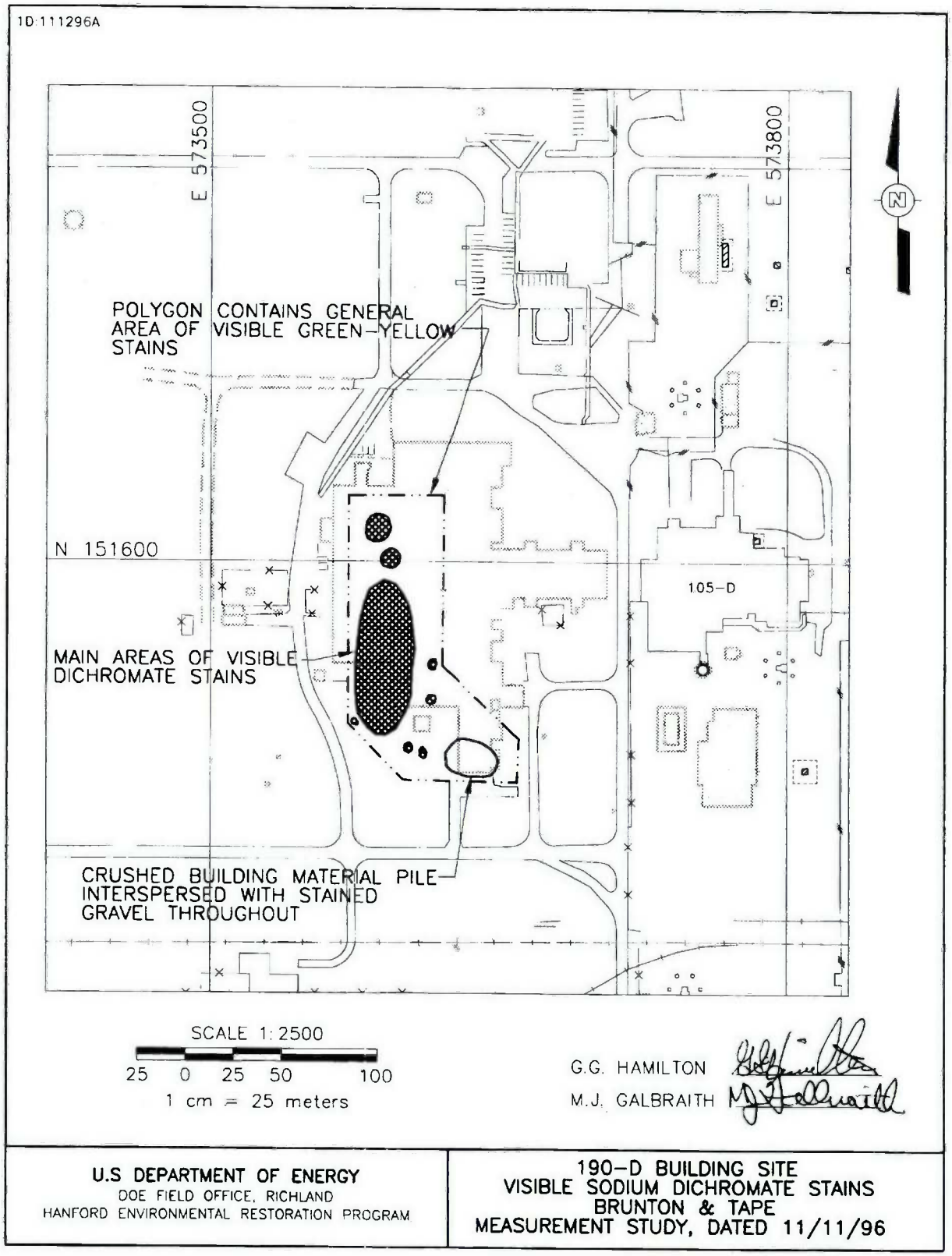


Figure 6. 100-D-30 Geophysical Investigation Results.

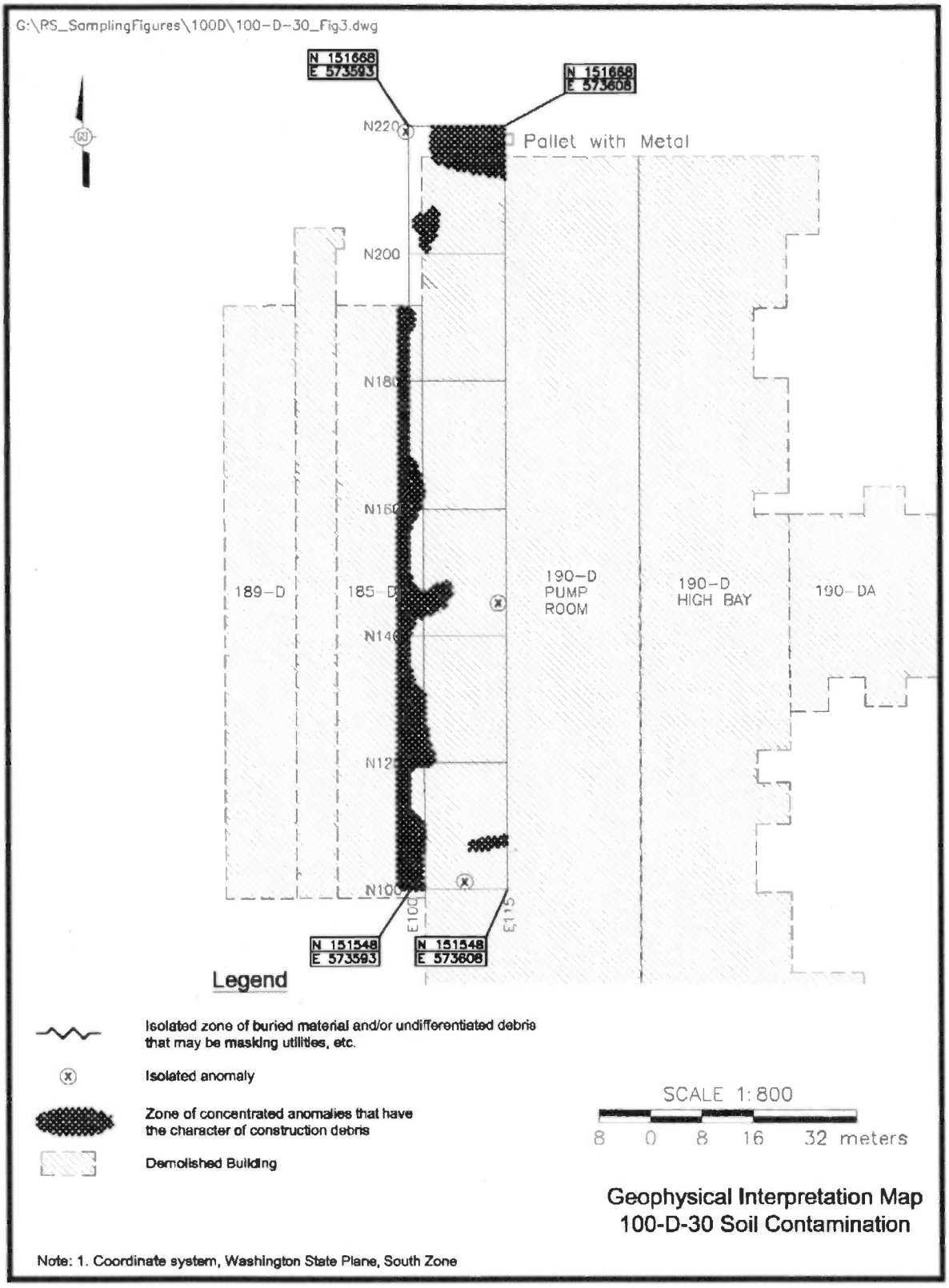


Figure 7. Stained Concrete Debris Exhibiting Elevated Chromium Concentration (June 29, 2006).

Figure 8. 100-D-30 Concrete and Debris Removal Activities (June 14, 2006).

Figure 9. 100-D-30 Concrete and Debris Removal Activities (June 14, 2006).

Figure 10. 100-D-30 Excavation Prior to Waste Pile Removal (June 26, 2007).

Figure 11. Photograph of the 100-D-56 (Southern Portion) and 100-D-30 Excavations (December 6, 2006).

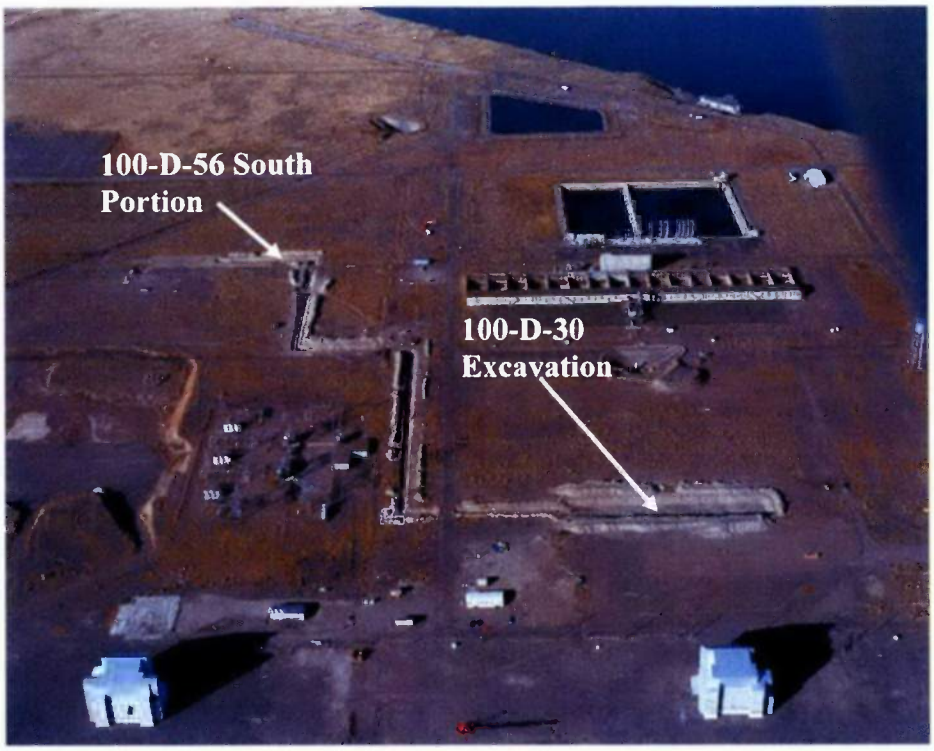


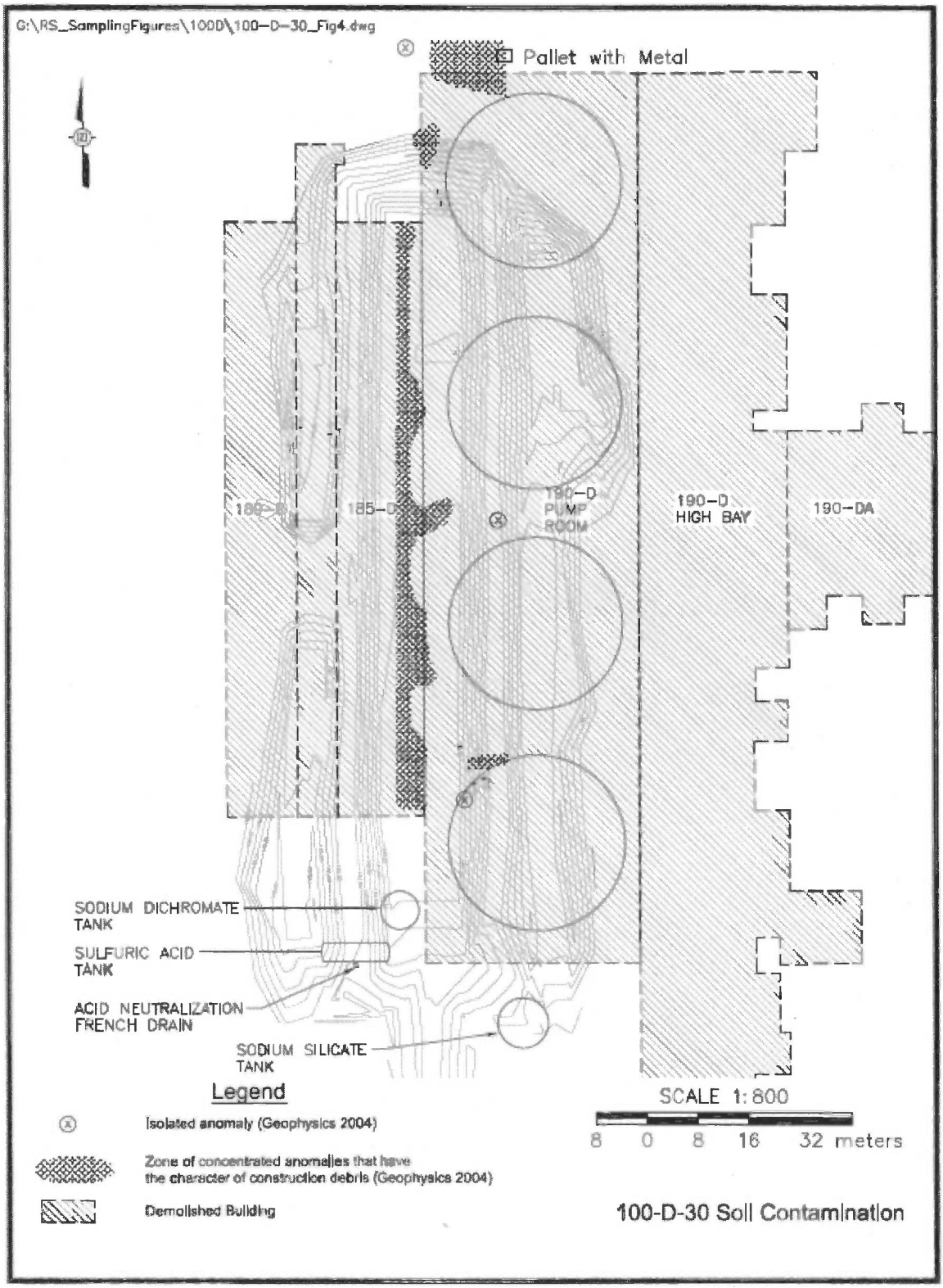
Figure 12. Removal of the 100-D-30 Waste Piles (February 27, 2007).

Figure 13. 100-D-30 Trench Excavation Showing a Piece of the Acid Neutralization French Drain (June 29, 2006).

A review of historical drawings (GE 1962) for the 190-D Complex indicated the presence of an acid neutralization french drain associated with an outdoor sulfuric acid tank. The vitrified clay pipe (Figure 13) may have been remnants of this french drain. A large sodium dichromate tank and sodium silicate tank were also once located near the southern portion of the 100-D-30 excavation, outside of the southwestern corner of the 190-D Building. Figure 14 indicates the location of these features in perspective with the footprint of the decommissioned 190-D Complex and the 100-D-30 excavation. The historical location of the sodium dichromate tank fell within the 100-D-30 excavation area, with the depth of the excavation below the elevation of this structure. The potential for residual contamination associated with the location of the acid neutralization french drain and the sodium dichromate storage tank was evaluated as part of initial verification sampling for the 100-D-30 waste site.

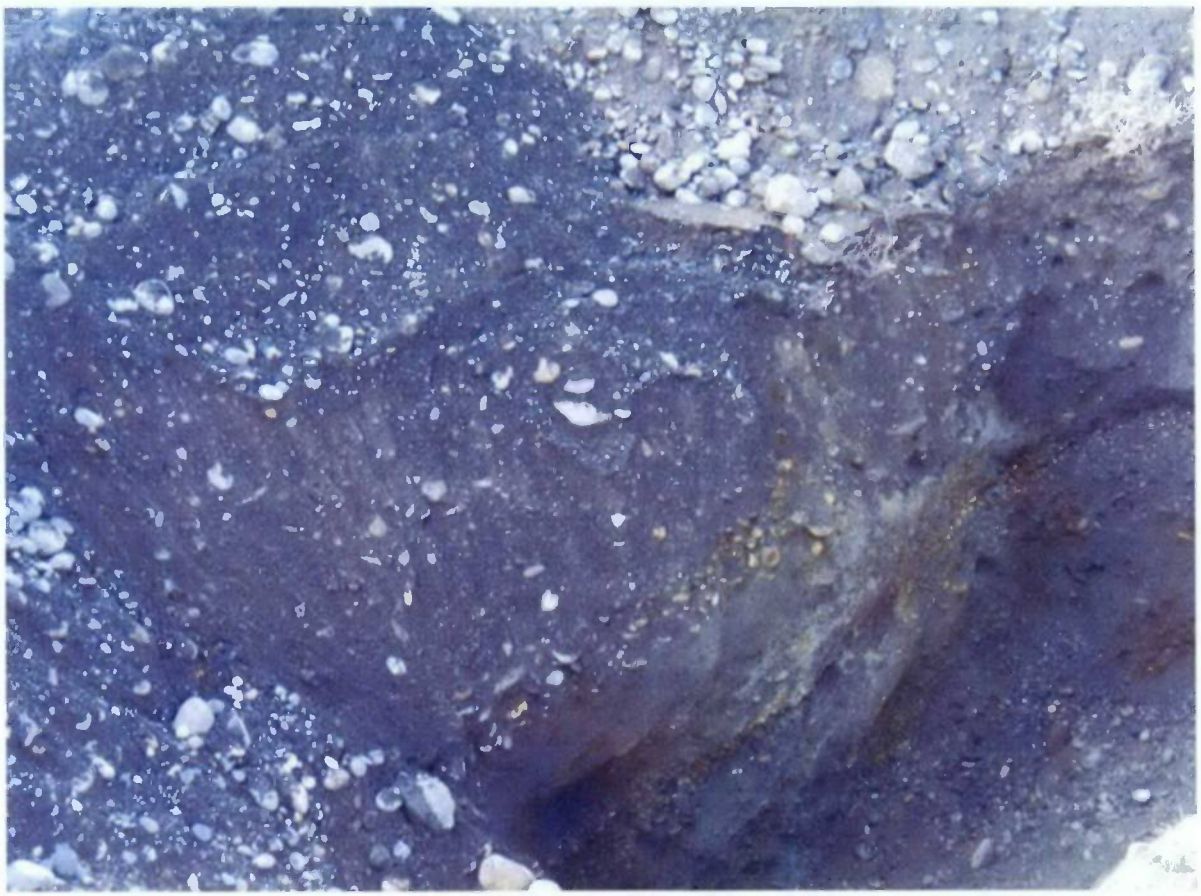
On December 20, 2007, additional soil removal was performed in this southwestern area of the 100-D-30 waste site to a depth of approximately 3 m (10 ft) below grade. Yellow staining was observed after this further excavation. Four judgmental in-process soil samples were collected in this area (J163Y2, J163Y3, J163Y4, and J163Y5) with one sample (J163Y2) having 20.6 mg/kg of hexavalent chromium. The results of this sampling are provided in Appendix B.

Figure 14. Location of the Sodium Dichromate Tank, Sulfuric Acid Tank, Sodium Silicate Tank, and Acid Neutralization French Drain.



On March 4, 2008, additional excavation was performed to open up the area for further evaluation. As the excavation progressed deeper, the soil became more stained. Prior to the hole sloughing as the excavation expanded, forset bedding (i.e., distinctly dipping sediment layers) exhibiting staining was observed at a depth of approximately 4.6 m (15 ft) in the south sidewall of the excavation (Figure 15). The forset bedding is a significant feature because it provides a preferential pathway for lateral migration of contamination within the vadose zone.

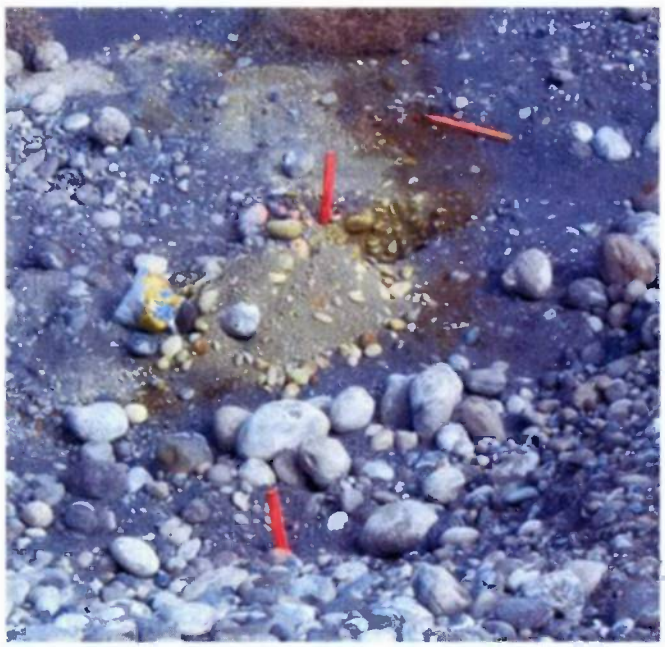
Figure 15. Excavation with Chromium Staining at the Southwestern Corner of the 100-D-30 Waste Site – "Forset Bedding" Observed in the Sidewall of the Excavation (March 4, 2008).



Excavation continued on March 5, 2008, to a depth of 6 m (20 ft). The excavation was halted at this depth because any deeper would require an engineering design. In the center of the excavation, an area approximately 3 m^2 (30 ft^2) was observed with yellow and brown staining (Figure 16). Three in-process samples were collected: one of "assumed clean" black sand (J16DH8), one of yellow-stained soil (J16DH9), and one of orange-brown stained soil (J16DJ0) (Figure 17). Total chromium concentrations were increasing at this depth (approximately 300 mg/kg), but hexavalent chromium decreased (0.31 mg/kg) (Appendix B).

Figure 16. Chromium Contamination Visible at the Base of the Excavation in the Southwestern Corner of the 100-D-30 Waste Site (March 5, 2008).

Figure 17. Chromium Contamination at the Base of the Excavation in the Southwestern Corner of the 100-D-30 Waste Site; Stakes Indicate Approximate Sample Locations (March 5, 2008).



On March 26, 2008, additional samples (J16J17, J16J18, and J16J19) were collected in the previously sampled stained soil area at the base of the excavation. The results of these samples (Appendix B) showed similar chromium concentrations; however, hexavalent chromium concentrations increased to as high as 286 mg/kg. Sulfate was also relatively high (4,590 mg/kg) in one sample (J16J17). Split samples were also collected for the Washington State Department of Ecology (Ecology) and stained soil was collected and provided to Pacific Northwest National Laboratories for chromium leachability tests and geochemistry research. The results of this testing are reported in *Geochemical Characterization of Chromate Contamination in the 100 Area Vadose Zone at the Hanford Site* (PNNL 2008) and *Geochemical Characterization of Chromate Contamination in the 100 Area Vadose Zone at the Hanford Site - Part 2* (PNNL 2011).

From January through February 2009, and June 2009, five investigation boreholes were drilled by the CH2M Hill Plateau Remediation Company at the 100-D-30 waste site to support evaluation of the vertical distribution of chromium contamination in the vadose zone below the waste site. Soil samples were collected at discrete depth intervals and analyzed for chromium (total) and hexavalent chromium (DOE-RL 2009b, 2010). Additional information concerning the field drilling and sampling, including copies of borehole logs, is provided in *Borehole Summary Report for Seven Boreholes at 100-D Area* (CHPRC 2010). A summary of the borehole sample results is provided in Table 1. Figure 18 is a drawing showing the approximate locations of the boreholes and Figure 19 is a schematic providing a cross-section through the waste site using the borehole information. The depth to groundwater shown on Figure 19 was based on groundwater elevation at the time of drilling as measured in nearby wells and recorded in HEIS.

Table 1. Summary of Sample Results for the Borehole Investigation. (2 Pages)

C6446 (139.76 m)					C6447 (139.84 m)				
Depth (ft)	**Elev (m)**	**HEIS**	**CrVI (mg/kg)**	**Cr (mg/kg)**	**Depth (ft)**	**Elev (m)**	**HEIS**	**CrVI (mg/kg)**	**Cr (mg/kg)**
4	138.5	B1YKD1	0.12 J	7.42	6	138.0	B1YK70	0.28	7.90
8	137.3	B1YKD2	0.62	8.09	11	136.5	B1YK71	0.12 J	12.0
12	136.1	B1YKD3	2.03	8.93	16	135.0	B1YK72	0.21 U	4.99
20	133.7	B1YKD4	0.93	18.3	20-22	133.4	B1YK74	0.21 U	6.51
30	130.6	B1YKD5	0.68	14.2	29	131.0	B1YK75	0.14 J	3.24
38	128.2	B1YKD6	0.20 U	23.1	36	128.9	B1YK76	0.33	5.26
44	126.4	B1YKD7	0.34	24.8	38	128.3	B1YK77	0.22	9.15
52	123.9	B1YKD8	0.20 U	15.4					
C6438 (139.83 m)					**C6448 (139.83 m)**				
Depth (ft)	**Elev (m)**	**HEIS**	**CrVI (mg/kg)**	**Cr (mg/kg)**	**Depth (ft)**	**Elev (m)**	**HEIS**	**CrVI (mg/kg)**	**Cr (mg/kg)**
11	136.5	B1YKY5	0.21 U	12.6	4-6	138.3	B1YK82	0.21 U	112
13	135.9	B1YKY6	0.25	4.12	8-10	137.1	B1YK83	0.21 U	19.7
21	133.4	B20XX8	0.15 U	4.96	12-14	135.9	B1YK84	0.21 U	28.1
28	131.3	B20XX9	0.21	5.20	12-14	135.9	B1YK85	0.155 U	15.6
31	130.4	B20XY0	0.193	12.2					
33	129.8	B20XY1	0.14 J	3.39					

Table 1. Summary of Sample Results for the Borehole Investigation. (2 Pages)

C6449 (140.55 m)					C6450 (142.02 m)				
Depth (ft)	Elev (m)	HEIS	CrVI (mg/kg)	Cr (mg/kg)	Depth (ft)	Elev (m)	HEIS	CrVI (mg/kg)	Cr (mg/kg)
6-8	138.4	B1YK58	0.20 U	15.7	4-6	140.5	B1YK94	14.2	178
6-8	138.4	B1YK59	0.155 U	6.13	8-10	139.3	B1YK95	0.61	159
8-10	137.8	B1YK60	0.21 U	31.0	12-14	138.1	B1YK96	8.4	265
12-14	136.6	B1YK61	0.21 U	22.9	20-22	135.6	B1YK97	0.70	43.6
20-22	134.2	B1YK62	0.21 U	9.0	28-30	133.2	B1YK98	0.56	51.2
28-30	131.7	B1YK63	0.20 U	16.5	36-38	130.7	B1YK99	0.78	31.3
36-38	128.3	B1YK64	0.20 U	12.6	46-48	127.7	B1YKB0	0.38	15.8
44-46	126.8	B1YK65	0.21 U	34.8					
52-54	124.4	B1YK66	0.29	40.3					

☐ = Indicates a sample result that exceeds groundwater and river protection soil cleanup criteria.
Cr = chromium (total)
CrVI = hexavalent chromium
Elev = elevation above sea level
J = estimate
HEIS = Hanford Environmental Information System
U = undetected

Figure 18. Location of the Boreholes Drilled for the Vadose Zone Chromium Investigation at the 100-D-30 Waste Site.

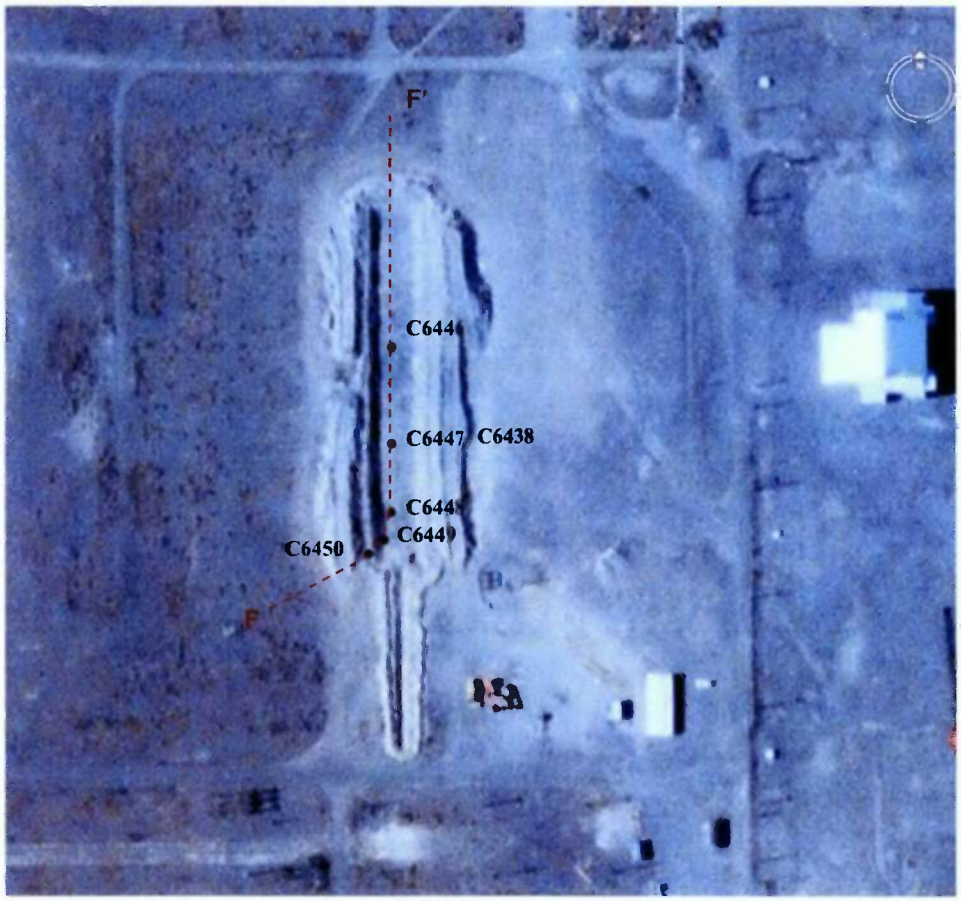
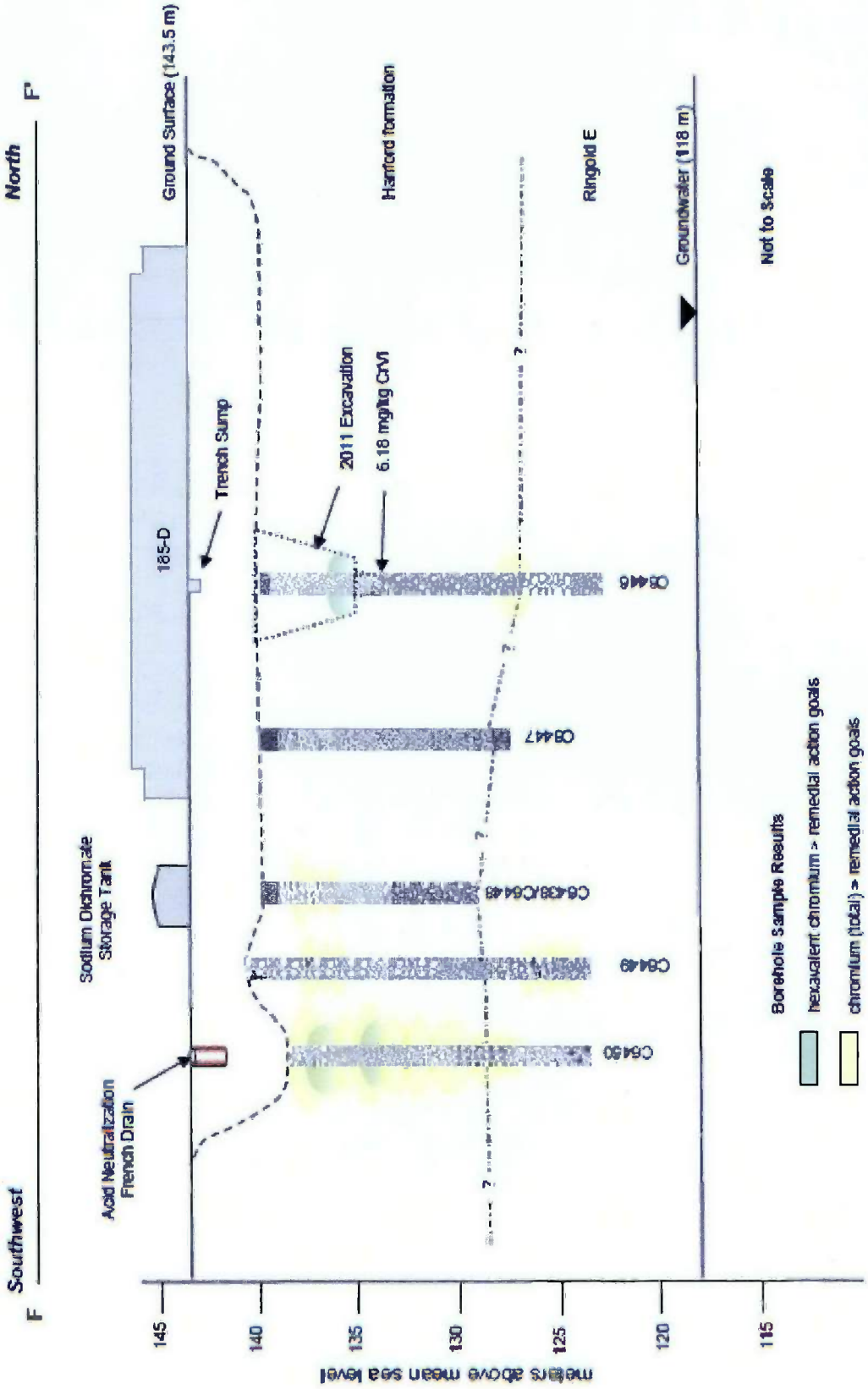


Figure 19. Cross-Section of Borehole Investigation at the 100-D-30 Waste Site.



Chromium contamination was observed at depth in the vadose zone directly below the french drain location (C6450), indicating probable transport of contamination associated with releases from the french drain and the outdoor sodium dichromate storage tank. Based on historical information, field observations, and sample results, it appeared that the residual contamination identified in the southwestern corner of the 100-D-30 waste site was associated with the acid neutralization french drain, sulfuric acid tank, and sodium dichromate tank that were located outside of the 190-D Complex. Therefore, it was decided to identify this location (Figure 20) as a discovery site (100-D-104) for further remediation because it was not associated with the 185-D Building sodium dichromate trench that was the source of the chromium contamination identified as the 100-D-30 waste site. Figure 21 is an aerial photograph showing the 100-D-104 waste site location relative to the 100-D-30 waste site excavation.

Verification sampling for the 100-D-30 waste site was initially performed in October 2007 and September 2009 to support a determination that residual contaminant concentrations at the 100-D-30 site meet the cleanup criteria specified in the 100 Area RDR/RAWP (DOE-RL 2009c) and the Remaining Sites ROD (EPA 1999). The results of this initial verification sampling are provided in Appendix C and indicated that the cleanup goals were met. However, based upon concentrations of hexavalent chromium found at depth in the boreholes that were drilled at the site (Table 1), a decision was made to perform additional remediation of the 100-D-30 waste site and to combine this remediation with the 100-D-104 waste site remediation.

This additional remediation was performed from October 2011 through March 2012, at each of these waste sites to a depth of approximately 15.2 m (50 ft) below surface grade and was identified as the Tier II excavation. Figure 22 provides a photograph of the Tier II excavation at the 100-D-30 waste site. This photograph shows the Hanford formation contact with the underlying Ringold Formation at the base of the excavation at an approximate depth of 14.9 m (49 ft). As the excavation proceeded, in-process grab samples for total chromium and hexavalent chromium laboratory analyses were collected on a grid at 1.5-m (5-ft)-depth intervals. The sample results for each lift were used to guide the excavation and to support waste characterization and disposal decisions for each underlying lift. Hexavalent chromium concentrations exceeding cleanup criteria were present at the base of the Tier II excavations. The highest concentration of hexavalent chromium detected at the base of the 100-D-30 Tier II excavation was 48.71 mg/kg and the highest concentration at the base of the 100-D-104 Tier II excavation was 32.5 mg/kg. The results of these in-process soil samples that were collected at 1.5-m (5-ft)-depth intervals during the excavation are provided in Appendix D. Further discussion concerning the geology encountered during the excavation at these waste sites is provided in Appendix E.

Because hexavalent chromium contamination exceeding cleanup criteria remained at the base of the Tier II excavation, a 100-D-30/100-D-104 Tier III excavation design was developed for continuing the remediation of these sites to an approximate depth of 24 m (78.7 ft) below surface grade, with the bottom of the excavations at an elevation of approximately 119 m (390.4 ft) above mean sea level, the estimated elevation of groundwater.

Figure 20. Location of the 100-D-104 Discovery Waste Site.

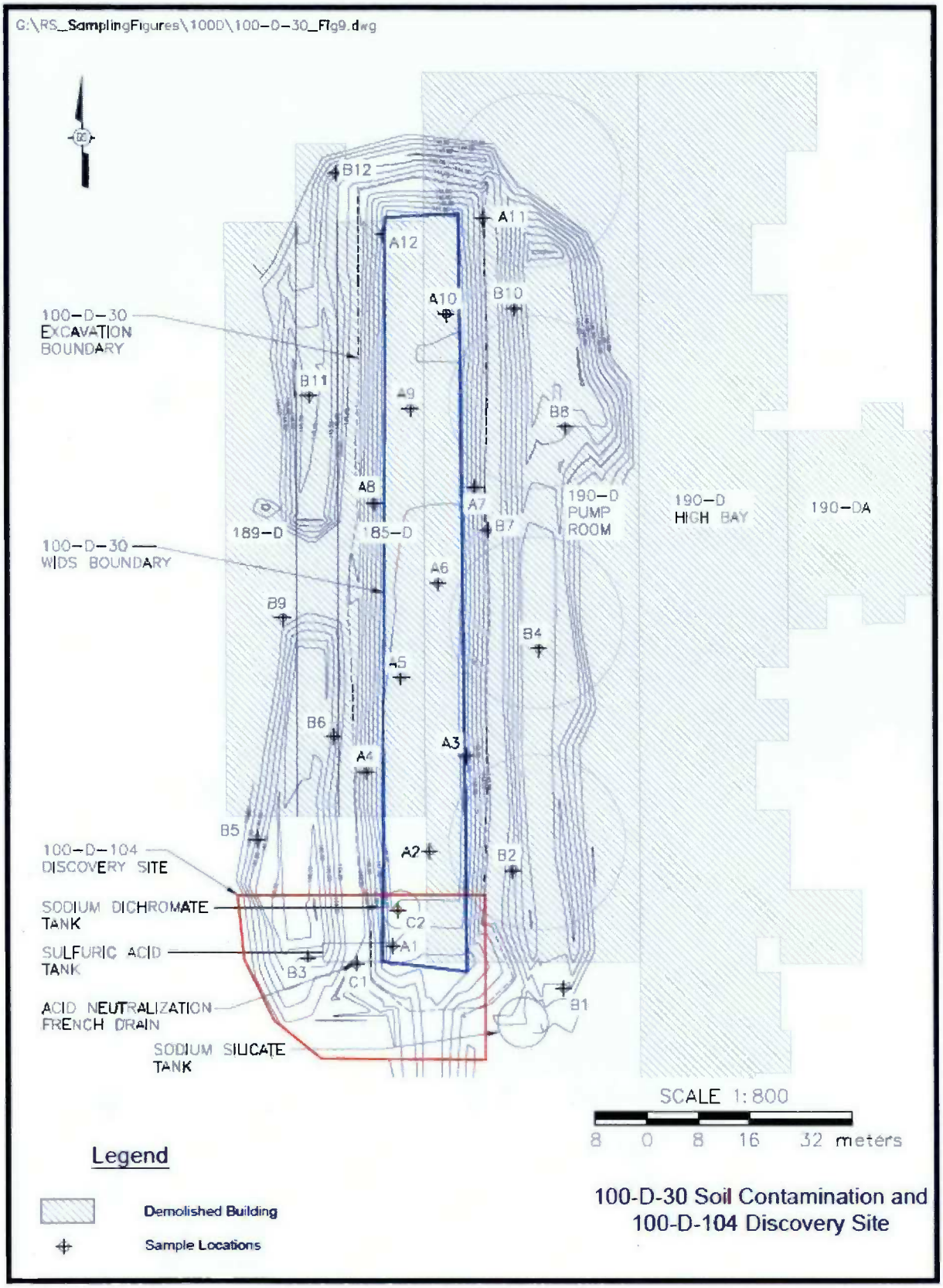
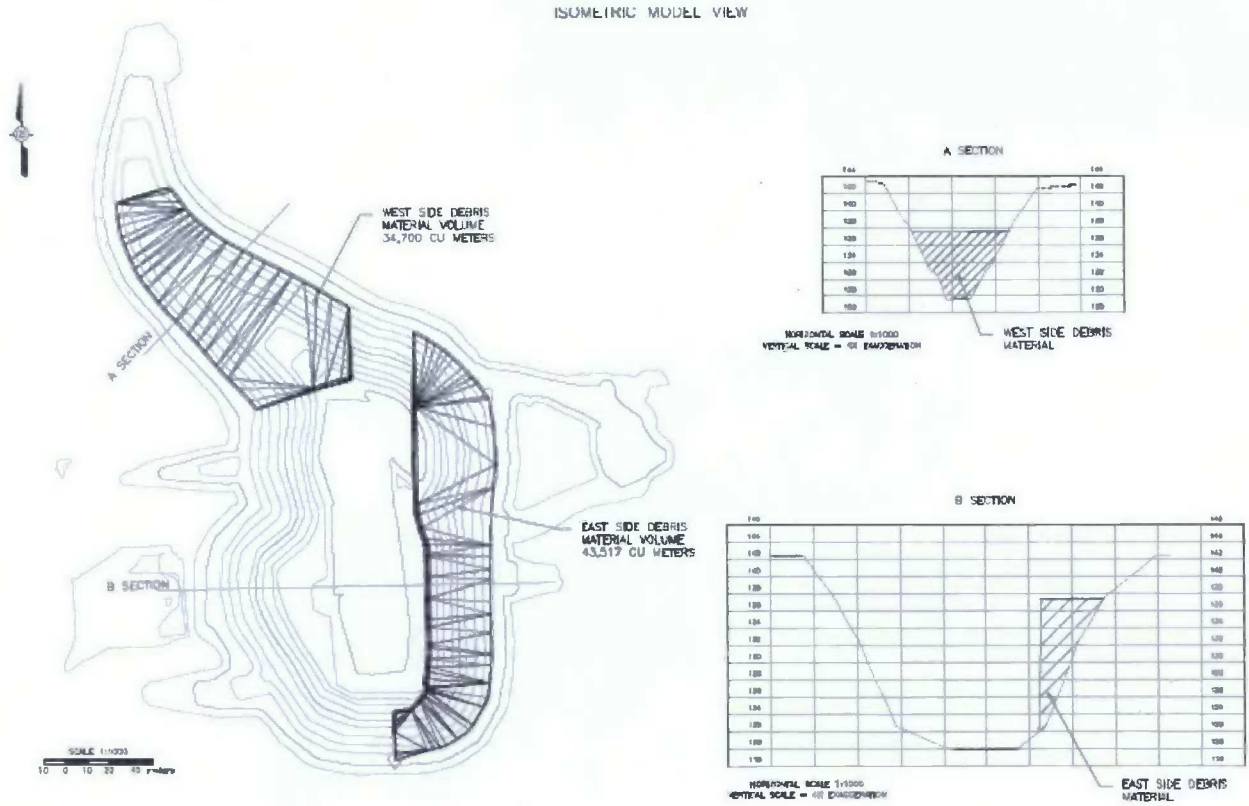


Figure 21. Location of the 100-D-104 Discovery Waste Site (September 2009).

Figure 22. 100-D-30 Tier II Excavation Showing Hanford/Ringold Formation Contact at Base of Excavation at Approximately 14.9 m (49 ft) Below Ground Surface (February 2012).

The Tier III excavation began in February 2013 and excavation to groundwater was completed in March 2014. Due to the depth and size of these excavations, considerable layback and overburden soil was removed and stockpiled for use as clean backfill or was placed into previously remediated waste sites (120-D-1, 100-D-73, and 100-D-76). Overburden/layback material was also placed in the south portion of the decommissioned 183-D clearwell. This overburden/layback soil was stockpiled or used as backfill in the previously closed waste site excavations in approximately 2.4-m (8-ft) thick lifts. Verification samples were collected and evaluated for each lift prior to adding the next 2.4-m (8-ft) lift. As the data for each of these lifts was collected, it was summarized and provided to Ecology for concurrence of meeting the cleanup criteria prior to addition of the next lift. As described in the backfill concurrence checklist for these sites (WCH 2014d), the overburden/layback soil stockpiles will be used for backfill of the 100-D-30/100-D-104 waste sites and may be used for backfill of other 100-D Area remediated waste sites that are approved for backfill. Additionally, an agreement with Ecology (WCH 2013g) allows use of clean concrete and steel debris encountered during remediation to be used as backfill for a portion of the 100-D-30/100-D-104 waste sites. Figure 23 provides the locations within the 100-D-30 and 100-D-104 excavations that were identified as acceptable for placement of debris. The agreement specified that the excavation would be backfilled with soil approximately 3 m (10 ft) above groundwater. Clean concrete and steel debris could be placed over the soil to an elevation that would be no closer than 6.1 m (20 ft) from the backfilled surface grade for the waste sites.

Figure 23. Debris Material Backfill Plan for 100-D-30/100-D-104.



During the Tier III remediation, the remnants of the 1724-D Underwater Test Facility that was demolished in 1995 were encountered on the east side of the 100-D-104 excavation. Nonradiological reactor components and fuel dummies were found within this facility debris; no green fuel or radiologically contaminated spacers were found. This debris was removed and disposed at ERDF.

As the Tier III excavation proceeded in-process grab samples for total chromium and hexavalent chromium laboratory analyses were collected on a grid at 1.5-m (5-ft)-depth intervals, consistent with the approach used for the Tier II excavation. These in-process sample results were used to guide the excavation and to support waste characterization and disposal decisions for each underlying lift. In October 2013, visual observations of chromium soil staining at a depth of 15.2 m (50 ft), in combination with the in-process soil sample results for hexavalent chromium, indicated that as the excavation was proceeding into the Ringold Formation, lateral spreading of hexavalent chromium contamination was occurring in association with the change in lithology from coarser Hanford sand and gravel to finer-grained Ringold silt and sand. As a result, an excavation design change was prepared that provided for expansion of the 100-D-104 excavation to the southeast. The in-process sample results are provided in Appendix D and discussion of the geology encountered during the excavation is provided in Appendix E.

Photographs of the Tier III excavation are provided in Figures 24 and 25. The sodium dichromate stained soil areas shown in Figure 5 were entirely removed as part of the combined 100-D-30/100-D-104 waste site excavation. The Tier III excavation proceeded to the interface with the unconfined groundwater table, an elevation of approximately 118.8 m (389.8 ft) above mean sea level that was encountered in March 2014 (Figures 26 and 27). Subsequently, higher Columbia River flow rates and river stages in June 2014 associated with spring runoff and controls at the Priest Rapids Dam resulted in higher groundwater elevations at the excavation (Figure 28).

Figure 24. 100-D-30/100-D-104 Tier III Excavation Looking Down the Ramp into the North Side of the 100-D-104 Excavation (October 3, 2013).

Figure 25. Tier III Excavation Looking North from the 100-D-30 Excavation Toward the 100-D-104 Excavation (October 3, 2013).

Figure 26. Tier III Excavation at 100-D-104 Looking West (March 3, 2014).

Figure 27. 100-D-30/100-D-104 Tier III Excavation Looking West (March 10, 2014).

Figure 28. 100-D-30/100-D-104 Tier III Excavation Looking South (June 19, 2014).

Waste that was removed for disposal to ERDF was placed in waste staging pile areas (SPAs). After the waste was removed, verification samples were collected from the floor of each SPA. The verification sampling results for the SPAs are included in this Remaining Sites Verification Package (Appendix F). The verification results for a 100-D-83:5 SPA that was not closed with the 100-D-83:5 waste site are also discussed in this Remaining Sites Verification Package; the sampling design was provided in 0100D-WI-G0133, *Work Instruction for Verification Sampling of the 100-D-83:5, 186-D Acid Neutralizing System Pipelines and Reactor Cooling Water Pipelines to 105-D Waste Site* (WCH 2014e).

FIELD ACTIVITIES ASSOCIATED WITH GROUNDWATER EVALUATION

In October 2014, subsequent to remediation, stained soil was observed in the rewetted zone at two locations in the lower excavation sidewalls. Soil samples from the sidewalls above and below the water table and groundwater samples were collected by Pacific Northwest National Laboratory. The approximate sample locations are shown in Figure 29. Hexavalent chromium was detected in these samples with concentrations ranging from 2.23 mg/kg up to 34.52 mg/kg (CHPRC 2015). Therefore, in consultation with the CH2M Hill Plateau Remediation Company groundwater project, U.S. Department of Energy, and Ecology, a decision was made to perform additional soil removal at the lower sidewalls of the excavation at these two locations. This additional soil removal was initiated on October 22, 2014, and completed on October 27, 2014.

Approximately 722 bank cubic meters (944 bank cubic yards) of additional soil was removed and disposed at ERDF.

After this additional soil removal was performed, five informational grab samples of soil were collected from each of the two remediated areas and analyzed for hexavalent chromium. The highest detected concentration of hexavalent chromium was 0.428 mg/kg. The results are provided in Appendix B.

VERIFICATION SAMPLING ACTIVITIES

Verification sampling for the 100-D-30 and 100-D-104 waste sites consisted of 8 decision units for the excavation, 5 decision units for SPAs, and 16 decision units for overburden/layback. Verification sampling designs were provided in approved verification work instructions (WCH 2013h, 2013i, 2014e, 2014f, and 2014g). Verification sampling designs for overburden/layback lifts were provided to Ecology for concurrence prior to sampling.

Verification sampling of the excavation was performed May 14, 2014, through May 27, 2014. Verification sampling of SPAs and overburden/layback was performed throughout the duration of the field activities, as needed, to support decision making related to closure of SPAs and use of overburden/layback for backfill. Specific verification sampling dates can be found in the data summary tables that are attached to the upper confidence limits (UCLs) calculations provided in Appendix F.

Figure 29. 100-D-30/100-D-104 Pacific Northwest National Laboratory Sample Locations (October 2014).

Verification sampling was performed to support a determination that residual contaminant concentrations at these waste sites meet the cleanup criteria specified in the 100 Area RDR/RAWP (DOE-RL 2009c) and the Remaining Sites ROD (EPA 1999). The verification sample results are provided in Appendix F and indicate that the waste removal action achieved compliance with the remedial action objectives and RAGs for the 100-D-30 and 100-D-104 waste sites.

The following subsections provide additional discussion of the information that was used to develop the verification sampling design. The statistical results of the verification sampling are also summarized to support interim closure of these waste sites.

Contaminants of Concern/Contaminants of Potential Concern

The COCs for verification sampling of the 100-D-30/100-D-104 waste sites were determined in consideration of process knowledge, historical sampling information, in-process sampling results from Tier I and Tier II remediation, and in consultation with Ecology. The COCs for the 100-D-30/100-D-104 waste sites include hexavalent chromium, total chromium, and mercury.

The analytical methods that were performed to evaluate the sites COCs are provided in Table 2.

Table 2. Laboratory Analytical Methods for 100-D-30 and 100-D-104 Waste Sites.

Analytical Method	Contaminants of Concern
ICP metals [a] – EPA Method 6010	Total chromium
Mercury – EPA Method 7471	Mercury
Hexavalent chromium – EPA Method 7196	Hexavalent chromium

[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

The contaminants of potential concern (COPCs) for the 100-D-83:5 SPA were identified in the *Work Instruction for Verification Sampling of the 100-D-83:5, 186-D Acid Neutralizing System Pipelines and Reactor Cooling Water Pipelines to 105-D Waste Site* (WCH 2014e). The analytical methods are provided in Table 3.

Table 3. Laboratory Analytical Methods for the 100-D-83:5 Waste Site. (2 Pages)

Analytical Method	Contaminant of Potential Concern
ICP metals [a] – EPA Method 6010	Chromium (total), lead
Mercury – EPA Method 7471	Mercury
Hexavalent chromium – EPA Method 7196	Hexavalent chromium
IC anions – EPA Method 300.0 [b, c]	Nitrate, sulfate (western decision unit and overburden only)
Nitrate/nitrite – EPA Method 353.2	Nitrate/nitrite (western decision unit and overburden only)

Table 3. Laboratory Analytical Methods for the 100-D-83:5 Waste Site. (2 Pages)

Analytical Method	Contaminant of Potential Concern
pH – EPA Method 9045	pH (western decision unit and overburden only)

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

[b] The extended list of IC anions including bromide, chloride, fluoride, nitrate, nitrite, phosphate, and sulfate was requested. To preclude holding time issues for nitrate and nitrite with EPA Method 300.0, EPA Method 353.2 was also performed.

[c] IC anion Method 300.0 and IC anion Method 9056M are based on the same analytical procedure and for the purposes of the project are interchangeable depending upon the laboratory performing the analysis.

EPA= U.S. Environmental Protection Agency
IC = ion chromatography
ICP = inductively coupled plasma
pH = hydrogen ion concentration

The COPCs for the 100-D-50:7 waste subsite were identified in the *Work Instruction for Verification Sampling of the 100-D-50:7 Headhouse Floor Drains and Catch Basins Pipeline Subsite* (WCH 2014j). These COPCs were included for verification samples that were collected from a SPA that was used to stage waste from both the 100-D-104 waste site and the 100-D 50:7 waste site. The analytical methods are provided in Table 4.

Table 4. 100-D-50:7 Subsite Laboratory Analytical Methods and Contaminants of Potential Concern.

Analysis	Analytical Method	Contaminant of Potential Concern
ICP metals [a]	EPA Method 6010	Chromium (total), copper, lead, manganese, zinc
IC Anions [b]	EPA Method 300.0	Chloride and sulfate
Mercury	EPA Method 7471	Mercury
Hexavalent chromium	EPA Method 7196	Hexavalent chromium
pH (Soil)	EPA Method 9045	pH
PCBs	EPA Method 8082	Polychlorinated biphenyls
Pesticides	EPA Method 8081	Pesticides

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

[b] IC anion Method 300.0 and IC anion Method 9056M are based on the same analytical procedure and for the purposes of the project are interchangeable depending upon the laboratory performing the analysis.

EPA = U.S. Environmental Protection Agency
ICP = inductively coupled plasma
PCB = polychlorinated biphenyl

Verification Sample Design

Statistical sampling designs were developed for collection of verification samples for the 100-D-30 and 100-D-104 waste sites decision units. Since the excavation was completed to the top of the saturated zone at an elevation of approximately 119 m (390.4 ft) above mean sea level,

only the sidewalls of the excavation were sampled to support closeout of the waste sites. This sampling design was developed using the post excavation civil survey as a base map for stratifying the waste sites into sampling areas and locating verification samples.

The Visual Sample Plan[1] was used to develop the statistical sampling design and identify verification sample locations as provided for in the *100 Area Remedial Action Sampling and Analysis Plan* (100 Area SAP) (DOE-RL 2009a). Historical information, in-process sample results, knowledge from field observations, site-specific lithology/geology, and location of potential chromium sources were used to stratify the planned excavation into eight decision units. Twelve statistical samples were collected from each decision unit using a systematic grid. A discrete soil sample was collected at each sample location. Due to the overlap of the west end of the 100-D-83:5 Reactor Cooling Water Pipelines waste site with the 100-D-30/100-D-104 waste sites excavation, one focused verification soil sample was collected at the west end of each of the two reactor cooling water pipelines. These samples were analyzed for the COPCs identified for the 100-D-83:5 waste site and included total chromium, lead, hexavalent chromium, mercury, nitrate, nitrite, sulfate, and pH.

All sampling was performed in accordance with ENV-1, *Environmental Monitoring & Management*, to fulfill the requirements of the 100 Area SAP (DOE-RL 2009a).

Additional information related to verification sampling can be found in the field sampling logbooks (WCH 2013a, 2013b, 2013c, 2013d, 2013e, 2013f, 2014a, 2014b, and 2014c). Summary tables of the verification sampling and the sample locations are provided in Appendix G.

Verification Sampling Results

All verification samples were collected for full protocol laboratory analyses using EPA-approved analytical methods. Evaluation of the verification data for the 100-D-30 and 100-D-104 waste sites and the 100-D-83:5 waste site was performed by direct comparison of the statistical or maximum sample results for each COC and COPC against the cleanup criteria.

The primary statistical calculation to evaluate compliance with cleanup standards is the 95% UCL on the arithmetic mean of the data. The 95% UCL values for each detected COC and COPC are computed for the decision units as specified by the 100 Area RDR/RAWP (DOE-RL 2009c). The calculations are provided in Appendix F. When a nonradionuclide COC/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 the RAGs. If no detections for a given COC/COPC were reported in the data set, then no statistical calculation or evaluation was performed for that COC/COPC.

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

Comparisons of the results for each COC/COPC from the 100-D-30 and 100-D-104 waste sites and the 100-D-83:5 waste site against the RAGs are summarized in Tables 5 through 35. Contaminants that were not detected by laboratory analysis are excluded from these tables. Calculated cleanup levels are not presented in the Cleanup Levels and Risk Calculations Database (Ecology 2014) under WAC 173-340-740(3) for calcium, magnesium, potassium, silicon, and sodium. The EPA's *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual* (EPA 1989) recommends that aluminum and iron not be considered in site risk evaluations; therefore, aluminum, calcium, iron, magnesium, potassium, silicon, and sodium are not considered site COPCs and are also not included in the tables.

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 F).

Table 5. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-D-30/100-D-104 Excavation Decision Unit 1 Statistical Verification Samples.

COC/COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	2.3 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	67.6 (<BG)	5,600	200	400	No	--
Boron [d]	1.2	7,200	320	-- [e]	No	--
Cadmium [f]	0.079 (<BG)	13.9 [g]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	7.5 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	10.2 (<BG)	24	15.7 [c]	-- [e]	No	--
Copper	14.8 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [d]	0.368	2.1 [g]	4.8	2	No	--
Lead	4.2 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	303 (<BG)	3,760	512 [c]	512 [c]	No	--
Mercury	0.0095 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Molybdenum [d]	0.29	400	8	-- [e]	No	--
Nickel	10.2 (<BG)	1,600	19.1 [c]	27.4	No	--
Selenium [f]	0.81	400 [g]	5	1	No	--
Vanadium	62.2 (<BG)	560	85.1 [c]	-- [e]	No	--
Zinc	43.9 (<BG)	24,000	480	67.8 [c]	No	--

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

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Attachment F (Calculation 0100D-CA-V0537).

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009c).

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

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

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

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

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table 6. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-D-30/100-D-104 Excavation Decision Unit 2 Statistical Verification Samples.

COC/COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	2.7 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	66.7 (<BG)	5,600	200	400	No	--
Boron [d]	1.3	7,200	320	-- [e]	No	--
Cadmium [f]	0.11 (<BG)	13.9 [g]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	8.4 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	9.3 (<BG)	24	15.7 [c]	-- [e]	No	--
Copper	14.3 (<BG)	2,960	59.2	22.0 [c]	No	--
Lead	4.9 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	305 (<BG)	3,760	512 [c]	512 [c]	No	--
Mercury	0.0053 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Molybdenum [d]	0.23	400	8	-- [e]	No	--
Nickel	10.6 (<BG)	1,600	19.1 [c]	27.4	No	--
Selenium [f]	1.2	400	5	1	Yes	Yes [h]
Vanadium	56.0 (<BG)	560	85.1 [c]	-- [e]	No	--
Zinc	42.4 (<BG)	24,000	480	67.8 [c]	No	--

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

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Attachment F (Calculation 0100D-CA-V0537).

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009c).

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

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

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

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

[h] Based on RESRAD modeling discussed in Appendix C of the 100 Area RDR/RAWP (DOE-RL 2009c), the residual concentrations of selenium are not expected to migrate more than 15 m (49.2 ft) vertically in 1,000 years based on the selenium distribution coefficient of 5 mL/g. The vadose zone underlying the soil below Decision Unit 2 is approximately 21 m (68.9 ft). Therefore, residual concentrations of selenium are predicted to be protective of groundwater and the Columbia River.

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table 7. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-D-30/100-D-104 Excavation Decision Unit 3 Statistical Verification Samples.

COC/COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	2.2 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	62.5 (<BG)	5,600	200	400	No	--
Cadmium [d]	0.099 (<BG)	13.9 [e]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	7.0 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	10.8 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	16.0 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [g]	0.269	2.1 [e]	4.8	2	No	--
Lead	4.8 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	307 (<BG)	3,760	512 [c]	512 [c]	No	--
Mercury	0.028 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Molybdenum [g]	0.35	400	8	-- [f]	No	--
Nickel	9.8 (<BG)	1,600	19.1 [c]	27.4	No	--
Selenium [d]	1.1	400	5	1	Yes	Yes [h]
Vanadium	68.3 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	44.7 (<BG)	24,000	480	67.8 [c]	No	--

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

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Attachment F (Calculation 0100D-CA-V0537).

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009c).

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

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

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

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

[h] Based on RESRAD modeling discussed in Appendix C of the 100 Area RDR/RAWP (DOE-RL 2009c), the residual concentrations of selenium are not expected to migrate more than 15 m (49.2 ft) vertically in 1,000 years based on the selenium distribution coefficient of 5 mL/g. Even though the vadose zone underlying the soil below Decision Unit 3 is approximately 14 m (45.9 ft); the residual concentrations of selenium are believed to be protective of groundwater and the Columbia River. This is because selenium was only detected in two samples at 1.1 mg/kg, slightly above the selenium river protection RAG of 1.0 mg/kg. Furthermore, selenium was not detected in any of the verification samples that were collected from Decision Units 5 and 7 that are at depths lower in the vadose zone than Decision Unit 3. Therefore, residual concentrations of selenium in Decision Unit 3 are predicted to be protective of groundwater and the Columbia River.

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table 8. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-D-30/100-D-104 Excavation Decision Unit 4 Statistical Verification Samples.

COC/COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	2.4 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	68.2 (<BG)	5,600	200	400	No	--
Beryllium	0.31 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Boron [e]	1.2	7,200	320	-- [f]	No	--
Chromium (total)	8.3 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	8.0 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	16.9 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [e]	0.248	2.1 [d]	4.8	2	No	--
Lead	5.0 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	310 (<BG)	3,760	512 [c]	512 [c]	No	--
Mercury	0.016 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Molybdenum [e]	0.23	400	8	-- [f]	No	--
Nickel	10.4 (<BG)	1,600	19.1 [c]	27.4	No	--
Vanadium	83.1 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	54.6 (<BG)	24,000	480	67.8 [c]	No	--

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

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Attachment F (Calculation 0100D-CA-V0537).

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009c).

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

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

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

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table 9. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-D-30/100-D-104 Excavation Decision Unit 5 Statistical Verification Samples.

COC/COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	1.8 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	60.3 (<BG)	5,600	200	400	No	--
Beryllium	0.090 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Cadmium [e]	0.088 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	10.5 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	7.0 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	11.3 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [g]	0.205	2.1 [d]	4.8	2	No	--
Lead	3.4 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	235 (<BG)	3,760	512 [c]	512 [c]	No	--
Nickel	11.1 (<BG)	1,600	19.1 [c]	27.4	No	--
Vanadium	42.4 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	32.8 (<BG)	24,000	480	67.8 [c]	No	--

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

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Attachment F (Calculation 0100D-CA-V0537).

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009c).

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

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

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

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

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table 10. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-D-30/100-D-104 Excavation Decision Unit 6 Statistical Verification Samples.

COC/COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	2.3 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	75.4 (<BG)	5,600	200	400	No	--
Beryllium	0.11 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Cadmium [e]	0.087 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	9.2 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	10.6 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	12.9 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [g]	0.215	2.1 [d]	4.8	2	No	--
Lead	4.1 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	301 (<BG)	3,760	512 [c]	512 [c]	No	--
Mercury	0.0090 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Molybdenum [g]	0.51	400	8	-- [f]	No	--
Nickel	11.1 (<BG)	1,600	19.1 [c]	27.4	No	--
Vanadium	70.2 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	38.8 (<BG)	24,000	480	67.8 [c]	No	--

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

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Attachment F (Calculation 0100D-CA-V0537).

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009c).

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

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

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

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

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table 11. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-D-30/100-D-104 Excavation Decision Unit 7 Statistical Verification Samples.

COC/COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	2.2 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	80.7 (<BG)	5,600	200	400	No	--
Beryllium	0.11 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Boron [e]	1.7	7,200	320	-- [f]	No	--
Cadmium [g]	0.092 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	10.7 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	6.8 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	13.3 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [e]	0.348	2.1 [d]	4.8	2	No	--
Lead	4.1 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	232 (<BG)	3,760	512 [c]	512 [c]	No	--
Mercury	0.0092 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Molybdenum [e]	0.36	400	8	-- [f]	No	--
Nickel	13.7 (<BG)	1,600	19.1 [c]	27.4	No	--
Silver	0.19 (<BG)	400	8	0.73 [c]	No	--
Vanadium	45.5 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	33.2 (<BG)	24,000	480	67.8 [c]	No	--

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

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Attachment F (Calculation 0100D-CA-V0537).

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009c).

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

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

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

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

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table 12. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-D-30/100-D-104 Excavation Decision Unit 8 Statistical Verification Samples.

COC/COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	2.2 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	50.0 (<BG)	5,600	200	400	No	--
Beryllium	0.15 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Chromium (total)	13.4 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	4.7 (<BG)	24	15.7 [c]	-- [e]	No	--
Copper	14.1 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [f]	0.410	2.1 [d]	4.8	2	No	--
Lead	3.3 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	181 (<BG)	3,760	512 [c]	512 [c]	No	--
Mercury	0.012 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Nickel	16.6 (<BG)	1,600	19.1 [c]	27.4	No	--
Vanadium	27.3 (<BG)	560	85.1 [c]	-- [e]	No	--
Zinc	25.8 (<BG)	24,000	480	67.8 [c]	No	--

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

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Attachment F (Calculation 0100D-CA-V0537).

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009c).

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

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

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

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table 13. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-D-30/100-D-104 SPA 3 Statistical Verification Samples.

COC/COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	2.3 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	83.8 (<BG)	5,600	200	400	No	--
Beryllium	0.029 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Boron [e]	4.2	7,200	320	-- [f]	No	--
Cadmium [g]	0.13 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	9.3 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	7.7 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	13.0 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [e]	0.308	2.1 [d]	4.8	2	No	--
Lead	5.3 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	301 (<BG)	3,760	512 [c]	512 [c]	No	--
Mercury	0.031 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Molybdenum [e]	0.30	400	8	-- [f]	No	--
Nickel	10.5 (<BG)	1,600	19.1 [c]	27.4	No	--
Selenium [g]	1.3	400	5	1	Yes	Yes [h]
Vanadium	45.8 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	39.0 (<BG)	24,000	480	67.8 [c]	No	--

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

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Attachment F (Calculation 0100D-CA-V0537).

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009c).

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

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

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

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

[h] Based on RESRAD modeling discussed in Appendix C of the 100 Area RDR/RAWP (DOE-RL 2009c), the residual concentrations of selenium are not expected to migrate more than 15 m (49.2 ft) vertically in 1,000 years based on the selenium distribution coefficient of 5 mL/g. The vadose zone underlying the soil below SPA 3 is approximately 24 m (78.7 ft) thick. Therefore, residual concentrations of selenium are predicted to be protective of groundwater and the Columbia River.

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
SPA = staging pile area
WAC = *Washington Administrative Code*

Table 14. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-D-83:5 SPA 4 Statistical Verification Samples.

COC/COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	2.7 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	78.1 (<BG)	5,600	200	400	No	--
Boron [d]	1.5	7,200	320	-- [e]	No	--
Cadmium [f]	0.14 (<BG)	13.9 [g]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	10.7 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	8.8 (<BG)	24	15.7 [c]	-- [e]	No	--
Copper	15.3 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [d]	0.226	2.1 [g]	4.8	2	No	--
Lead	5.2 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	331 (<BG)	3,760	512 [c]	512 [c]	No	--
Mercury	0.047 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Nickel	11.5 (<BG)	1,600	19.1 [c]	27.4	No	--
Selenium [f]	0.81	400	5	1	No	--
Silver	0.15 (<BG)	400	8	0.73 [c]	No	--
Vanadium	49.9 (<BG)	560	85.1 [c]	-- [c]	No	--
Zinc	41.5 (<BG)	24,000	480	67.8 [c]	No	--
Chloride	8.5 (<BG)	--	25,000	-- [e]	No	--
Nitrogen in nitrate	3.9 (<BG)	128,000	1,000	2,000	No	--
Nitrogen in nitrate nitrite	11.1	8,000	100	200	No	--
Sulfate	11.9 (<BG)	--	25,000	-- [e]	No	--

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

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Attachment F (Calculation 0100D-CA-V0537).

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009c).

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

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

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

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

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table 15. Comparison of Contaminant Concentrations to Remedial Action Goals for 100-D-30/100-D-104 Overburden/Layback Soil (120DL1) Placed in the 120-D-1 Waste Site Excavation (Lift 1, ~8 ft).

COC/COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	2.0 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	110 (<BG)	5,600	200	400	No	--
Beryllium	0.24 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Boron [e]	16.5	7,200	320	-- [f]	No	--
Cadmium [g]	0.23 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	4.8 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	10.0 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	16.0 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [e]	0.203	2.1 [d]	4.8	2	No	--
Lead	3.2 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	318 (<BG)	3,760	512 [c]	512 [c]	No	--
Mercury	0.022 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Molybdenum [e]	0.28	400	8	-- [f]	No	--
Nickel	8.9 (<BG)	1,600	19.1 [c]	27.4	No	--
Vanadium	84.0 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	49.5 (<BG)	24,000	480	67.8 [c]	No	--

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

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Attachment F (Calculation 0100D-CA-V0537).

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009c).

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

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

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

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

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table 16. Comparison of Contaminant Concentrations to Remedial Action Goals for 100-D-30/100-D-104 Overburden/Layback Soil (120DL2) Placed in the 120-D-1 Waste Site Excavation (Lift 2, ~16 ft).

COC/COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Antimony	0.44 (<BG)	32	5 [c]	5 [c]	No	--
Arsenic	1.8 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	59.9 (<BG)	5,600	200	400	No	--
Beryllium	0.14 (<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 (total)	5.8 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	10.5 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	15.5 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [g]	0.250	2.1 [d]	4.8	2	No	--
Lead	8.3 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	309 (<BG)	3,760	512 [c]	512 [c]	No	--
Mercury	0.014 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Molybdenum [g]	0.44	400	8	-- [f]	No	--
Nickel	8.7 (<BG)	1,600	19.1 [c]	27.4	No	--
Vanadium	81.7 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	52.8 (<BG)	24,000	480	67.8 [c]	No	--

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

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Attachment F (Calculation 0100D-CA-V0537).

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009c).

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

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

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

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

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table 17. Comparison of Contaminant Concentrations to Remedial Action Goals for 100-D-30/100-D-104 Overburden/Layback Soil (120DL3) Placed in the 120-D-1 Waste Site Excavation (Lift 3, ~24 ft).

COC/COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	1.4 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	63.0 (<BG)	5,600	200	400	No	--
Beryllium	0.10 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Cadmium [e]	0.054 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	5.0 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	7.7 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	13.1 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [g]	0.250	2.1 [d]	4.8	2	No	--
Lead	2.5 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	265 (<BG)	3,760	512 [c]	512 [c]	No	--
Molybdenum [g]	0.27	400	8	-- [f]	No	--
Nickel	8.2 (<BG)	1,600	19.1 [c]	27.4	No	--
Vanadium	59.5 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	38.0 (<BG)	24,000	480	67.8 [c]	No	--

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

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Attachment F (Calculation 0100D-CA-V0537).

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009c).

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

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

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

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

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table 18. Comparison of Contaminant Concentrations to Remedial Action Goals for 100-D-30/100-D-104 Overburden/Layback Soil (OBVL1) Placed in the 100-D-73/100-D-76 Waste Site Excavation (Lift 1, ~8 ft).

COC/COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	2.5 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	64.6 (<BG)	5,600	200	400	No	--
Beryllium	0.26 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Boron [e]	1.1	7,200	320	-- [f]	No	--
Cadmium [g]	0.12 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	7.5 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	8.6 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	16.3 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [e]	0.293	2.1	4.8	2	No	--
Lead	8.6 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	317 (<BG)	3,760	512 [c]	512 [c]	No	--
Mercury	0.022 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Molybdenum [e]	0.37	400	8	-- [f]	No	--
Nickel	10.2 (<BG)	1,600	19.1 [c]	27.4	No	--
Vanadium	57.6 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	42.7 (<BG)	24,000	480	67.8 [c]	No	--

[a] RAGs obtained from the 100 Area RDR/RAWP (DOE-RL 2009c) unless otherwise noted.

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Attachment C (Calculation 0100D-CA-V0537).

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009c).

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

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

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

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

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table 19. Comparison of Contaminant Concentrations to Remedial Action Goals for 100-D-30/100-D-104 Overburden/Layback Soil (OBVL2) Placed in the 100-D-73/100-D-76 Waste Site Excavation (Lift 2, ~ 8-16 ft).

COC/COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	2.3 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	61.6 (<BG)	5,600	200	400	No	--
Beryllium	0.27 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Cadmium [e]	0.099 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	6.8 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	8.2 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	14.9 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [g]	0.181	2.1 [d]	4.8	2	No	--
Lead	3.4 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	300 (<BG)	3,760	512 [c]	512 [c]	No	--
Mercury	0.0083 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Molybdenum [g]	0.36	400	8	-- [f]	No	--
Nickel	8.5 (<BG)	1,600	19.1 [c]	27.4	No	--
Vanadium	65.3 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	43.4 (<BG)	24,000	480	67.8 [c]	No	--

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

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Attachment F (Calculation 0100D-CA-V0537).

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009c).

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

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

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

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

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table 20. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-D-30/100-D-104 Overburden/Layback Soil Stockpile (OBVL1) (West Lift) (Lift 1, ~ 0 to 8 ft).

COC/COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	2.1 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	59.6 (<BG)	5,600	200	400	No	--
Beryllium	0.15 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Cadmium [e]	0.26 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	6.7 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	8.9 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	14.5 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [g]	0.211	2.1 [d]	4.8	2	No	--
Lead	3.0 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	286 (<BG)	3,760	512 [c]	512 [c]	No	--
Mercury	0.0080 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Molybdenum [g]	0.23	400	8	-- [f]	No	--
Nickel	10.3 (<BG)	1,600	19.1 [c]	27.4	No	--
Vanadium	65.8 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	44.6 (<BG)	24,000	480	67.8 [c]	No	--

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

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Attachment F (Calculation 0100D-CA-V0537).

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009c).

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

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

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

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

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table 21. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-D-30/100-D-104 Overburden/Layback Soil Stockpile (OBVL2) (West Lift) (Lift 2, ~ 8 to 16 ft).

COC/COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	1.6 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	64.2 (<BG)	5,600	200	400	No	--
Beryllium	0.10 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Cadmium [e]	0.14 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	4.3 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	10.6 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	16.3 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [g]	0.204	2.1 [d]	4.8	2	No	--
Lead	2.8 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	311 (<BG)	3,760	512 [c]	512 [c]	No	--
Mercury	0.011 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Molybdenum [g]	0.29	400	8	-- [f]	No	--
Nickel	7.8 (<BG)	1,600	19.1 [c]	27.4	No	--
Vanadium	81.9 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	52.0 (<BG)	24,000	480	67.8 [c]	No	--

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

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Attachment F (Calculation 0100D-CA-V0537).

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009c).

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

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

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

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

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table 22. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-D-30/100-D-104 Overburden/Layback Soil Stockpile (OBL1E) (East Lift) (Lift 1, ~ 0 to 8 ft).

COC/COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	2.1 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	57.9 (<BG)	5,600	200	400	No	--
Beryllium	0.16 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Boron [e]	1.4	7,200	320	-- [f]	No	--
Cadmium [g]	0.17 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	6.1 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	7.2 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	13.3 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [e]	0.309	2.1 [d]	4.8	2	No	--
Lead	3.5 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	261 (<BG)	3,760	512 [c]	512 [c]	No	--
Mercury	0.010 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Molybdenum [e]	0.24	400	8	-- [f]	No	--
Nickel	9.1 (<BG)	1,600	19.1 [c]	27.4	No	--
Vanadium	40.0 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	33.5 (<BG)	24,000	480	67.8 [c]	No	--

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

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Attachment F (Calculation 0100D-CA-V0537).

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009c).

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

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

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

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

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table 23. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-D-30/100-D-104 Overburden/Layback Soil Stockpile (OBEVL2) (East Lift) (Lift 2, ~ 8 to 16 ft).

COC/COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	2.4 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	63.2 (<BG)	5,600	200	400	No	--
Beryllium	0.48 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Cadmium [e]	0.10 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	5.8 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	7.8 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	12.2 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [g]	0.160	2.1 [d]	4.8	2	No	--
Lead	2.2 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	286 (<BG)	3,760	512 [c]	512 [c]	No	--
Molybdenum [g]	0.38	400	8	-- [f]	No	--
Nickel	8.0 (<BG)	1,600	19.1 [c]	27.4	No	--
Vanadium	56.6 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	38.4 (<BG)	24,000	480	67.8 [c]	No	--

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

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Attachment F (Calculation 0100D-CA-V0537).

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009c).

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

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

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

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

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table 24. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-D-30/100-D-104 Overburden/Layback Soil Stockpile 3 (OB3VL1) (Lift 1, ~ 0 to 8 ft).

COC/COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	1.7 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	67.0 (<BG)	5,600	200	400	No	--
Beryllium	0.28 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Cadmium [e]	0.17 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	4.7 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	10.7 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	17.4 (<BG)	2,960	59.2	22.0 [c]	No	--
Lead	3.2 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	322 (<BG)	3,760	512 [c]	512 [c]	No	--
Mercury	0.016 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Molybdenum [g]	0.33	400	8	-- [f]	No	--
Nickel	9.4 (<BG)	1,600	19.1 [c]	27.4	No	--
Vanadium	85.4	560	85.1 [c]	-- [f]	Yes	Yes [h]
Zinc	53.5 (<BG)	24,000	480	67.8 [c]	No	--

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

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Attachment F (Calculation 0100D-CA-V0537).

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009c).

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

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

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

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

[h] Based on RESRAD modeling discussed in Appendix C of the 100 Area RDR/RAWP (DOE-RL 2009c), the residual concentrations of vanadium are not expected to migrate vertically in 1,000 years based on the vanadium distribution coefficient of 1,000 mL/g. Therefore, residual concentrations of vanadium in Lift 1 of this overburden/layback soil stockpile are predicted to be protective of groundwater and the Columbia River and there is no restriction on the depth of placement of this material when used as backfill of a waste site.

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table 25. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-D-30/100-D-104 Overburden/Layback Soil Stockpile 3 (OB3VL2) (Lift 2, ~ 8 to 16 ft).

COC/COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	2.2 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	69.2 (<BG)	5,600	200	400	No	--
Beryllium	0.19 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Cadmium [e]	0.15 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	9.9 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	9.6 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	14.6 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [g]	0.228	2.1 [d]	4.8	2	No	--
Lead	3.8 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	307 (<BG)	3,760	512 [c]	512 [c]	No	--
Mercury	0.0095 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Molybdenum [g]	0.27	400	8	-- [f]	No	--
Nickel	13.1 (<BG)	1,600	19.1 [c]	27.4	No	--
Vanadium	73.7 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	48.2 (<BG)	24,000	480	67.8 [c]	No	--

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

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Attachment F (Calculation 0100D-CA-V0537).

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009c).

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

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

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

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

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table 26. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-D-30/100-D-104 Overburden/Layback Soil Stockpile (OB3EVL1) (Lift 1, ~ 0 to 8 ft).

COC/COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	2.4 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	86.3 (<BG)	5,600	200	400	No	--
Beryllium	0.14 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Cadmium [e]	0.093 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	13.1 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	5.4 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	13.6 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [g]	1.37	2.1 [d]	4.8	2	No	--
Lead	3.7 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	359 (<BG)	3,760	512 [c]	512 [c]	No	--
Mercury	0.0055 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Nickel	15.5 (<BG)	1,600	19.1 [c]	27.4	No	--
Vanadium	32.1 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	31.2 (<BG)	24,000	480	67.8 [c]	No	--

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

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Attachment F (Calculation 0100D-CA-V0537).

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009c).

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

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

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

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

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table 27. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-D-30/100-D-104 Overburden/Layback Soil Stockpile (OB3EVL2) (Lift 1, ~ 8 to 16 ft).

COC/COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	1.9 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	64.4 (<BG)	5,600	200	400	No	--
Beryllium	0.034 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Cadmium [e]	0.077 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	10.1 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	7.4 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	13.1 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [g]	0.322	2.1 [d]	4.8	2	No	--
Lead	3.4 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	295 (<BG)	3,760	512 [c]	512 [c]	No	--
Nickel	14.2 (<BG)	1,600	19.1 [c]	27.4	No	--
Vanadium	54.5 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	38.8 (<BG)	24,000	480	67.8 [c]	No	--

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

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Attachment F (Calculation 0100D-CA-V0537).

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009c).

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

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

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

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

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table 28. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-D-30/100-D-104 Overburden/Layback Soil Stockpile (183DVL1) Placed in the South Portion of the 183-D Clearwell (Lift 1, ~ 8 to 16 ft).

COC/COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	2.9 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	75.5 (<BG)	5,600	200	400	No	--
Beryllium	0.11 (<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 (total)	7.6 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	8.1 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	13.4 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [g]	0.221	2.1 [d]	4.8	2	No	--
Lead	4.0 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	366 (<BG)	3,760	512 [c]	512 [c]	No	--
Mercury	0.12 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Molybdenum [g]	0.26	400	8	-- [f]	No	--
Nickel	10.2 (<BG)	1,600	19.1 [c]	27.4	No	--
Vanadium	65.8 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	42.9 (<BG)	24,000	480	67.8 [c]	No	--

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

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Attachment F (Calculation 0100D-CA-V0537).

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009c).

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

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

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

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

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table 29. Comparison of Maximum Contaminant Concentrations to Remedial Action Goals for the 100-D-83:5 Focused Verification Samples.

COPC	Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	2.6 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	95.2 (<BG)	5,600	200	400	No	--
Beryllium	0.27 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Chromium (total)	5.0 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	11.2 (<BG)	24	15.7 [c]	-- [e]	No	--
Copper	17.9 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [f]	0.197	2.1 [d]	4.8	2	No	--
Lead	2.9 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	318 (<BG)	3,760	512 [c]	512 [c]	No	--
Molybdenum [f]	0.37	400	8	-- [e]	No	--
Nickel	8.1 (<BG)	1,600	19.1 [c]	27.4	No	--
Vanadium	97.9	560	85.1 [c]	-- [e]	Yes	Yes [g]
Zinc	63.0 (<BG)	24,000	480	67.8 [c]	No	--
Chloride	4.7 (<BG)	--	25,000	-- [e]	No	--
Nitrogen in nitrate	0.96 (<BG)	128,000	1,000	2,000	No	--
Sulfate	7.6 (<BG)	--	25,000	-- [e]	No	--

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

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Attachment F (Calculation 0100D-CA-V0543).

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009c).

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

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

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

[g] Based on RESRAD modeling discussed in Appendix C of the 100 Area RDR/RAWP (DOE-RL 2009c), the residual concentrations of vanadium are not expected to migrate vertically in 1,000 years based on the vanadium distribution coefficient of 1,000 mL/g. Therefore, residual concentrations of vanadium in the focused samples for the 100-D-83:5 excavation are predicted to be protective of groundwater and the Columbia River and there is no restriction on the depth of placement of this material when used as backfill of a waste site.

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COPC = contaminant of potential concern
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table 30. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-D-30/100-D-104 SPA 2 Statistical Verification Samples.

COC/COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	3.1 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	79.5 (<BG)	5,600	200	400	No	--
Beryllium	0.28 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Boron [e]	3.1	7,200	320	-- [f]	No	--
Cadmium [g]	0.091 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	10.0 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	8.3 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	13.6 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [e]	0.409	2.1	4.8	2	No	--
Lead	6.2 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	318 (<BG)	3,760	512 [c]	512 [c]	No	--
Mercury	0.013 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Molybdenum [e]	0.50	400	8	-- [f]	No	--
Nickel	10.8 (<BG)	1,600	19.1 [c]	27.4	No	--
Vanadium	58.1 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	44.8 (<BG)	24,000	480	67.8 [c]	No	--

[a] RAGs obtained from the 100 Area RDR/RAWP (DOE-RL 2009c) unless otherwise noted.

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

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009c).

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

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

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

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

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table 31. Comparison of Statistical Samples Contaminant Concentrations to Remedial Action Goals for the Tier II 100-D-30/100-D-104 Overburden/Layback Soil Stockpiles Statistical Verification Samples [a].

COC/COPC	Statistical or Maximum Result [c] (mg/kg)	Remedial Action Goals [b] (mg/kg)			Does the Maximum Result Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	2.1 (<BG)	20 [d]	20 [d]	20 [d]	No	--
Barium	63.8 (<BG)	5,600	200	400	No	--
Beryllium	0.24 (<BG)	10.4 [e]	1.51 [d]	1.51 [d]	No	--
Boron [f]	1.5	7,200	320	-- [h]	No	--
Cadmium [g]	0.15 (<BG)	13.9 [e]	0.81 [e]	0.81 [e]	No	--
Chromium (total)	6.6 (<BG)	80,000	18.5 [d]	18.5 [d]	No	--
Cobalt	10.7 (<BG)	24	15.7 [d]	-- [h]	No	--
Copper	15.5 (<BG)	2,960	59.2	22.0 [d]	No	--
Hexavalent chromium	0.257	2.1 [e]	4.8	2	No	--
Lead	3.1 (<BG)	353	10.2 [d]	10.2 [d]	No	--
Manganese	329 (<BG)	3,760	512 [d]	512 [d]	No	--
Mercury	0.021 (<BG)	24	0.33 [d]	0.33 [d]	No	--
Molybdenum [f]	0.38	400	8	NA	No	--
Nickel	11.0 (<BG)	1,600	19.1 [d]	27.4	No	--
Vanadium	79.7 (<BG)	560	85.1 [d]	NA	No	--
Zinc	51.3 (<BG)	24,000	480	67.8 [d]	No	--
Chloride	3.3 (<BG)	--	25,000	-- [h]	No	--
Nitrogen in nitrate	0.81 (<BG)	128,000	1,000	2,000	No	--
Nitrogen in nitrate and nitrite	0.56 (<BG)	128,000	1,000	2,000	No	--
Sulfate	7.2 (<BG)	--	25,000	-- [h]	No	--

[a] These Tier II overburden/layback soil stockpiles were previously presented in a backfill concurrence that was approved by Ecology and DOE on May 16, 2013 (CCN 0635352, "Backfill Concurrence Checklist, 100-D Overburden Stockpiles from the 100-D-30, 100-D-31:1, 100-D-31:12, 100-D-50:7, 100-D-100, and 100-D-104 Waste Sites").

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

[c] Maximum or 95% UCL, depending on data censorship, as described in Appendix F (Calculation 0100D-CA-V0495).

[d] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (Ecology 1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement Project managers, as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009).

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

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

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

[h] No parameters (bioconcentration factors or ambient water quality criteria values) are available from the Washington State Department of Ecology Cleanup Levels and Risk Calculations database (Ecology 2014) or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], Ecology 1996 [Method B for surface waters]).

-- = not applicable
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
DOE = U.S. Department of Energy
Ecology = Washington State Department of Ecology
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
UCL = upper confidence limit
WAC = *Washington Administrative Code*

Table 32. Comparison of Statistical Samples Contaminant Concentrations to Remedial Action Goals for the Tier II 100-D-30/100-D-104 Overburden/Layback Soil Stockpiles Statistical Verification Samples [a].

COC/COPC	Statistical or Maximum Result [c] (mg/kg)	Remedial Action Goals [b] (mg/kg)			Does the Maximum Result Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	2.4 (<BG)	20 [d]	20 [d]	20 [d]	No	--
Barium	59.8 (<BG)	5,600	200	400	No	--
Beryllium	0.36 (<BG)	10.4 [e]	1.51 [d]	1.51 [d]	No	--
Cadmium [f]	0.18 (<BG)	13.9 [e]	0.81 [d]	0.81 [d]	No	--
Chromium (total)	8.7 (<BG)	80,000	18.5 [d]	18.5 [d]	No	--
Cobalt	9.2 (<BG)	24	15.7 [d]	-- [g]	No	--
Copper	15.8 (<BG)	2,960	59.2	22.0 [d]	No	--
Hexavalent chromium	0.340	2.1 [e]	4.8	2	No	--
Lead	3.9 (<BG)	353	10.2 [d]	10.2 [d]	No	--
Manganese	305 (<BG)	3,760	512 [d]	512 [d]	No	--
Molybdenum [h]	0.29	400	8	-- [g]	No	--
Nickel	10.9 (<BG)	1,600	19.1 [d]	27.4	No	--
Vanadium	70.9 (<BG)	560	85.1 [d]	-- [g]	No	--
Zinc	44.1 (<BG)	24,000	480	67.8 [d]	No	--
Chloride	3.3 (<BG)	--	25,000	-- [g]	No	--
Fluoride	0.85 (<BG)	4,800	96	400	No	--
Nitrogen in nitrate	0.81 (<BG)	128,000	1,000	2,000	No	--
Nitrogen in nitrate and nitrite	0.59 (<BG)	128,000	1,000	2,000	No	--
Nitrogen in nitrite	0.66	8,000	100	200	No	--
Sulfate	5.7 (<BG)	--	25,000	-- [g]	No	--

[a] These Tier II overburden/layback soil stockpiles were previously presented in a backfill concurrence that was approved by Ecology and DOE on May 16, 2013 (CCN 0635352, "Backfill Concurrence Checklist, 100-D Overburden Stockpiles from the 100-D-30, 100-D-31:1, 100-D-31:12, 100-D-50:7, 100-D-100, and 100-D-104 Waste Sites").

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

[c] Maximum or 95% UCL, depending on data censorship, as described in Appendix F (Calculation 0100D-CA-V0495).

[d] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement Project managers, as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009).

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

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

[g] No parameters (bioconcentration factors or ambient water quality criteria values) are available from the Washington State Department of Ecology Cleanup Levels and Risk Calculations database (Ecology 2014) or other databases to calculate cleanup levels (WAC 173-340-730[3][a][iii], Ecology 1996 [Method B for surface waters]).[h] No Hanford Site-specific or Washington State background value is available.

-- = not applicable
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
DOE = U.S. Department of Energy
Ecology = Washington State Department of Ecology
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
UCL = upper confidence limit
WAC = *Washington Administrative Code*

Table 33. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-D-104/100-D-50:7 Tier II SPA Statistical Verification Samples.

COC/COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Arsenic	3.2 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	76.8 (<BG)	5,600	200	400	No	--
Beryllium	0.58 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Boron [e]	2.3	7,200	320	-- [f]	No	--
Cadmium [g]	0.099 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	9.4 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	8.2 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	15.7 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [e]	0.347	2.1 [d]	4.8	2	No	--
Lead	10.7	353	10.2 [c]	10.2 [c]	Yes	Yes [h]
Manganese	375 (<BG)	3,760	512 [c]	512 [c]	No	--
Mercury	0.011 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Molybdenum [e]	0.28	400	8	-- [f]	No	--
Nickel	11.1 (<BG)	1,600	19.1 [c]	27.4	No	--
Vanadium	64.8 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	47.9 (<BG)	24,000	480	67.8 [c]	No	--
4-4'-DDE	0.0036	2.94	0.0257	0.0033 [i]	Yes	Yes [h]
4-4'-DDT	0.0055	2.94	0.0257	0.0033 [i]	Yes	Yes [h]
Aroclor-1254	0.0055	0.5	0.017 [i]	0.017 [i]	No	--

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

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Attachment F (Calculation 0100D-CA-V0502).

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009c).

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

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

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

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

[h] Based on RESRAD modeling discussed in Appendix C of the 100 Area RDR/RAWP (DOE-RL 2009c), the residual concentrations of lead, 4-4'-DDE, and 4-4'-DDT are not expected to migrate more than 2 m (6.7 ft) vertically in 1,000 years based on the contaminant (lead) with the lowest soil-partitioning K_d of 30 mL/g. The vadose zone underlying the soil below this SPA is approximately 24 m (78.7 ft). Therefore, residual concentrations of lead, 4-4'-DDE, and 4-4'-DDT are predicted to be protective of groundwater and the Columbia River. Note that DDE and DDT are COPCs associated with the 100-D-50:7 waste site and not the 100-D-104 waste site.

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

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
DDE = dichlorodiphenyldichloroethylene
DDT = dichlorodiphenyltrichloroethane
K_d = distribution coefficient
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
RDL = required detection limit
WAC = *Washington Administrative Code*

Table 34. Comparison of Contaminant Concentrations to Remedial Action Goals for the 100-D-30 Tier II SPA Statistical Verification Samples.

COC/COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Antimony	1.1 (<BG)	32	5 [c]	5 [c]	No	--
Arsenic	3.3 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	80.3 (<BG)	5,600	200	400	No	--
Beryllium	0.064 (<BG)	10.4 [d]	1.51 [c]	1.51 [c]	No	--
Boron [e]	9.2	7,200	320	-- [f]	No	--
Cadmium [g]	0.13 (<BG)	13.9 [d]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	11.7 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	9.1 (<BG)	24	15.7 [c]	-- [f]	No	--
Copper	15.5 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [e]	0.701	2.1 [d]	4.8	2	No	--
Lead	3.8 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	316 (<BG)	3,760	512 [c]	512 [c]	No	--
Mercury	0.027 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Molybdenum [e]	0.26	400	8	-- [f]	No	--
Nickel	11.1 (<BG)	1,600	19.1 [c]	27.4	No	--
Silver	0.22 (<BG)	400	8	0.73 [c]	No	--
Vanadium	53.1 (<BG)	560	85.1 [c]	-- [f]	No	--
Zinc	43.8 (<BG)	24,000	480	67.8 [c]	No	--

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

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Attachment F (Calculation 0100D-CA-V0505).

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009c).

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

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

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

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

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

Table 35. Comparison of Contaminant Concentrations to Remedial Action Goals for the Two Small 100-D-30 Tier III SPA Statistical Verification Samples.

COC/COPC	Statistical or Maximum Result [b] (mg/kg)	Remedial Action Goals [a]			Do the Results Exceed RAGs?	Do the Results Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Antimony	0.61 (<BG)	32	5 [c]	5 [c]	No	--
Arsenic	2.9 (<BG)	20 [c]	20 [c]	20 [c]	No	--
Barium	100 (<BG)	5,600	200	400	No	--
Boron [d]	7.6	7,200	320	-- [e]	No	--
Cadmium [f]	0.074 (<BG)	13.9 [g]	0.81 [c]	0.81 [c]	No	--
Chromium (total)	9.0 (<BG)	80,000	18.5 [c]	18.5 [c]	No	--
Cobalt	7.0 (<BG)	24	15.7 [c]	-- [e]	No	--
Copper	20.2 (<BG)	2,960	59.2	22.0 [c]	No	--
Hexavalent chromium [d]	0.371	2.1 [g]	4.8	2	No	--
Lead	4.5 (<BG)	353	10.2 [c]	10.2 [c]	No	--
Manganese	313 (<BG)	3,760	512 [c]	512 [c]	No	--
Mercury	0.019 (<BG)	24	0.33 [c]	0.33 [c]	No	--
Molybdenum [d]	0.61	400	8	-- [e]	No	--
Nickel	10.6 (<BG)	1,600	19.1 [c]	27.4	No	--
Silver	0.24 (<BG)	400	8	0.73 [c]	No	--
Vanadium	54.0 (<BG)	560	85.1 [c]	-- [e]	No	--
Zinc	42.1 (<BG)	24,000	480	67.8 [c]	No	--

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

[b] 95% upper confidence limit or maximum value, depending on data censorship, as described in Attachment F (Calculation 0100D-CA-V0505).

[c] Where cleanup levels are less than background, cleanup levels default to background per WAC 173-340-700(4)(d) (1996). The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL 2009c).

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

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

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

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

-- = not applicable
AWQC = ambient water quality criteria
BG = background
COC = contaminant of concern
COPC = contaminant of potential concern
RAG = remedial action goal
RDR/RAWP = remedial design report/remedial action work plan
RESRAD = RESidual RADioactivity (dose model)
WAC = *Washington Administrative Code*

VERIFICATION SAMPLE DATA EVALUATION

This section demonstrates that contaminant concentrations at the 100-D-30 and 100-D-104 achieve the applicable RAGs developed to support unrestricted land use at the 100 Area as established in the Remaining Sites ROD (EPA 1999) and documented in the 100 Area RDR/RAWP (DOE-RL 2009c).

Attainment of Nonradionuclide RAGs

Tables 5 through 35 compare the cleanup verification samples for the 100-D-30 and 100-D-104 waste sites decision units to the applicable soil RAGs for direct exposure, protection of groundwater, and protection of the Columbia River. All COCs and COPCs were quantified below direct exposure RAGs. All COCs/COPCs were quantified below groundwater and/or river protection soil RAGs with the exception of lead, dichlorodiphenyldichloroethylene (DDE), and dichlorodiphenyltrichloroethane (DDT) that were detected in one decision unit, a Tier II SPA that was used to stage waste from the 100-D-104 and the 100-D-50:7 waste site remediation; vanadium detected in one overburden/layback soil stockpile decision unit; and selenium detected in three decision units. In all instances, RESidual RADioactivity (RESRAD) modeling, as discussed in Appendix C of the 100 Area RDR/RAWP (DOE-RL 2009c), predicts that residual concentrations of these constituents will be protective of groundwater and the Columbia River. Specifically:

- Lead, DDE, and DDT were detected in one of the Tier II SPAs. They are not expected to migrate more than 2 m (6.6 ft) vertically in 1,000 years (based on the contaminant having the lowest distribution coefficient [K_d], lead with a K_d of 30 mL/g). The vadose zone beneath this SPA is approximately 24 m (72 ft) thick.

- Vanadium detected in one of the overburden/layback soil stockpiles and in one of the 100-D-83:5 waste site focus samples has a K_d of 1,000 mL/g and is not predicted to migrate vertically in 1,000 years. Therefore, this soil may be used for waste site backfill at any depth above the groundwater table.

- Selenium that was detected in one SPA and in decision units 2 and 3, having a K_d of 5 mL/g, is not expected to migrate more than 15 m (49.2 ft) vertically in 1,000 years. With the exception of decision unit 3, the vadose zone below these selenium detections is 15.5 m (50.9 ft) thick or greater. Even though the vadose zone underlying the soil below decision unit 3 is approximately 14 m (45.9 ft), the residual concentration of selenium in decision unit 3 is believed to be protective of groundwater and the Columbia River. This is because selenium was only detected in two samples at 1.1 mg/kg, slightly above the selenium river protection RAG of 1.0 mg/kg. Furthermore, selenium was not detected in any of the verification samples that were collected from decision units 5 and 7 that are at depths lower in the vadose zone than decision unit 3.

  Therefore, residual concentrations of lead, selenium, and vanadium (and DDE and DDT associated with 100-D-50:7) are predicted to be protective of groundwater and the Columbia River.

Three-Part Test for Nonradionuclides

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

The application of the three-part test for the 100-D-30 and 100-D-104 waste sites is included in the 95% UCL calculations provided in Appendix F of this remaining sites verification package, where half or more of the data set was detected. The results of this evaluation indicate that residual COPC concentrations pass the three-part test in comparison against applicable RAGs with the exception of the following:

- Lead detected in the 100-D-50:7/100-D-104 Tier II SPA fails the first and third part of the three-part test
- Lead detected in two overburden/layback decision units fails one or more of the three-part test
- Vanadium detected in three overburden/layback decision units fails one or more of the three-part test.

In all instances, RESRAD modeling, as discussed in "Attainment of NonRadionuclide RAGs" (above) and in Appendix C of the 100 area RDR/RAWP (DOE-RL 2009c), predicts residual concentrations of these constituents are 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 the following:

- DDE and DDT fail the first part of the three-part test because they were detected slightly above the river protection RAG in one sample collected from the Tier II SPA that was used to stage waste from the 100-D-104 and the 100-D-50:7 waste site remediation
- Selenium fails one or more of the three-part test for two excavation decision units and one SPA decision unit.

However, based on RESRAD modeling discussed in Appendix C of the 100 Area RDR/RAWP (DOE-RL 2009c), the residual concentration 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 1×10^{-6}, and a cumulative carcinogenic risk of less than 1×10^{-5}. For the 100-D-30 and 100-D-104 waste sites, these risk values were not calculated for constituents that were either not detected or were detected at concentrations below Hanford Site or Washington State background. All individual hazard quotients for noncarcinogenic constituents were less than 1.0. The cumulative hazard quotient for those noncarcinogenic constituents above background or detected levels is 1.9×10^{-1}, which is less than 1.0. The individual carcinogenic risk values for the carcinogenic constituents detected above background are less than 1×10^{-6}, and the cumulative carcinogenic risk value is 6.5×10^{-7}, which is less than 1×10^{-5}. These values are conservative and represent the highest calculated value for all the decision units. The 100-D-30 and 100-D-104 waste sites meet the requirements for the direct contact hazard quotient and excess carcinogenic risk as identified in the 100 Area RDR/RAWP (DOE-RL 2009c).

Nonradionuclide Groundwater Hazard Quotient and Carcinogenic Risk RAGs Attained

Assessment of the risk requirements for the 100-D-30 and 100-D-104 waste sites included a calculation of the hazard quotient and carcinogenic (excess cancer) risk values for groundwater protection for nonradionuclides. The requirements include an individual and cumulative hazard quotient of less than 1.0, an individual excess carcinogenic risk of less than 1×10^{-6}, and a cumulative excess carcinogenic risk of less than 1×10^{-5}. Risk values were calculated for constituents that were detected at concentrations above Hanford Site or Washington State background values or for which there is no background value. All individual hazard quotients for noncarcinogenic constituents are less than 1.0. The cumulative hazard quotient for groundwater protection for nonradionuclides at the 100-D-30 and 100-D-104 waste sites is 6.6×10^{-1}, which is less than 1.0. No carcinogenic constituents met the criteria for groundwater protection evaluation at the 100-D-30 and 100-D-104 waste sites; therefore, no calculations of excess carcinogenic risk were performed. Therefore, nonradionuclide risk requirements related to groundwater are met.

DATA QUALITY ASSESSMENT

A data quality assessment (DQA) was performed to compare the verification sampling approach (WCH 2013h, 2013i, 2014e, 2014f, and 2014g), the field logbooks (WCH 2013a, 2013b, 2013c, 2013d, 2013e, 2013f, 2014a, 2014b, and 2014c) and resulting analytical data with the sampling and data quality requirements specified by the project objectives and performance specifications.

The DQA for the 100-D-30 and 100-D-104 waste sites established that the data are of the right type, quality, and quantity to support site closeout decisions within specified error tolerances. The evaluation verified that the sample design was sufficient for the purpose of clean site verification. The cleanup verification sample analytical data are stored in a WCH

project-specific database for data evaluation prior to archival in HEIS and are summarized in Appendix F. The detailed DQA is presented in Appendix H.

SUMMARY FOR INTERIM CLOSURE

The 100-D-30 and 100-D-104 waste sites have been evaluated in accordance with the Remaining Sites ROD (EPA 1999) and the 100 Area RDR/RAWP (DOE-RL 2009c). Verification sampling was performed, and the analytical results indicate that the residual concentrations of COCs/COPCs at the site meet the remedial action objectives for direct exposure, groundwater protection, and river protection.

In accordance with this evaluation, the verification sampling results support a reclassification of the 100-D-30 and 100-D-104 waste sites 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.

REFERENCES

40 CFR 141, "National Primary Drinking Water Regulations," *Code of Federal Regulations*, as amended.

BHI, 1994, *Characterization of the 190-D Complex*, BHI-00058, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

BHI, 1996, *Final Report for the 190-D Complex Decontamination and Decommissioning*, BHI-00903, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

BHI, 2000, *Cleanup Verification Package for the 100-D-12 Sodium Dichromate Pump Station*, CVP-2000-00016, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

BHI, 2001, *Calculation of Total Uranium Activity Corresponding to a Maximum Contaminant Level for Total Uranium of 30 Micrograms per Liter in Groundwater*, 0100X-CA-V0038, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

Bergstrom, K. A., and T. H. Mitchell, 2004, "Supercedes CCN 114934. Results of Geophysical Investigation at the 100-D/DR Area Phase II Remaining Sites," CCN 115042 to R. A. Carlson and E. T. Feist, Bechtel Hanford, Inc., Richland, Washington, July 27.

CHPRC, 2010, *Borehole Summary Report for Seven Boreholes at 100-D Area*, SGW-42209, Rev. 0, CH2M Hill Plateau Remediation Company, Richland, Washington.

CHPRC, 2015, *Persistent Source Investigation at 100-D Area*, SGW-58416, Rev. 1, CH2M Hill Plateau Remediation Company, Richland, Washington.

Dittmer, L. M., 2005, "100-D-30 Remaining Site for Remedial Action," CCN 112500 to R. A. Carlson, Bechtel Hanford, Inc., Richland, Washington, May 19.

DOE Order 5400.5, *Radiation Protection of the Public and Environment*, as amended, U.S. Department of Energy, Washington, D.C.

DOE-RL, 2001, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes,* DOE/RL-92-24, Rev. 4, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

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

DOE-RL, 2009b, *Field Investigation Plan for the Source of the Northern Chromium Plume in the 100-D Area,* DOE/RL-2008-09, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

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

DOE-RL, 2010, *Report on Investigation of Hexavalent Chromium Source in the Northern 100-D Area,* DOE/RL-2010-40, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2011, *100 Area "Plug-in" and Candidate Waste Sites for Calendar Year 2010,* AR/PRI Accession Number 0084011, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2011, *Tri-Party Agreement Handbook Management Procedures,* RL-TPA-90-0001, Guideline Number TPA-MP-14, "Maintenance of the Waste Information Data System (WIDS)," Rev. 2, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Ecology, 1994, *Natural Background Soil Metals Concentrations in Washington State*, Publication No. 94-115, Washington State Department of Ecology, Olympia, Washington.

Ecology, 2014, Cleanup Levels and Risk Calculations (CLARC) Database, Washington State Department of Ecology, Olympia, Washington, <https://fortress.wa.gov/ecy/clarc/CLARCHome.aspx>.

ENV-1, *Environmental Monitoring & Management*, Washington Closure Hanford, Richland, Washington.

EPA, 1989, *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part A)*, Interim Final, EPA/540/1-89/002, Office of Emergency and Remedial Response, U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1999, *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

EPA, 2009, *Explanation of Significant Difference for the 100 Area Remaining Sites Interim Remedial Action Record of Decision, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

Galbraith, M. J., 1996, "Dichromate Stain at Site of 190-D Complex," CCN 037770 to F. M. Corpuz and R. L. Donahoe, Bechtel Hanford, Inc., Richland, Washington, November 19.

GE, 1953, *Process Specifications Reactor Cooling Water Treatment*, HW-28505, General Electric Company, Richland, Washington.

GE, 1962, *Acid Storage and Supply System*, H-I-13449, General Electric Company, Richland, Washington.

McCain, R. G., 1996, "Update on "Yellow Soil" in 100-D Area," CCN 051184 to T. D. Lefrancois, R. E. Petersen, and C. W. Hedel, Bechtel Hanford, Inc., Richland, Washington, June 17.

PNNL, 2008, *Geochemical Characterization of Chromate Contamination in the 100 Area Vadose Zone at the Hanford Site*, PNNL-17674, Pacific Northwest National Laboratory, Richland, Washington.

PNNL, 2011, *Geochemical Characterization of Chromate Contamination in the 100 Area Vadose Zone at the Hanford Site - Part 2*, PNNL-17865, Pacific Northwest National Laboratory, Richland, Washington.

Sharpe, J. J., 2006, "Sodium Dichromate Investigation for the 105-D/105-DR Reactor Area Report," CCN 129547 to Distribution, Washington Closure Hanford, Richland, Washington, August 30.

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

WCH, 2008, "Historical Information for 100-D/DR Area Uses of Chromic Acid and Sodium Dichromate: Supplement to IOM 129547," CCN 141284 to C. W. Hedel from M. R. Schwab, Washington Closure Hanford, Richland, Washington, September 29.

WCH, 2012a, *Remaining Sites Verification Package for the 100-D-56:2, South Portion of the Sodium Dichromate Underground Supply Lines,* WSRF-2009-16, Rev. 1, Washington Closure Hanford, Richland, Washington.

WCH, 2012b, *Remaining Sites Verification Package for the 100-D-56:1, North Portion of the Sodium Dichromate Underground Supply Lines,* WSRF-2008-44, Rev. 0, Washington Closure Hanford, Richland, Washington.

WCH, 2013a, *100D Field Remediation Project Sampling and Field Notes*, Logbook EL-1607-16, Washington Closure Hanford, Richland, Washington.

WCH, 2013b, *100D Field Remediation Project Sampling and Field Notes*, Logbook EL-1607-18, Washington Closure Hanford, Richland, Washington.

WCH, 2013c, *100D Field Remediation Project Sampling and Field Notes*, Logbook EL-1607-19, Washington Closure Hanford, Richland, Washington.

WCH, 2013d, *100D Field Remediation Project Sampling and Field Notes*, Logbook EL-1607-20, Washington Closure Hanford, Richland, Washington.

WCH, 2013e, *100D Field Remediation Project Sampling and Field Notes*, Logbook EL-1607-21, Washington Closure Hanford, Richland, Washington.

WCH, 2013f, *100D Field Remediation Project Sampling and Field Notes*, Logbook EL-1607-22, Washington Closure Hanford, Richland, Washington.

WCH, 2013g, "Amended Debris as Backfill Agreement," CCN 172300 to S. W. Callison, Washington Closure Hanford, from A. Kapell, Washington State Department of Ecology, Richland, Washington, August 14.

WCH, 2013h, *Work Instruction for Verification Sampling of the 100-D-30 and 100-D-50:7 Waste Staging Pile Areas,* 0100D-WI-G0129, Rev. 0, Washington Closure Hanford, Richland, Washington.

WCH, 2013i, *Work Instruction for Verification Sampling of the 100-D Overburden Stockpiles from the 100-D-30, 100-D-31:11, 100-D-31:12, 100-D-50:7, 100-D-100, and 100-D-104 Waste Sites,* 0100D-WI-G0125, Rev. 0, Washington Closure Hanford, Richland, Washington.

WCH, 2013j, *Work Instruction for Verification Sampling of the 100-D-50:7 Headhouse Floor Drains and Catch Basins Pipeline Subsite,* 0100D-WI-G0130, Rev. 0, Washington Closure Hanford, Richland, Washington.

WCH, 2014a, *100D Field Remediation Project Sampling and Field Notes*, Logbook EL-1607-23, Washington Closure Hanford, Richland, Washington.

WCH, 2014b, *100D Field Remediation Project Sampling and Field Notes*, Logbook EL-1607-24, Washington Closure Hanford, Richland, Washington.

WCH, 2014c, *100D Field Remediation Miscellaneous Sampling Activities*, Logbook EL-1662-02, Washington Closure Hanford, Richland, Washington.

WCH, 2014d, *Backfill Concurrence Checklist, 100-D-30 and 100-D-104,* CCN 0660642, Washington Closure Hanford, Richland, Washington.

WCH, 2014e, *Work Instruction for Verification Sampling of the 100-D-83:5, 186-D Acid Neutralizing System Pipelines and Reactor Cooling Water Pipelines to 105-D Waste Site,* 0100D-WI-G0133, Rev. 0, Washington Closure Hanford, Richland, Washington.

WCH, 2014f, *Work Instruction for Verification Sampling of the 100-D-30/100-D-104 Tier III Excavation,* 0100D-WI-G0132, Rev. 0, Washington Closure Hanford, Richland, Washington.

WCH, 2014g, *Work Instruction for Verification Sampling of Two 100-D-30 Waste Staging Pile Areas,* 0100D-WI-G0143, Rev. 0, Washington Closure Hanford, Richland, Washington.

WDOH, 1997, *Hanford Guidance for Radiological Cleanup*, WDOH/320-015, Rev. 1, Washington State Department of Health, Olympia, Washington.

APPENDIX A

ECOLOGICAL RISK COMPARISON TABLE

Table A-1. Maximum or Statistical Contaminant Concentrations that Exceed Ecological Screening Levels for the 100-D-30/100-D-104 Waste Site Remediation. [a]

Hazardous Substance		2007 WAC 173-340, Table 749-3			EPA Ecological Soil Screening Levels [b]				Maximum or Statistical Result
		Plants	Soil Biota	Wildlife	Plants	Soil Biota	Avian [c]	Mammalian [c]	
	Background								
Metals (mg/kg)									
Antimony	5	5	NA	NA	NA	78	NA	0.27	1.1 (<BG)
Barium	132	500	NA	102	NA	330	NA	2,000	110 (<BG)
Boron	NA	0.5	NA	NA	NA	NA	NA	NA	16.5
Manganese	512	1,100 [d]	NA	1,500	220	450	4,300	4,000	375 (<BG)
Selenium	0.78	1	70	0.3	0.52	4.1	1.2	0.63	1.3
Vanadium	85.1	2	NA	NA	NA	NA	7.8	280	97.9
Zinc	67.8	86 [d]	200	360	160	120	46	79	63.0 (<BG)

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

[b] Available at <www.epa/gov/ecotox/ecossl>.

[c] Wildlife.

[d] Benchmark replaced by Washington State natural background concentration.

NOTE: Shaded cells indicate screening values that are exceeded.

BG = background
EPA = U.S. Environmental Protection Agency
NA = not available
WAC = *Washington Administrative Code*

APPENDIX B

WASTE CHARACTERIZATION AND IN-PROCESS SAMPLE RESULTS

Table B-1. 100-D-30 Inorganic Sample Results. (2 Pages)

Sample Type	HEIS Number	Sample Date	Arsenic			Barium			Cadmium			Chromium			Hexavalent Chromium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Surface soil (composite)	J11L39	3/22/06	2.3		0.57	55.2	C	0.02	0.12		0.07	32.5		0.12	Not Analyzed		
Soil stockpile	J12NV4	6/26/06	3.1		0.59	57.4		0.02	0.07	U	0.07	38.4		0.13			
Soil stockpile	J12NV5	6/26/06	2.7		0.58	56.3		0.02	0.07	U	0.07	18.9		0.12			
Soil stockpile	J12NV6	6/26/06	2.4		0.59	51.5		0.02	0.07	U	0.07	16.5		0.13			
Soil (floor-north)	J12NV7	6/26/06	Not Analyzed												0.22		0.20
Soil (floor-south)	J12NV8	6/26/06													0.92		0.20
Stained soil	J12NV9	6/26/06													108	D	2.0
Stained concrete	J12XP5	8/1/06	11		1.8	168		0.06	0.21		0.21	4060	C	0.38	Not analyzed		
Soil (west sidewall)	J13D94	9/6/06	Not Analyzed												0.25		0.20
Soil (west sidewall)	J13D95	9/6/06													0.20	U	0.20
Soil (west sidewall)	J13D96	9/6/06													0.20	U	0.20
Soil (west sidewall)	J13D97	9/6/06													2.3		0.20
Soil (east sidewall)	J13D98	9/6/06													0.20	U	0.20
Soil (east sidewall)	J13D99	9/6/06													0.20	U	0.20
Soil (east sidewall)	J13DB0	9/6/06													0.36		0.20
Soil (east sidewall)	J13DB1	9/6/06													2.1		0.21

Sample Type	HEIS Number	Sample Date	Lead			Mercury			Selenium			Silver		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Surface soil (composite)	J11L39	3/22/06	7.1		0.29	0.08		0.02	0.44	U	0.44	0.07	U	0.07
Soil stockpile	J12NV4	6/26/06	9.7		0.30	1.3		0.02	0.45	U	0.45	0.07	U	0.07
Soil stockpile	J12NV5	6/26/06	6.9		0.30	14.6		0.26	0.45	U	0.45	0.07	U	0.07
Soil stockpile	J12NV6	6/26/06	6		0.30	0.11		0.02	0.51		0.45	0.07	U	0.07
Soil (floor-north)	J12NV7	6/26/06	Not Analyzed											
Soil (floor-south)	J12NV8	6/26/06												
Stained soil	J12NV9	6/26/06												
Stained concrete	J12XP5	8/1/06	4.4		0.91	0.02	U	0.02	1.4	U	1.4	0.21	U	0.21
Soil (west sidewall)	J13D94	9/6/06	Not Analzyed											
Soil (west sidewall)	J13D95	9/6/06												
Soil (west sidewall)	J13D96	9/6/06												
Soil (west sidewall)	J13D97	9/6/06												
Soil (east sidewall)	J13D98	9/6/06												
Soil (east sidewall)	J13D99	9/6/06												
Soil (east sidewall)	J13DB0	9/6/06												
Soil (east sidewall)	J13DB1	9/6/06												

Table B-1. 100-D-30 Inorganic Sample Results. (2 Pages)

Sample Type	HEIS Number	Sample Date	Hexavalent Chromium		
			mg/kg	Q	PQL
Soil (floor)	J13DB2	9/6/06	0.20	U	0.20
Soil (floor)	J13DB3	9/6/06	0.20	U	0.20
Soil (floor)	J13DB4	9/6/06	0.20	U	0.20
Soil (floor)	J13DB5	9/6/06	0.20	U	0.20
Soil (floor)	J13DB6	9/6/06	0.20	U	0.20
Soil (floor)	J13DB7	9/6/06	0.20	U	0.20
Soil (floor)	J13DB8	9/6/06	11.1		0.20
Soil (floor)	J13DB9	9/6/06	1.2		0.20
Soil (floor)	J13DC0	9/6/06	6.6		0.20
Soil (floor)	J13DC1	9/6/06	0.84		0.20
Soil (floor)	J13DC2	9/6/06	1.9		0.20
Soil (floor)	J13DC3	9/6/06	0.97		0.20
Soil (composite)	J15204	4/17/07	1.3		0.21
Soil (composite)	J15205	4/17/07	0.97		0.22

C = blank contamination (inorganic constituents) D = diluted HEIS = Hanford Environmental Information System PQL = practical quantitation limit Q = qualifier U = undetected

Table B-2. 100-D-30 Radiological Sample Results.

Sample Type	HEIS Number	Sample Date	Gross alpha			Gross beta		
			pCi/g	Q	MDA	pCi/g	Q	MDA
Surface soil (composite)	J11L39	3/22/06	7.94		5.0	13.0		10.0

HEIS = Hanford Environmental Information System
MDA = minimum detectable activity

Table B-3. 100-D-30 TCLP Sample Results.

Sample Type	HEIS Number	Sample Date	Arsenic - TCLP			Barium - TCLP			Cadmium - TCLP			Chromium - TCLP			Lead - TCLP			Mercury - TCLP			Selenium - TCLP			Silver - TCLP		
			mg/L	Q	PQL	mg/L	Q	PQL	mg/L	Q	PQL	mg/L	Q	PQL	mg/L	Q	PQL	mg/L	Q	PQL	mg/L	Q	PQL	mg/L	Q	PQL
Surface soil (composite)	J11L39	3/22/06	39.1		24.6	373		3.0	4.2	U	4.2	41.1		6.4	26	U	26.0	0.1	U	0.10	36.5	U	36.5	5.6	U	5.6
Soil stockpile	J12NV5	6/26/06	36.6	U	36.6	320	C	1.2	4.2	U	4.2	50.9		7.8	18.6	U	18.6	19.0		0.3	28.2	U	28.2	4.2	U	4.2
Stained concrete	J12XP5	8/1/06	24.6	U	24.6	224		3.0	4.2	U	4.2	54300		6.4	1100		26.0	0.1	U	0.1	36.5	U	36.5	5.6	U	5.6

HEIS = Hanford Environmental Information System Q = qualifier PQL = practical quantitation limit TCLP = toxicity characteristic leaching procedure U = undetected

Table B-4. Sample Locations for Stained Soil in Southwest Corner of 100-D-30.

Sample Description	HEIS Number	Sample Date	Sample Location	
			Northing	Easting
Verification soil sample	J15WB3	10/30/07	N151525.7	E573590.1
Soil near french drain	J15WF1	10/31/08	N151522.9	E573584.1
Soil near dichromate tank	J15WF2	10/31/08	N151531.4	E573590.8
Stained soil (10 ft bgs)	J163Y2	12/20/07	N151523	E573579
Soil sample (10 ft bgs)	J163Y3	12/20/07	N151517	E573584
Soil sample (10 ft bgs)	J163Y4	12/20/07	N151517	E573578
Soil sample (10 ft bgs)	J163Y5	12/20/07	N151520	E573574
Black sand (20 ft bgs)	J16DH8	3/5/08	N151523	E573577
Yellow stained soil (20 ft bgs)	J16DH9	3/5/08	N151524	E573579
Orange-brown stained soil (20 ft bgs)	J16DJ0	3/5/08	N151524	E573580
Yellow stained soil (20 ft bgs)	J16J17	3/26/08	N151525	E573580.5
Brown stained soil (22 ft bgs)	J16J18	3/26/08	N151523.8	E573580.2
Yellow stained soil (22 ft bgs)	J16J19	3/26/08	N151523.8	E573579.6

bgs = below ground surface

Table B-5. Sample Locations for Stained Soil in Southwest Corner of 100-D-30. (6 Pages)

Sample Description	HEIS Number	Sample Date	Aluminum			Antimony			Arsenic			Barium			Beryllium			Bismuth		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Verification soil sample	J15WB3	10/30/07	5700		11.5	0.86	U	0.86	3.9		1.4	63.7	C	0.29	0.14	U	0.14	1.7	U	1.7
Soil near french drain	J15WF1	10/31/08	5440		11.9	0.89	U	0.89	2.7		1.5	55.8	C	0.30	0.15	U	0.15	1.8	U	1.8
Soil near dichromate tank	J15WF2	10/31/08	4400		10.8	0.81	U	0.81	1.5		1.4	41.8	C	0.27	0.14	U	0.14	1.6	U	1.6
Stained soil (10 ft bgs)	J163Y2	12/20/07	4140	C	10.9	0.82	U	0.82	1.4		1.4	50.8		0.27	0.88		0.14	1.6	U	1.6
Soil sample (10 ft bgs)	J163Y3	12/20/07	Not Analyzed																	
Soil sample (10 ft bgs)	J163Y4	12/20/07																		
Soil sample (10 ft bgs)	J163Y5	12/20/07																		
Black sand (20 ft bgs)	J16DH8	3/5/08	2670		11.0	0.83	U	0.83	1.4	U	1.4	35.7		0.28	0.14	U	0.14	1.7	U	1.7
Yellow stained soil (20 ft bgs)	J16DH9	3/5/08	3260		11.2	0.84	U	0.84	1.4	U	1.4	52.5		0.28	0.14	U	0.14	1.7	U	1.7
Orange-brown stained soil (20 ft bgs)	J16DJ0	3/5/08	3450		10.8	0.81	U	0.81	1.8		1.3	63.4		0.27	0.13		0.13	1.6	U	1.6
Yellow stained soil (20 ft bgs)	J16J17	3/26/08	2410		10.9	0.82	U	0.82	1.8		1.4	60.3		0.27	0.59		0.14	1.6	U	1.6
Brown stained soil (20 ft bgs)	J16J18	3/26/08	2970		10.8	0.81	U	0.81	1.6		1.3	50.5		0.27	0.51		0.13	1.6	U	1.6
Yellow stained soil (20 ft bgs)	J16J19	3/26/08	2610		10.7	0.8	U	0.80	1.6		1.3	61.2		0.27	0.50		0.13	1.6	U	1.6

Sample Description	HEIS Number	Sample Date	Boron			Cadmium			Calcium			Chromium			Cobalt			Copper		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Verification soil sample	J15WB3	10/30/07	1.9		1.4	0.29	U	0.29	8210	C	11.5	64.7		0.57	6.4		0.57	15.4		0.57
Soil near french drain	J15WF1	10/31/08	1.5	U	1.5	0.3	U	0.3	10300	C	11.9	16		0.60	7.5		0.60	12.9		0.60
Soil near dichromate tank	J15WF2	10/31/08	1.4	U	1.4	0.27	U	0.27	5250	C	10.8	12.9		0.54	8.2		0.54	13.4		0.54
Stained soil (10 ft bgs)	J163Y2	12/20/07	2.6	C	1.4	0.14	U	0.14	5990	C	10.9	47.3		0.55	5.7		0.55	13.7		0.55
Soil sample (10 ft bgs)	J163Y3	12/20/07	Not Analyzed																	
Soil sample (10 ft bgs)	J163Y4	12/20/07																		
Soil sample (10 ft bgs)	J163Y5	12/20/07																		
Black sand (20 ft bgs)	J16DH8	3/5/08	1.4	U	1.4	0.14	U	0.14	3890	C	11	2.8		0.55	7.8		0.55	12.6		0.55
Yellow stained soil (20 ft bgs)	J16DH9	3/5/08	1.4	U	1.4	0.14	U	0.14	3680	C	11.2	303		0.56	6.3		0.56	11.5		0.56
Orange-brown stained soil (20 ft bgs)	J16DJ0	3/5/08	1.3	U	1.3	0.13	U	0.13	4460	C	10.8	267		0.54	7.8		0.54	16.9		0.54
Yellow stained soil (20 ft bgs)	J16J17	3/26/08	1.4	U	1.4	0.14	U	0.14	3720		10.9	266		0.55	5.6		0.55	10.2		0.55
Brown stained soil (20 ft bgs)	J16J18	3/26/08	1.3	U	1.3	0.15		0.13	3720		10.8	187		0.54	7.1		0.54	15.1		0.54
Yellow stained soil (20 ft bgs)	J16J19	3/26/08	1.3	U	1.3	0.13	U	0.13	2530		10.7	198		0.53	5.5		0.53	10.3		0.53

C = blank contamination (inorganic constituents) D = diluted HEIS = Hanford Environmental Information System PQL = practical quantitation limit Q = qualifier U = undetected
bgs = below ground surface

Table B-5. Sample Locations for Stained Soil in Southwest Corner of 100-D-30. (6 Pages)

Sample Description	HEIS Number	Sample Date	Hexavalent Chromium			Iron			Lead			Lithium			Magnesium			Manganese		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Verification soil sample	J15WB3	10/30/07	6.3		0.2	18800	C	12.9	18.7		0.86	5.9	C	0.11	3600		10.6	291	C	0.11
Soil near french drain	J15WF1	10/31/08	1.4		0.2	21700	C	13.4	4.1		0.89	5.5		0.12	4080		11	309	C	0.12
Soil near dichromate tank	J15WF2	10/31/08	1.5		0.2	23600	C	12.2	4.8		0.81	3.3		0.11	4210		10	289	C	0.11
Stained soil (10 ft bgs)	J163Y2	12/20/07	20.6	D	0.41	21200		12.3	1.9		0.82	3.4	C	0.11	3480		6.8	280	C	0.11
Soil sample (10 ft bgs)	J163Y3	12/20/07	0.86		0.21	Not Analyzed														
Soil sample (10 ft bgs)	J163Y4	12/20/07	0.21	U	0.21															
Soil sample (10 ft bgs)	J163Y5	12/20/07	0.79		0.21															
Black sand (20 ft bgs)	J16DH8	3/5/08	0.24		0.2	20500	C	12.4	2.1		0.83	2.4	C	0.11	3270	C	6.9	243	C	0.11
Yellow stained soil (20 ft bgs)	J16DH9	3/5/08	0.31		0.21	29100	C	12.6	2.9		0.84	2.6	C	0.11	2910	C	7	206	C	0.11
Orange-brown stained soil (20 ft bgs)	J16DJ0	3/5/08	0.22		0.21	28200	C	12.1	2.1		0.81	2.5	C	0.11	3720	C	6.7	261	C	0.11
Yellow stained soil (20 ft bgs)	J16J17	3/26/08	286		11.2	25300		12.3	2.4		0.82	1.8		0.11	2330		6.8	182		0.11
Brown stained soil (20 ft bgs)	J16J18	3/26/08	243		10.1	26000		12.1	1.8		0.81	2.2		0.11	3500		6.7	224		0.11
Yellow stained soil (20 ft bgs)	J16J19	3/26/08	83.9		5.2	25800		12.0	2.2		0.80	2.0		0.11	2840		6.7	182		0.11

Sample Description	HEIS Number	Sample Date	Mercury			Molybdenum			Nickel			Phosphorous			Potassium			Selenium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Verification soil sample	J15WB3	10/30/07	4.3		0.1	0.86	U	0.86	10.7		0.57	906		14.4	921		142	1.7	U	1.7
Soil near french drain	J15WF1	10/31/08	0.1		0.01	0.89	U	0.89	9.6		0.6	1050		14.9	950		147	1.8	U	1.8
Soil near dichromate tank	J15WF2	10/31/08	1.9		0.05	0.92		0.81	10.2		0.54	1100		13.6	579		134	1.6	U	1.6
Stained soil (10 ft bgs)	J163Y2	12/20/07	0.21		0.009	0.82	U	0.82	5.8		0.55	1340		13.6	578		10.9	1.6	U	1.6
Soil sample (10 ft bgs)	J163Y3	12/20/07	Not Analyzed																	
Soil sample (10 ft bgs)	J163Y4	12/20/07																		
Soil sample (10 ft bgs)	J163Y5	12/20/07																		
Black sand (20 ft bgs)	J16DH8	3/5/08	0.009	U	0.009	0.83	U	0.83	6.1		0.55	1150		13.8	362		11.0	1.7	U	1.7
Yellow stained soil (20 ft bgs)	J16DH9	3/5/08	0.27		0.01	0.84	U	0.84	4.9		0.59	1130		14.0	663		11.2	1.7	U	1.7
Orange-brown stained soil (20 ft bgs)	J16DJ0	3/5/08	0.04		0.008	0.81	U	0.81	7.5		0.54	1640		13.5	489		10.8	1.6	U	1.6
Yellow stained soil (20 ft bgs)	J16J17	3/26/08	0.17		0.01	0.82	U	0.82	4.1		0.55	952		13.6	395		10.9	1.6	U	1.6
Brown stained soil (20 ft bgs)	J16J18	3/26/08	0.04		0.01	0.81	U	0.81	6.2		0.54	1440		13.4	389		10.8	1.6	U	1.6
Yellow stained soil (20 ft bgs)	J16J19	3/26/08	0.13		0.01	0.80	U	0.80	6.5		0.53	792		13.3	631		10.7	1.6	U	16

C = blank contamination (inorganic constituents) D = diluted HEIS = Hanford Environmental Information System PQL = practical quantitation limit Q = qualifier U = undetected

Table B-5. Sample Locations for Stained Soil in Southwest Corner of 100-D-30. (6 Pages)

Sample Description	HEIS Number	Sample Date	Silicon			Silver			Sodium			Strontium			Thallium			Tin		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Verification soil sample	J15WB3	10/30/07	1970		11.5	0.29	U	0.29	269	C	5.7	28.3	C	0.09	1.7	U	1.7	1.7	U	1.7
Soil near french drain	J15WF1	10/31/08	1140		11.9	0.3	U	0.3	258	C	6	26.1	C	0.09	1.8	U	1.8	2.1		1.8
Soil near dichromate tank	J15WF2	10/31/08	1750		10.8	0.27	U	0.27	280	C	5.4	19.2	C	0.08	1.6	U	1.6	1.6	U	1.6
Stained soil (10 ft bgs)	J163Y2	12/20/07	2410		10.9	0.27	U	0.27	240	C	5.5	25.3	C	0.08	1.6	U	1.6	2.6	C	1.6
Soil sample (10 ft bgs)	J163Y3	12/20/07	Not Analyzed																	
Soil sample (10 ft bgs)	J163Y4	12/20/07																		
Soil sample (10 ft bgs)	J163Y5	12/20/07																		
Black sand (20 ft bgs)	J16DH8	3/5/08	240		11	0.28	U	0.28	139	C	5.5	12.1	C	0.08	1.7	U	1.7	1.9	C	1.7
Yellow stained soil (20 ft bgs)	J16DH9	3/5/08	319		11.2	0.28	U	0.28	490	C	5.6	30.8	C	0.08	1.7	U	1.7	1.9	C	1.7
Orange-brown stained soil (20 ft bgs)	J16DJ0	3/5/08	287		10.8	0.27	U	0.27	142	C	5.4	22.9	C	0.08	1.6	U	1.6	1.7	C	1.6
Yellow stained soil (20 ft bgs)	J16J17	3/26/08	275		10.9	0.27	U	0.27	313		5.5	18.2		0.08	1.6	U	1.6	1.6	U	1.6
Brown stained soil (20 ft bgs)	J16J18	3/26/08	252		10.8	0.27	U	0.27	144		5.4	17.8		0.08	1.6	U	1.6	1.6	U	1.6
Yellow stained soil (20 ft bgs)	J16J19	3/26/08	281		10.7	0.27	U	0.27	290		5.3	24.9		0.08	1.6	U	1.6	1.6	U	1.6

Sample Description	HEIS Number	Sample Date	Uranium			Vanadium			Zinc		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Verification soil sample	J15WB3	10/30/07	14.4	U	14.4	41.7		0.4	50.2	C	1.7
Soil near french drain	J15WF1	10/31/08	14.9	U	14.9	52		0.42	43.4	C	1.8
Soil near dichromate tank	J15WF2	10/31/08	13.6	U	13.6	63.8		0.38	45.8	C	1.6
Stained soil (10 ft bgs)	J163Y2	12/20/07	5.5	U	5.5	51.5		0.38	37.6		1.6
Soil sample (10 ft bgs)	J163Y3	12/20/07	Not Analyzed								
Soil sample (10 ft bgs)	J163Y4	12/20/07									
Soil sample (10 ft bgs)	J163Y5	12/20/07									
Black sand (20 ft bgs)	J16DH8	3/5/08	5.5	U	5.5	51.3		0.39	33.5		1.7
Yellow stained soil (20 ft bgs)	J16DH9	3/5/08	5.6	U	5.6	78.6		0.39	40		1.7
Orange-brown stained soil (20 ft bgs)	J16DJ0	3/5/08	5.4	U	5.4	71.5		0.38	43.5		1.6
Yellow stained soil (20 ft bgs)	J16J17	3/26/08	5.5	U	5.5	77.8		0.38	37.6		1.6
Brown stained soil (20 ft bgs)	J16J18	3/26/08	5.4	U	5.4	68.4		0.38	39.3		1.6
Yellow stained soil (20 ft bgs)	J16J19	3/26/08	5.3	U	5.3	69.3		0.37	35.7		1.6

C = blank contamination (inorganic constituents) D = diluted HEIS = Hanford Environmental Information System PQL = practical quantitation limit Q = qualifier U = undetected

Table B-5. Sample Locations for Stained Soil in Southwest Corner of 100-D-30. (6 Pages)

Sample Description	HEIS Number	Sample Date	TCLP Aluminum			TCLP Antimony			TCLP Arsenic			TCLP Barium			TCLP Beryllium			TCLP Boron		
			ug/L	Q	PQL	ug/L	Q	PQL	ug/L	Q	PQL	ug/L	Q	PQL	ug/L	Q	PQL	ug/L	Q	PQL
Yellow stained soil (20 ft bgs)	J16DH9	3/5/08	240	U	240	18.0	U	18.0	30.0	U	30.0	13.9		6.0	3.0	U	3.0	42.3		30.0
Orange-brown stained soil (20 ft bgs)	J16DJ0	3/5/08	240	U	240	18.0	U	18.0	30.0	U	30.0	187		6.0	3.0	U	3.0	30.7		30.0
Yellow stained soil (20 ft bgs)	J16J17	3/26/08	Not Analyzed						31.7	U	31.7	55.4		3.1	Not Analyzed					
Brown stained soil (20 ft bgs)	J16J18	3/26/08							31.7	U	31.7	68.9		3.1						
Yellow stained soil (20 ft bgs)	J16J19	3/26/08							33.4		31.7	36.2		3.1						

Sample Description	HEIS Number	Sample Date	TCLP Cadmium			TCLP Calcium			TCLP Chromium			TCLP Cobalt			TCLP Copper			TCLP Iron		
			ug/L	Q	PQL	ug/L	Q	PQL	ug/L	Q	PQL	ug/L	Q	PQL	ug/L	Q	PQL	ug/L	Q	PQL
Yellow stained soil (20 ft bgs)	J16DH9	3/5/08	3.0	U	3.0	34500		240	54.6		12.0	12.0	U	12.0	12.0	U	12.0	338		270
Orange-brown stained soil (20 ft bgs)	J16DJ0	3/5/08	3.0	U	3.0	31300		240	41.5		12.0	12.0	U	12.0	12.0	U	12.0	270	U	270
Yellow stained soil (20 ft bgs)	J16J17	3/26/08	5.6	U	5.6	Not Analyzed			88.9		4.6	Not Analyzed								
Brown stained soil (20 ft bgs)	J16J18	3/26/08	5.6	U	5.6				171		4.6									
Yellow stained soil (20 ft bgs)	J16J19	3/26/08	5.6	U	5.6				63.5		4.6									

Table B-5. Sample Results for Stained Soil in Southwest Corner of 100-D-30.

Sample Description	HEIS Number	Sample Date	TCLP Lead			TCLP Lithium			TCLP Magnesium			TCLP Mangesium			TCLP Mercury			TCLP Molybdenum		
			ug/L	Q	PQL	ug/L	Q	PQL	ug/L	Q	PQL	ug/L	Q	PQL	ug/L	Q	PQL	ug/L	Q	PQL
Yellow stained soil (20 ft bgs)	J16DH9	3/5/08	44.0		18.0	6.8		2.4	1870		150	90.9		2.4	0.06	U	0.06	18.0	U	18.0
Orange-brown stained soil (20 ft bgs)	J16DJ0	3/5/08	18.0	U	18.0	6.5		2.4	1850		150	199		2.4	0.06	U	0.06	18.0	U	18.0
Yellow stained soil (20 ft bgs)	J16J17	3/26/08	34.8	U	34.8	Not Analyzed									0.10	U	0.10	Not Analyzed		
Brown stained soil (20 ft bgs)	J16J18	3/26/08	34.8	U	34.8										0.10	U	0.10			
Yellow stained soil (20 ft bgs)	J16J19	3/26/08	34.8	U	34.8										0.10	U	0.10			

C = blank contamination (inorganic constituents) D = diluted HEIS = Hanford Environmental Information System PQL = practical quantitation limit Q = qualifier U = undetected
TCLP = toxicity characteristic leaching procedure

Table B-5. Sample Locations for Stained Soil in Southwest Corner of 100-D-30. (6 Pages)

Sample Description	HEIS Number	Sample Date	Nickel			Potassium			Selenium			Silver			Strontium			Thallium		
			ug/L	Q	PQL	ug/L	Q	PQL	ug/L	Q	PQL	ug/L	Q	PQL	ug/L	Q	PQL	ug/L	Q	PQL
Yellow stained soil (20 ft bgs)	J16DH9	3/5/08	12.0	U	12.0	2100		240	36.0	U	36.0	6.0	U	6.0	40.2	U	1.8	36.0	U	36.0
Orange-brown stained soil (20 ft bgs)	J16DJ0	3/5/08	12.0	U	12.0	2530		240	36.0	U	36.0	6.0	U	6.0	55.9	U	1.8	36.0	U	36.0
Yellow stained soil (20 ft bgs)	J16J17	3/26/08	Not Analyzed						41.3	U	41.3	4.5	U	4.5	Not Analyzed					
Brown stained soil (20 ft bgs)	J16J18	3/26/08							41.3	U	41.3	4.5	U	4.5						
Yellow stained soil (20 ft bgs)	J16J19	3/26/08							41.3	U	41.3	4.5	U	4.5						

Sample Description	HEIS Number	Sample Date	Tin			Uranium			Vanadium			Zinc		
			ug/L	Q	PQL	ug/L	Q	PQL	ug/L	Q	PQL	ug/L	Q	PQL
Yellow stained soil (20 ft bgs)	J16DH9	3/5/08	36.0	U	36.0	120	U	120	8.4	U	8.4	57.2		36.0
Orange-brown stained soil (20 ft bgs)	J16DJ0	3/5/08	36.0	U	36.0	120	U	120	8.4	U	8.4	143		36.0
Yellow stained soil (20 ft bgs)	J16J17	3/26/08	Not Analyzed											
Brown stained soil (20 ft bgs)	J16J18	3/26/08												
Yellow stained soil (20 ft bgs)	J16J19	3/26/08												

C = blank contamination (inorganic constituents) D = diluted HEIS = Hanford Environmental Information System PQL = practical quantitation limit Q = qualifier U = undetected

Table B-5. Sample Locations for Stained Soil in Southwest Corner of 100-D-30. (6 Pages)

Sample Description	HEIS Number	Sample Date	Bromide			Cloride			Fluoride			Nitrite		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Verification soil sample	J15WB3	10/30/07	Not Analyzed											
Soil near french drain	J15WF1	10/31/08	2.3	U	2.3	2.3	U	2.3	3.4		2.3	2.26	U	2.26
Soil near dichromate tank	J15WF2	10/31/08	Not Analyzed											
Stained soil (10 ft bgs)	J163Y2	12/20/07												
Soil sample (10 ft bgs)	J163Y3	12/20/07												
Soil sample (10 ft bgs)	J163Y4	12/20/07												
Soil sample (10 ft bgs)	J163Y5	12/20/07												
Black sand (20 ft bgs)	J16DH8	3/5/08	2.5	U	2.5	2.5	U	2.5	2.5	U	2.5	5.08	U	5.08
Yellow stained soil (20 ft bgs)	J16DH9	3/5/08	2.8	U	2.8	2.8	U	2.8	4.7		2.8	5.61	U	5.61
Orange-brown stained soil (20 ft bgs)	J16DJ0	3/5/08	2.5	U	2.5	2.5	U	2.5	2.5	U	2.5	5.05	U	5.05
Yellow stained soil (20 ft bgs)	J16J17	3/26/08	3.0	U	3.0	3.0	U	3.0	3.0	U	3.0	2.97	U	2.97
Brown stained soil (20 ft bgs)	J16J18	3/26/08	2.5	U	2.5	2.5	U	2.5	2.5	U	2.5	2.46	U	2.46
Yellow stained soil (20 ft bgs)	J16J19	3/26/08	2.6	U	2.6	2.6	U	2.6	4.0		2.6	2.61	U	2.61

Sample Description	HEIS Number	Sample Date	Nitrate			Phosphate			Sulfate			pH		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	pH Units	Q	PQL
Verification soil sample	J15WB3	10/30/07	Not Analyzed											
Soil near french drain	J15WF1	10/31/08	2.82		2.82	2.3	U	2.3	55.3		2.3	8.3		0.01
Soil near dichromate tank	J15WF2	10/31/08	Not Analyzed											
Stained soil (10 ft bgs)	J163Y2	12/20/07												
Soil sample (10 ft bgs)	J163Y3	12/20/07												
Soil sample (10 ft bgs)	J163Y4	12/20/07												
Soil sample (10 ft bgs)	J163Y5	12/20/07												
Black sand (20 ft bgs)	J16DH8	3/5/08	5.08	U	5.08	5.1	U	5.1	2.5	U	2.5	8.9		0.01
Yellow stained soil (20 ft bgs)	J16DH9	3/5/08	5.61	U	5.61	5.6	U	5.6	45.3	U	2.8	7.2		0.01
Orange-brown stained soil (20 ft bgs)	J16DJ0	3/5/08	5.01	U	5.05	5.0	U	5.0	136		25.2	7.1		0.01
Yellow stained soil (20 ft bgs)	J16J17	3/26/08	7.06		2.97	3.0	U	3.0	4590		148	6.9		0.01
Brown stained soil (20 ft bgs)	J16J18	3/26/08	2.46	U	2.46	2.5	U	2.5	79.6		2.5	6.3		0.01
Yellow stained soil (20 ft bgs)	J16J19	3/26/08	2.61	U	2.61	2.6	U	2.6	19.0		2.6	6.2		0.01

HEIS = Hanford Environmental Information System PQL = practical quantitation limit Q = qualifier TCLP = toxicity characteristic leaching procedure U = undetected

Table B-6. In-Process Sample Results for Remediation at the Water Table.

Sample Area	Sample Number	Sample Date	Northing	Easting	Hexavalent Chromium		
					mg/kg	Q	PQL
Southwest Wall	J1V180	10/23/14	151498	573584.1	0.155	U	0.155
Southwest Wall	J1V181	10/23/14	151499.5	573583	0.248		0.155
Southwest Wall	J1V182	10/23/14	151501.8	573583	0.185		0.155
Southwest Wall	J1V183	10/23/14	151504.4	573582.6	0.272		0.155
Southwest Wall	J1V184	10/23/14	151507.1	573581.9	0.333		0.155
East Wall	J1V185	10/23/14	151546.6	573622.1	0.323		0.155
East Wall	J1V186	10/23/14	151547.6	573623	0.29		0.155
East Wall	J1V187	10/23/14	151548.9	573622	0.233		0.155
East Wall	J1V188	10/23/14	151550.4	573621.9	0.251		0.155
East Wall	J1V189	10/23/14	151551.2	573621.1	0.428		0.155

PQL = practical quantitation limit Q = qualifier U = undetected

APPENDIX C

SUMMARY OF PRELIMINARY VERIFICATION SAMPLE RESULTS FOR 100-D-30

Table C-1. 100-D-30 Preliminary Verification Sample Results. (8 Pages)

Sample Location	HEIS Number	Sample Date	Aluminum			Antimony			Arsenic			Barium			Beryllium			Bismuth		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
A9	J15WC1	10/31/07	3760		11.8	0.88	U	0.88	2.0		1.5	41.0	C	0.29	0.15	U	0.15	1.8	U	1.8
Duplicate of J15WC1	J15WC6	10/31/07	4110		11.7	0.88	U	0.88	1.6		1.5	45.7	C	0.29	0.15	U	0.15	1.8	U	1.8
A2	J15WB4	10/31/07	4370		11.7	0.88	U	0.88	1.7		1.5	76.8	C	0.29	0.15	U	0.15	1.8	U	1.8
A3	J15WB5	10/31/07	4080		10.7	0.81	U	0.81	2.2		1.3	52.8	C	0.27	0.13	U	0.13	1.6	U	1.6
A4	J15WB6	10/31/07	4350		10.3	0.77	U	0.77	1.8		1.3	45.7	C	0.26	0.13	U	0.13	1.5	U	1.5
A5	J15WB7	10/31/07	3920		11.5	0.86	U	0.86	1.4	U	1.4	48.1	C	0.29	0.14	U	0.14	1.7	U	1.7
A6	J15WB8	10/31/07	3860		11.3	0.84	U	0.84	1.8		1.4	68.1	C	0.28	0.14	U	0.17	1.7	U	1.7
A7	J15WB9	10/31/07	5600		11.5	0.87	U	0.87	3.1		1.4	57.0	C	0.29	0.14	U	0.14	1.7	U	1.7
A8	J15WC0	10/31/07	5870		10.2	0.76	U	0.76	2.5		1.3	56.7	C	0.25	0.13	U	0.13	1.5	U	1.5
A10	J15WC2	10/31/07	3130		11.0	0.82	U	0.82	1.4	U	1.4	33.0	C	0.27	0.14	U	0.14	1.6	U	1.6
A11	J15WC3	10/31/07	4430		10.2	0.76	U	0.76	2.3		1.3	50.9	C	0.26	0.13	U	0.13	1.5	U	1.5
A12	J15WC4	10/31/07	4430		11.2	0.84	U	0.84	3.1		1.4	70.3	C	0.28	0.14	U	0.14	1.7	U	1.7
Equipment Blank	J15WC5	10/31/07	58.9		3.5	0.27	U	0.27	0.44	U	0.44	1.4	C	0.09	0.04	U	0.04	0.53	U	0.53
B8	J15WD4	10/31/07	5770		12.3	0.92	U	0.92	3.3		1.5	57.3	C	0.31	0.15	U	0.15	1.8	U	1.8
Duplicate of J15WD4	J15WF0	10/31/07	4320		11.7	0.87	U	0.87	2.0		1.5	43.5	C	0.29	0.15	U	0.15	1.7	U	1.7
B1	J15WC7	10/31/07	5520		11.6	0.87	U	0.87	2.7		1.4	67.1	C	0.29	0.14	U	0.14	1.7	U	1.7
B2	J15WC8	10/31/07	4480		11.2	0.84	U	0.84	1.7		1.4	54.1	C	0.28	0.14	U	0.14	1.7	U	1.7
B4	J15WD0	10/31/07	5530		11.3	0.85	U	0.85	2.9		1.4	40.7	C	0.28	0.14	U	0.14	1.7	U	1.7
B5[a]	J15WD1	10/31/07	5760		10.9	0.81	U	0.81	2.9		1.4	61.6	C	0.27	0.14	U	0.14	1.6	U	1.6
B5[b]	J19611	9/2/09	6130		3.45	0.414	U	0.414	2.94		0.69	54.6		0.345	0.204		0.138	6.89	U	6.89
B6[a]	J15WD2	10/31/07	7460		11.5	0.87	U	0.87	7.8		1.4	100	C	0.29	0.14	U	0.14	1.7	U	1.7
B6[b]	J19612	9/2/09	7410		3.41	0.503		0.409	6.86		0.681	92.5		0.341	0.210		0.136	6.81	U	6.81
B7	J15WD3	10/31/07	5640		10.5	0.79	U	0.79	2.6		1.3	63.1	C	0.26	0.13	U	0.13	1.6	U	1.6
B9[a]	J15WD5	10/31/07	4850		11.8	0.89	U	0.89	2.6		1.5	64	C	0.30	0.15	U	0.15	1.8	U	1.8
B9[b]	J19613	9/2/09	8250		4.28	0.514	U	0.514	6.43		0.856	94.4		0.428	0.240		0.171	8.56	U	8.56
B10	J15WD6	10/31/07	3550		11.1	0.84	U	0.84	1.4	U	1.4	45.4	C	0.28	0.14	U	0.14	1.7	U	1.7
B11	J15WD7	10/31/07	4930		11.3	0.85	U	0.85	3.2		1.4	51.9	C	0.28	0.14	U	0.14	1.7	U	1.7
B12	J15WD8	10/31/07	4670		11.1	0.83	U	0.83	2.5		1.4	56.4	C	0.28	0.14	U	0.14	1.7	U	1.7
Equipment Blank	J15WD9	10/31/07	71.4		3.7	0.28	U	0.28	0.46	U	0.46	1.5	C	0.09	0.05	U	0.55	0.55	U	0.55
A1[c]	J15WB3	10/31/07	5700		11.5	0.86	U	0.86	3.9		1.4	63.7	C	0.29	0.14	U	0.14	1.7	U	1.7
B3[c]	J15WC9	10/31/07	5730		10.8	0.81	U	0.81	3.0		1.3	63.7	C	0.27	0.13	U	0.13	1.6	U	1.6
FS-C1[c]	J15WF1	10/31/07	5440		11.9	0.89	U	0.89	2.7		1.5	55.8	C	0.30	0.15	U	0.15	1.8	U	1.8
FS-C2[c]	J15WF2	10/31/07	4400		10.8	0.81	U	0.81	1.5		1.4	41.8	C	0.27	0.14	U	0.14	1.6	U	1.6

[a] Samples collected 10/31/07 in locations B5, B6, and B9 were replaced after additional remediation was performed.
[b] Sample was recollected after additional remediation was performed in this area
[c] Samples; A1, B3, FS-C1, and FS-C2 were removed from 100-D-30 closeout sampling. The area from which these samples were obtained is a new discovery site (100-D-104)
HEIS = Hanford Environmental Information System
B = method blank contamination
C = The analyte was detected in both the sample and the associated QC blank.
J = estimate
L = Dilution indicating physical and chemical interference are present
M = sample duplicate precision not met
N = all LCS recovery is outside control limit
PQL = practical quantitation limit
Q = qualifier
U = undetected

Table C-1. 100-D-30 Preliminary Verification Sample Results. (8 Pages)

Sample Location	HEIS Number	Sample Date	Boron			Cadmium			Calcium			Chromium			Cobalt			Copper		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
A9	J15WC1	10/31/07	1.5	U	1.5	0.29	U	0.29	5700	C	11.8	5.00		0.59	6.5		0.59	11.1		0.59
Duplicate of J15WC1	J15WC6	10/31/07	1.5	U	1.5	0.29	U	0.29	7550	C	11.7	4.60		0.58	8.0		0.58	12.6		0.58
A2	J15WB4	10/31/07	1.5	U	1.5	0.29	U	0.29	7680	CJ	11.7	4.70	J	0.59	8.0		0.59	15.5		0.59
A3	J15WB5	10/31/07	1.8		1.3	0.27	U	0.27	7570	CJ	10.7	7.00	J	0.54	7.6		0.54	14.0		0.54
A4	J15WB6	10/31/07	1.3	U	1.3	0.26	U	0.26	6710	CJ	10.3	15.3	J	0.51	6.7		0.51	13.8		0.51
A5	J15WB7	10/31/07	1.4	U	1.4	0.29	U	0.29	5810	CJ	11.5	4.20	J	0.57	7.9		0.57	13.8		0.57
A6	J15WB8	10/31/07	1.4	U	1.4	0.28	U	0.28	6570	CJ	11.3	3.70	J	0.56	8.9		0.56	13.8		0.56
A7	J15WB9	10/31/07	1.4	U	1.4	0.29	U	0.29	12900	CJ	11.5	11.2	J	0.58	6.0		0.58	13.5		0.58
A8	J15WC0	10/31/07	1.3	U	1.3	0.25	U	0.25	11900	CJ	10.2	10.1	J	0.51	7.1		0.51	16.5		0.51
A10	J15WC2	10/31/07	1.4	U	1.4	0.27	U	0.27	5230	CJ	11	3.30	J	0.55	5.5		0.55	10.2		0.55
A11	J15WC3	10/31/07	1.3		1.3	0.26	U	0.26	6840	CJ	10.2	71.9	J	0.51	6.6		0.51	12.5		0.51
A12	J15WC4	10/31/07	1.4	U	1.4	0.28	U	0.28	7140	CJ	11.2	6.40	J	0.56	5.3		0.56	10.3		0.56
Equipment Blank	J15WC5	10/31/07	0.44	U	0.44	0.09	U	0.09	31.1	CJ	3.5	0.18	J	0.18	0.18	U	0.18	0.18	U	0.18
B8	J15WD4	10/31/07	1.5	U	1.5	0.31	U	0.20	10100	C	12.3	11.3		0.61	6.7		0.61	19.4		0.61
Duplicate of J15WD4	J15WF0	10/31/07	1.5	U	15	0.29	U	0.29	8670	C	11.7	7.80		0.58	5.0		0.58	10.9		0.58
B1	J15WC7	10/31/07	3.8		1.4	0.29	U	0.29	8660	CJ	116	34.6	J	0.58	6.7		0.58	15.5		0.58
B2	J15WC8	10/31/07	2.1		1.4	0.28	U	0.28	7920	CJ	11.2	12.5	J	0.56	6.3		0.56	14.4		0.50
B4	J15WD0	10/31/07	1.4	U	1.4	0.28	U	0.28	8120	C	11.3	7.70		0.57	6.5		0.57	14.9		0.57
B5[a]	J15WD1	10/31/07	1.4	U	1.4	0.27	U	0.27	8510	C	10.9	34.0		0.54	7.7		0.54	16.2		0.54
B5[b]	J19611	9/2/09	1.09	B	1.38	0.0693		0.138	8070		68.9	13.6		0.138	8.33		1.38	15.3		0.689
B6[a]	J15WD2	10/31/07	4.3		1.4	0.30		0.29	42500	C	11.5	15.9		0.58	6.7		0.58	21.1		0.58
B6[b]	J19612	9/2/09	3.10		1.36	0.138		0.136	30800		68.1	18.3		0.136	7.34		1.36	18.8		0.681
B7	J15WD3	10/31/07	1.4		1.3	0.26	U	0.26	15000	C	10.5	15.8		0.52	6.0		0.52	13.2		0.52
B9[a]	J15WD5	10/31/07	2.3		1.5	0.3	U	0.3	18600	C	11.8	12.1		0.59	6.1		0.59	16.3		0.59
B9[b]	J19613	9/2/09	3.88		1.71	0.127	B	0.171	34700		85.6	24.2		0.171	7.14		1.71	18.5		0.856
B10	J15WD6	10/31/07	1.4	U	1.4	0.28	U	0.28	6060	C	11.1	5.30		0.56	5.0		0.56	9.8		0.56
B11	J15WD7	10/31/07	1.5		1.4	0.28	U	0.28	8050	C	11.3	7.70		0.57	6.7		0.57	13.3		0.57
B12	J15WD8	10/31/07	2.2		1.4	0.28	U	0.28	7770	C	11.1	5.90		0.55	7.1		0.55	17.7		0.55
Equipment Blank	J15WD9	10/31/07	0.46	U	0.46	0.09	U	0.09	30.5	C	3.7	0.18	U	0.18	0.18	U	0.18	0.18	U	0.18
A1[c]	J15WB3	10/31/07	1.9		1.4	0.29	U	0.29	8210	CJ	11.5	64.7	J	0.57	6.4		0.57	15.4		0.57
B3[c]	J15WC9	10/31/07	1.8		1.3	0.27	U	0.27	10700	CJ	10.8	15.8	J	0.54	6.2		0.54	13.9		0.54
FS-C1[c]	J15WF1	10/31/07	1.5	U	1.5	0.3	U	0.3	10300	C	11.9	16.0		0.60	7.5		0.60	12.9		0.60
FS-C2[c]	J15WF2	10/31/07	1.4	U	1.4	0.27	U	0.27	5250	C	10.8	12.9		0.54	8.2		0.54	13.4		0.54

Table C-1. 100-D-30 Preliminary Verification Sample Results. (8 Pages)

Sample Location	HEIS Number	Sample Date	Hexavalent Chromium			Iron			Lead			Lithium			Magnesium			Manganese		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
A9	J15WC1	10/31/07	0.20	U	0.20	20600	C	13.3	2.1		0.88	2.9	C	0.12	3460		10.9	264	C	0.12
Duplicate of J15WC1	J15WC6	10/31/07	0.20	U	0.20	22300	C	13.1	2.0		0.88	3.1	C	0.12	3910		10.8	301	C	0.12
A2	J15WB4	10/31/07	0.21	U	0.21	26800	C	13.2	1.6		0.88	3.2	C	0.12	4770	J	10.8	342	C	0.12
A3	J15WB5	10/31/07	0.20	U	0.20	23300	C	12.1	2.6		0.81	3.5	C	0.11	4060	J	9.9	298	C	0.11
A4	J15WB6	10/31/07	1.8		0.20	19800	C	11.6	2.8		0.77	4.0	C	0.10	3560	J	9.5	276	C	0.10
A5	J15WB7	10/31/07	0.20	U	0.20	23300	C	12.9	1.2		0.86	3.0	C	0.11	3740	J	10.6	294	C	0.11
A6	J15WB8	10/31/07	0.20	U	0.20	27400	C	12.7	1.2		0.84	2.9	C	0.11	4290	J	10.4	342	C	0.11
A7	J15WB9	10/31/07	0.20	U	0.20	17400	C	13	3.4		0.87	6.0	C	0.12	3940	J	10.6	259	C	0.12
A8	J15WC0	10/31/07	0.20	U	0.20	21600	C	11.4	6.0		0.76	5.3	C	0.10	4230	J	9.4	283	C	0.10
A10	J15WC2	10/31/07	0.20	U	0.20	15300	C	12.4	1.8		0.82	2.9	C	0.11	2820	J	10.1	217	C	0.11
A11	J15WC3	10/31/07	0.20	U	0.20	30200	C	11.5	5.5		0.76	3.9	C	0.10	3560	J	9.4	276	C	0.10
A12	J15WC4	10/31/07	0.20	U	0.20	14000	C	12.6	5.7		0.84	4.1	C	0.11	3200	J	10.3	221	C	0.11
Equipment Blank	J15WC5	10/31/07	0.20	U	0.20	120	C	4	0.27	U	0.27	0.13	C	0.04	6.8	J	3.3	3.5	C	0.04
B8	J15WD4	10/31/07	0.29		0.20	19300	C	13.8	8.0		0.92	6.8		0.12	4500		11.3	280	C	0.12
Duplicate of J15WD4	J15WF0	10/31/07	0.20	U	0.20	12600	C	13.1	6.0		0.87	4.9		0.12	3080		10.8	199	C	0.12
B1	J15WC7	10/31/07	0.98		0.20	21400	C	13	11.4		0.87	6.4	C	0.12	4100	J	10.7	295	C	0.12
B2	J15WC8	10/31/07	0.62		0.20	18700	C	12.6	5.2		0.84	4.4	C	0.11	3840	J	10.3	255	C	0.11
B4	J15WD0	10/31/07	0.20	U	0.20	20000	C	12.7	3.7		0.85	5.7		0.11	4030		10.5	275	C	0.11
B5[a]	J15WD1	10/31/07	1.4		0.20	24000	C	12.2	10.1		0.81	5.1		0.11	4350		10	322	C	0.11
B5[b]	J19611	9/2/09	0.20	U	0.20	26400		13.8	8.78		0.345	3.21		1.72	4960		51.7	344		3.45
B6[a]	J15WD2	10/31/07	1.6		0.20	19000	C	13	10.9		0.87	5.7		0.12	4020		10.6	291	C	0.12
B6[b]	J19612	9/2/09	0.20	U	0.20	22100		13.6	12.4		0.341	3.94		1.70	4530		51.1	309		3.41
B7	J15WD3	10/31/07	1.2		0.20	17000	C	11.8	4.8		0.79	6.3		0.10	4400		9.7	277	C	0.10
B9[a]	J15WD5	10/31/07	1.4		0.21	17900	C	13.3	5.7		0.89	3.9		0.12	3680		10.9	246	C	0.12
B9[b]	J19613	9/2/09	0.20	U	0.20	22900		17.1	32.0		0.428	4.35		2.14	4830		64.2	341		4.28
B10	J15WD6	10/31/07	0.22		0.20	13500	C	12.5	3.5		0.84	4.0		0.11	2900		10.3	227	C	0.11
B11	J15WD7	10/31/07	0.20	U	0.20	20100	C	12.8	7.0		0.85	4.6		0.11	3790		10.5	288	C	0.11
B12	J15WD8	10/31/07	0.23		0.20	20900	C	12.4	6.5		0.83	4.0		0.11	3870		10.2	273	C	0.11
Equipment Blank	J15WD9	10/31/07	0.20	U	0.20	114	C	4.1	0.28	U	0.28	0.07		0.04	7.5		3.4	3.9	C	0.04
A1[c]	J15WB3	10/31/07	6.3		0.20	18800	C	12.9	18.7		0.86	5.9	C	0.11	3600	J	10.6	291	C	0.11
B3[c]	J15WC9	10/31/07	0.78		0.21	18800	C	12.1	4.1		0.81	5.9	C	0.11	4180	J	10	344	C	0.11
FS-C1[c]	J15WF1	10/31/07	1.4		0.20	21700	C	13.4	4.1		0.89	5.5		0.12	4080		11	309	C	0.12
FS-C2[c]	J15WF2	10/31/07	1.5		0.20	23600	C	12.2	4.8		0.81	3.3		0.11	4210		10	289	C	0.11

Table C-1. 100-D-30 Preliminary Verification Sample Results. (8 Pages)

Sample Location	HEIS Number	Sample Date	Mercury			Molybdenum			Nickel			Phosphorus			Potassium			Selenium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
A9	J15WC1	10/31/07	0.04		0.02	0.88	U	0.88	7.3		0.59	1020		14.7	584		145	1.8	U	1.8
Duplicate of J15WC1	J15WC6	10/31/07	0.07		0.02	0.88	U	0.88	8.8		0.58	1320		14.6	592		144	1.8	U	1.8
A2	J15WB4	10/31/07	0.02	UJ	0.02	0.88	U	0.88	8.5		0.59	1380	J	14.7	579		145	1.8	U	1.8
A3	J15WB5	10/31/07	0.01	UJ	0.01	0.81	U	0.81	11.6		0.54	1230	J	13.4	549		132	1.6	U	1.6
A4	J15WB6	10/31/07	0.08	J	0.02	0.77	U	0.77	7.1		0.51	1100	J	12.8	764		126	1.5	U	1.5
A5	J15WB7	10/31/07	0.02	UJ	0.02	0.86	U	0.86	7.0		0.57	1300	J	14.3	562		141	1.7	U	1.7
A6	J15WB8	10/31/07	0.02	UJ	0.02	0.84	U	0.84	8.7		0.59	1390	J	14.1	374		139	1.7	U	1.7
A7	J15WB9	10/31/07	0.03	J	0.01	0.87	U	0.87	9.6		0.58	775	J	14.4	911		142	1.7	U	1.7
A8	J15WC0	10/31/07	0.49	J	0.02	0.76	U	0.76	10.6		0.51	995	J	12.7	947		125	1.5	U	1.5
A10	J15WC2	10/31/07	0.01	UJ	0.01	0.82	U	0.82	5.9		0.55	916	J	13.7	526		135	1.6	U	1.6
A11	J15WC3	10/31/07	0.99	J	0.02	0.80		0.76	7.8		0.51	871	J	12.8	781		126	1.5	U	1.5
A12	J15WC4	10/31/07	0.50	J	0.02	0.84	U	0.84	7.3		0.56	716	J	14	882		138	1.7	U	1.7
Equipment Blank	J15WC5	10/31/07	0.01	UJ	0.01	0.27	U	0.27	0.18	U	0.18	4.4	UJ	4.4	43.6	U	43.6	0.53	U	0.53
B8	J15WD4	10/31/07	0.03		0.009	0.92	U	0.92	12.0		0.61	896		15.4	868		151	1.8	U	1.8
Duplicate of J15WD4	J15WF0	10/31/07	0.04		0.01	0.87	U	0.87	10.4		0.58	626		14.6	727		144	1.7	U	1.7
B1	J15WC7	10/31/07	0.73	J	0.02	0.88		0.87	10.0		0.58	1030	J	14.5	1030		143	1.7	U	1.7
B2	J15WC8	10/31/07	0.17	J	0.02	0.84	U	0.84	10.2		0.56	1010	J	14	729		138	1.7	U	1.7
B4	J15WD0	10/31/07	0.01	U	0.01	0.85	U	0.85	10.0		0.57	922		14.2	836		140	1.7	U	1.7
B5[a]	J15WD1	10/31/07	0.44		0.02	0.81	U	0.81	10.4		0.54	1060		13.6	936		134	1.6	U	1.6
B5[b]	J19611	9/2/09	0.0452		0.0238	0.492	B	1.38	9.62		2.76	1020		34.5	934		276	0.689	U	0.689
B6[a]	J15WD2	10/31/07	0.17		0.02	0.87	U	0.87	9.6		0.58	839		14.4	1210		142	1.7	U	1.7
B6[b]	J19612	9/2/09	1.59		0.0550	0.788	B	1.36	10.4		2.73	868		34.1	1370		273	0.681	U	0.681
B7	J15WD3	10/31/07	0.01	U	0.01	0.79	U	0.79	12.4		0.52	830		13.1	934		129	1.6	U	1.6
B9[a]	J15WD5	10/31/07	0.57		0.01	0.89	U	0.89	9.0		0.59	1000		14.8	752		146	1.8	U	1.8
B9[b]	J19613	9/2/09	0.157		0.0260	1.29	B	1.71	12.2		3.42	846		42.8	1680		342	0.856	U	0.856
B10	J15WD6	10/31/07	0.13		0.02	0.84		0.84	7.9		0.56	643		13.9	572		137	1.7	U	1.7
B11	J15WD7	10/31/07	0.30		0.01	0.85	U	0.85	8.6		0.57	996		14.2	899		140	1.7	U	1.7
B12	J15WD8	10/31/07	0.69		0.01	0.83	U	0.83	8.9		0.55	1010		13.8	745		136	1.7	U	1.7
Equipment Blank	J15WD9	10/31/07	0.02	U	0.02	0.28	U	0.28	0.24		0.18	4.6		4.6	45.2	U	45.2	0.58		0.55
A1[c]	J15WB3	10/31/07	4.3		0.10	0.86	U	0.86	10.7		0.57	906	J	14.4	921		142	1.7	U	1.7
B3[c]	J15WC9	10/31/07	0.02		0.02	0.81	U	0.81	10.1		0.54	939	J	13.5	963		133	1.6	U	1.6
FS-C1[c]	J15WF1	10/31/07	0.10		0.01	0.89	U	0.89	9.6		0.60	1050		14.9	950		147	1.8	U	1.8
FS-C2[c]	J15WF2	10/31/07	1.9		0.05	0.92		0.81	10.2		0.54	1100		13.6	579		134	1.6	U	1.6

Table C-1. 100-D-30 Preliminary Verification Sample Results. (8 Pages)

Sample Location	HEIS Number	Sample Date	Silicon			Silver			Sodium			Strontium			Thallium			Tin		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
A9	J15WC1	10/31/07	1460		11.8	0.29	U	0.29	336	C	5.9	17.7	C	0.09	1.8	U	1.8	1.8	U	1.8
Duplicate of J15WC1	J15WC6	10/31/07	2840		11.7	0.29	U	0.29	366	C	5.8	21.1	C	0.09	1.8	U	1.8	1.8	U	1.8
A2	J15WB4	10/31/07	2190		11.7	0.29	U	0.29	326	C	5.9	27.1	C	0.09	2.0		1.8	1.8	U	1.8
A3	J15WB5	10/31/07	738		10.7	0.27	U	0.27	307	C	5.4	22.9	C	0.08	1.6	U	1.6	1.6	U	1.6
A4	J15WB6	10/31/07	1900		10.3	0.26	U	0.26	305	C	5.1	22.2	C	0.08	1.5	U	1.5	1.5	U	1.5
A5	J15WB7	10/31/07	2560		11.5	0.29	U	0.29	395	C	5.7	18.4	C	0.09	1.7	U	1.7	1.7	U	1.7
A6	J15WB8	10/31/07	2440		11.3	0.28	U	0.28	313	C	5.6	22.6	C	0.08	1.7	U	1.7	1.7		1.7
A7	J15WB9	10/31/07	957		11.5	0.29	U	0.29	299	C	5.8	36.9	C	0.09	1.7	U	1.7	1.7	U	1.7
A8	J15WC0	10/31/07	619		10.2	0.25	U	0.25	372	C	5.1	36.2	C	0.08	1.5	U	1.5	1.8		1.5
A10	J15WC2	10/31/07	1880		11.0	0.57		0.27	207	C	5.5	14.7	C	0.08	1.6	U	1.6	1.6	U	1.6
A11	J15WC3	10/31/07	1760		10.2	0.26	U	0.26	267	C	5.1	25.1	C	0.08	1.5	U	1.5	1.5	U	1.5
A12	J15WC4	10/31/07	2160		11.2	0.28	U	0.28	228	C	5.6	26.9	C	0.08	1.7	U	1.7	1.7	U	1.7
Equipment Blank	J15WC5	10/31/07	84.7		3.5	0.09	U	0.09	10.9	C	1.8	0.24	C	0.03	0.53	U	0.53	0.77		0.53
B8	J15WD4	10/31/07	1070		12.3	0.31	U	0.31	341	C	6.1	34.9	C	0.09	1.8	U	1.8	1.8	U	1.8
Duplicate of J15WD4	J15WF0	10/31/07	2290		11.7	0.29	U	0.29	239	C	5.8	28.7	C	0.09	1.7	U	1.7	1.7	U	1.7
B1	J15WC7	10/31/07	2030		11.9	0.29	U	0.29	386	C	5.8	29.2	C	0.09	1.7	U	1.7	1.7	U	1.7
B2	J15WC8	10/31/07	2260		11.2	0.28	U	0.28	268	C	5.6	25.8	C	0.08	1.7	U	1.7	1.7	U	1.7
B4	J15WD0	10/31/07	1680		11.3	0.28	U	0.28	290	C	5.7	26.1	C	0.08	1.7	U	1.7	1.7	U	1.7
B5[a]	J15WD1	10/31/07	1060		10.9	0.27	U	0.27	391	C	5.4	27.8	C	0.08	1.6	U	1.6	1.6	U	1.6
B5[b]	J19611	9/2/09	456		1.38	0.138	U	0.138	214		34.5	29.1		0.689	0.345	U	0.345	3.08	B	6.89
B6[a]	J15WD2	10/31/07	1160		11.5	0.56		0.29	672	C	5.8	77	C	0.09	1.7	U	1.7	2.0		1.7
B6[b]	J19612	9/2/09	452		1.36	0.136	U	0.136	561		34.1	59.9		0.681	0.341	U	0.341	3.25	B	6.81
B7	J15WD3	10/31/07	2000		10.5	0.26	U	0.26	244	C	5.2	43.8	C	0.08	1.6	U	1.6	1.6	U	1.6
B9[a]	J15WD5	10/31/07	2520		11.8	0.30	U	0.30	438	C	5.9	42.1	C	0.09	1.8	U	1.8	1.8	U	1.8
B9[b]	J19613	9/2/09	713		1.71	0.171	U	0.171	528		42.8	73.0		0.856	0.428	U	0.428	3.36	B	8.56
B10	J15WD6	10/31/07	1580		11.1	0.30	U	0.28	201	C	5.6	21.5	C	0.08	1.7	U	1.7	1.7	U	1.7
B11	J15WD7	10/31/07	1100		11.3	0.28	U	0.28	304	C	5.7	26.8	C	0.09	1.7	U	1.7	1.7	U	1.7
B12	J15WD8	10/31/07	1520		11.1	0.28	U	0.28	262	C	5.5	25.0	C	0.08	1.7	U	1.7	1.7	U	1.7
Equipment Blank	J15WD9	10/31/07	107		37	0.09	U	0.09	13.7	C	1.8	0.24	C	0.03	0.55	U	0.55	0.68		0.55
A1[c]	J15WB3	10/31/07	1970		11.5	0.29	U	0.29	269	C	5.7	28.3	C	0.09	1.7	U	1.7	1.7	U	1.7
B3[c]	J15WC9	10/31/07	1350		10.8	0.27	U	0.27	172	C	5.4	29.4	C	0.08	1.6	U	1.6	1.6	U	1.6
FS-C1[c]	J15WF1	10/31/07	1140		11.9	0.30	U	0.30	258	C	6.0	26.1	C	0.09	1.8	U	1.8	2.1		1.8
FS-C2[c]	J15WF2	10/31/07	1750		10.8	0.27	U	0.27	280	C	5.4	19.2	C	0.08	1.6	U	1.6	1.6	U	1.6

Table C-1. 100-D-30 Preliminary Verification Sample Results. (8 Pages)

Sample Location	HEIS Number	Sample Date	Uranium			Vanadium			Zinc		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
A9	J15WC1	10/31/07	14.7	U	14.7	55.2		0.41	36.3	C	1.8
Duplicate of J15WC1	J15WC6	10/31/07	14.6	U	14.6	52.7		0.41	41.1	C	1.8
A2	J15WB4	10/31/07	14.7	U	14.7	61.2		0.41	45.1	C	1.8
A3	J15WB5	10/31/07	13.4	U	13.4	62.6		0.38	44.0	C	1.6
A4	J15WB6	10/31/07	12.8	U	12.8	42.5		0.36	36.1	C	1.5
A5	J15WB7	10/31/07	14.3	U	14.3	57.5		0.40	47.1	C	1.7
A6	J15WB8	10/31/07	14.1	U	14.1	74.5		0.39	45.8	C	1.7
A7	J15WB9	10/31/07	14.4	U	14.4	41.4		0.40	45.3	C	1.7
A8	J15WC0	10/31/07	12.7	U	12.7	53.6		0.36	45.6	C	1.5
A10	J15WC2	10/31/07	13.7	U	13.7	33.6		0.38	30.3	C	1.6
A11	J15WC3	10/31/07	12.8	U	12.8	47.1		0.36	45.3	C	1.5
A12	J15WC4	10/31/07	14.0	U	14.0	30.1		0.39	42.4	C	1.7
Equipment Blank	J15WC5	10/31/07	4.4	U	4.4	0.12	U	0.12	1.7	C	0.53
B8	J15WD4	10/31/07	15.4	U	15.4	44.9		0.43	40.3	C	1.8
Duplicate of J15WD4	J15WF0	10/31/07	14.6	U	14.6	28.4		0.41	30.8	C	1.7
B1	J15WC7	10/31/07	14.5	U	14.5	50.3		0.41	50.5	C	1.7
B2	J15WC8	10/31/07	14.0	U	14.0	42.0		0.39	38.0	C	1.7
B4	J15WD0	10/31/07	14.2	U	14.2	45.8		0.40	38.7	C	1.7
B5[a]	J15WD1	10/31/07	13.6	U	13.6	61.5		0.38	52.2	C	1.6
B5[b]	J19611	9/2/09	13.8	U	13.8	67.3		1.72	48.1		6.89
B6[a]	J15WD2	10/31/07	14.4	U	14.4	48.5		0.40	88.4	C	1.7
B6[b]	J19612	9/2/09	13.6	U	13.6	57.6		1.70	78.7		6.81
B7	J15WD3	10/31/07	13.1	U	13.1	38.5		0.37	33.8	C	1.6
B9[a]	J15WD5	10/31/07	14.8	U	14.8	41.9		0.41	50.0	C	1.8
B9[b]	J19613	9/2/09	17.1	U	17.1	56.1		2.14	88.7		8.56
B10	J15WD6	10/31/07	13.9	U	13.9	32.4		0.39	27.2	C	1.7
B11	J15WD7	10/31/07	14.2	U	14.2	51.0		0.40	43.4	C	1.7
B12	J15WD8	10/31/07	13.8	U	13.8	48.8		0.39	43.9	C	1.7
Equipment Blank	J15WD9	10/31/07	4.6	U	4.6	0.13	U	0.13	2.9	C	0.55
A1[c]	J15WB3	10/31/07	14.4	U	14.4	41.7		0.40	50.2	C	1.7
B3[c]	J15WC9	10/31/07	13.5	U	13.5	40.2		0.38	35.6	C	1.6
FS-C1[c]	J15WF1	10/31/07	14.9	U	14.9	52.0		0.42	43.4	C	1.8
FS-C2[c]	J15WF2	10/31/07	13.6	U	13.6	63.8		0.38	45.8	C	1.6

Table C-1. 100-D-30 Preliminary Verification Sample Results. (8 Pages)

Attachment 1, 100-D-30 Verification Sampling Results

Sample Location	HEIS Number	Sample Date	Bromide			Chloride			Fluoride			Nitrate			Nitrite			Phosphate			Sulfate		
			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
B5[a]	J19611	09/02/09	2.5	U	2.5	2.5	U	2.5	2.5	U	2.5	1.6	B	2.5	2.5	U	2.5	1.9	B	2.5	5.1		2.5
B6[a]	J19612	09/02/09	2.5	U	2.5	2.4	B	2.5	2.5	U	2.5	1.7	B	2.5	2.5	U	2.5	2.5	U	2.5	93.6		2.5
B9[a]	J19613	09/02/09	2.5	U	2.5	3.4		2.5	2.5	U	2.5	5.0		2.5	2.5	U	2.5	2.5	U	2.5	135		2.5
FS - Cl[b]	J15WF1	10/31/07	2.3	U	2.3	2.3	U	2.3	3.4		2.3	2.82		2.26	2.26	U	2.26	2.3	U	2.3	55.3		2.3

Table C-1. 100-D-30 Preliminary Verification Sample Results. (8 Pages)

Sample Location	Sample Number	Sample Date	Aluminum			Antimony			Arsenic			Barium			Beryllium			Cadmium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Split of J15WB4	ECY 13	10/31/07	4400		20	2	U	2	1	U	1	78		10	1	U	1	1	U	1
Split of J15WC1	ECY 14	10/31/07	4600		20	2	U	2	0.98	U	0.98	57		9.8	0.49	U	0.49	0.49	U	0.49
Split of J19611	ECY 15	10/31/07	5500		20	2	U	2	1.3		0.99	64		9.9	1	U	1	1	U	1
Split of J15WD4	ECY 16	10/31/07	6200		20	2	U	2	2.5		1	64		10	1	U	1	1	U	1
Split of J15WF2[C]	ECY 17	10/31/07	4800		20	2	U	2	1	U	1	51		10	1	U	1	1	U	1

Sample Location	Sample Number	Sample Date	Calcium			Chromium			Cobalt			Copper			Hexavalent Chromium			Iron		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Split of J15WB4	ECY 13	10/31/07	5700		100	6.2		1	9.3		5	14		1	2	U	2	30000		50
Split of J15WC1	ECY 14	10/31/07	7400		98	5.1		0.98	9.5		4.9	16		0.98	2	U	2	30000		49
Split of J19611	ECY 15	10/31/07	8000		99	30		0.99	7.7		5	17		0.99	2.2		2	27000		50
Split of J15WD4	ECY 16	10/31/07	11000		100	9.9		1	6.3		2	15		1	2	U	2	19000		10
Split of J15WF2[C]	ECY 17	10/31/07	5400		100	16		1	8.8		5	16		1	2	U	2	29000		50

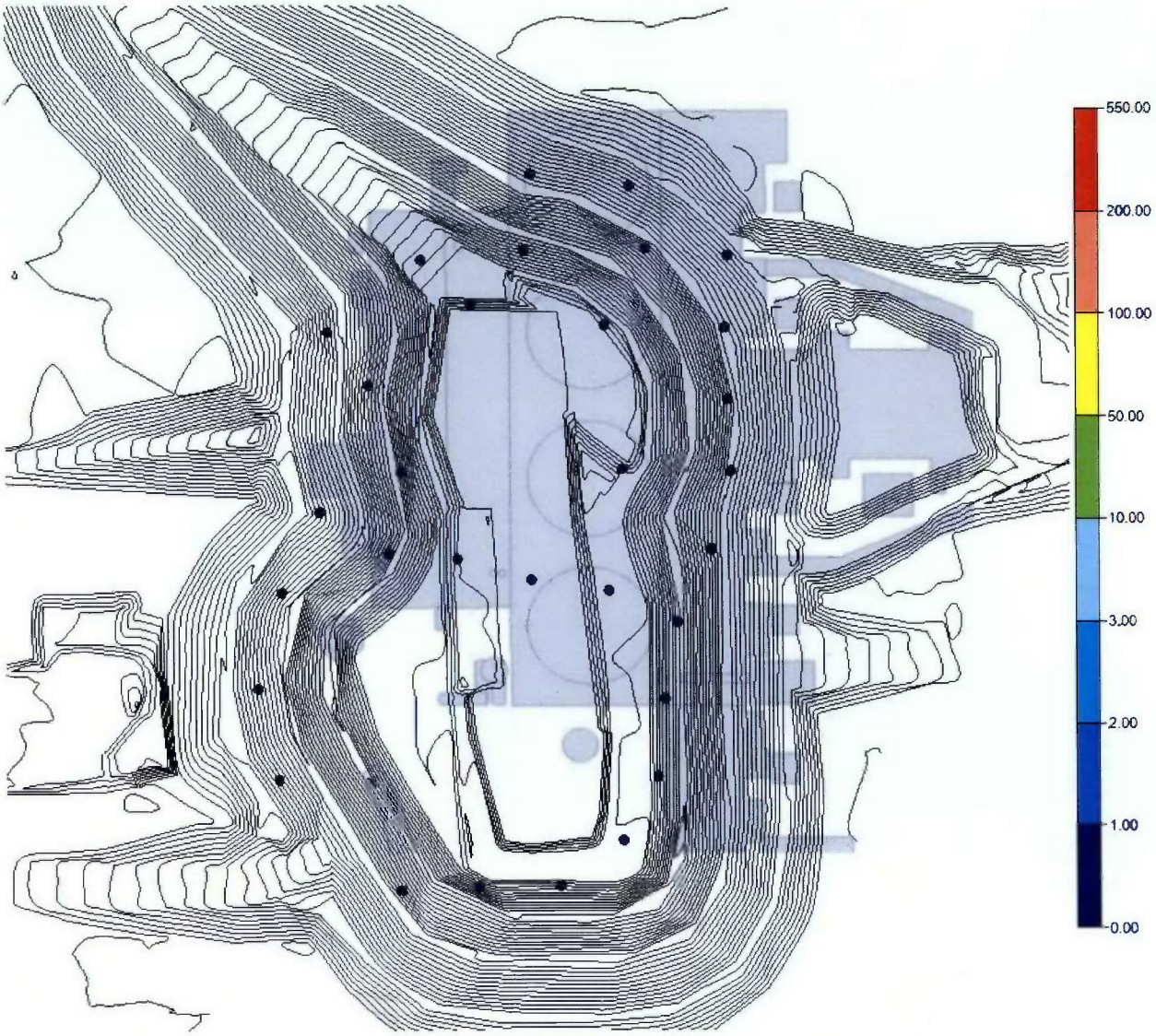
Sample Location	Sample Number	Sample Date	Lead			Magnesium			Manganese			Mercury			Nickel			Potassium		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Split of J15WB4	ECY 13	10/31/07	9.9		1.5	4400		100	310		1	0.033	U	0.033	8.0		2.0	580		100
Split of J15WC1	ECY 14	10/31/07	11		1.5	4900		98	320		0.98	0.097		0.032	9.6		2.0	770		98
Split of J19611	ECY 15	10/31/07	14		1.5	4500		99	310		0.99	0.47		0.034	9.5		2.0	900		99
Split of J15WD4	ECY 16	10/31/07	9.8		0.6	4600		100	250		1	0.037		0.034	11		2.0	1,100		100
Split of J15WF2[C]	ECY 17	10/31/07	12		1.5	4500		100	300		1	1.7		0.34	9.8		2.0	660		100

Sample Location	Sample Number	Sample Date	Selenium			Silver			Sodium			Thallium			Vanadium			Zinc		
			mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL	mg/kg	Q	PQL
Split of J15WB4	ECY 13	10/31/07	2.5	U	2.5	1	U	1	310		100	5	U	5	83		5	41		2
Split of J15WC1	ECY 14	10/31/07	2.5	U	2.5	0.98		0.98	330		98	4.9	U	4.9	81		4.9	45		2
Split of J19611	ECY 15	10/31/07	2.5	U	2.5	0.99	U	0.99	320		99	5	U	5	67		5	47		2
Split of J15WD4	ECY 16	10/31/07	0.50	U	0.50	1	U	1	270		100	2	U	2	41		1	37		2
Split of J15WF2[C]	ECY 17	10/31/07	2.5	U	2.5	1	U	1	230		100	5	U	5	79		5	43		2

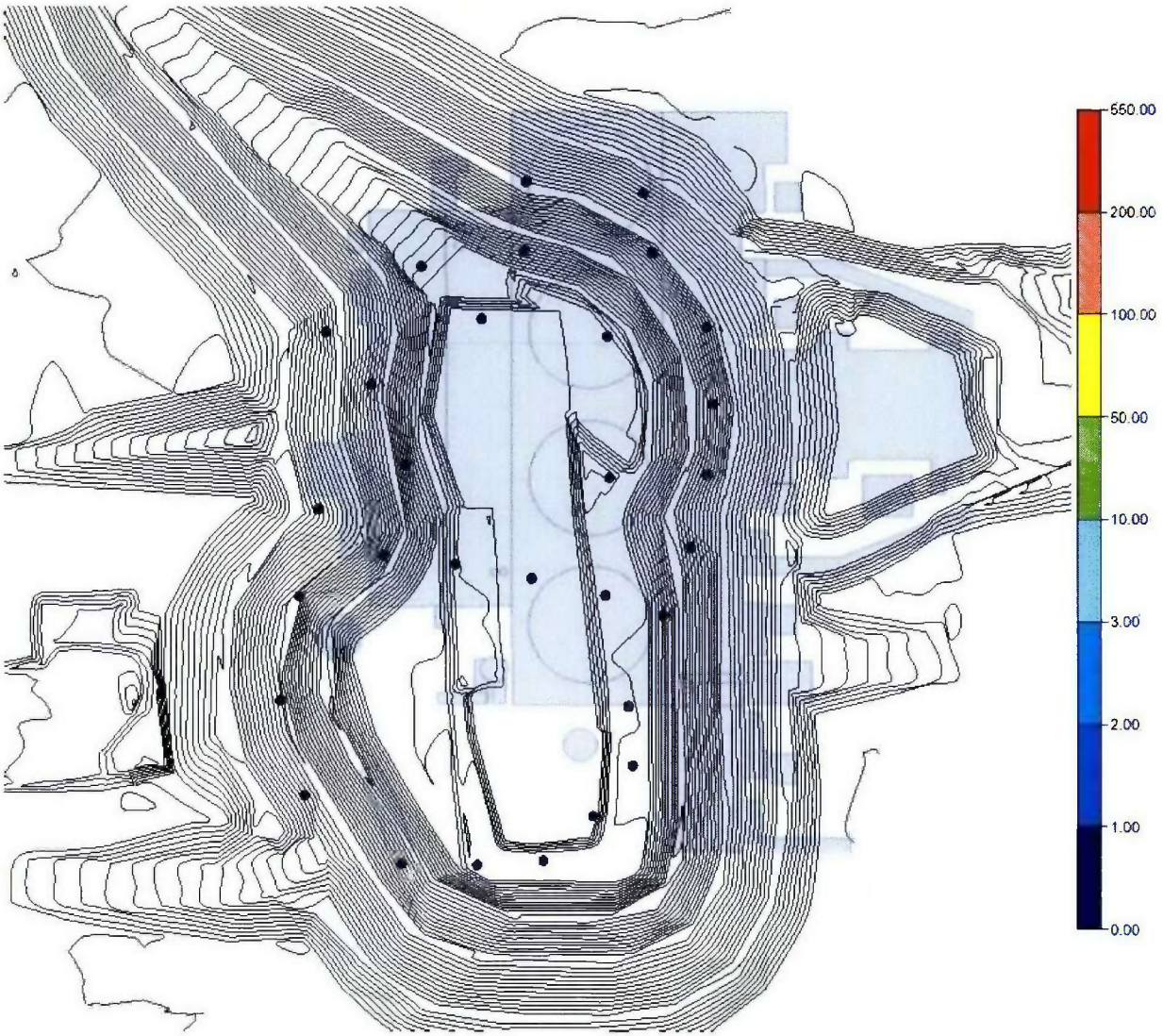
APPENDIX D

IN PROCESS GRIDDED SAMPLE DATA USED TO GUIDE EXCAVATION

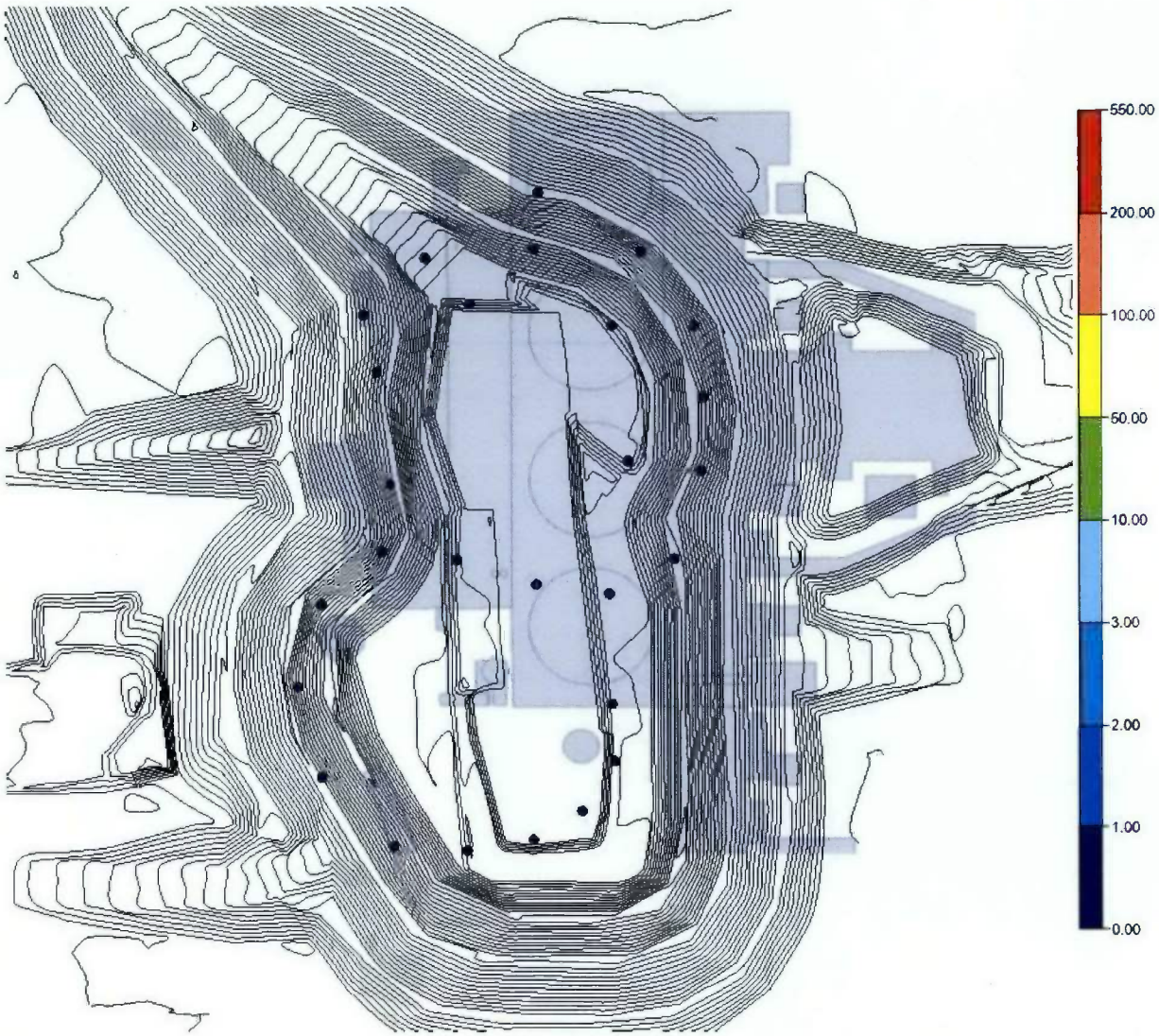
Hexavalent Chromium (mg/kg) - 25 Ft Depth



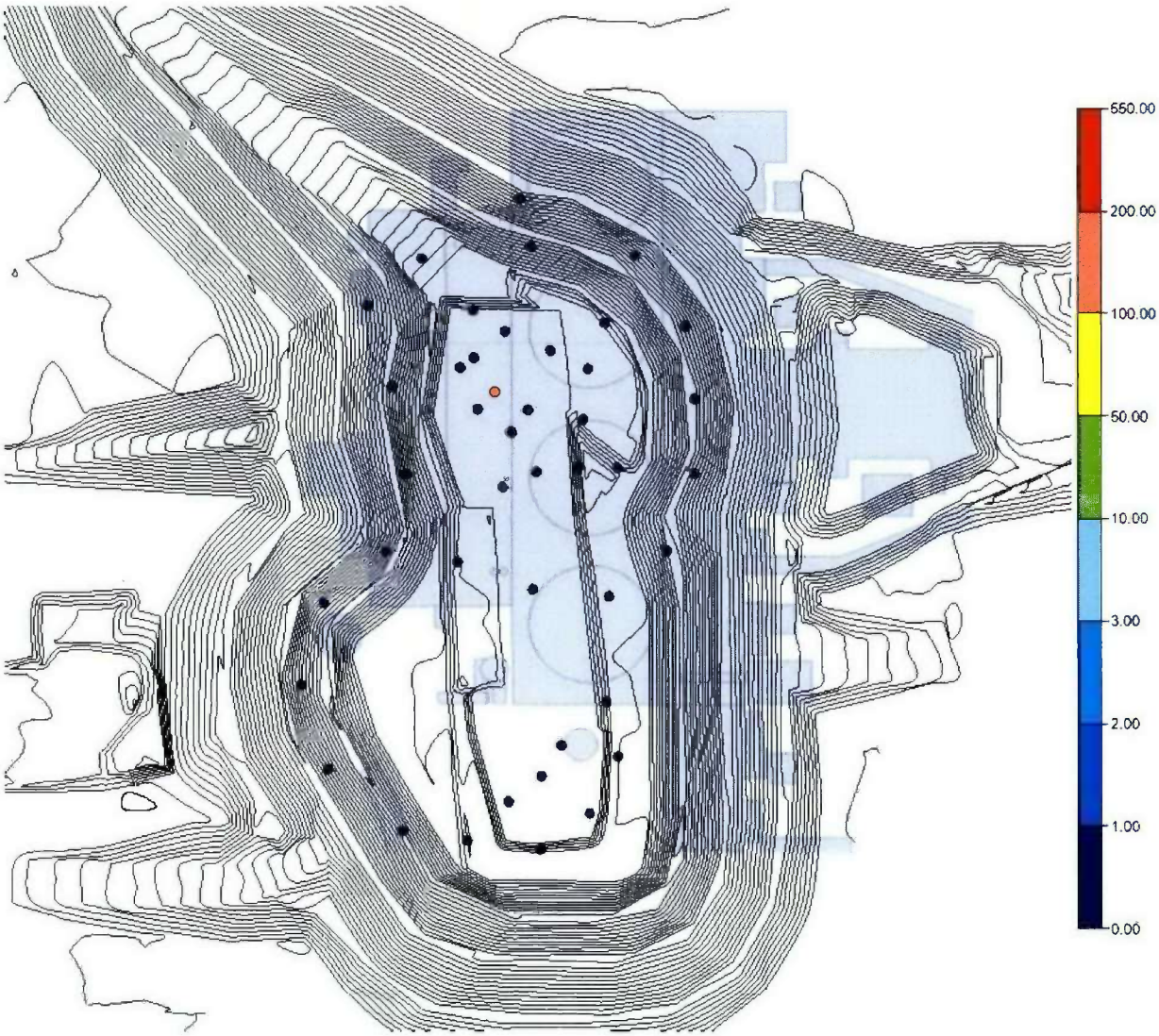
Hexavalent Chromium (mg/kg) - 30 Ft Depth



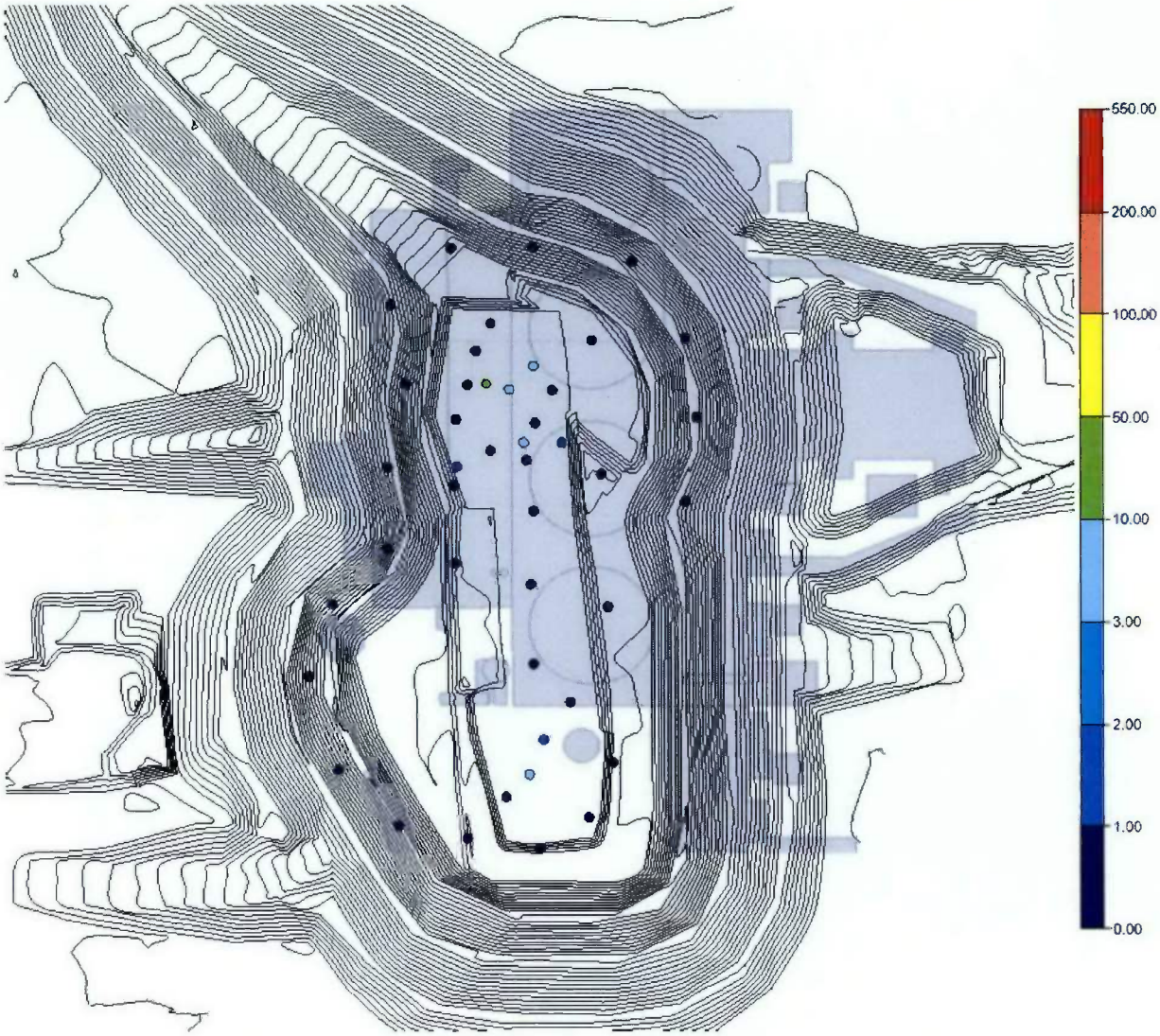
Hexavalent Chromium (mg/kg) – 35 Ft Depth



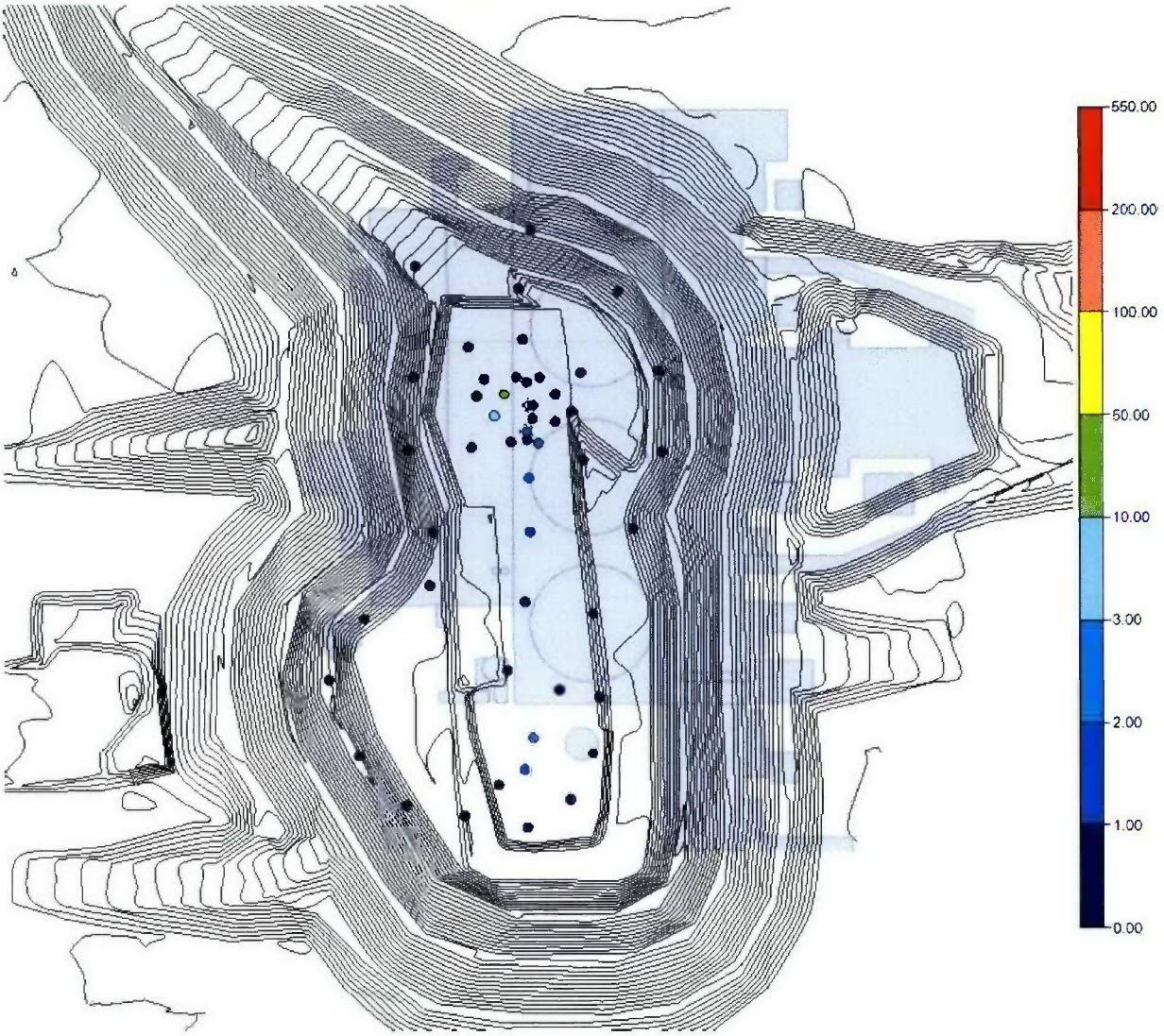
Hexavalent Chromium (mg/kg) - 40 Ft Depth



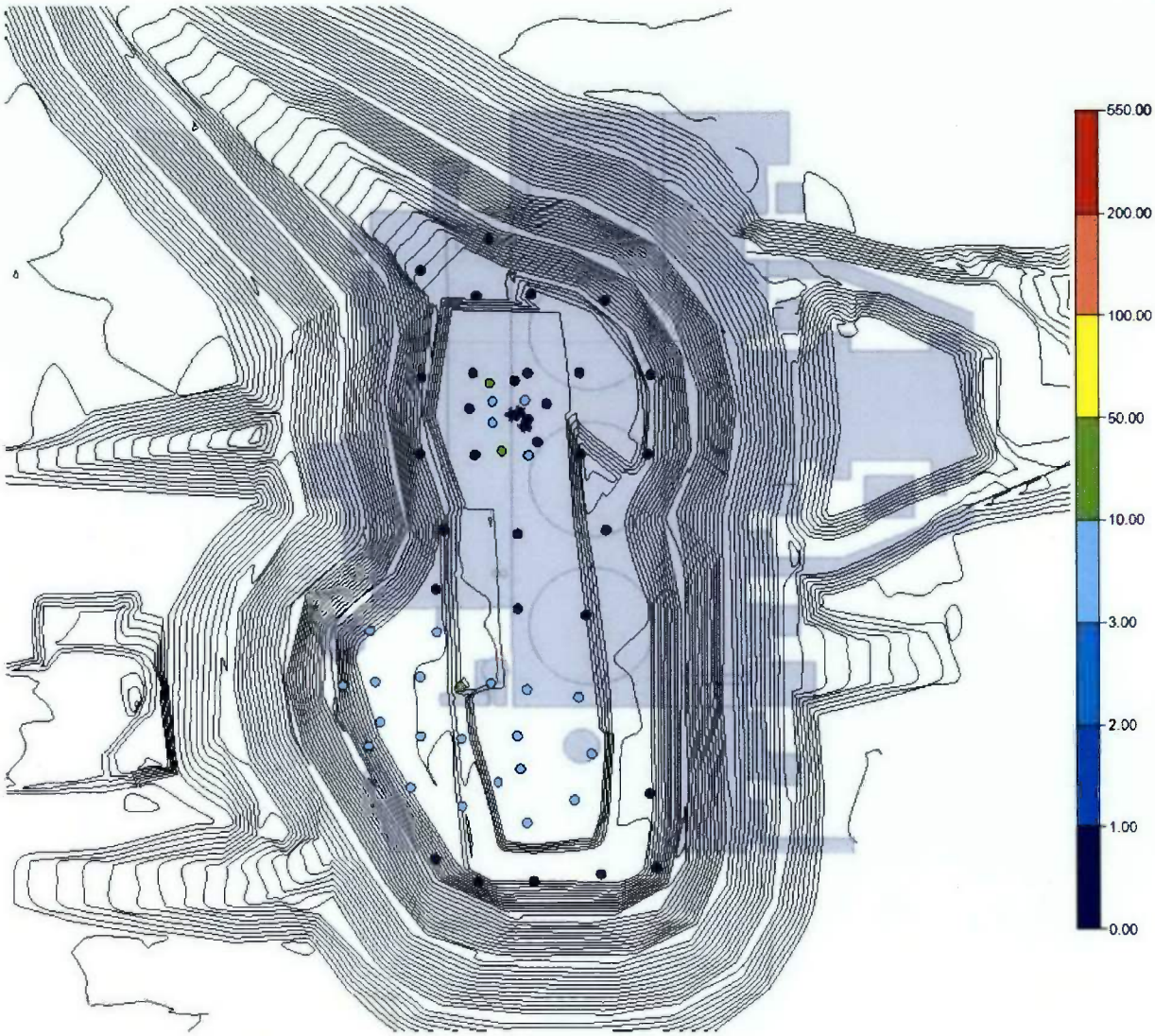
Hexavalent Chromium (mg/kg) - 45 Ft Depth



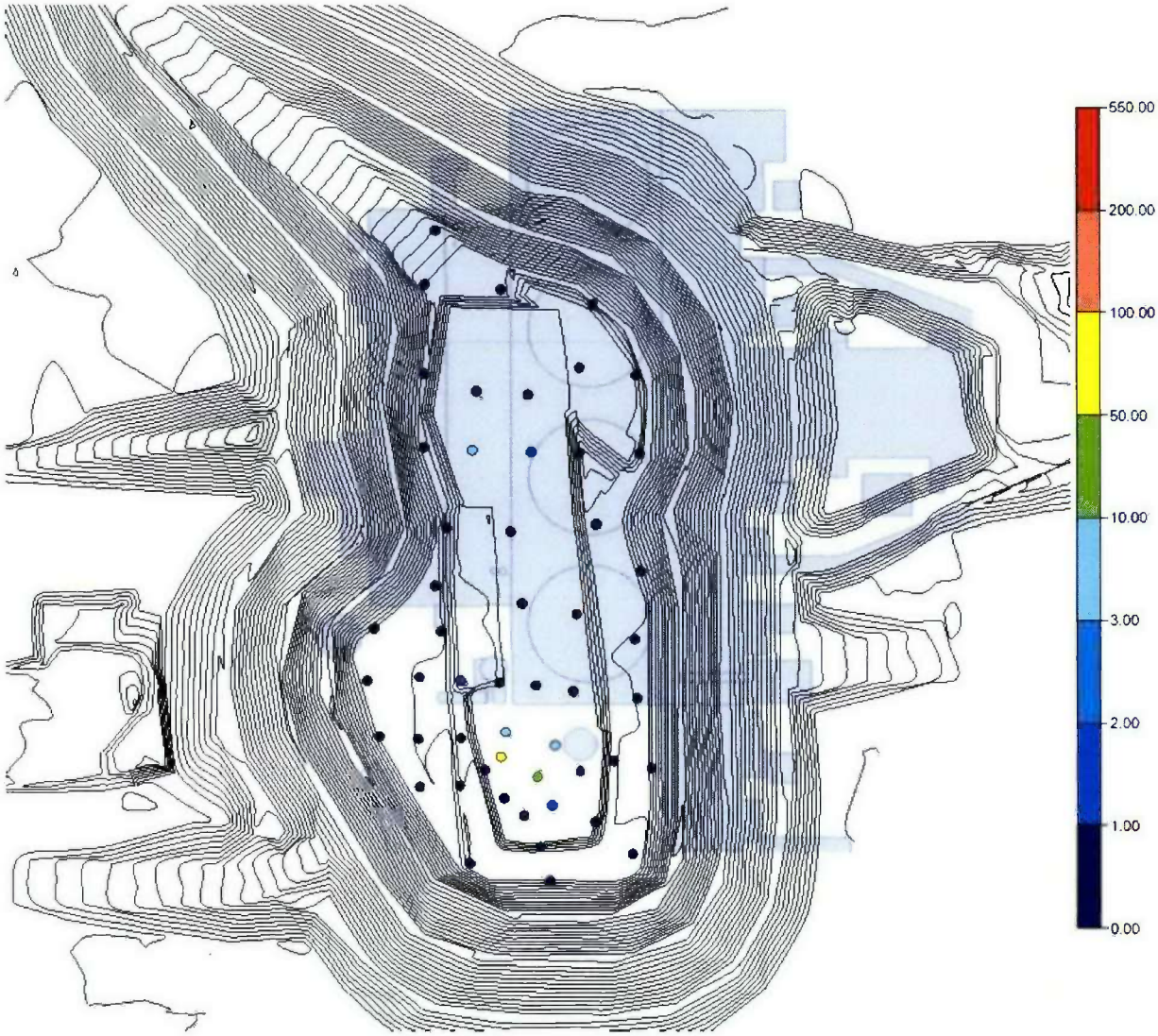
Hexavalent Chromium (mg/kg) - 50 Ft Depth



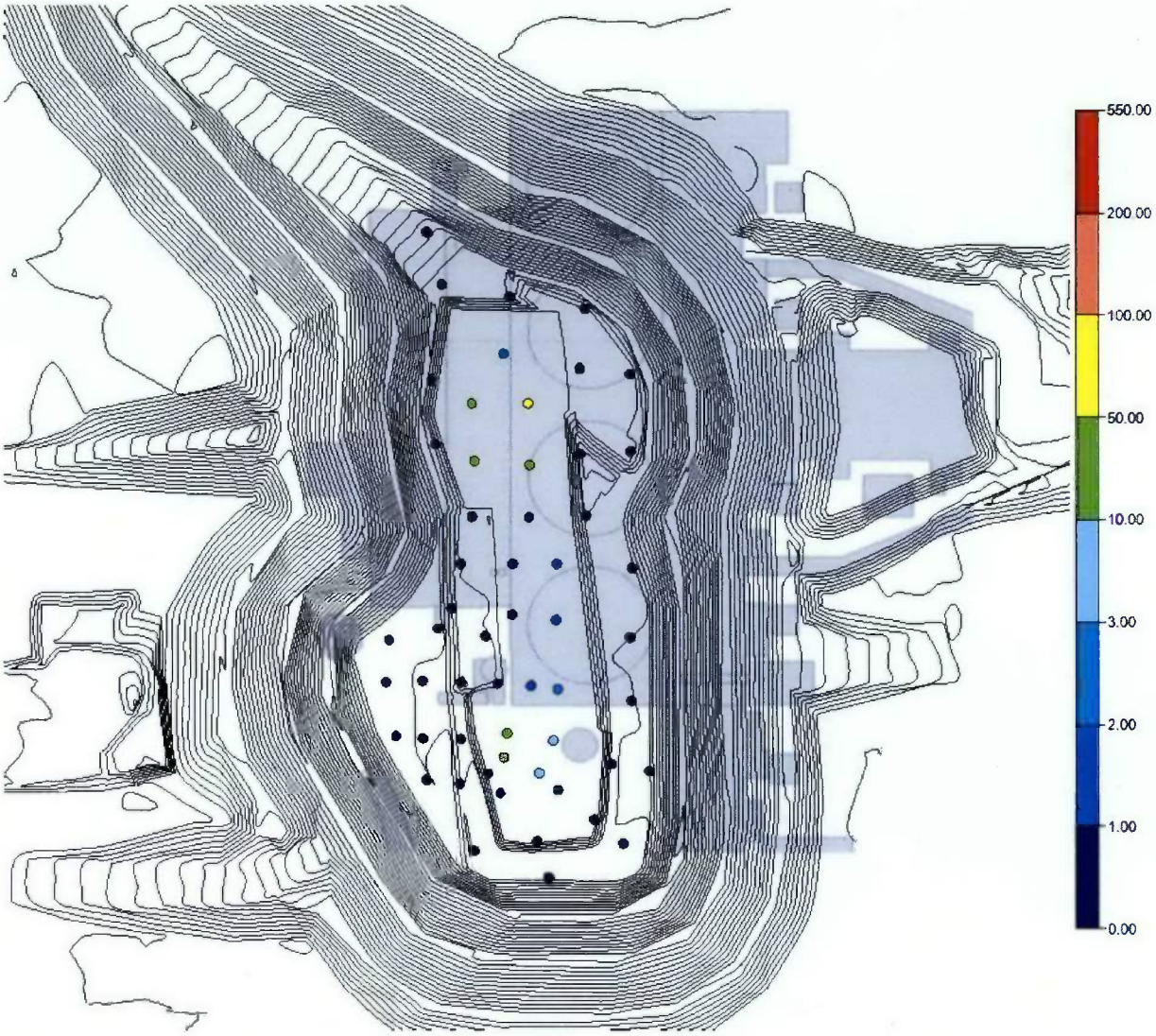
Hexavalent Chromium (mg/kg) - 55 Ft Depth



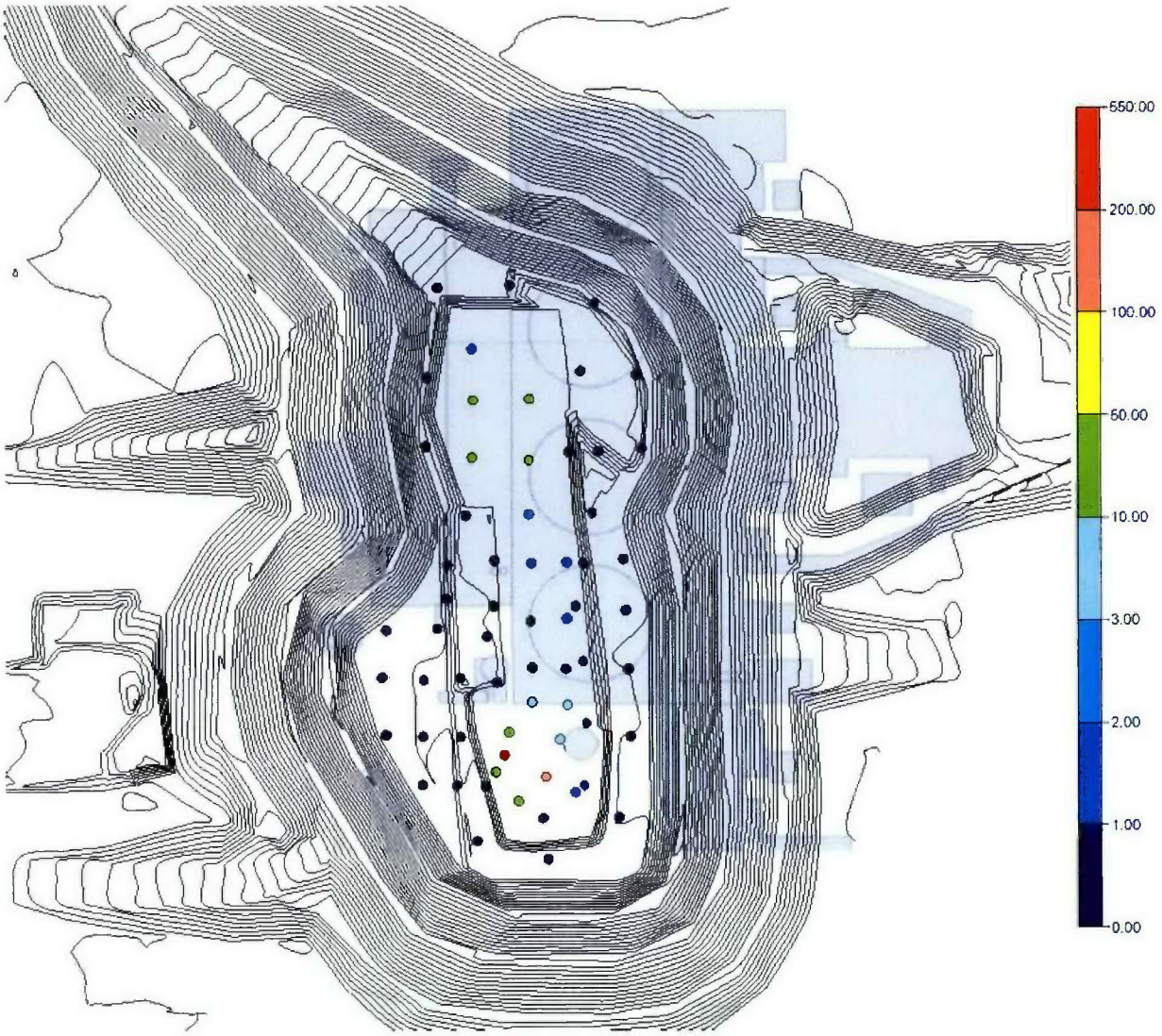
Hexavalent Chromium (mg/kg) - 60 Ft Depth



Hexavalent Chromium (mg/kg) - 65 Ft Depth



Hexavalent Chromium (mg/kg) - 70 Ft Depth



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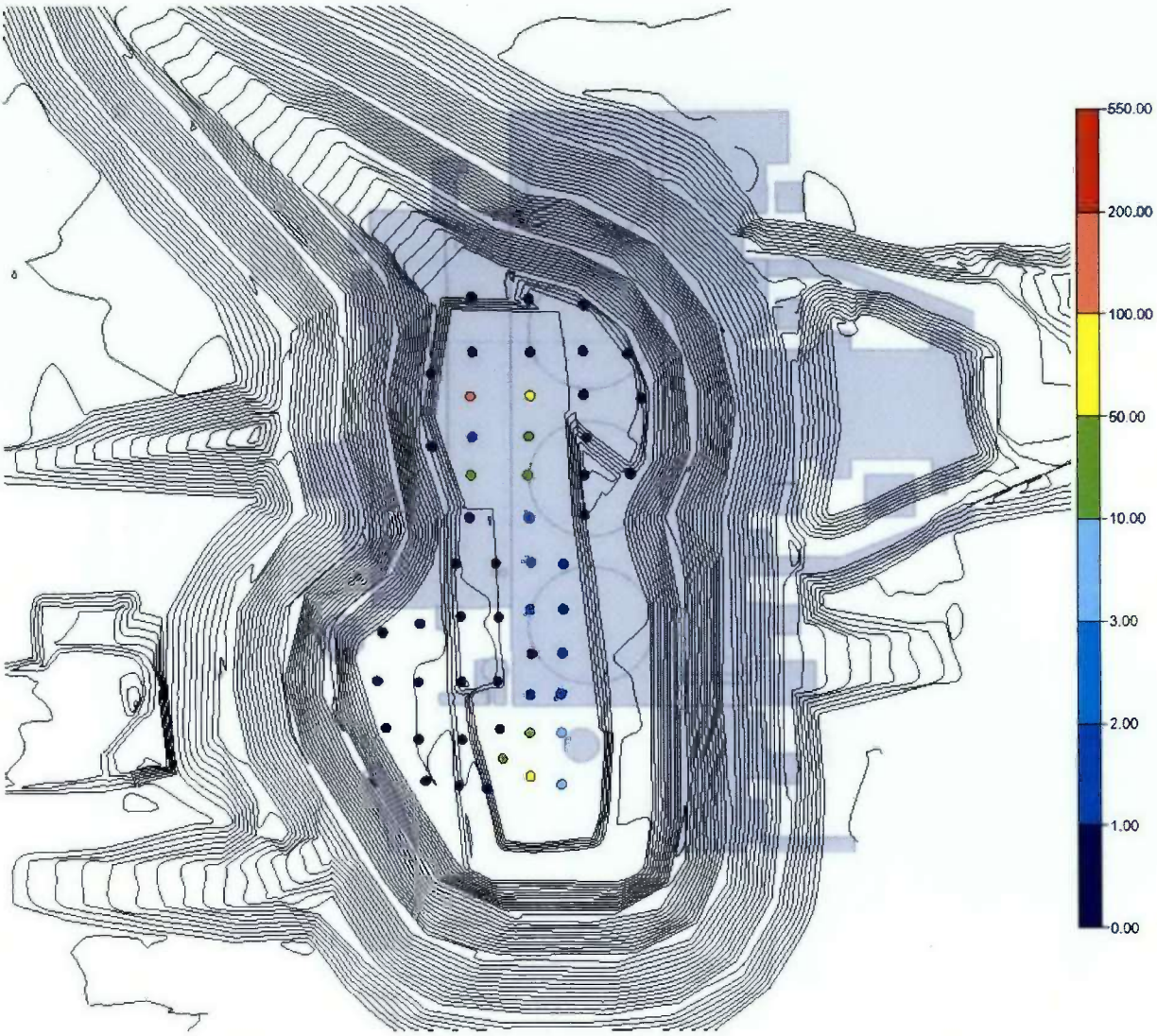

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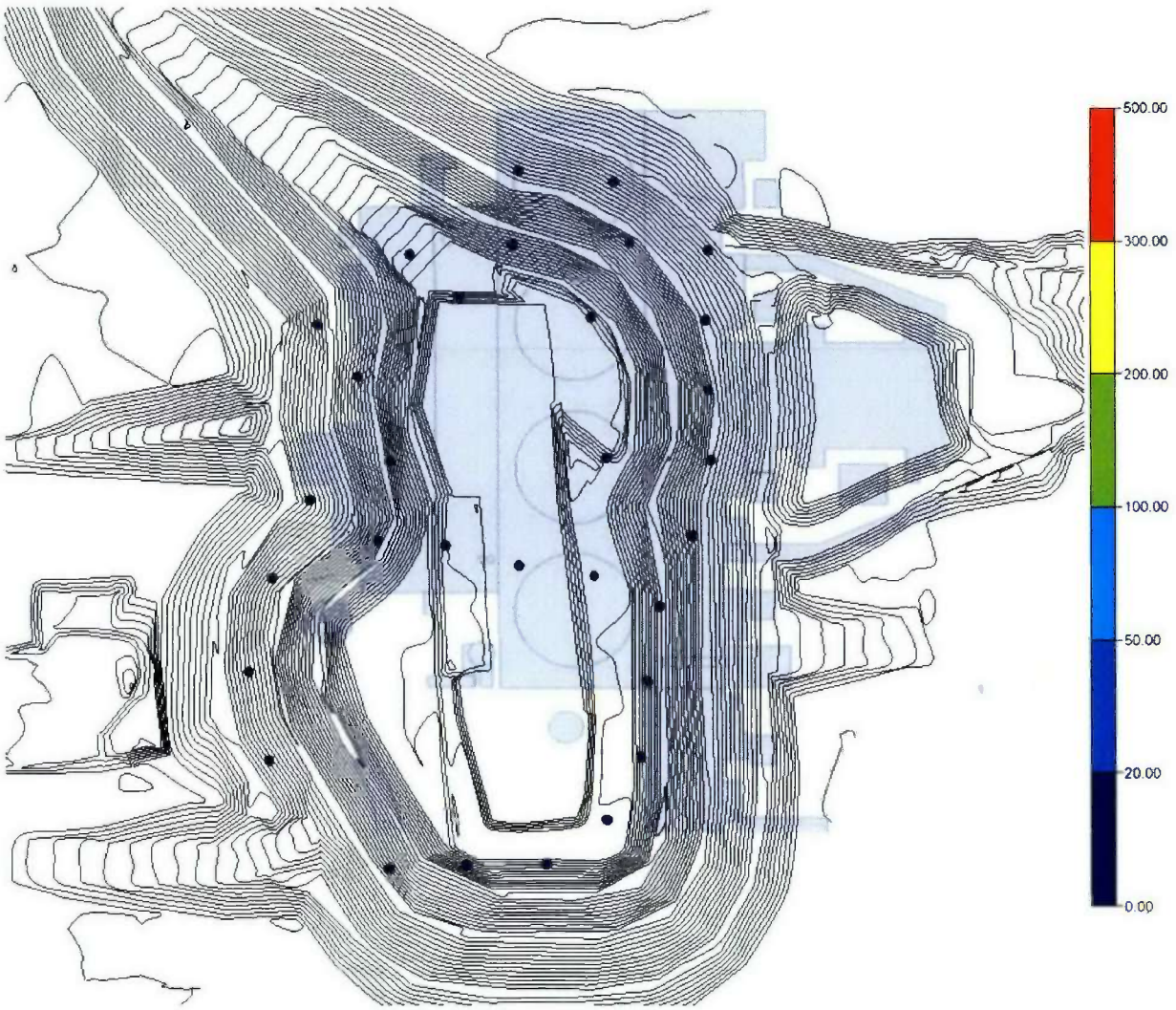

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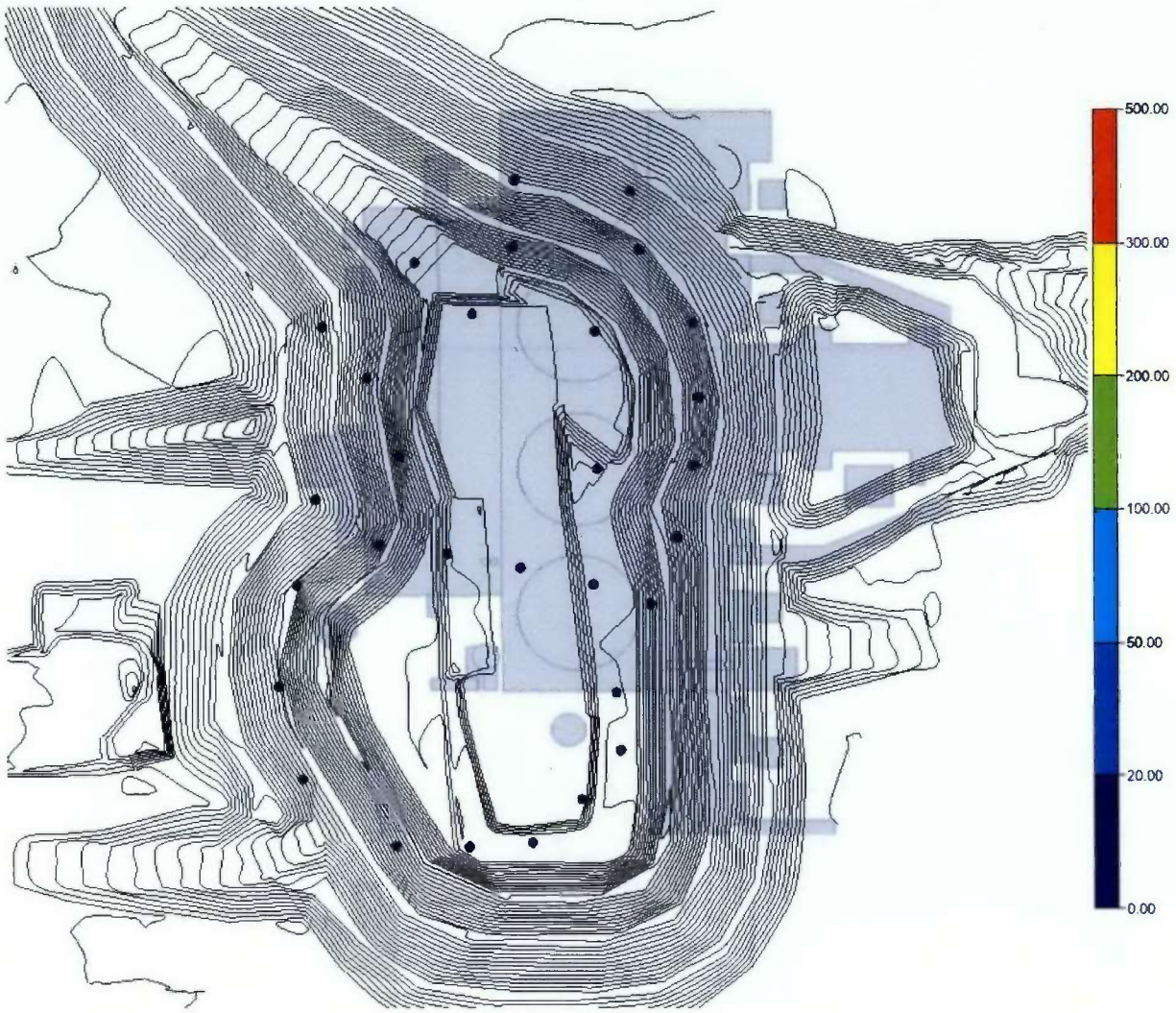

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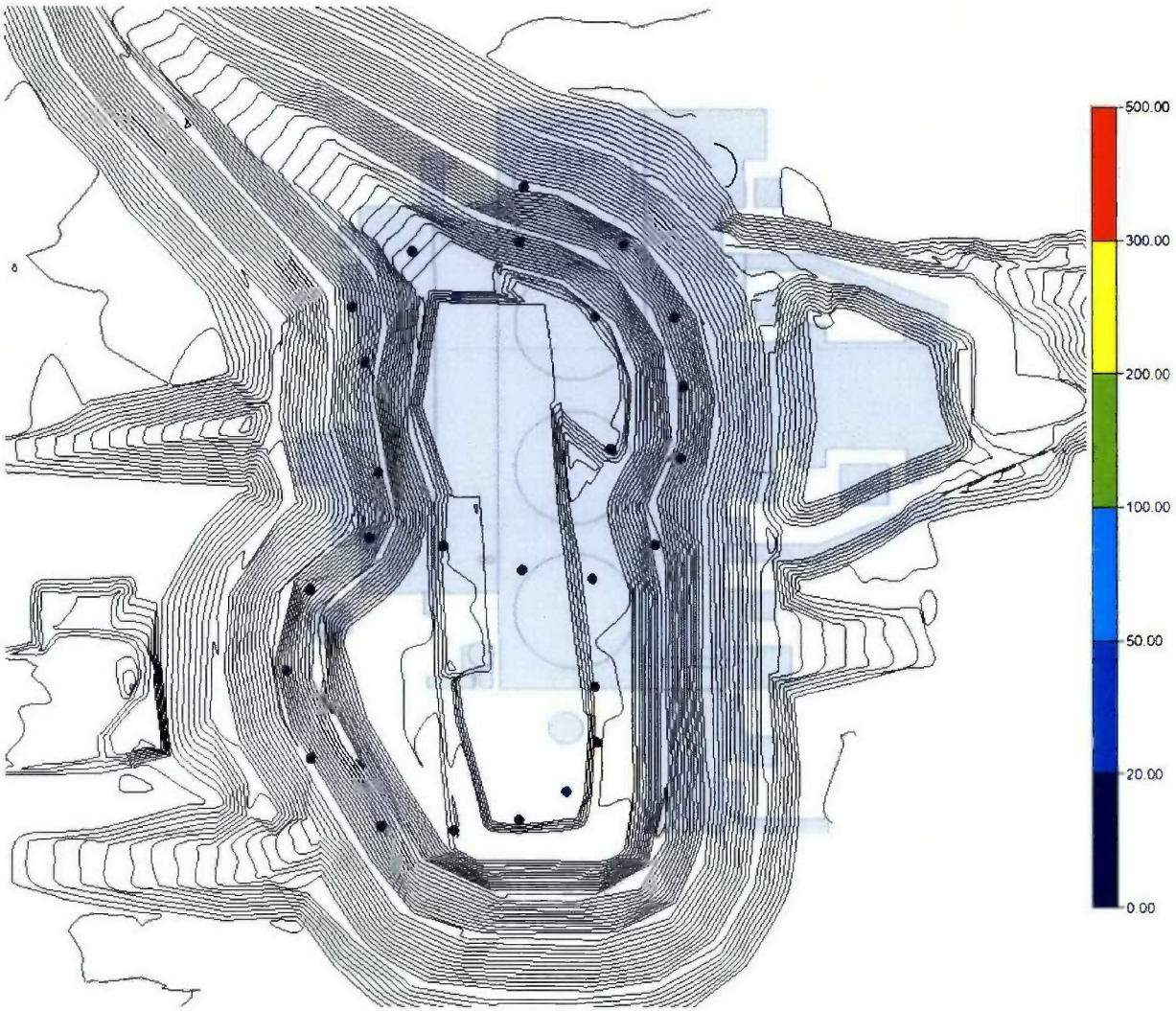
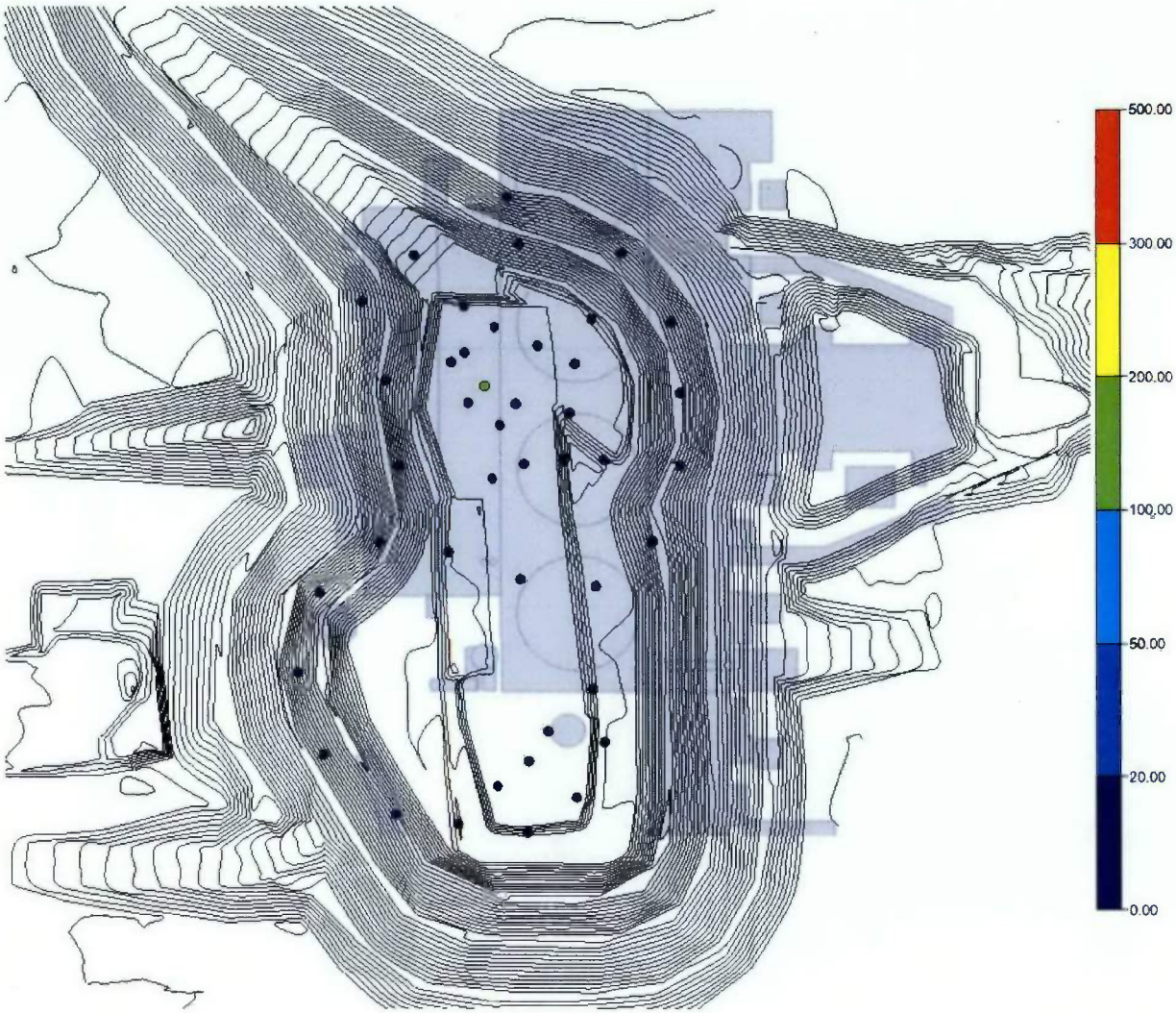


Total Chromium (mg/kg) - 40 Ft Depth



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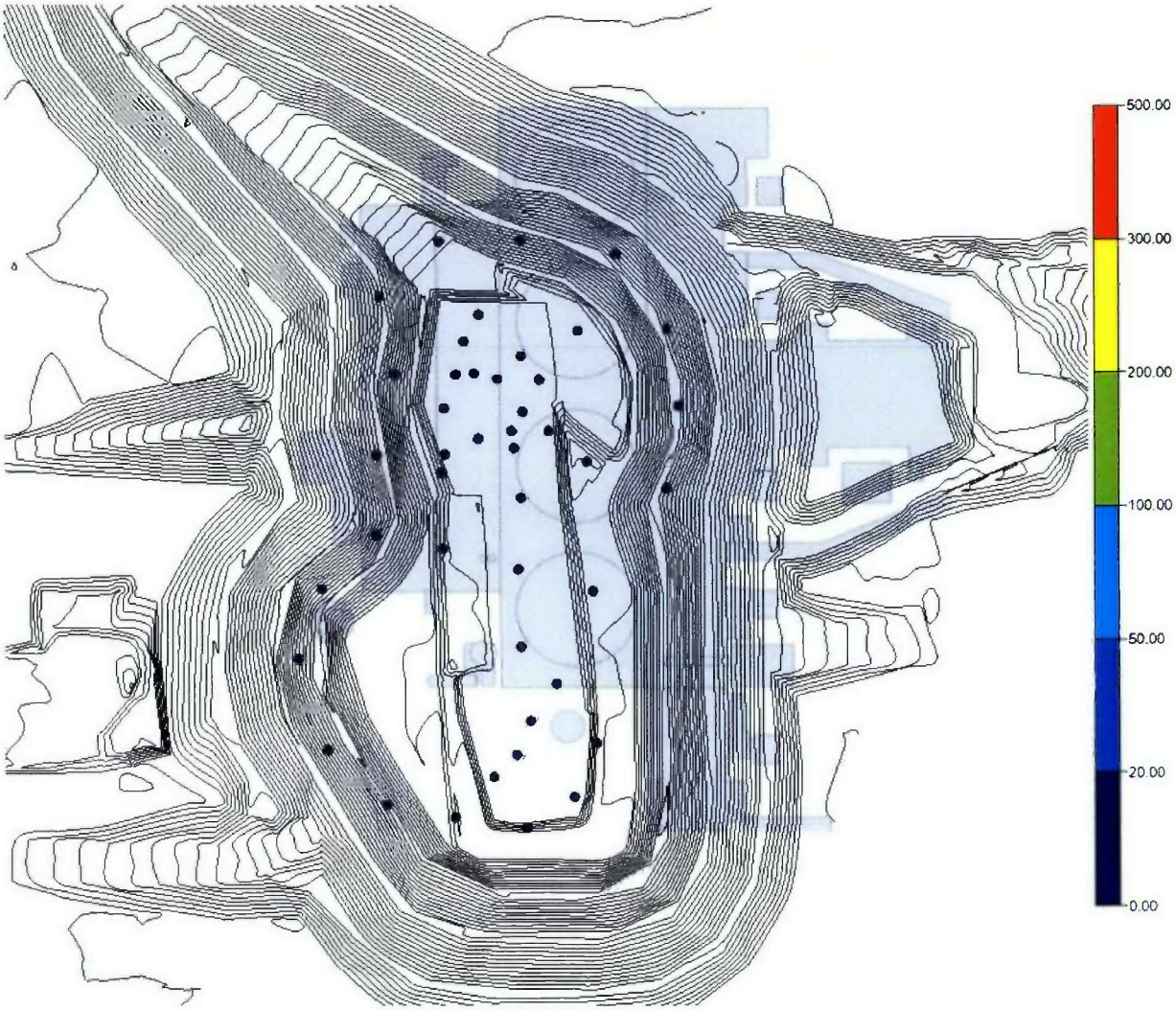
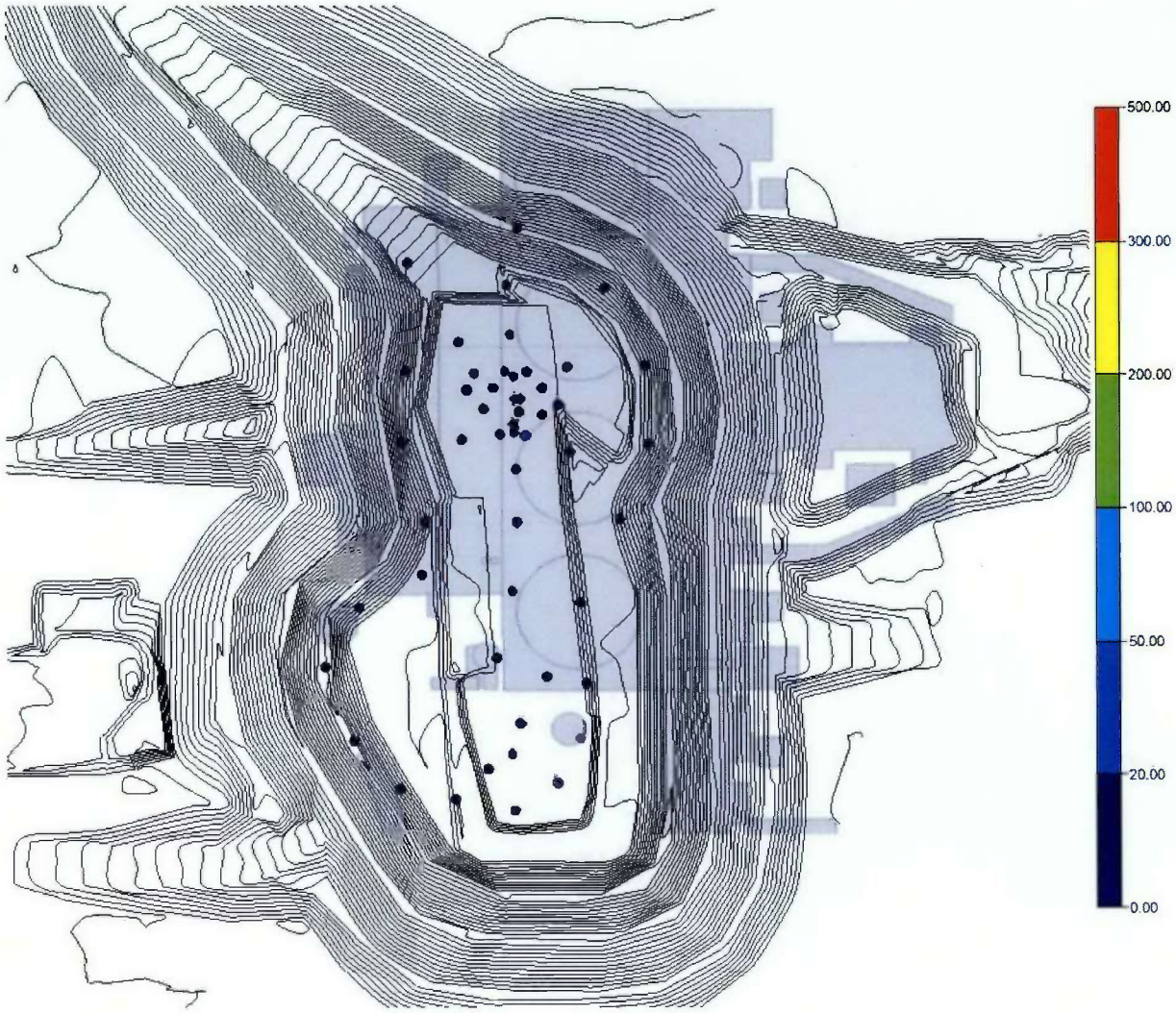


Total Chromium (mg/kg) - 50 Ft Depth



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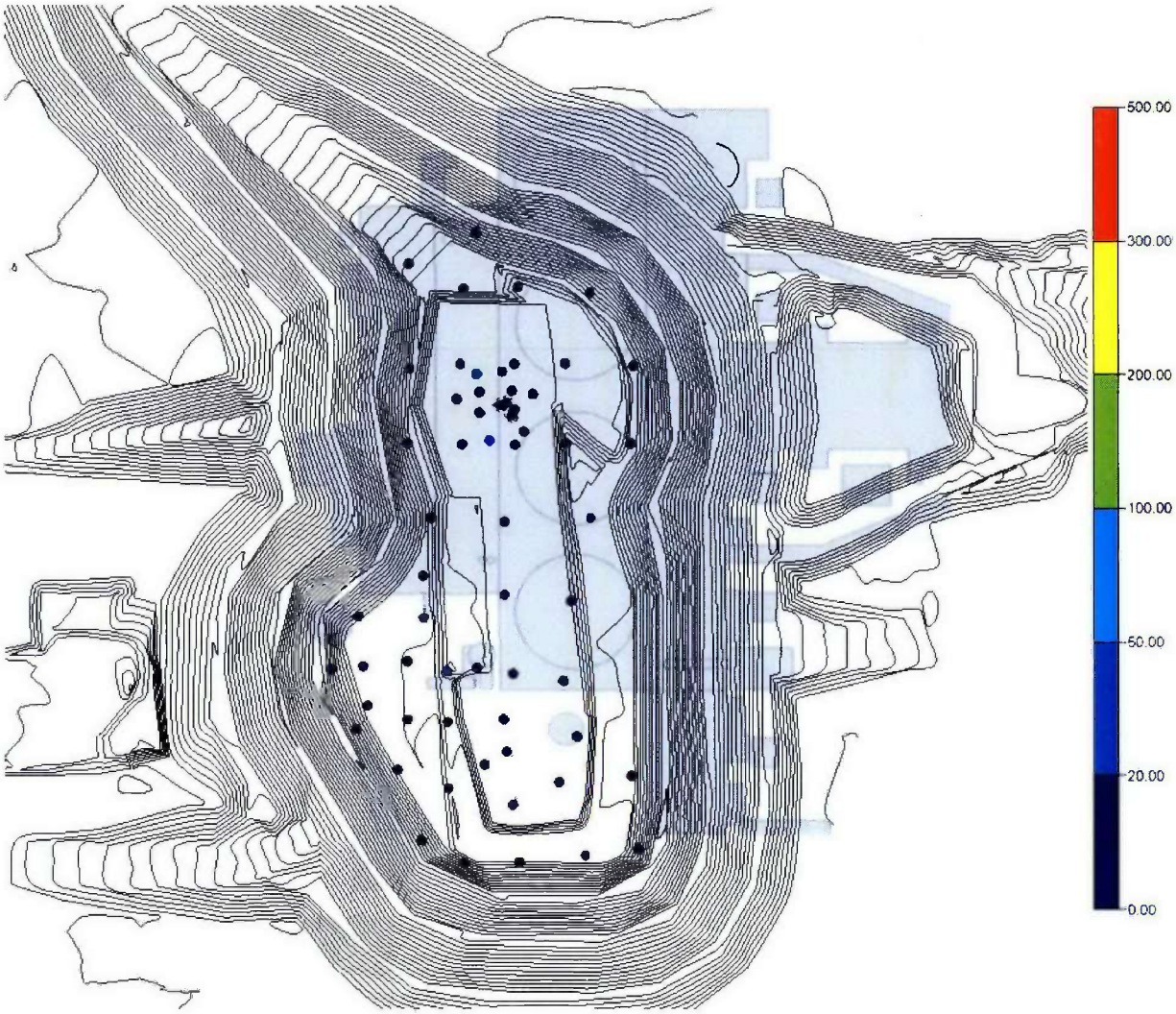

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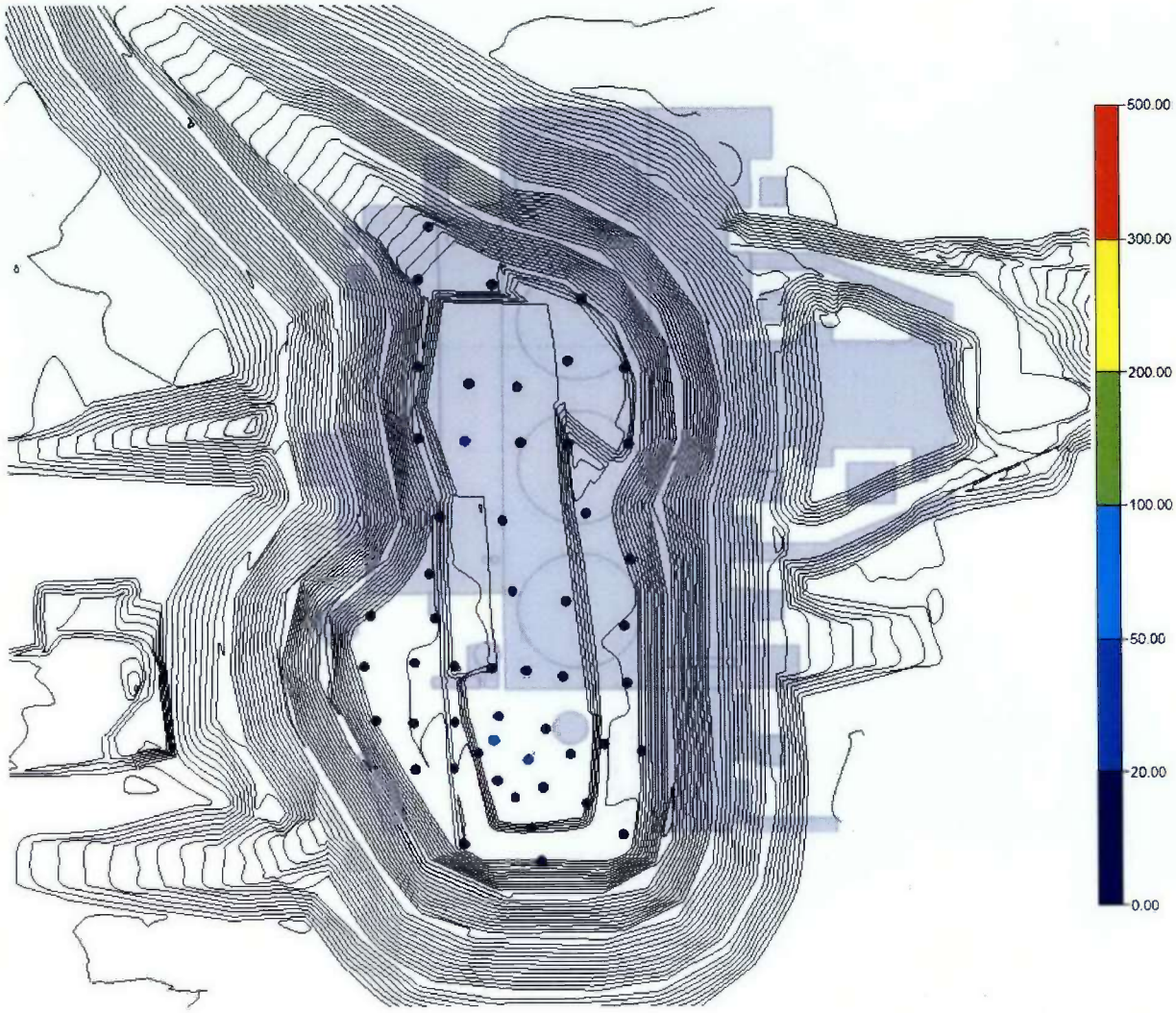
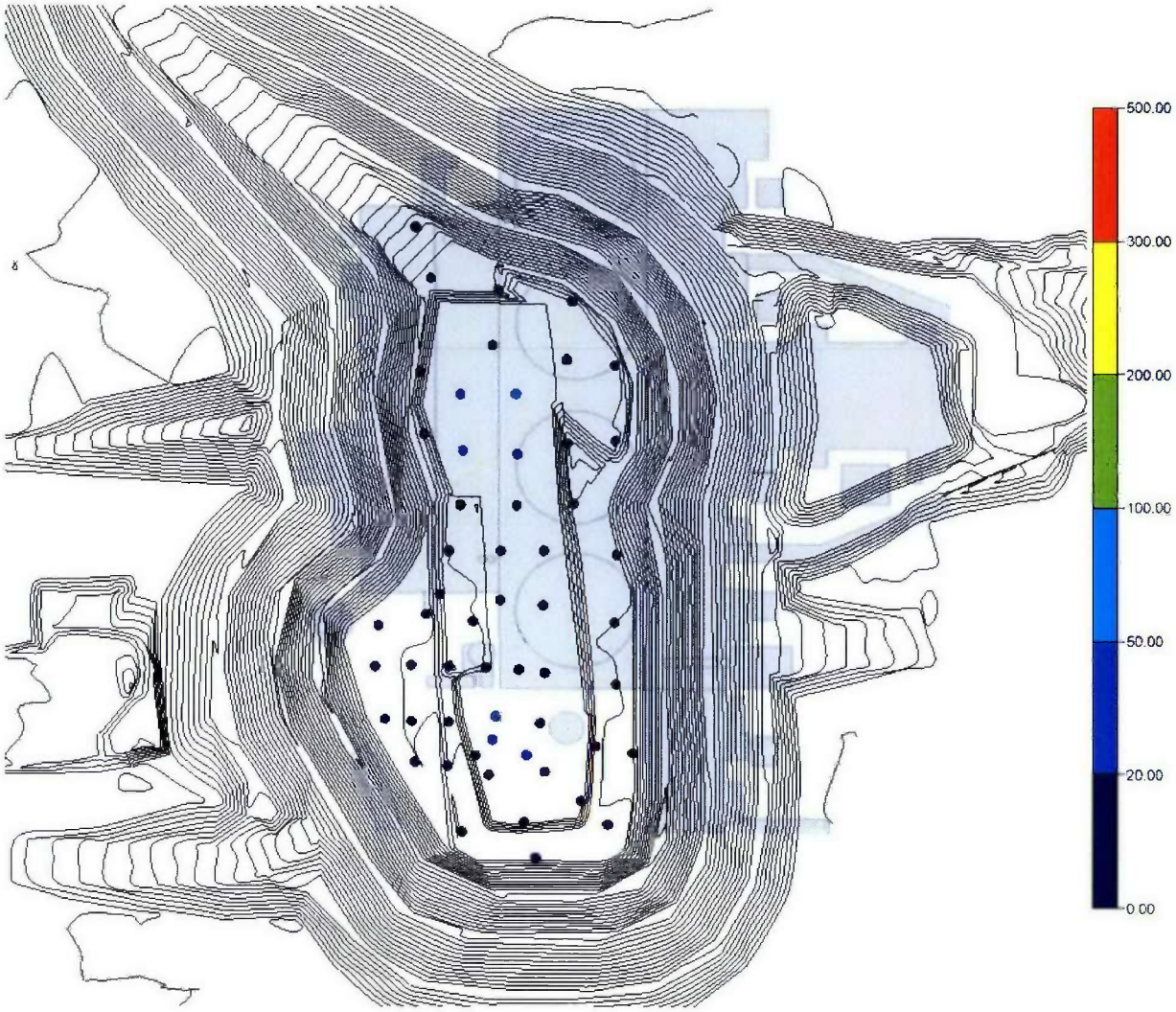
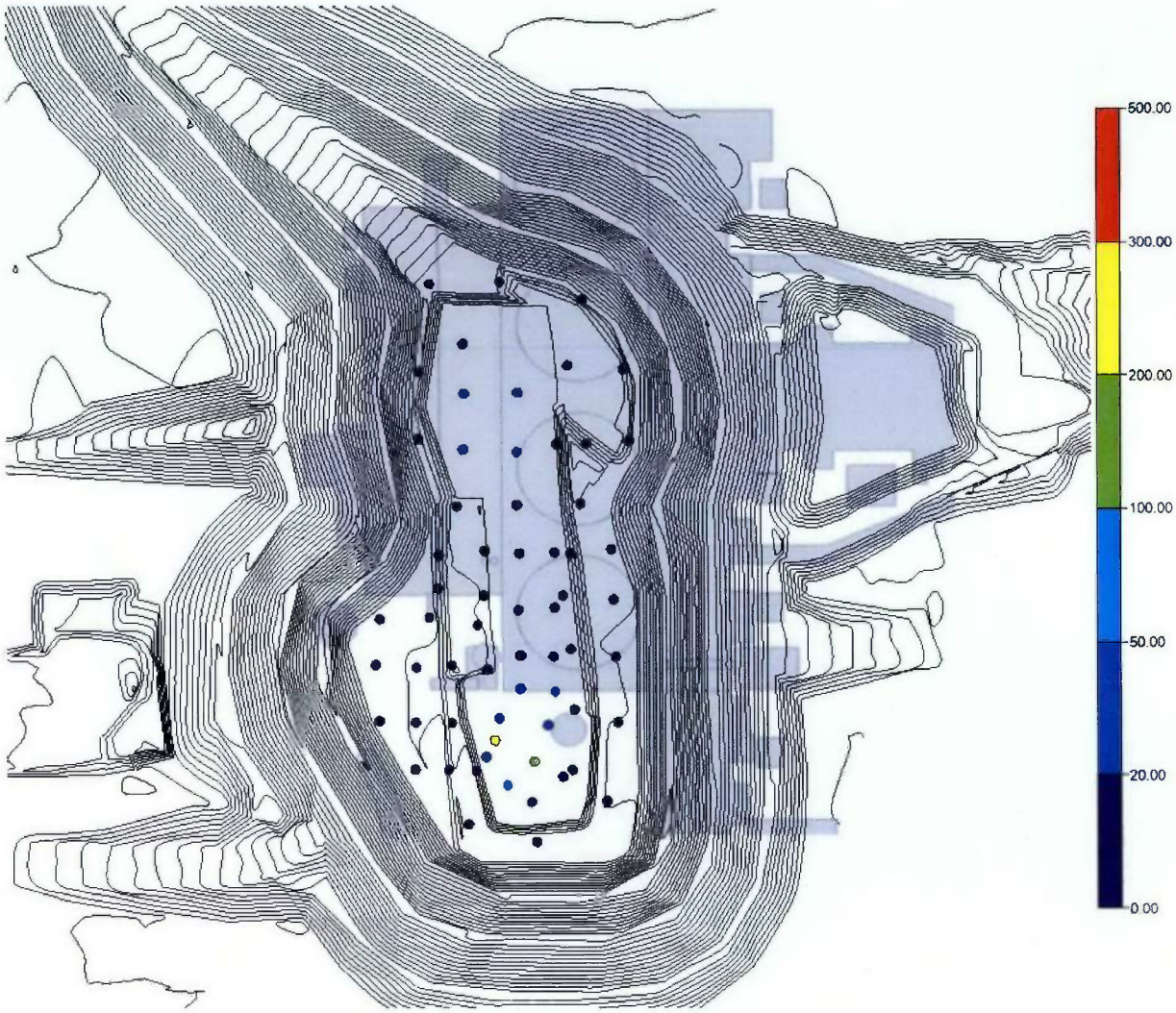


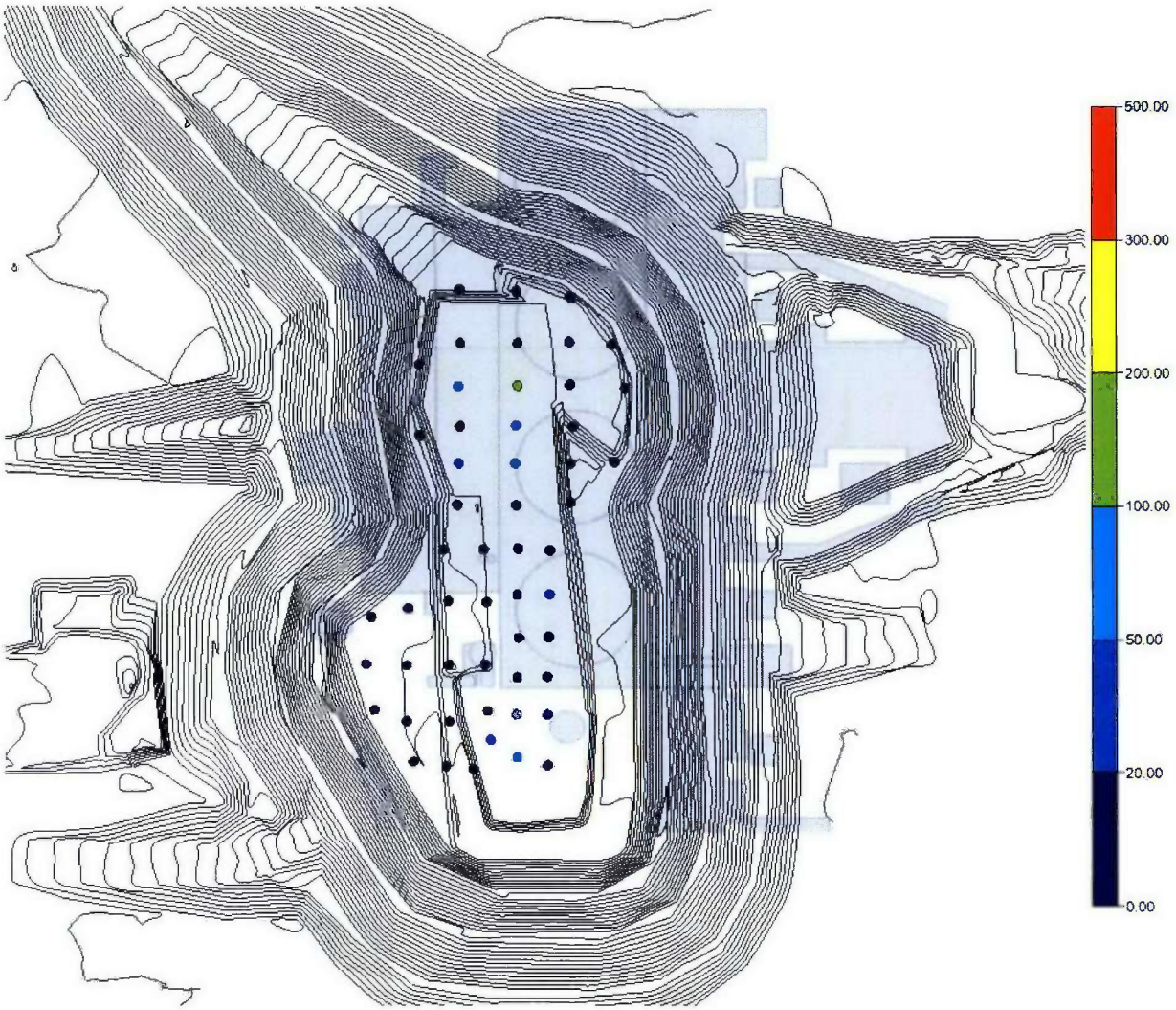
Total Chromium (mg/kg) - 65 Ft Depth



Total Chromium (mg/kg) - 70 Ft Depth



Total Chromium (mg/kg) - 75 Ft Depth



APPENDIX E

SITE GEOLOGY

APPENDIX E

VADOSE ZONE GEOLOGY AT THE 100-D-30/100-D-104 AND 100-D-100 WASTE SITES

This appendix provides a description of the geologic features observed during and post-excavation of the 100-D-30/100-D-104 and 100-D-100 waste sites which were excavations to groundwater to remove chromium contaminated soil. The 100-D-30/100-D-104 waste site excavation was approximately 160 m (525 ft) wide by 300 m (984 ft) long and up to 25 m (82 ft) deep. The 100-D-100 waste site excavation was approximately 200 m (656 ft) wide by 240 m (787) long and up to 25 m (82 ft deep), not including the additional 3 m (10 ft) of aquifer sediment removed below the water table at the 100-D-100 waste site. The stratigraphy consists of sediments of the Missoula floods that comprise the Hanford formation and the older Ringold Formation lacustrine and fluvial deposits associated with the ancestral Columbia River. The lithology of the Hanford formation is dominated sands and gravels that are largely unconsolidated and exhibit cross stratification and foreset beds. The sedimentary layers of the Ringold Formation are flat lying with inter-bedded sand, silt, and fine grained gravel. The general framework of the site geology was published by Lindsey and Jaeger (1993).

GEOLOGY OF THE 100-D-100 AND 100-D-30/100-D-104 EXCAVATIONS

Anthropogenic-Fill Material – Sand, gravel, and construction debris from Hanford operations (up to several meters) and minor surface disturbances from pre-Hanford agriculture activities.

Eolian Sand – Local accumulations of Holocene silty medium-to-fine sand commonly mixed with basalt granules and small pebbles commonly 15 to 60 cm thick. The eolian sand is tan in color due to the felsic-rich sediments (quartz and feldspar). The eolian sand has infiltrated over a meter into the Upper Gravel Unit.

Hanford Formation – Includes gravel- and sand-dominated deposits from Pleistocene cataclysmic glacial outburst floods and meltwater runoff. The Hanford formation in the 100-D-30/104 and 100-D-100 excavations is divided into four units based on lithofacies, gravel-clast composition, and stratigraphic position.

Upper Gravel Unit – Consists of channel-fill sandy gravel to silty sandy gravel. The gravel is clast supported, poorly sorted, loosely compacted, and dark gray in color. The gravel deposit is dominated by large-scale planar cross beds (Gp) and foreset beds that are several meters thick and extend across the 100-D-30/104 and 100-D-100 excavations. The cross beds and foreset beds provide preferential pathways for transport of hexavalent chromium contamination in the vadose zone along the dip of the bedding and provide a mechanism for both lateral and vertical migration of contamination. Other minor lithofacies in the Upper Gravel Unit include crude horizontal beds (Gh) and low-angle cross-beds (Gt) are present as shallow erosional channel fill near the top of the unit (e.g., east wall of the 100-D-100 excavation). Gravel clasts are pebble and cobble in size (90:10), subrounded to rounded in shape, and composed largely of basalt

(>80% based on pebble count) with minor contributions of granite, quartzite, volcanic porphyries, and other metamorphics. The gravel matrix is mainly very coarse-to-medium sand, but ranges from very coarse sand to mud (silt and clay). Sand grains are subrounded to subangular in shape. The composition of the sandy matrix is similar to the clast composition (i.e., very high in basalt). The finer fraction (finer than medium sand) is composed of quartzofeldspathic minerals with minor amounts of basalt. Locally, the gravel has an open-framework fabric. Thin coatings of calcium carbonate formed on the underside of gravel clasts in the upper meter of the Upper Gravel Unit in areas beneath native soils. The upper bounding surface with the native eolian soil is sharp and distinct due to color and grain size contrast. The lower bounding surface is sharp with an erosional surface scoured into the Black Sand Unit. Paleocurrent analysis of cross bedding and bedform accretion directions indicate an easterly flow of outburst floods. The Upper Gravel Unit was deposited by a single cataclysmic outburst flood followed by minor channeling and channel filling.

Black Sand Unit – Forms a series of channel-fill gravelly sand to granule deposits. The unit is moderately well sorted, loosely compacted, and dark gray in color. Lithofacies include horizontally laminated beds (Sh), low- angle cross beds (Sl), and high-angle planar cross beds (Sp). Several gravelly sand/granule beds are continuous across the excavations, but most beds have short lateral extents due to erosional truncations. Sand beds range in size from very coarse-to-coarse sand to granules. Grains are subrounded to subangular in shape and composed primarily of basalt fragments (estimated to be greater than 80%). The mud (silt and clay) fraction makes up less than 10% of the unit and is mainly felsic (quartz and feldspar) with lesser amounts of basalt. Beds commonly are normally graded, often with a thin basal layer (one to two pebbles thick) of gravel. Interbedded with the gravelly sand/granule beds are thin stringers of fine sand or gravel. The stringers are less than 30 cm thick. The upper and lower bounding surfaces are sharp. The Black Sand Unit was deposited by glaciofluvial floodwater/meltwater with a high bedload and rapidly shifting channels that eroded channel bars and subsequently aggraded sediments by lateral, downstream, and vertical accretion. Paleocurrent analysis indicates a general easterly to southeasterly flow direction of glaciofluvial floodwater/meltwater runoff.

Middle Gravel Unit – Consists of sandy gravel to silty sandy gravel that has similar textural, compositional and lithofacies characteristics as the Upper Gravel Unit. The Middle Gravel Unit forms a 2.5 m thick lense within the Black Sand Unit along the south wall of the 100-D-30/104 excavation. The unit is not observed in the 100-D-100 excavation. The upper and lower bounding surfaces are sharp and distinct. The Middle Gravel Unit is a channel-fill deposit in a channel scoured into the Black Sand Unit and subsequently filled with high-energy coarse basaltic gravel during a falling hydrograph. The deposit is likely derived from a river flood event or a high elevation channel filling during a small-scale glaciofluvial outburst-flood event.

Lower Gravel Unit – Is sandy gravel that occurs as two distinct lateral facies; (1) a felsic facies that is present in the 100-D-30/104 excavation and northern portion of the 100-D-100 excavation and (2) a basalt (mafic) facies that occurs in the southern part of the 100-D-100 excavation. The lateral transition between the two facies is gradational and occurs over tens of meters.

The felsic facies is moderately well sorted, loosely compacted, and light colored. The unit consists of low-angle (Gt) and high-angle planar (Gp) cross-bed lithofacies. The gravel is predominantly quartzite and basalt with lesser contributions of granite, volcanic porphryries and other metamorphics. The clasts are pebble to cobble in size, rounded to subrounded in shape, and show little evidence of weathering (absence of weathering rinds, significant staining, or cementation). The matrix is coarse-to-medium sand and is composed of 80 percent felsic (quartzofeldspathic) and 20 percent basalt grains. In the 100-D-100 excavation the lower part of the gravel contains abundant concretions (sand cemented calcium carbonate) and rip-up clasts scattered throughout. The concretions are irregular in shape, loose and slightly abraded indicating that the compact masses formed as a precipitate in another sediment body and were entrained, transported and deposited along with the sandy gravel to form the Lower Gravel Unit.

The basalt (mafic) facies is poorly sorted, loosely compacted, and dark colored. The main lithofacies includes high-angle planar cross beds (Gp), crude horizontal beds (Gh) and low-angle cross beds (Gt) The gravel composition is dominated by basalt clasts with only minor contributions from other rock types. The gravel has a broad range of clast sizes including cobbles, pebbles, and granules. The clasts are rounded to subangular in shape with fresh abraded surfaces. The matrix is predominantly very coarse-to-medium sand that is composed chiefly of basalt. The fine fraction of the matrix (very fine sand and silt) constitutes a few percent by weight and is largely quartzofeldspathic. Concretions that occur in the felsic facies of the Lower Gravel Unit have not been observed in the basalt facies.

The Lower Gravel Unit is a glaciofluvial deposit from outburst flooding down the Columbia River Valley. The flood deposits are derived from two primary sources: (1) local upstream bank erosion of Ringold channel deposits based on presence of abundant Ringold gravel/sand and intact concretions that were mixed with basaltic sand, (2) basaltic debris eroded from the Columbia Plateau upstream of the excavations. The age of the Lower Gravel Unit is likely pre-Wisconsin based on Stage I to II caliche capping sandy gravel beneath basaltic sand encountered 12 m (40 ft) beneath the 118-D-1 Burial Ground.

Ringold Formation – Includes sedimentary deposits of Mio-Pliocene age that originated from fluvial and lacustrine processes along with secondary surficial processes that acted across basins of the central Columbia Plateau. The Ringold Formation at the 100-D-30/100-D-104 and 100-D-100 excavations is divided into two units based on sediment texture: the Interbedded Sand and Gravel Unit and the Mud Unit. The description of the coarse-grained unit is based on field observations and measurements of excavation walls and descriptions of samples from four boreholes drilled into the floor of the 100-D-100 excavation (CHPRC 2015). The Mud Unit descriptions are based on samples collected from boreholes in the central 100-D Area.

<u>Interbedded Sand and Gravel Unit (RE)</u> – The unit includes multistory stacked beds of sandy gravel and sand/silty sand. Sandy gravel beds are clast supported, moderately well sorted, poorly consolidated to loosely compacted. The unit is lighter in color than stratigraphic units of the Hanford Formation. The lighter color is due to (1) the abundance of acidic volcanic and quartzite gravel clasts and (2) the presence of a light-colored, felsic-rich sand matrix. Lithofacies observed in the Interbedded Sand and Gravel Unit include massive gravel (Gms), crude horizontal bedding (Gh), massive sand (Sm), horizontal-laminated sand (Sh), and low-angle

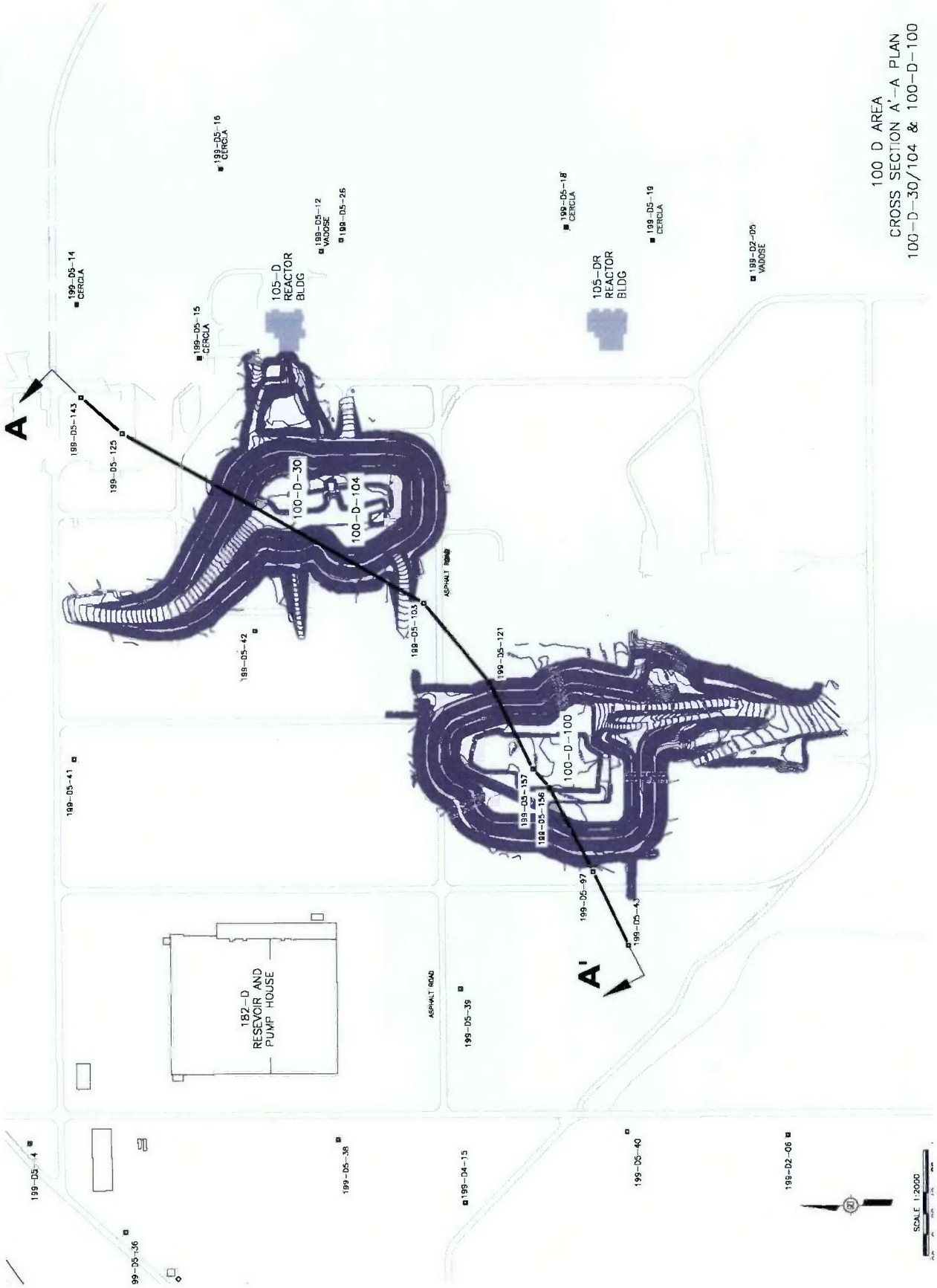
cross beds (St). Gravel deposits are bimodal in texture with a pebble-to-cobble coarse fraction and a sand matrix that is typically coarse to fine grained. Gravel composition is mainly basalt, granite, and quartzite with lesser volcanic porphyries, other metamorphic and sedimentary rocks. Some beds are normally graded from a basal pebbly (granules) coarse-to-fine sand upward to silty coarse-to-fine sand. The sand matrix and sand lenses are quartzofeldspathic with a minor basalt and mica (muscovite). Thicker gravel bodies (greater than 2 m thick) are persistent laterally across the 100-D-30/104 and 100-D-100 excavations. Thin sand and gravel bodies (less than 1 m thick) extend laterally up to 100 m with sand bodies generally less than 1 m thick. These horizontal bedding planes can promote lateral spreading of contamination along the bedding planes. The unit is highly bedded and more texturally varied as compared to other Ringold gravel units south and west of 100-D Area. The average number of beds beneath 100-D-100 is 13 (ranging from 8 to 17). Texturally, the beds are largely gravel (70% sandy gravel and gravelly sand beds) with interbedded sand (30% of beds). The average bed thicknesses are: sandy gravels 60-cm thick (ranging from 15 cm to 3 m), gravelly sand 30-cm thick (ranging 15 to 60 cm thick), sand 60-cm thick (ranging 15 cm to 2 m). Local cut-and-fill channel deposits were observed along the ramp of the 100-D-30/100-D-104 excavation. The fill features include low-angle cross bedded sand (St). The channel is less than 2 m thick and less than 10 m wide. The upper bounding surface is sharp and distinct with an approximate 6 degree dip to the south to southeast. The lower contact with the Mud Unit forms an undulating surface and is sharp and distinct over much of the central 100-D Area except in several boreholes to the west of the excavation where the contact is gradational. The interbedded sand and gravel unit represents the distal channel-fill deposits of an ancient Columbia River flowing through the northern Pasco Basin. The unit is part of the Ringold E unit of the Ringold Formation.

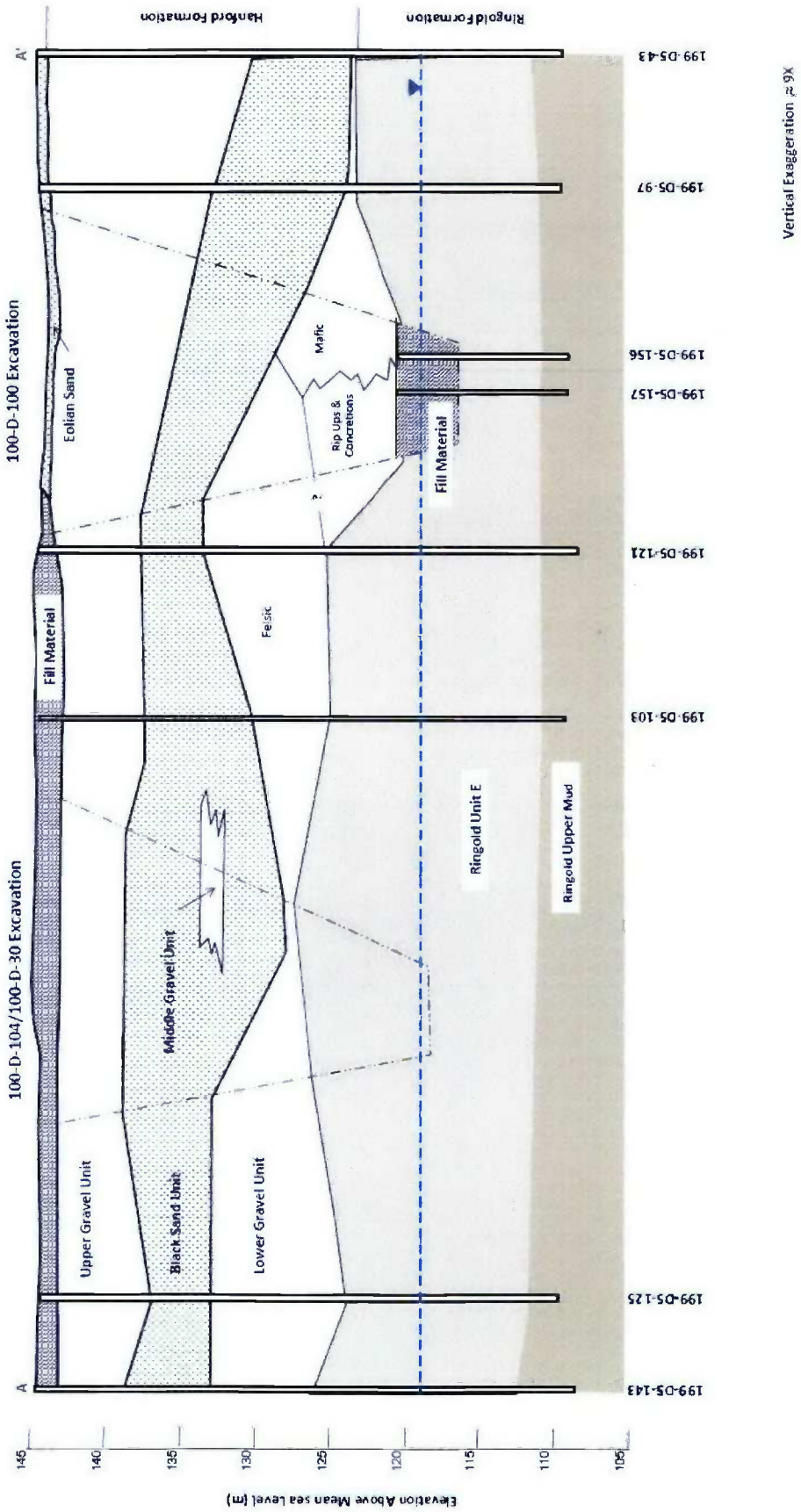
Mud Unit (RUM) – is a compact fine-grained unit mainly consisting of mud (silt and clay) with varying amounts of sand. The unit ranges from a massive mud (Fm) greater than 95% mud with varying amounts of silt and clay) with very fine quartz sand to thin stratified mud and sand beds (Fl). Individual beds are often well sorted. Sand beds texturally range from very fine sand to coarse-to-very fine sand with sand grains composed mainly of quartz. Locally, the unit includes very fine angular pebbles (greater than 5%) within the top 30 cm and within sand beds. The unit has evidence of bioturbation based on the presence of black streaks of organic material or iron oxides. The Mud Unit was deposited in an overbank setting and was modified by surficial processes.

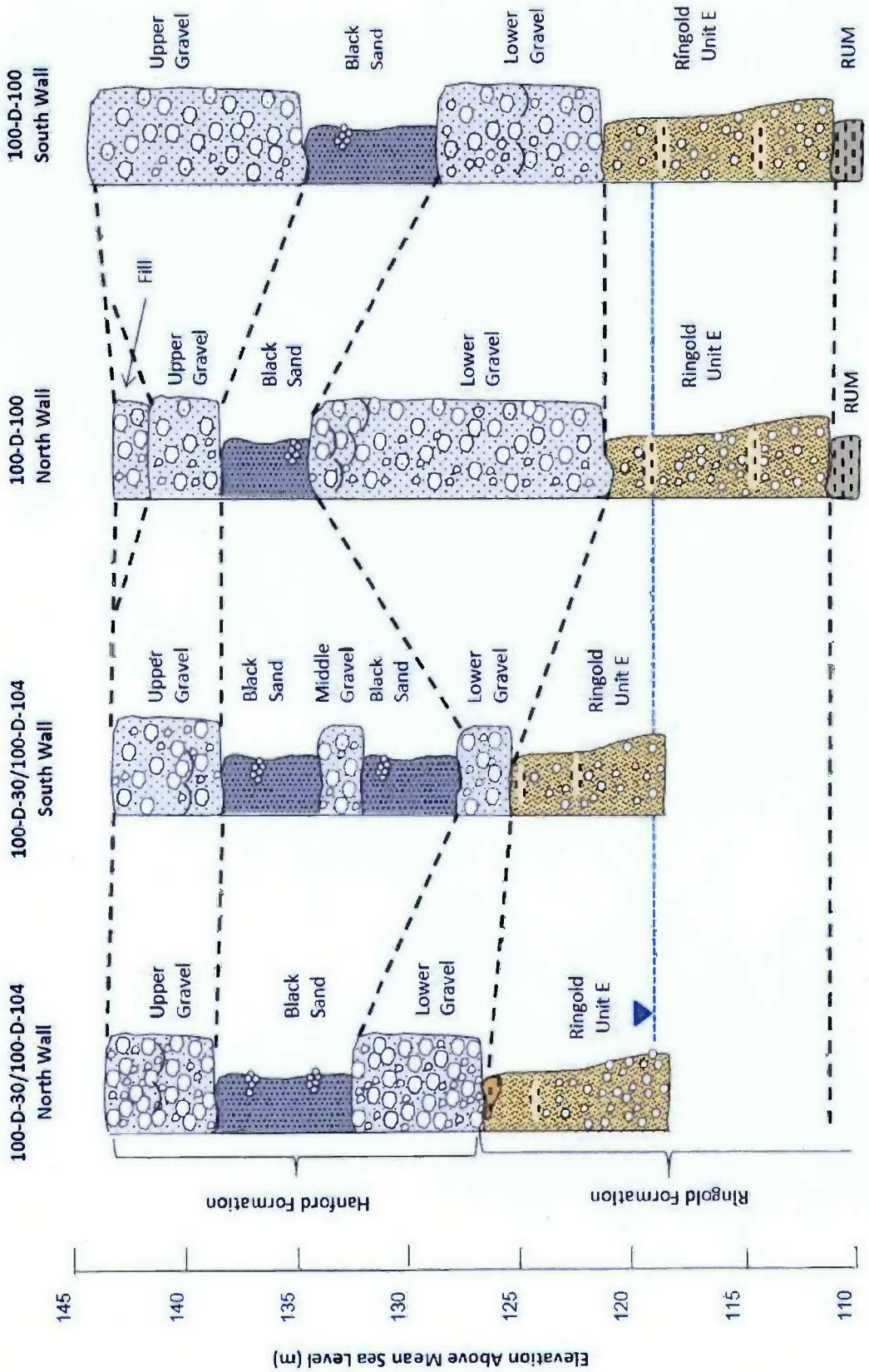
REFERENCES

CHPRC, 2015, *Persistent Source Investigation at 100-D*, SGW-58416, Rev. 1, CH2MHill Plateau Remediation Company, Richland, Washington.

Lindsey, K. A., and G. K. Jaeger, 1993, *Geologic Setting of the 100-HR-3 Operable Unit, Hanford Site, South-Central Washington*, WHC-SD-EN-TI-132, Rev. 0. Westinghouse Hanford Company, Richland, Washington.

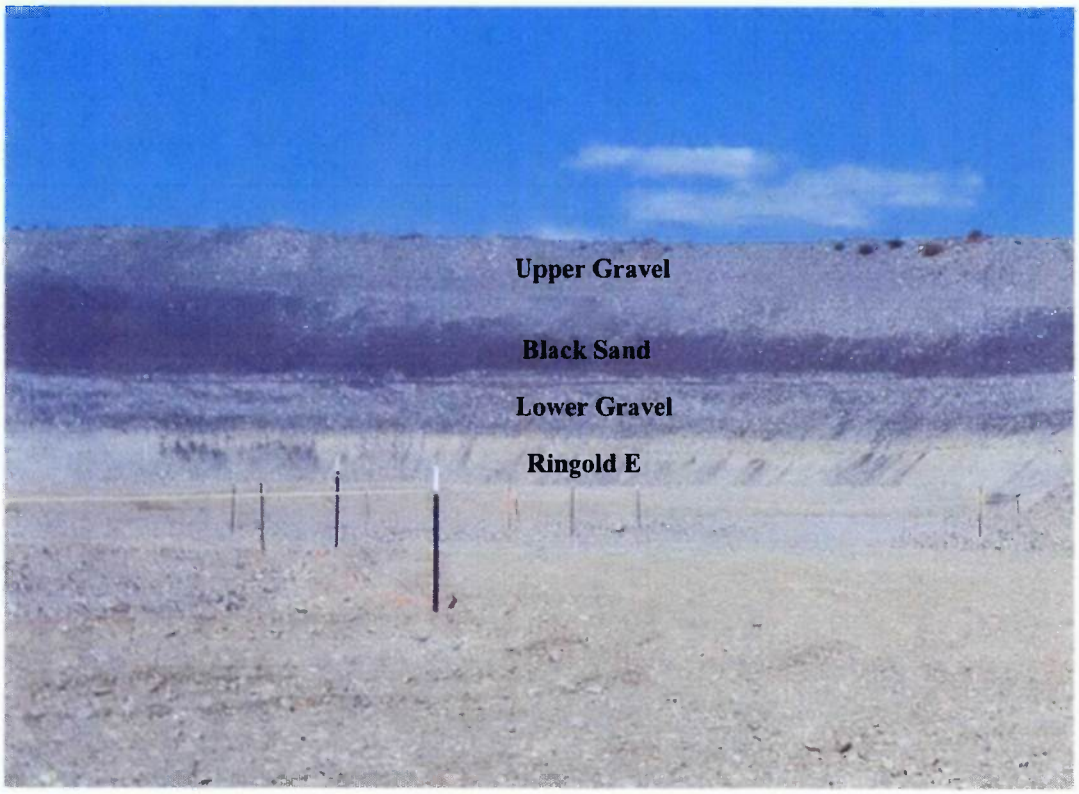

100 D AREA
CROSS SECTION A'-A PLAN
100-D-30/104 & 100-D-100
A
A'
100-D-30
100-D-104
100-D-100
105-D REACTOR BLDG
105-DR REACTOR BLDG
182-D RESEVOIR AND PUMP HOUSE
ASPHALT ROAD
199-D5-14 CERCLA
199-D5-15 CERCLA
199-D5-16 CERCLA
199-D5-12 VADOSE
199-D5-26
199-D5-18 CERCLA
199-D5-19 CERCLA
199-D2-05 VADOSE
199-D5-143
199-D5-125
199-D5-42
199-D5-103
199-D5-121
199-D5-41
199-D5-157
199-D5-156
199-D5-97
199-D5-39
199-D5-4
199-D5-36
199-D4-15
199-D5-40
199-D2-06
SCALE 1:2000


A
A'
100-D-104/100-D-30 Excavation
100-D-100 Excavation
Hanford Formation
Ringold Formation
Upper Gravel Unit
Black Sand Unit
Middle Gravel Unit
Lower Gravel Unit
Fill Material
Eolian Sand
Felsic
Mafic
Rip Ups & Concretions
Fill Material
Ringold Unit E
Ringold Upper Mud
199-D5-143
199-D5-125
199-D5-103
199-D5-121
199-D5-157
199-D5-156
199-D5-97
199-D5-43
145
140
135
130
125
120
115
110
105
Elevation Above Mean sea Level (m)
Vertical Exaggeration ≈ 9X

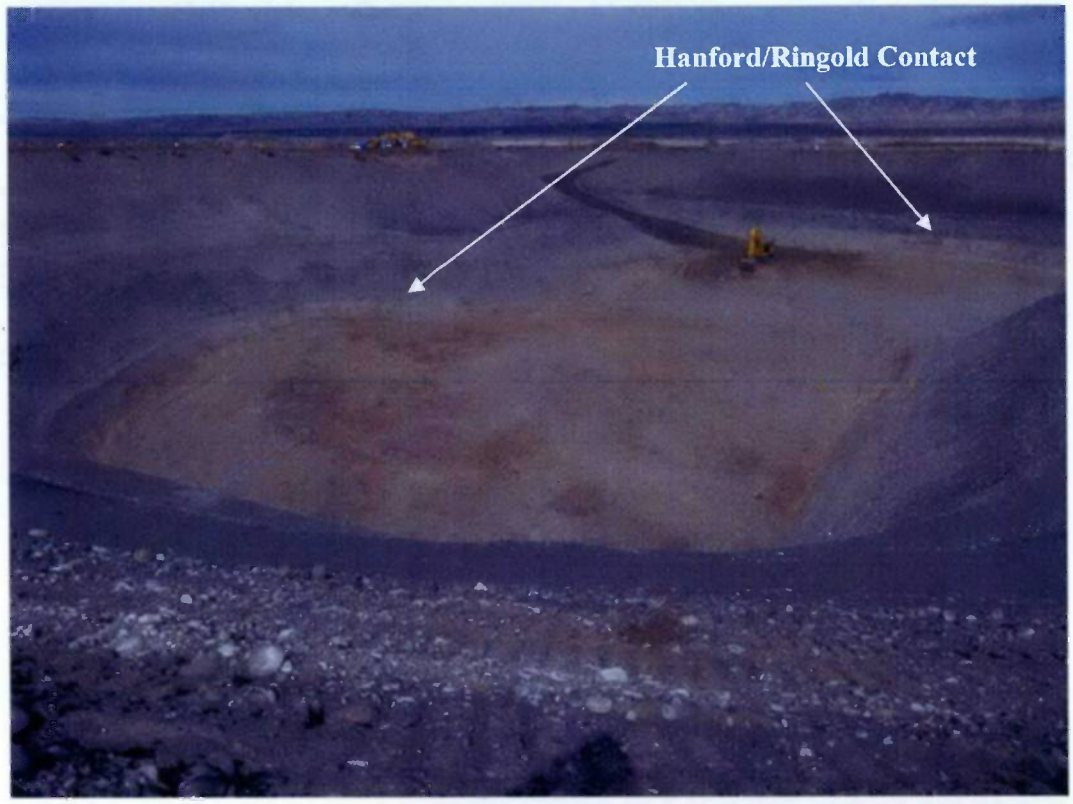

100-D-100 South Wall
100-D-100 North Wall
100-D-30/100-D-104 South Wall
100-D-30/100-D-104 North Wall
Fill
Upper Gravel
Black Sand
Middle Gravel
Lower Gravel
Ringold Unit E
RUM
Hanford Formation
Ringold Formation
145
140
135
130
125
120
115
110
Elevation Above Mean Sea Level (m)

E-1. 100-D-30 Tier II Excavation Showing Upper Gravel Unit and Underlying Black Sand.

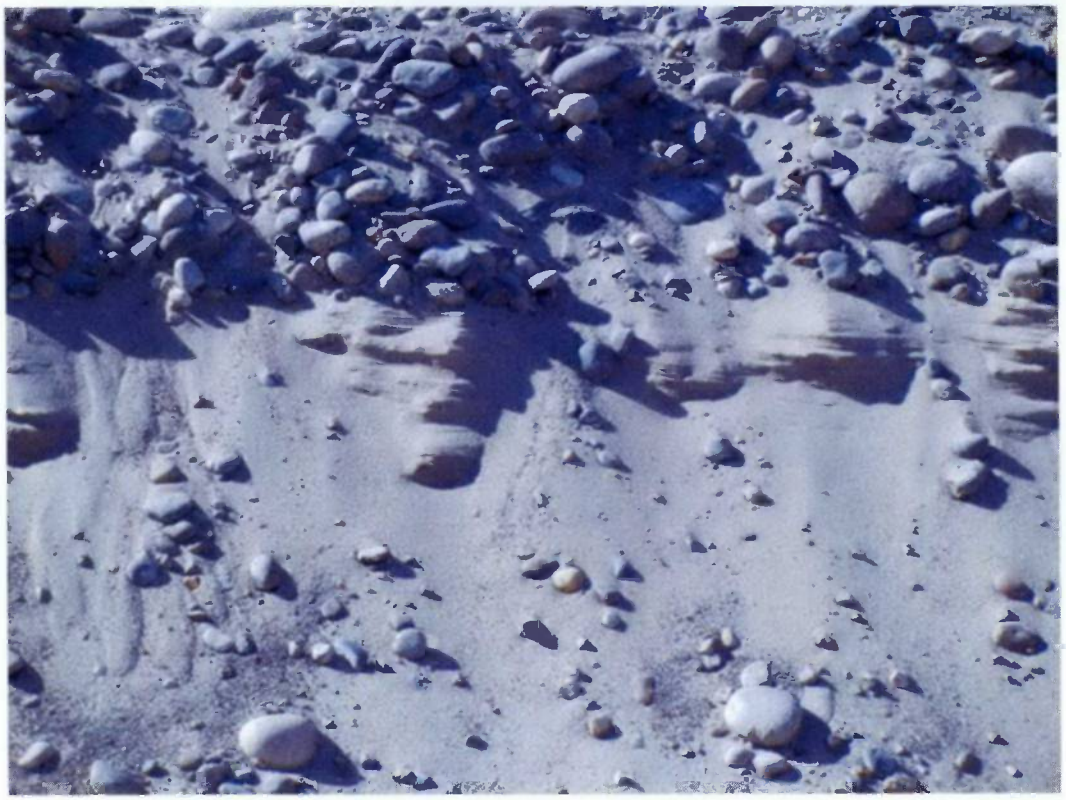
E-2. 100-D-30/100-D-104 Excavation North Wall.



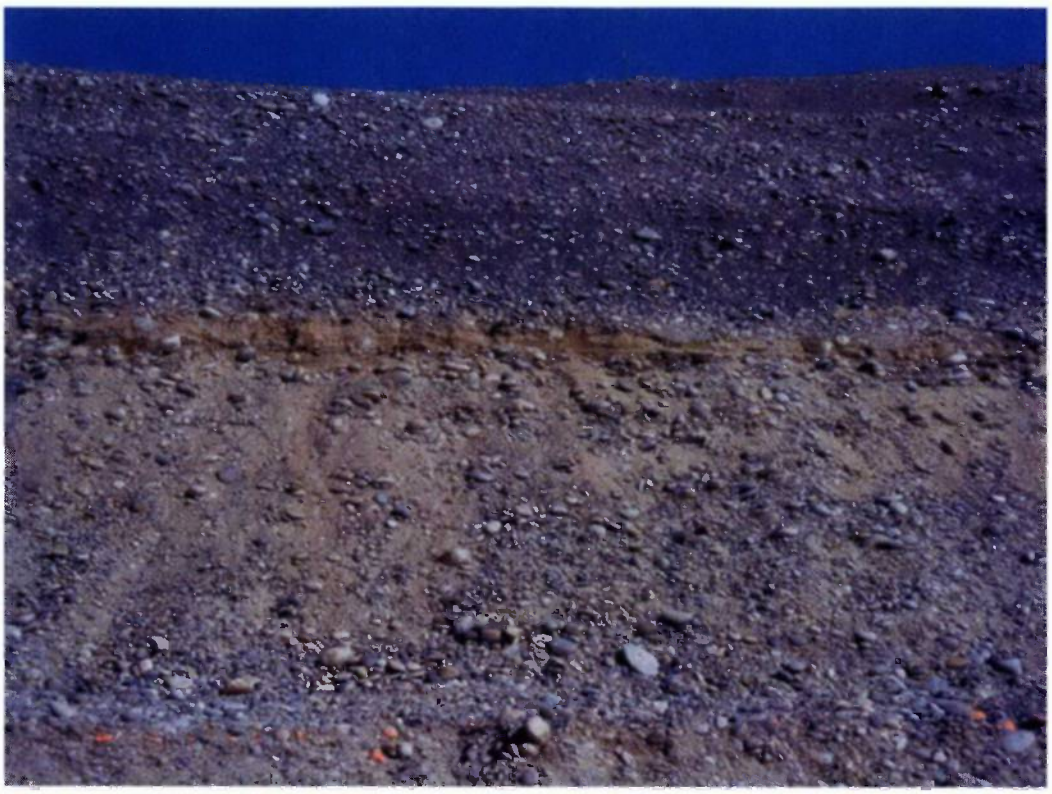
E-3. Hanford/Ringold Contact Exposed in 100-D-30/100-D-104 Excavation Sidewalls.



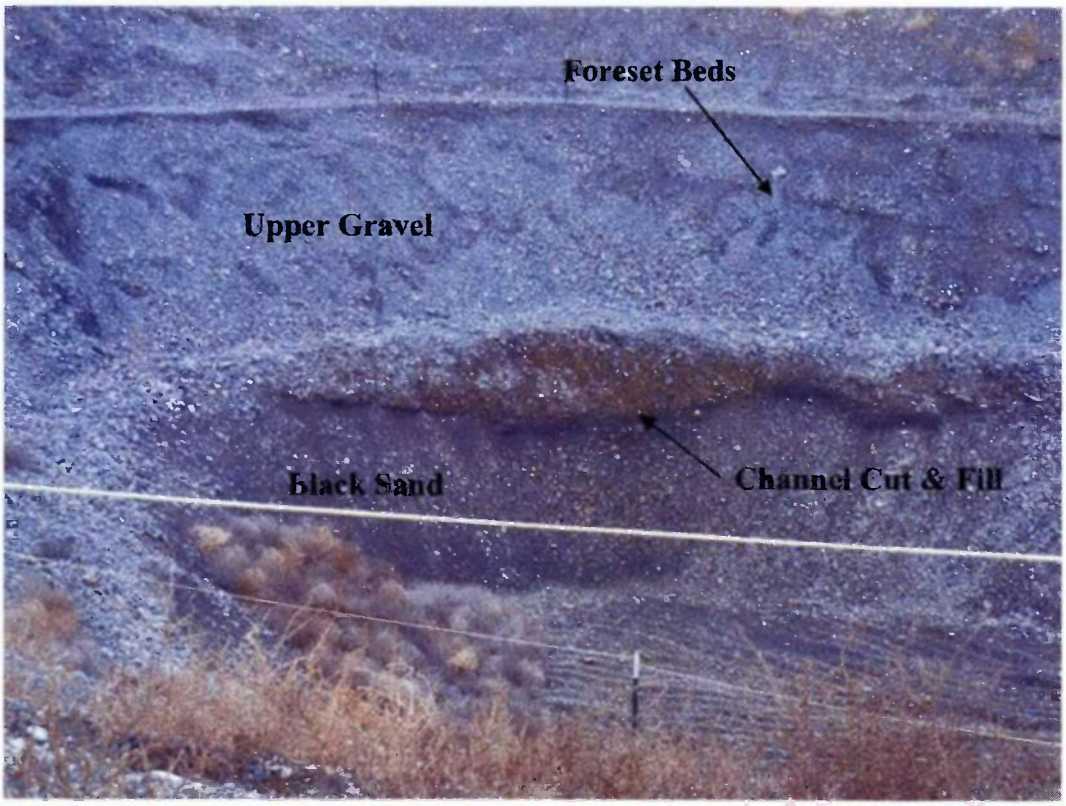
E-4. Hanford Lower Gravel Overlying Ringold Sand in West Wall of 100-D-30/100-D-104.



E-5. Hanford Lower Gravel Contact with Ringold in North Wall of 100-D-30/100-D-104.

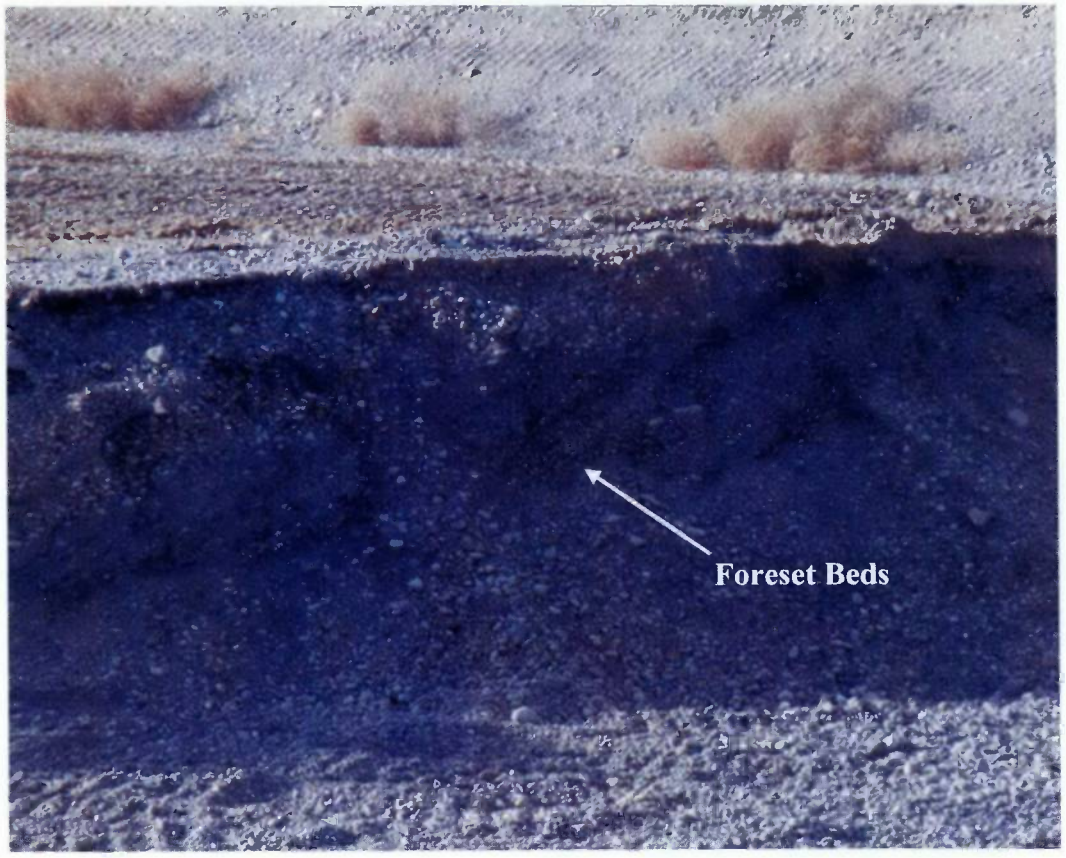


E-6. Hanford Upper Gravel Overlying Black Sand in Northeast Wall of 100-D-100.



E-7. Upper Gravel Contact with Black Sand at 35 Ft Depth at 100-D-100.

E-8. Foreset Beds Dipping East in Lower Gravel at 100-D-100.



E-9. Hanford/Ringold Contact in Test Pit in Southeast Floor of 100-D-100.

E-10. Hanford/Ringold Contact in East Wall at 100-D-100.

E-11. Hanford/Ringold Contact at 100-D-100 Excavation.

E-12. Bedding in Ringold at 100-D-100 Excavation.

APPENDIX F

CALCULATIONS

APPENDIX F

CALCULATION BRIEFS

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

Decision Unit	UCL	HQ	GWHQ
Excavation, staging pile area 3, staging pile area 4, focus sampling (100-D-83:5), overburden/layback (piles & backfill in waste sites)	0100D-CA-V0537	0100D-CA-V0538	0100D-CA-V0539
Staging pile area 2	0100D-CA-V0543	0100D-CA-V0544	0100D-CA-V0545
100-D-50:7/100-D-104 Tier II staging pile area (south of Paddock street)	0100D-CA-V0502	0100D-CA-V0503	0100D-CA-V0504
Tier II staging pile area (north of Paddock Street)	0100D-CA-V0505	0100D-CA-V0506	0100D-CA-V0507
Tier II overburden/layback	0100D-CA-V0495	0100D-CA-V0496	0100D-CA-V0557
Two small 100-D-30 staging pile areas	0100D-CA-V0565	0100D-CA-V0566	0100D-CA-V0567

DISCLAIMER FOR CALCULATIONS

The calculations 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.

100-D-30 Overburden Stockpiles Cleanup Verification 95% UCL Calculation, 0100D-CA-V0495, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-D-30 Overburden Stockpiles Direct Contact Hazard Quotient and Carcinogenic Risk Calculations, 0100D-CA-V0496, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-D-104 and 100-D-50:7 Waste Sites Staging Pile Area Cleanup Verification 95% UCL Calculations, 0100D-CA-V0502, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-D-104 and 100-D-50:7 Waste Sites Staging Pile Area Direct Contact Hazard Quotient and Carcinogenic Risk Calculation, 0100D-CA-V0503, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-D-104 and 100-D-50:7 Waste Sites Staging Pile Area Hazard Quotient and Carcinogenic Risk Calculations for Protection of Groundwater, 0100D-CA-V0504, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-D-30 and 100-D-50:7 Waste Sites Staging Pile Areas Cleanup Verification 95% UCL Calculation, 0100D-CA-V0505, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-D-30 and 100-D-50:7 Waste Sites Staging Pile Areas Direct Contact Hazard Quotient and Carcinogenic Risk Calculation, 0100D-CA-V0506, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-D-30 and 100-D-50:7 Waste Sites Staging Pile Areas Hazard Quotient and Carcinogenic Risk Calculation for Protection of Groundwater, 0100D-CA-V0507, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-D-30 and 100-D-104 Waste Sites Cleanup Verification 95% UCL Calculations, 0100D-CA-V0537, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-D-30 and 100-D-104 Waste Sites Direct Contact Hazard Quotient and Carcinogenic Risk Calculations, 0100D-CA-V0538, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-D-30 and 100-D-104 Waste Sites Hazard Quotient and Carcinogenic Risk Calculations for Protection of Groundwater, 0100D-CA-V0539, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-D-30 and 100-D-104 Waste Sites Staging Pile Area Cleanup Verification 95% UCL Calculations, 0100D-CA-V0543, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-D-30 and 100-D-104 Waste Sites Staging Pile Area Direct Contact Hazard Quotient and Carcinogenic Risk Calculations, 0100D-CA-V0544, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-D-30 and 100-D-104 Waste Sites Staging Pile Area Hazard Quotient and Carcinogenic Risk Calculations for Protection of Groundwater, 0100D-CA-V0545, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-D-30, 100-D-100, and 100-D-104 Overburden Stockpile Waste Sites Hazard Quotient and Carcinogenic Risk Calculations for Protection of Groundwater, 0100D-CA-V0557, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-D-30 Waste Staging Pile Area Cleanup Verification 95% UCL Calculation, 0100D-CA-V0565, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-D-30 Waste Staging Pile Area Direct Contact Hazard Quotient and Carcinogenic Risk Calculations, 0100D-CA-V0566, Rev. 0, Washington Closure Hanford, Richland, Washington.

100-D-30 Waste Staging Pile Area Hazard Quotient and Carcinogenic Risk Calculations for Protection of Groundwater, 0100D-CA-V0567, Rev. 0, Washington Closure Hanford, Richland, Washington.

APPENDIX G

VERIFICATION SAMPLE SUMMARY TABLES AND LOCATIONS

Table G-1. 100-D-30/100-D-104 Excavation Verification Sample Summary. (3 Pages)

Sample Location	HEIS Sample Number	Washington State Plane Coordinates (m)		Sample Analysis
		Easting	Northing	
Sample Area 1				
EXC1-1	J1T119	573545.3	151629.2	ICP metals [a], hexavalent chromium, mercury
EXC1-2	J1T120	573494.8	151658.3	
EXC1-3	J1T121	573528.5	151658.3	
EXC1-4	J1T122	573562.1	151658.3	
EXC1-5	J1T123	573595.8	151658.3	
EXC1-6	J1T124	573478.0	151687.5	
EXC1-7	J1T125	573511.6	151687.5	
EXC1-8	J1T126	573545.3	151687.5	
EXC1-9	J1T127	573494.8	151716.7	
EXC1-10	J1T128	573478.0	151745.8	
EXC1-11	J1T129	573511.6	151745.8	
EXC1-12	J1T130	573494.8	151775.0	
Sample Area 2				
EXC2-1	J1T131	573512.8	151468.6	ICP metals [a], hexavalent chromium, mercury
EXC2-2	J1T132	573530.8	151468.6	
EXC2-3	J1T133	573485.7	151484.3	
EXC2-4	J1T134	573503.7	151484.3	
EXC2-5	J1T135	573521.8	151484.3	
EXC2-6	J1T136	573539.9	151484.3	
EXC2-7	J1T137	573675.4	151531.2	
EXC2-8	J1T138	573693.5	151531.2	
EXC2-9	J1T139	573485.7	151578.2	
EXC2-10	J1T140	573503.7	151578.2	
EXC2-11	J1T141	573521.8	151578.2	
EXC2-12	J1T142	573530.8	151593.8	
Sample Area 3				
EXC3-1	J1TLL1	573538.2	151570.3	ICP metals [a], hexavalent chromium, mercury
EXC3-2	J1TLL2	573557.5	151570.3	
EXC3-3	J1TLL3	573654.3	151570.3	
EXC3-4	J1TLL4	573547.8	151587.1	
EXC3-5	J1TLL5	573664.0	151587.1	
EXC3-6	J1TLL6	573538.2	151603.8	
EXC3-7	J1TLL7	573654.3	151603.8	
EXC3-8	J1TLL8	573644.6	151620.6	
EXC3-9	J1TLL9	573664.0	151620.6	
EXC3-10	J1TLM0	573635.0	151637.4	
EXC3-11	J1TLM1	573605.9	151654.1	
EXC3-12	J1TLM2	573625.3	151654.1	

Table G-1. 100-D-30/100-D-104 Excavation Verification Sample Summary. (3 Pages)

Sample Location	HEIS Sample Number	Washington State Plane Coordinates (m)		Sample Analysis
		Easting	Northing	
Sample Area 4				
EXC4-1	J1TLM3	573575.3	151457.2	ICP metals [a], hexavalent chromium, mercury
EXC4-2	J1TLM4	573601.1	151457.2	
EXC4-3	J1TLM5	573626.9	151457.2	
EXC4-4	J1TLM6	573652.8	151457.2	ICP metals [a], hexavalent chromium, mercury
EXC4-5	J1TLM7	573562.4	151479.6	
EXC4-6	J1TLM8	573665.7	151479.6	
EXC4-7	J1TLM9	573523.7	151501.9	
EXC4-8	J1TLN0	573549.5	151501.9	
EXC4-9	J1TLN1	573652.8	151501.9	
EXC4-10	J1TLN2	573536.6	151524.3	
EXC4-11	J1TLN3	573523.7	151546.7	
EXC4-12	J1TLN4	573652.8	151546.7	
Dup of EXC4-12	J1TLN5	573652.8	151546.7	
Sample Area 5				
EXC5-1	J1TLN6	573567.3	151551.4	ICP metals [a], hexavalent chromium, mercury
EXC5-2	J1TLN7	573576.6	151567.6	
EXC5-3	J1TLN8	573632.6	151567.6	
EXC5-4	J1TLN9	573567.3	151583.7	
EXC5-5	J1TLP0	573641.9	151583.7	
EXC5-6	J1TLP1	573558.0	151599.9	
EXC5-7	J1TLP2	573632.6	151599.9	
EXC5-8	J1TLP3	573567.3	151616.1	
EXC5-9	J1TLP4	573623.3	151616.1	
EXC5-10(m)	J1TLP5	573641.9	151616.1	
EXC5-11	J1TLP6	573595.3	151632.2	
EXC5-12	J1TLP7	573614.0	151632.2	
Dup of EXC5-10	J1TLP8	573641.9	151616.1	
Sample Area 6				
EXC6-1	J1TLP9	573581.5	151470.4	ICP metals [a], hexavalent chromium, mercury
EXC6-2	J1TLR0	573601.3	151470.4	
EXC6-3	J1TLR1	573621.1	151470.4	
EXC6-4	J1TLR2	573571.6	151487.5	
EXC6-5	J1TLR3	573631.0	151487.5	
EXC6-6	J1TLR4	573561.6	151504.7	
EXC6-7(m)	J1TLR5	573640.9	151504.7	
EXC6-8	J1TLR6	573551.7	151521.8	
EXC6-9	J1TLR7	573631.0	151521.8	
EXC6-10	J1TLR8	573561.6	151539.0	
EXC6-11	J1TLR9	573640.9	151539.0	

Table G-1. 100-D-30/100-D-104 Excavation Verification Sample Summary. (3 Pages)

Sample Location	HEIS Sample Number	Washington State Plane Coordinates (m)		Sample Analysis
		Easting	Northing	
EXC6-12	J1TLT0	573631.0	151556.2	ICP metals [a], hexavalent chromium, mercury
Dup of EXC6-7	J1TLT1	573640.9	151504.7	
Sample Area 7				
EXC7-1(m)	J1TLT2	573618.8	151575.1	ICP metals [a], hexavalent chromium, mercury
EXC7-2	J1TLT3	573577.0	151585.4	
EXC7-3	J1TLT4	573612.9	151585.4	ICP metals [a], hexavalent chromium, mercury
EXC7-4	J1TLT5	573624.8	151585.4	
EXC7-5	J1TLT6	573618.8	151595.8	
EXC7-6	J1TLT7	573577.0	151606.1	
EXC7-7	J1TLT8	573612.9	151606.1	
EXC7-8	J1TLT9	573624.8	151606.1	
EXC7-9	J1TLV0	573583.0	151616.4	
EXC7-10	J1TLV1	573595.0	151616.4	
EXC7-11	J1TLV2	573606.9	151616.4	
EXC7-12	J1TLV3	573589.0	151626.8	
Dup of EXC7-1	J1TLV4	573618.8	151575.1	
Sample Area 8				
EXC8-1	J1TLV5	573586.4	151485.6	ICP metals [a], hexavalent chromium, mercury
EXC8-2	J1TLV6	573603.8	151485.6	
EXC8-3	J1TLV7	573621.1	151485.6	
EXC8-4	J1TLV8	573577.8	151500.6	
EXC8-5	J1TLV9	573569.1	151515.6	
EXC8-6	J1TLW0	573586.4	151515.6	
EXC8-7	J1TLW1	573621.1	151515.6	
EXC8-8	J1TLW2	573560.4	151530.6	
EXC8-9	J1TLW3	573577.8	151530.6	
EXC8-10(m)	J1TLW4	573586.4	151545.6	
EXC8-11	J1TLW5	573621.1	151545.6	
EXC8-12	J1TLW6	573612.5	151560.7	
Dup of EXC8-10	J1TLW7	573586.4	151545.6	
Equipment blank	J1TLW8	NA	NA	ICP metals [a], hexavalent chromium, mercury
Focus Sampling - 100-D-83:5				
FS-1	J1TPW5	573651.8	151625.8	ICP metals [a], hexavalent chromium, mercury, IC anions, nitrate/nitrite, pH
FS-2	J1TPW6	573646.6	151555.6	

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

HEIS = Hanford Environmental Information System
IC = ion chromatography
ICP = inductively coupled plasma
NA = not applicable
pH = hydrogen ion concentration

Table G-2. Verification Sample Summary for100-D-30/100-D-104 SPA 2 and SPA 3 and 100-D-83:5 SPA 4. (2 Pages)

Sample Location	HEIS Sample Number	Washington State Plane Coordinates (m)		Sample Analysis
		Easting	Northing	
SPA 2 Area 2 (100-D-30/100-D-104)				
SPA 2-1	J1TM02	574010.7	151448.0	ICP metals [a], hexavalent chromium, mercury
SPA 2-2	J1TM03	574050.6	151448.0	
SPA 2-3	J1TM04	574090.6	151448.0	
SPA 2-4	J1TM05	573990.7	151482.6	
SPA 2-5	J1TM06	573950.7	151551.8	
SPA 2-6	J1TM07	573990.7	151551.8	
SPA 2-7	J1TM08	573970.7	151586.4	
SPA 2-8	J1TM09	573950.7	151621.0	
SPA 2-9	J1TM11	573990.7	151621.0	
SPA 2-10	J1TM11	573970.7	151655.6	
SPA 2-11	J1TM12	573950.7	151690.2	
SPA 2-12	J1TM13	573950.7	151759.4	
Duplicate of J1TM04	J1TM14	574090.6	151448.0	
SPA 3 Area 3 (100-D-30/100-D-104)				
SPA 3-1	J1TM15	573930.1	151835.3	ICP metals [a], hexavalent chromium, mercury
SPA 3-2	J1TM16	573972.0	151835.3	
SPA 3-3	J1TM17	573951.1	151871.5	
SPA 3-4	J1TM18	573992.9	151871.5	
SPA 3-5	J1TM19	573930.1	151907.8	
SPA 3-6	J1TM20	573972.0	151907.8	
SPA 3-7	J1TM21	573909.2	151944.0	
SPA 3-8	J1TM22	573951.1	151944.0	
SPA 3-9	J1TM23	573992.9	151944.0	
SPA 3-10	J1TM24	573888.3	151980.2	
SPA 3-11	J1TM25	573930.1	151980.2	
SPA 3-12	J1TM26	573972.0	151980.2	
SPA 4 Area 4 (100-D-83:5)				
SPA 4-1	J1TM27	573981.3	151672.7	ICP metals [a], hexavalent chromium, mercury, IC anions [b], nitrate/nitrite, pH
SPA 4-2	J1TM28	574004.8	151672.7	
SPA 4-3	J1TM29	573993.0	151693.0	
SPA 4-4	J1TM30	574016.5	151693.0	
SPA 4-5	J1TM31	574004.8	151713.3	
SPA 4-6	J1TM32	573993.0	151733.7	
SPA 4-7	J1TM33	574016.5	151733.7	
SPA 4-8	J1TM34	573981.3	151754.0	
SPA 4-9	J1TM35	574004.8	151754.0	
SPA 4-10	J1TM36	574028.2	151754.0	
SPA 4-11	J1TM37	573993.0	151774.3	

Table G-2. Verification Sample Summary for100-D-30/100-D-104 SPA 2 and SPA 3 and 100-D-83:5 SPA 4. (2 Pages)

Sample Location	HEIS Sample Number	Washington State Plane Coordinates (m)		Sample Analysis
		Easting	Northing	
SPA 4-12	J1TM38	574016.5	151774.3	ICP metals [a], hexavalent chromium, mercury, IC anions [b], nitrate/nitrite, pH
Duplicate of J1TM28	J1TM39	574004.8	151672.7	
Equipment blank	J1TM40	NA	NA	ICP metals [a], hexavalent chromium, mercury

[a] The expanded list of ICP metals was requested to include antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.
[b] The extended list of IC anions including bromide, chloride, fluoride, nitrate, nitrite, phosphate, and sulfate was requested. To preclude holding time issues for nitrate and nitrite with EPA Method 300.0, EPA Method 353.2 was also performed.

HEIS = Hanford Environmental Information System
IC = ion chromatography
ICP = inductively coupled plasma
NA = not applicable
pH = hydrogen ion concentration
SPA = staging pile area

Table G-3. Verification Sample Summary Table for 100-D-30/100-D-104 Overburden/Layback Soil Stockpile (West) Lift 1 (0 to ~8 ft).

Sample Location	HEIS Sample Number	Washington State Plane Coordinates		Sample Analysis
		Easting	Northing	
OBVL1-1	J1RP90	573112.6	151861.8	Chromium (total) [a], mercury, hexavalent chromium
OBVL1-2	J1RP91	573142.3	151861.8	
OBVL1-3	J1RP92	573172.0	151861.8	
OBVL1-4	J1RP89	573097.7	151887.5	
OBVL1-5	J1RP88	573127.4	151887.5	
OBVL1-6	J1RP93	573157.1	151887.5	
OBVL1-7	J1RP94	573186.8	151887.5	
OBVL1-8	J1RP86	573112.6	151913.2	
OBVL1-9	J1RP87	573142.3	151913.2	
OBVL1-10	J1RP84	573172.0	151913.2	
OBVL1-11	J1RP85	573157.1	151939.0	
OBVL1-12	J1RP95	573172.0	151964.7	
Duplicate of J1RP84	J1RP96	TBD	TBD	
Equipment blank	J1RP97	NA	NA	

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

HEIS = Hanford Environmental Information System
ICP = inductively coupled plasma
NA = not applicable
TBD = to be determined

Table G-4. Verification Sample Summary Table for 100-D-30/100-D-104 Overburden/Layback Soil Stockpile (West) Lift 2 (8 to ~16 ft).

Sample Location	HEIS Sample Number	Washington State Plane Coordinates		Sample Analysis
		Easting	Northing	
OBVL2-1	J1T001	573122.9	151871.5	Chromium (total) [a], mercury, hexavalent chromium
OBVL2-2	J1T002	573154.2	151871.5	
OBVL2-3	J1T003	573185.5	151871.5	
OBVL2-4	J1T004	573216.9	151871.5	
OBVL2-5	J1T005	573138.6	151898.6	
OBVL2-6	J1T006	573169.9	151898.6	
OBVL2-7	J1T007	573201.2	151898.6	
OBVL2-8	J1T008	573154.2	151925.7	
OBVL2-9	J1T009	573185.5	151925.7	
OBVL2-10	J1T010	573216.9	151925.7	
OBVL2-11	J1T011	573169.9	151952.8	
OBVL2-12	J1T012	573201.2	151952.8	
Duplicate of J1T004	J1T013	573216.9	151871.5	
Equipment blank	J1T014	NA	NA	

[a] Analysis was performed for the expanded list of ICP metals to include antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.
HEIS = Hanford Environmental Information System
ICP = inductively coupled plasma
NA = not applicable

Table G-5. Verification Sample Results Summary Table for 100-D-30/100-D-104 Overburden/Layback Soil Stockpile (East) Lift 1 (Thickness Varies from 0 to ~12 ft). (2 Pages)

Sample Location	HEIS Sample Number	Washington State Plane Coordinates		Sample Analysis
		Easting	Northing	
OBL1E-1	J1RVD0	573203.9	151872.4	Chromium (total) [a], mercury, hexavalent chromium
OBL1E-2	J1RVD1	573247.3	151872.4	
OBL1E-3	J1RVD2	573290.7	151872.4	
OBL1E-4	J1RVD3	573334.0	151872.4	
OBL1E-5	J1RVD4	573225.6	151909.9	
OBL1E-6	J1RVD5	573269.0	151909.9	
OBL1E-7	J1RVD6	573312.3	151909.9	
OBL1E-8	J1RVD7	573203.9	151947.5	
OBL1E-9	J1RVD8	573247.3	151947.5	

Table G-5. Verification Sample Results Summary Table for 100-D-30/100-D-104 Overburden/Layback Soil Stockpile (East) Lift 1 (Thickness Varies from 0 to ~12 ft). (2 Pages)

Sample Location	HEIS Sample Number	Washington State Plane Coordinates		Sample Analysis
		Easting	Northing	
OBL1E-10	J1RVD9	573290.7	151947.5	Chromium (total) [a], mercury, hexavalent chromium
OBL1E-11	J1RVF0	573225.6	151985.0	
OBL1E-12	J1RVF1	573269.0	151985.0	
Duplicate of J1RVD0	J1RVF2	573203.9	151872.4	
Equipment blank	J1RVF3	NA	NA	

[a] Analysis was performed for the expanded list of ICP metals to include antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.
HEIS = Hanford Environmental Information System
ICP = inductively coupled plasma
NA = not applicable

Table G-6. Verification Sample Results Summary Table for 100-D-30/100-D-104 Overburden/Layback Soil Stockpile (East) Lift 2 (Thickness Varies from ~8 to ~12 ft Above Surface Grade).

Sample Location	HEIS Sample Number	Washington State Plane Coordinates		Sample Analysis
		Easting	Northing	
OBEVL2-1	J1T5L2	573238.5	151868.2	Chromium (total)[a], mercury, hexavalent chromium
OBEVL2-2	J1T5L3	573268.9	151868.2	
OBEVL2-3	J1T5L4	573223.3	151894.5	
OBEVL2-4	J1T5L5	573253.7	151894.5	
OBEVL2-5	J1T5L6	573238.5	151920.8	
OBEVL2-6	J1T5L7	573268.9	151920.8	
OBEVL2-7	J1T5L8	573223.3	151947.2	
OBEVL2-8	J1T5L9	573253.7	151947.2	
OBEVL2-9	J1T5M0	573208.1	151973.5	
OBEVL2-10	J1T5M1	573238.5	151973.5	
OBEVL2-11	J1T5M2	573268.9	151973.5	
OBEVL2-12	J1T5M3	573299.3	151973.5	
Duplicate of J1T5L8	J1T5M4	573223.3	151947.2	
Equipment blank	J1T5M5	NA	NA	

[a] Analysis was performed for the expanded list of ICP metals to include antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.
HEIS = Hanford Environmental Information System
ICP = inductively coupled plasma
NA = not applicable

Table G-7. Verification Sample Results Summary Table for 100-D-30/100-D-104 Overburden/Layback Soil Stockpile 3, Lift 1 (~ 8 ft).

Sample Location	HEIS Sample Number	Washington State Plane Coordinates		Sample Analysis
		Easting	Northing	
OB3VL1-1	J1T0X8	573492.5	151933.8	Chromium (total) [a], mercury, hexavalent chromium
OB3VL1-2	J1T0X9	573507.0	151958.9	
OB3VL1-3	J1T100	573492.5	151984.1	
OB3VL1-4	J1T101	573507.0	152009.2	
OB3VL1-5	J1T102	573492.5	152034.4	
OB3VL1-6	J1T103	573521.5	152034.4	
OB3VL1-7	J1T104	573507.0	152059.5	
OB3VL1-8	J1T105	573492.5	152084.6	
OB3VL1-9	J1T106	573521.5	152084.6	
OB3VL1-10	J1T107	573507.0	152109.8	
OB3VL1-11	J1T108	573507.0	152160.1	
OB3VL1-12	J1T109	573521.5	152185.2	
Duplicate of J1T0X8	J1T110	573492.5	151933.8	
Equipment blank	J1T111	NA	NA	

[a] Analysis was performed for the expanded list of ICP metals to include antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.
HEIS = Hanford Environmental Information System
ICP = inductively coupled plasma
NA = not applicable

Table G-8. Verification Sample Results Summary Table for 100-D-30/100-D-104 Overburden/Layback Soil Stockpile 3, Lift 2 (~ 8 to 16 ft). (2 Pages)

Sample Location	HEIS Sample Number	Washington State Plane Coordinates		Sample Analysis
		Easting	Northing	
OB3VL2-1	J1TFW8	573508.1	151931.7	Chromium (total) [a], mercury, hexavalent chromium
OB3VL2-2	J1TFW9	573493.7	151956.6	
OB3VL2-3	J1TFX0	573508.1	151981.5	
OB3VL2-4	J1TFX1	573493.7	152006.4	
OB3VL2-5	J1TFX2	573479.4	152031.3	
OB3VL2-6	J1TFX3	573508.1	152031.3	
OB3VL2-7	J1TFX4	573465.0	152056.2	
OB3VL2-8	J1TFX5	573493.7	152056.2	
OB3VL2-9	J1TFX6	573479.4	152081.1	

Table G-8. Verification Sample Results Summary Table for 100-D-30/100-D-104 Overburden/Layback Soil Stockpile 3, Lift 2 (~ 8 to 16 ft). (2 Pages)

Sample Location	HEIS Sample Number	Washington State Plane Coordinates		Sample Analysis
		Easting	Northing	
OB3VL2-10	J1TFX7	573508.1	152081.1	Chromium (total) [a], mercury, hexavalent chromium
OB3VL2-11	J1TFX8	573508.1	152130.9	
OB3VL2-12	J1TFX9	573508.1	152180.8	
Duplicate of J1TFX1	J1TH00	573493.7	152006.4	
Equipment blank	J1TH01	NA	NA	

[a] Analysis was performed for the expanded list of ICP metals to include antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.
HEIS = Hanford Environmental Information System
ICP = inductively coupled plasma
NA = not applicable

Table G-9. Verification Sample Results Summary Table for 100-D-30/100-D-104 Overburden/Layback Soil Placed East of Stockpile 3, Lift 1 (~ 8 ft).

Sample Location	HEIS Sample Number	Washington State Plane Coordinates		Sample Analysis
		Easting	Northing	
OB3EVL1-1	J1T5J8	573643.2	151877.2	Chromium (total) [a], mercury, hexavalent chromium
OB3EVL1-2	J1T5J9	573560.0	151906.0	
OB3EVL1-3	J1T5K0	573593.3	151906.0	
OB3EVL1-4	J1T5K1	573626.6	151906.0	
OB3EVL1-5	J1T5K2	573659.9	151906.0	
OB3EVL1-6	J1T5K3	573576.7	151934.9	
OB3EVL1-7	J1T5K4	573609.9	151934.9	
OB3EVL1-8	J1T5K5	573643.2	151934.9	
OB3EVL1-9	J1T5K6	573560.0	151963.7	
OB3EVL1-10	J1T5K7	573593.3	151963.7	
OB3EVL1-11	J1T5K8	573626.6	151963.7	
OB3EVL1-12	J1T5K9	573659.9	151963.7	
Duplicate of J1T5J9	J1T5L0	573560.0	151906.0	
Equipment blank	J1T5L1	NA	NA	

[a] Analysis was performed for the expanded list of ICP metals to include antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.
HEIS = Hanford Environmental Information System
ICP = inductively coupled plasma
NA = not applicable

Table G-10. Verification Sample Results Summary Table for 100-D-30/100-D-104 Overburden/Layback Soil Placed East of Stockpile 3, Lift 2 (~ 8 to 16 ft).

Sample Location	HEIS Sample Number	Washington State Plane Coordinates		Sample Analysis
		Easting	Northing	
OB3EVL2-1	J1TFP4	573618.0	151900.3	Chromium (total) [a], mercury, hexavalent chromium
OB3EVL2-2	J1TFP5	573645.7	151900.3	
OB3EVL2-3	J1TFP6	573548.7	151924.3	
OB3EVL2-4	J1TFP7	573576.4	151924.3	
OB3EVL2-5	J1TFP8	573604.2	151924.3	
OB3EVL2-6	J1TFP9	573631.9	151924.3	
OB3EVL2-7	J1TFR0	573659.6	151924.3	
OB3EVL2-8	J1TFR1	573562.6	151948.3	
OB3EVL2-9	J1TFR2	573590.3	151948.3	
OB3EVL2-10	J1TFR3	573618.0	151948.3	
OB3EVL2-11	J1TFR4	573645.7	151948.3	
OB3EVL2-12	J1TFR5	573521.0	151972.3	
Duplicate of J1TFP7	J1TFR6	573576.4	151924.3	
Equipment blank	J1TFR7	NA	NA	

[a] Analysis was performed for the expanded list of ICP metals to include antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.
HEIS = Hanford Environmental Information System
ICP = inductively coupled plasma
NA = not applicable

Table G-11. Verification Sample Results Summary Table for 100-D-30/100-D-104 Overburden/Layback Soil Placed in 120-D-1 (Lift 1, ~ 8 ft). (2 Pages)

Sample Location	HEIS Sample Number	Washington State Plane Coordinates		Sample Analysis
		Easting	Northing	
120DL1-1	J1RW20	573459.3	152008.0	Chromium (total) [a], mercury, hexavalent chromium
120DL1-2	J1RW21	573456.0	152013.7	
120DL1-3	J1RW22	573462.6	152013.7	
120DL1-4	J1RW23	573459.3	152019.4	
120DL1-5	J1RW24	573456.0	152025.0	
120DL1-6	J1RW25	573459.3	152030.7	
120DL1-7	J1RW26	573456.0	152036.4	
120DL1-8	J1RW27	573459.3	152042.1	
120DL1-9	J1RW28	573459.3	152053.5	

Table G-11. Verification Sample Results Summary Table for 100-D-30/100-D-104 Overburden/Layback Soil Placed in 120-D-1 (Lift 1, ~ 8 ft). (2 Pages)

Sample Location	HEIS Sample Number	Washington State Plane Coordinates		Sample Analysis
		Easting	Northing	
120DL1-10	J1RW29	573459.3	152064.9	Chromium (total) [a], mercury, hexavalent chromium
120DL1-11	J1RW30	573462.6	152070.6	
120DL1-12	J1RW31	573459.3	152076.3	
Duplicate of J1RW20	J1RW32	573459.3	152008.0	
Equipment blank	J1RW33	NA	NA	

[a] Analysis was performed for the expanded list of ICP metals to include antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.
HEIS = Hanford Environmental Information System
ICP = inductively coupled plasma
NA = not applicable

Table G-12. Verification Sample Results Summary Table for 100-D-30/100-D-104 Overburden/Layback Soil Placed in 120-D-1 (Lift 2, ~ 16 ft).

Sample Location	HEIS Sample Number	Washington State Plane Coordinates		Sample Analysis
		Easting	Northing	
120DL2-1	J1RXW1	573443.0	152012.8	Chromium (total) [a], mercury, hexavalent chromium
120DL2-2	J1RXW2	573454.6	152012.8	
120DL2-3	J1RXW3	573448.8	152022.8	
120DL2-4	J1RXW4	573460.4	152022.8	
120DL2-5	J1RXW5	573454.6	152032.9	
120DL2-6	J1RXW6	573448.8	152042.9	
120DL2-7	J1RXW7	573460.4	152042.9	
120DL2-8	J1RXW8	573454.6	152053.0	
120DL2-9	J1RXW9	573448.8	152063.0	
120DL2-10	J1RXX0	573460.4	152063.0	
120DL2-11	J1RXX1	573454.6	152073.1	
120DL2-12	J1RXX2	573460.4	152083.1	
Duplicate of J1RXW1	J1RXX3	573443.0	152012.8	
Equipment blank	J1RXX4	NA	NA	

[a] Analysis was performed for the expanded list of ICP metals to include antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.
HEIS = Hanford Environmental Information System
ICP = inductively coupled plasma
NA = not applicable

Table G-13. Verification Sample Results Summary Table for 100-D-30/100-D-104 Overburden/Layback Soil Placed in 120-D-1 (Lift 3, ~24 ft).

Sample Location	HEIS Sample Number	Washington State Plane Coordinates		Sample Analysis
		Easting	Northing	
120DL3-1	J1T4R9	573416.4	152010.8	Chromium (total) [a], mercury, hexavalent chromium
120DL3-2	J1T4T0	573432.0	152010.8	
120DL3-3	J1T4T1	573447.6	152010.8	
120DL3-4	J1T4T2	573463.3	152010.8	
120DL3-5	J1T4T3	573439.8	152024.3	
120DL3-6	J1T4T4	573455.5	152024.3	
120DL3-7	J1T4T5	573447.6	152037.8	
120DL3-8	J1T4T6	573455.5	152051.3	
120DL3-9	J1T4T7	573447.6	152064.9	
120DL3-10	J1T4T8	573463.3	152064.9	
120DL3-11	J1T4T9	573455.5	152078.4	
120DL3-12	J1T4V0	573463.3	152091.9	
Duplicate of J1T4R9	J1T4V1	573416.4	152010.8	
Equipment blank	J1T4V2	NA	NA	

[a] Analysis was performed for the expanded list of ICP metals to include antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.
HEIS = Hanford Environmental Information System
ICP = inductively coupled plasma
NA = not applicable

Table G-14. Verification Sample Results Summary Table for 100-D-30/100-D-104 Overburden/Layback Soil Placed in 183-D South Clearwell (Lift 1, ~0 to 8 ft). (2 Pages)

Sample Location	HEIS Sample Number	Washington State Plane Coordinates		Sample Analysis
		Easting	Northing	
183DVL1-1	J1TF63	573317.0	151495.2	Chromium (total) [a], mercury, hexavalent chromium
183DVL1-2	J1TF64	573337.3	151495.2	
183DVL1-3	J1TF65	573327.2	151512.7	
183DVL1-4	J1TF66	573347.4	151512.7	
183DVL1-5	J1TF67	573317.0	151530.3	
183DVL1-6	J1TF68	573337.3	151530.3	
183DVL1-7	J1TF69	573327.2	151547.8	
183DVL1-8	J1TF70	573347.4	151547.8	
183DVL1-9	J1TF71	573317.0	151565.3	

Table G-14. Verification Sample Results Summary Table for 100-D-30/100-D-104 Overburden/Layback Soil Placed in 183-D South Clearwell (Lift 1, ~0 to 8 ft). (2 Pages)

Sample Location	HEIS Sample Number	Washington State Plane Coordinates		Sample Analysis
		Easting	Northing	
183DVL1-10	J1TF72	573337.3	151565.3	Chromium (total) [a], mercury, hexavalent chromium
183DVL1-11	J1TF73	573327.2	151582.9	
183DVL1-12	J1TF74	573347.4	151582.9	
Duplicate of J1TF70	J1TF75	573347.4	151547.8	
Equipment blank	J1TF76	NA	NA	

[a] Analysis was performed for the expanded list of ICP metals to include antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.
HEIS = Hanford Environmental Information System
ICP = inductively coupled plasma
NA = not applicable

Table G-15. Verification Sample Results Summary Table for 100-D-30/100-D-104 Overburden/Layback Soil Placed in 100-D-73/100-D-76 (Lift 1, ~8 ft).

Sample Location	HEIS Sample Number	Washington State Plane Coordinates		Sample Analysis
		Easting	Northing	
OBVL1-1	J1T772	573756.7	151718.8	Chromium (total) [a], mercury, hexavalent chromium
OBVL1-2	J1T773	573730.6	151733.8	
OBVL1-3	J1T774	573748.0	151733.8	
OBVL1-4	J1T775	573765.4	151733.8	
OBVL1-5	J1T776	573721.9	151748.9	
OBVL1-6	J1T777	573756.7	151748.9	
OBVL1-7	J1T778	573730.6	151763.9	
OBVL1-8	J1T779	573765.4	151763.9	
OBVL1-9	J1T780	573739.3	151779.0	
OBVL1-10	J1T781	573756.7	151779.0	
OBVL1-11	J1T782	573730.6	151794.0	
OBVL1-12	J1T783	573748.0	151794.0	
Duplicate of J1T772	J1T784	573756.7	151718.8	
Equipment blank	J1T785	NA	NA	

[a] Analysis was performed for the expanded list of ICP metals to include antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.
HEIS = Hanford Environmental Information System
ICP = inductively coupled plasma
NA = not applicable

Table G-16. Verification Sample Results Summary Table for 100-D-30/100-D-104 Overburden/Layback Soil Placed in 100-D-73/100-D-76 (Lift 2, 8 to 16 ft).

Sample Location	HEIS Sample Number	Washington State Plane Coordinates		Sample Analysis
		Easting	Northing	
OBVL2-1	J1T858	573763.4	151717.1	Chromium (total) [a], mercury, hexavalent chromium
OBVL2-2	J1T859	573754.3	151732.8	
OBVL2-3	J1T860	573772.4	151732.8	
OBVL2-4	J1T861	573745.3	151748.4	
OBVL2-5	J1T862	573763.4	151748.4	
OBVL2-6	J1T863	573736.2	151764.1	
OBVL2-7	J1T864	573754.3	151764.1	
OBVL2-8	J1T865	573772.4	151764.1	
OBVL2-9	J1T866	573745.3	151779.8	
OBVL2-10	J1T867	573763.4	151779.8	
OBVL2-11	J1T868	573736.2	151795.5	
OBVL2-12	J1T869	573754.3	151795.5	
Duplicate of J1T858	J1T870	573763.4	151717.1	
Equipment blank	J1T871	NA	NA	

[a] Analysis was performed for the expanded list of ICP metals to include antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.
HEIS = Hanford Environmental Information System
ICP = inductively coupled plasma
NA = not applicable

Table G-17. 100-D-30/100-D-104 Tier II Overburden Stockpiles Sample Summary. (2 Pages)

Sample Location	HEIS Sample Number	Washington State Plane		Sample Analysis
		Northing	Easting	
DU1-1	J1RDD3	152081.7	573527.5	ICP metals [a], hexavalent chromium, mercury, IC anions, nitrate/nitrite, and pH
DU1-2	J1RDD4	152115.7	573523.6	
DU1-3	J1RDD5	152149.6	573519.7	
DU1-4	J1RDD6	152183.6	573515.8	
DU1-5	J1RDD7	151722.0	573539.2	
DU1-6	J1RDD8	152027.4	573504.0	
DU1-7	J1RDD9	152061.4	573500.1	
DU1-8	J1RDF0	152095.3	573496.2	
DU1-9	J1RDF1	152129.3	573492.2	
DU1-10	J1RDF2	152163.2	573488.3	
DU1-11	J1RDF3	151701.6	573511.8	
DU1-12	J1RDF4	151735.6	573507.9	

Table G-17. 100-D-30/100-D-104 Tier II Overburden Stockpiles Sample Summary. (2 Pages)

Sample Location	HEIS Sample Number	Washington State Plane		Sample Analysis
		Northing	Easting	
Duplicate of J1RDD5	J1RDF5	152149.6	573519.7	ICP metals [a], hexavalent chromium, mercury, IC anions, nitrate/nitrite, and pH
DU4-1	J1RDK3	150994.6	573054.3	ICP metals [a], mercury, hexavalent chromium, IC anions, and nitrate/nitrite, and pH
DU4-2	J1RDK4	151062.3	573042.2	
DU4-3	J1RDK5	151031.9	573067.8	
DU4-4	J1RDK6	151001.5	573093.4	
DU4-5	J1RDK7	151069.3	573081.3	
DU4-6	J1RDK8	151038.9	573106.9	
DU4-7	J1RDK9	151167.4	573043.7	
DU4-8	J1RDL0	151137.0	573069.3	
DU4-9	J1RDL1	151106.6	573094.9	
DU4-10	J1RDL2	150854.1	573442.4	
DU4-11	J1RDL3	150861.0	573481.5	
DU4-12	J1RDL4	150868.0	573520.6	
Duplicate of J1RDK8	J1RDL5	151038.9	573106.9	
Equipment blank	J1RDK2	NA	NA	ICP metals [a], mercury, and SVOA

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

HEIS = Hanford Environmental Information System
IC = ion chromatography
ICP = inductively coupled plasma
NA = not applicable
pH = hydrogen ion concentration
SVOA = semivolatile organic analysis

Table G-18. 100-D-104/100-D-50:7 Tier II SPA Verification Sample Summary Table. (2 Pages)

Sample Location	HEIS Sample Number	Washington State Plane Coordinates (m)		Sample Analysis
		Easting	Northing	
SPA 1	J1RH58	573049.6	150783.0	ICP metals [a], hexavalent chromium, mercury
SPA 2	J1RH59	573089.3	150783.2	
SPA 3	J1RH60	573069.3	150817.6	
SPA 4	J1RH61	573109.1	150817.8	
SPA 5	J1RH62	573049.2	150851.9	
SPA 6	J1RH63	573089.0	150852.1	
SPA 7	J1RH64	573068.9	150886.5	
SPA 8	J1RH65	573108.7	150886.7	
SPA 9	J1RH66	573048.9	150920.8	
SPA 10	J1RH67	573088.6	150921.0	
SPA 11	J1RH68	573068.6	150955.4	
SPA 12	J1RH69	573108.4	150955.6	

Table G-18. 100-D-104/100-D-50:7 Tier II SPA Verification Sample Summary Table. (2 Pages)

Sample Location	HEIS Sample Number	Washington State Plane Coordinates (m)		Sample Analysis
		Easting	Northing	
Duplicate of J1RH64	J1RH64	573068.9	150886.5	ICP metals [a], hexavalent chromium, mercury
Equipment blank	J1RH71	NA	NA	

[a] The expanded list of ICP metals was requested to include antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.
HEIS = Hanford Environmental Information System
ICP = inductively coupled plasma
NA = not applicable
SPA = staging pile area

Table G-19. 100-D-30 Tier II SPA Verification Sample Summary Table.

Sample Location	HEIS Sample Number	Washington State Plane Coordinates (m)		Sample Analysis
		Easting	Northing	
SPA 1-1	J1RK39	573503.2	151850.5	ICP metals [a], hexavalent chromium, mercury
SPA 1-2	J1RK40	573490.8	151872.0	
SPA 1-3	J1RK41	573515.6	151872.0	
SPA 1-4	J1RK42	573503.2	151893.6	
SPA 1-5	J1RK43	573490.8	151915.1	
SPA 1-6	J1RK44	573515.6	151915.1	
SPA 1-7	J1RK45	573503.2	151936.7	
SPA 1-8	J1RK46	573490.8	151958.2	
SPA 1-9	J1RK47	573515.6	151958.2	
SPA 1-10	J1RK48	573503.2	151979.8	
SPA 1-11	J1RK49	573490.8	152001.3	
SPA 1-12	J1RK50	573515.6	152001.3	
Duplicate of J1RK39	J1RK51	573503.2	151850.5	
Equipment blank	J1RK52	NA	NA	

[a] The expanded list of ICP metals was requested to include antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.
HEIS = Hanford Environmental Information System
ICP = inductively coupled plasma
NA = not applicable
SPA = staging pile area

Table G-20. 100-D-30 Verification Sample Summary for Two Small SPAs.

Sample Location	HEIS Sample Number	Washington State Plane Coordinates (m)		Sample Analysis
		Easting	Northing	
SPA 1	J1TXP7	573776.0	151843.7	ICP metals [a], hexavalent chromium, mercury
SPA 2	J1TXP8	573779.3	151843.7	
SPA 3	J1TXP9	573777.7	151846.6	
SPA 4	J1TXR0	573737.9	151858.1	
SPA 5	J1TXR1	573736.2	151860.9	
SPA 6	J1TXR2	573739.6	151860.9	
SPA 7	J1TXR3	573737.9	151863.8	
SPA 8	J1TXR4	573741.2	151863.8	
SPA 9	J1TXR5	573736.2	151866.7	
SPA 10	J1TXR6	573739.6	151866.7	
SPA 11	J1TXR7	573734.6	151869.6	
SPA 12	J1TXR8	573737.9	151869.6	
Duplicate of J1TXR5	J1TXR9	TBD	TBD	
Equipment blank	J1TXT0	NA	NA	

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

HEIS = Hanford Environmental Information System
ICP = inductively coupled plasma
NA = not applicable
SPA = staging pile area
TBD = to be determined

Figure G-1. Verification Sample Locations for the 100-D-30/100-D-104 Waste Site Excavation Decision Unit 1.

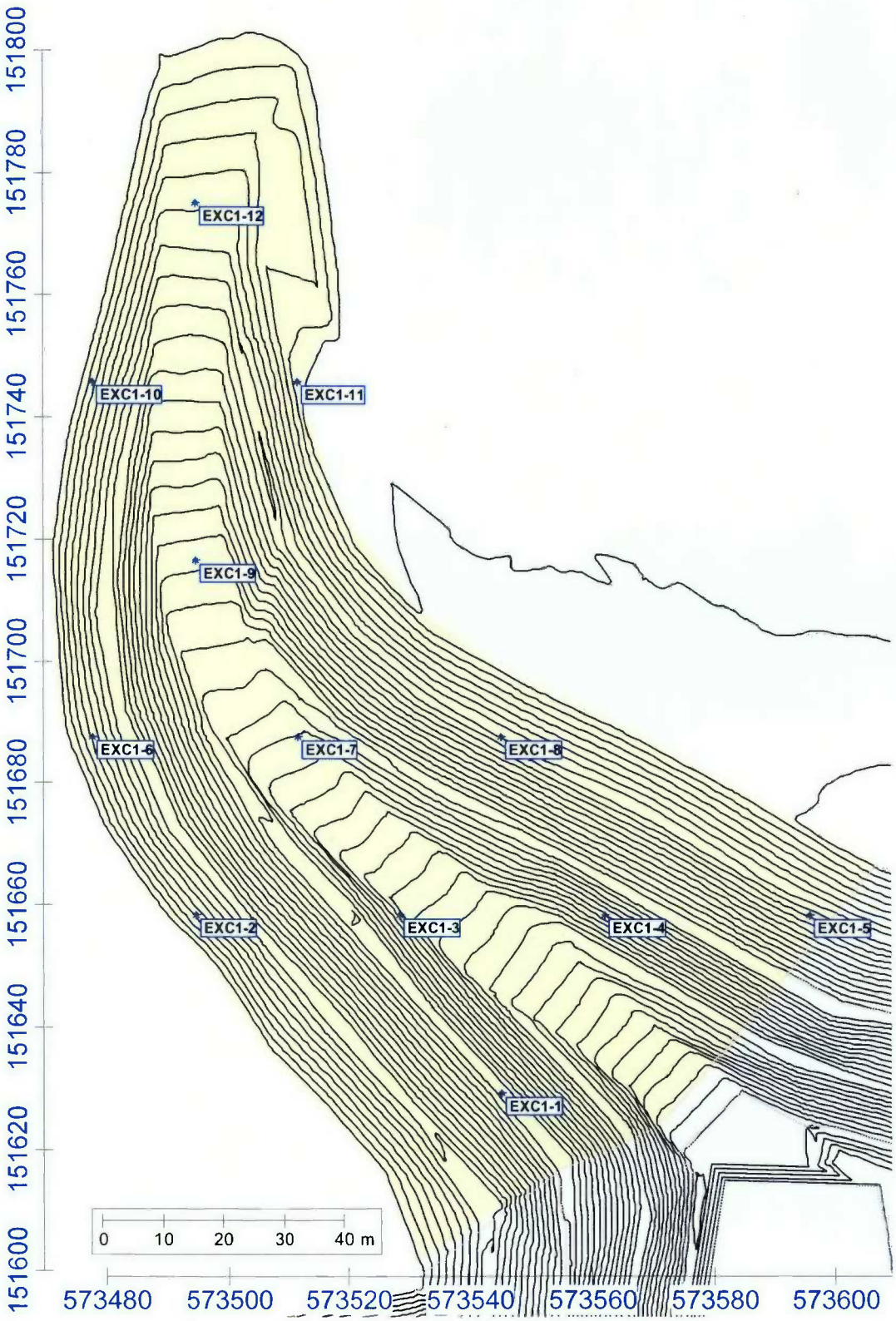


Figure G-2. Verification Sample Locations for the 100-D-30/100-D-104 Waste Site Excavation Decision Units 2 through 8.

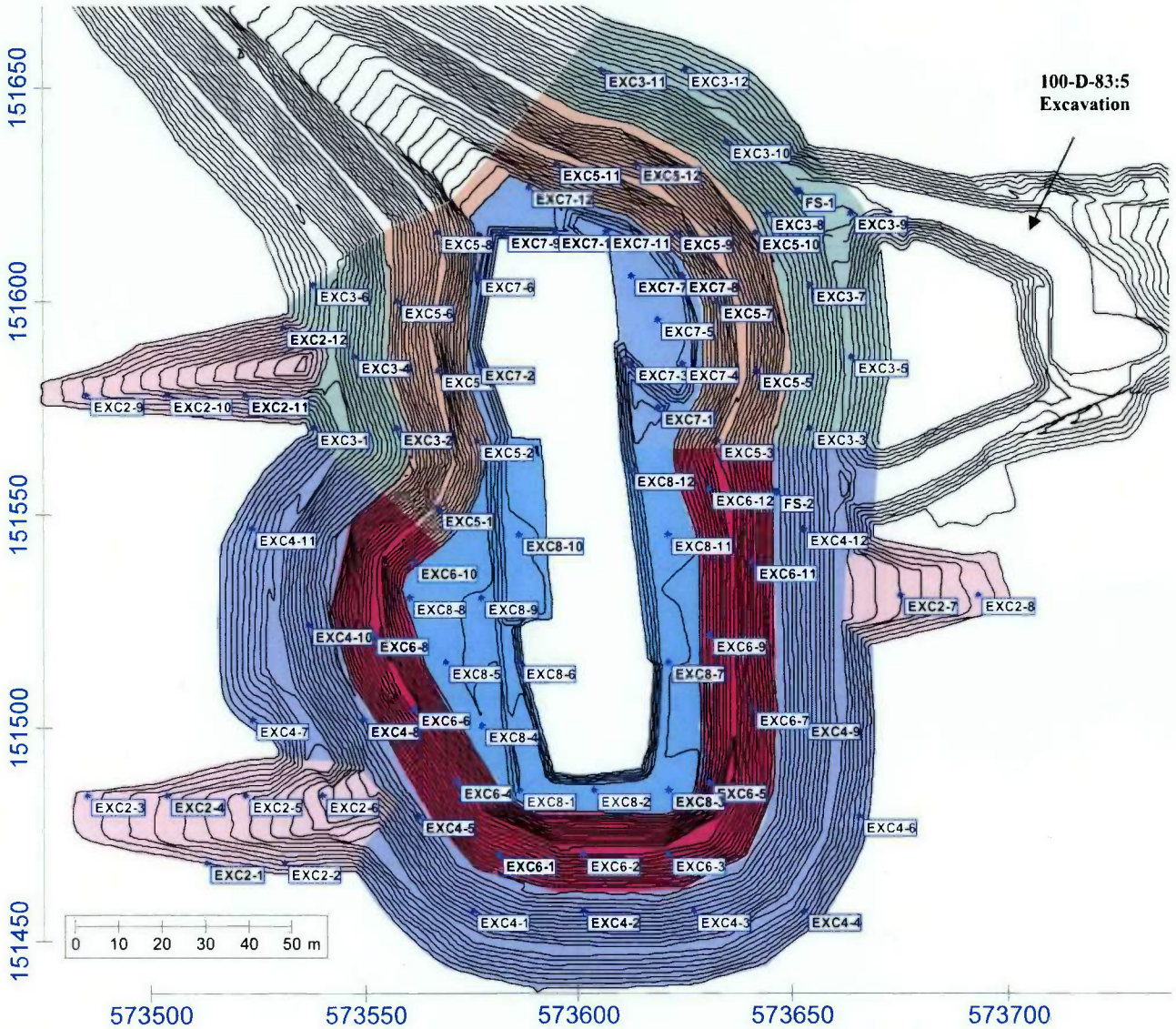


Figure G-3. Verification Sample Locations for 100-D-30/100-D-104 SPA 3.

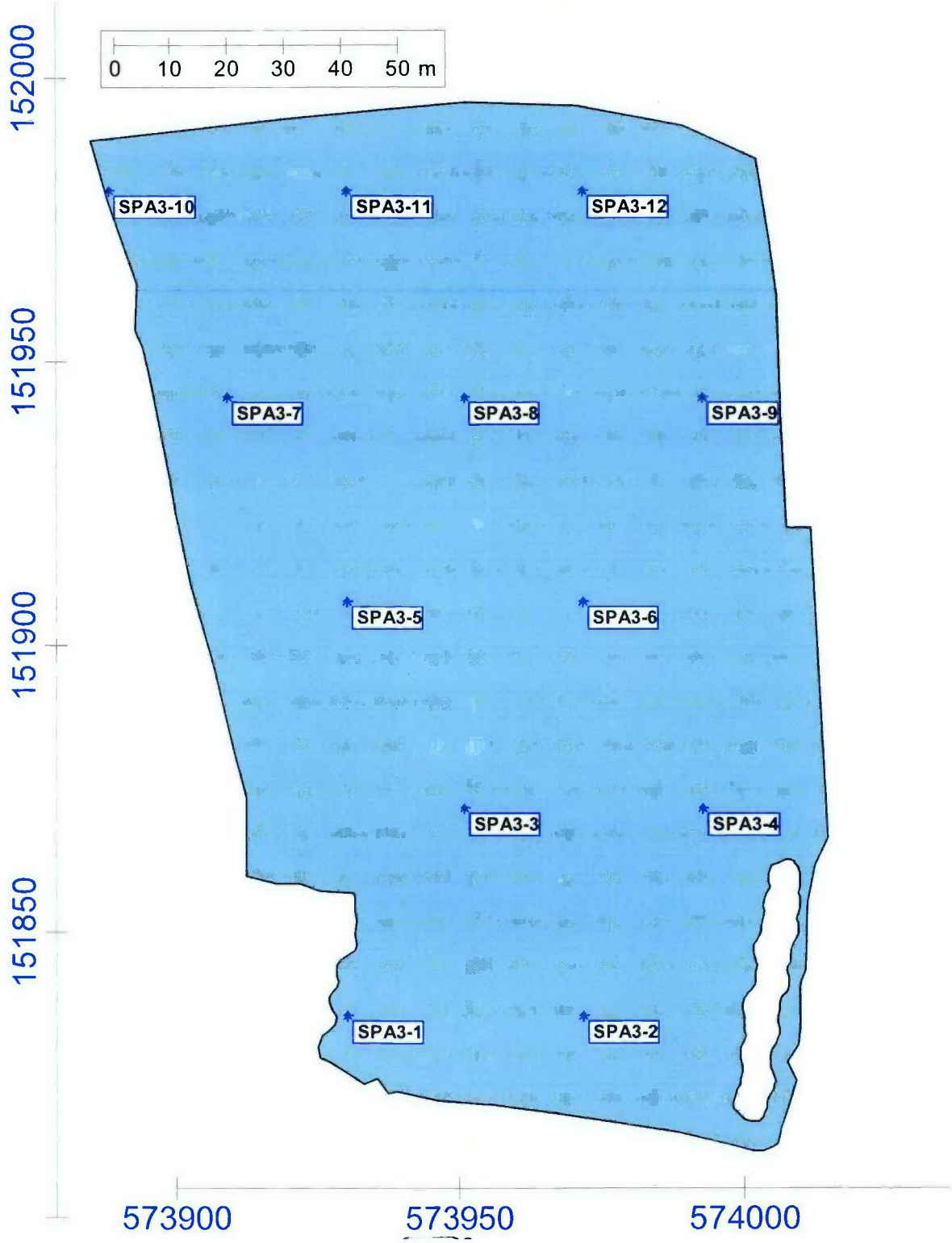


Figure G-4. Verification Sample Locations for 100-D-30/100-D-104 SPA 2 and 100-D-83:5 SPA 4.

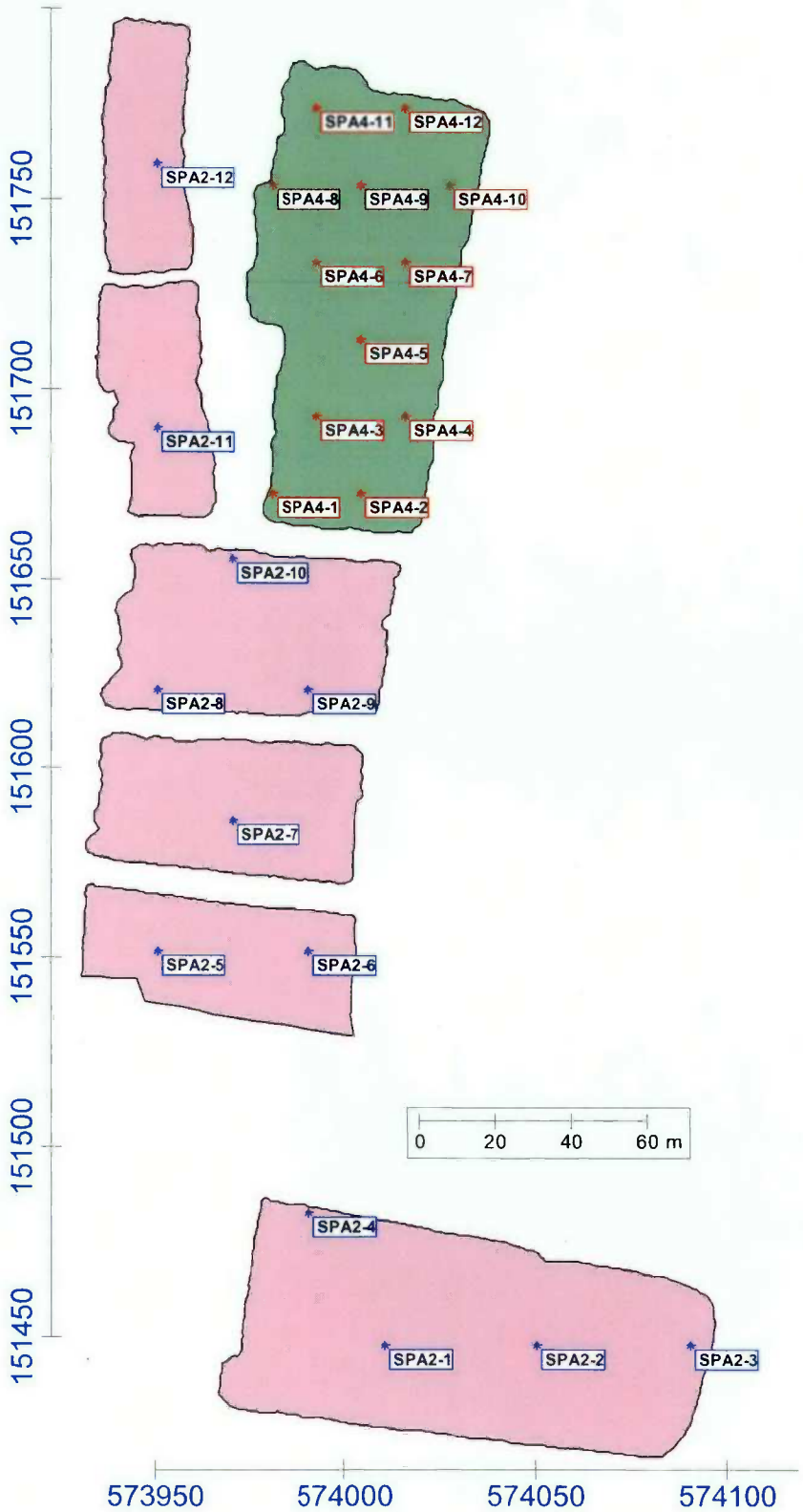


Figure G-5. Verification Sample Locations for 100-D-30/100-D-104 Overburden/Layback (OBVL1) Soil Stockpile (West) Lift 1 (0 to ~8 ft).

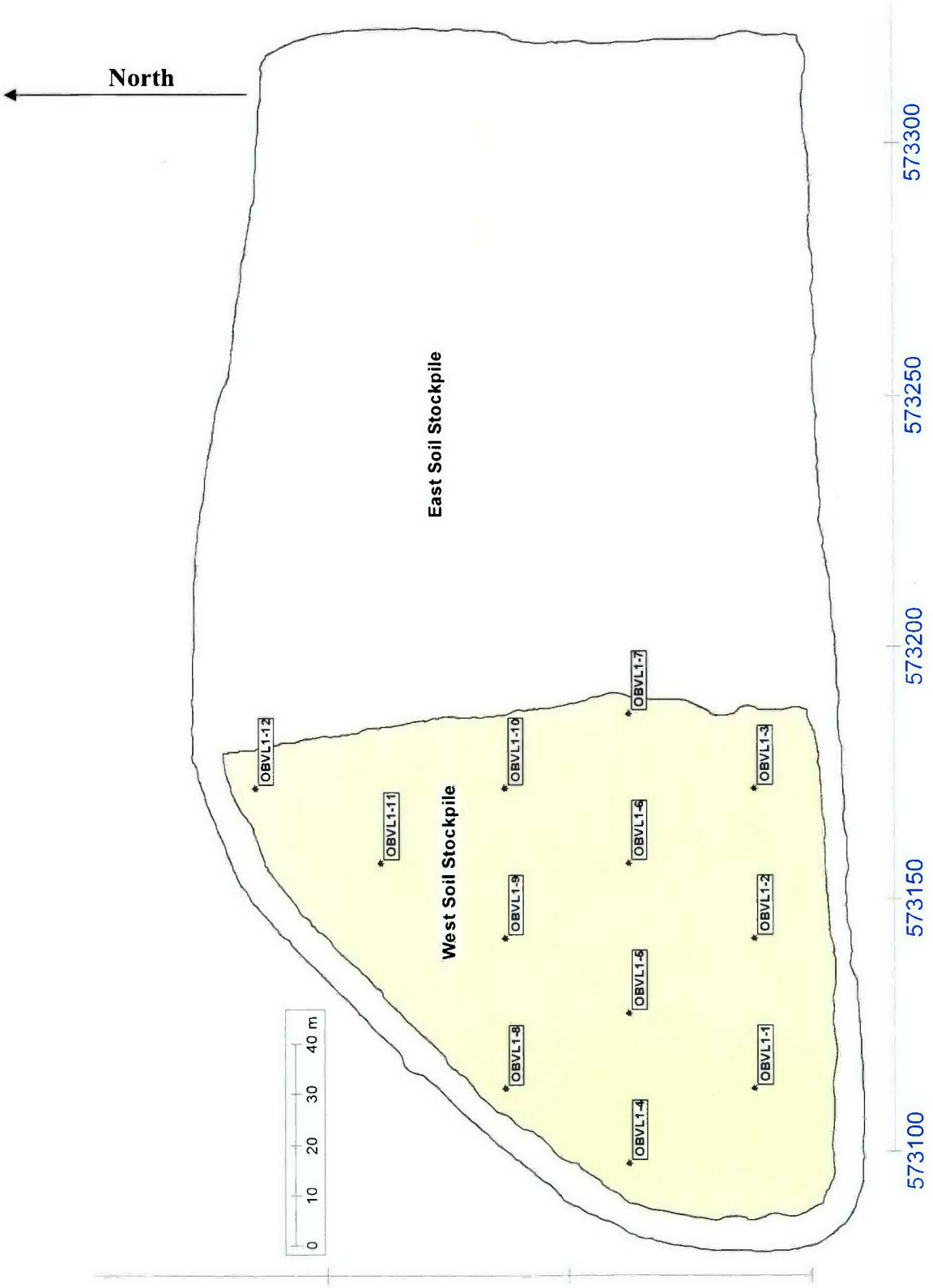


Figure G-6. Verification Sample Locations for 100-D-30/100-D-104 Overburden/Layback (OBVL2) Soil Stockpile (West) Lift 2 (8 to ~16 ft).

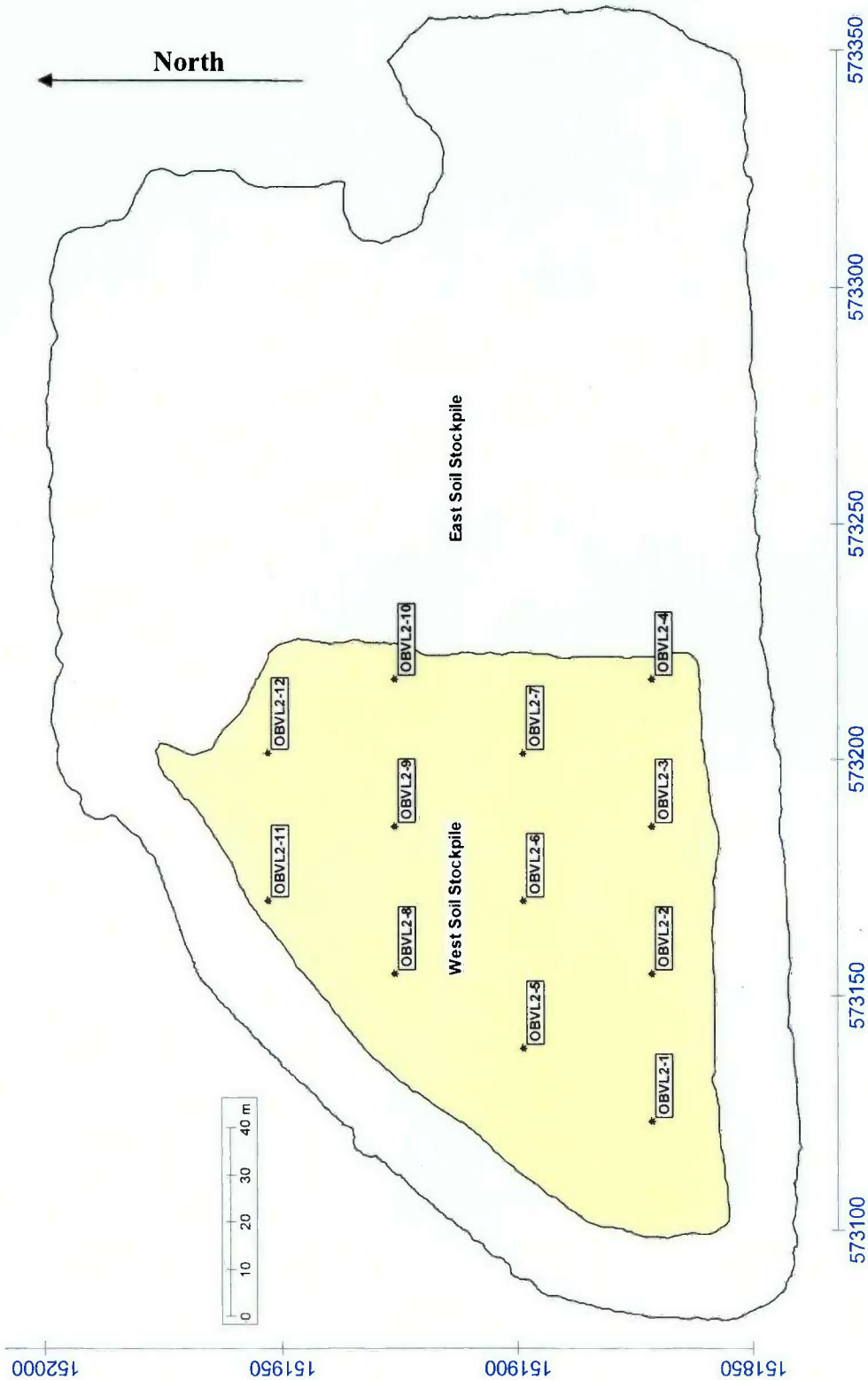


Figure G-7. Verification Sample Locations for 100-D-30/100-D-104 Overburden/Layback (OBL1E) Soil Stockpile (East) Lift 1 (0 to ~8 ft).

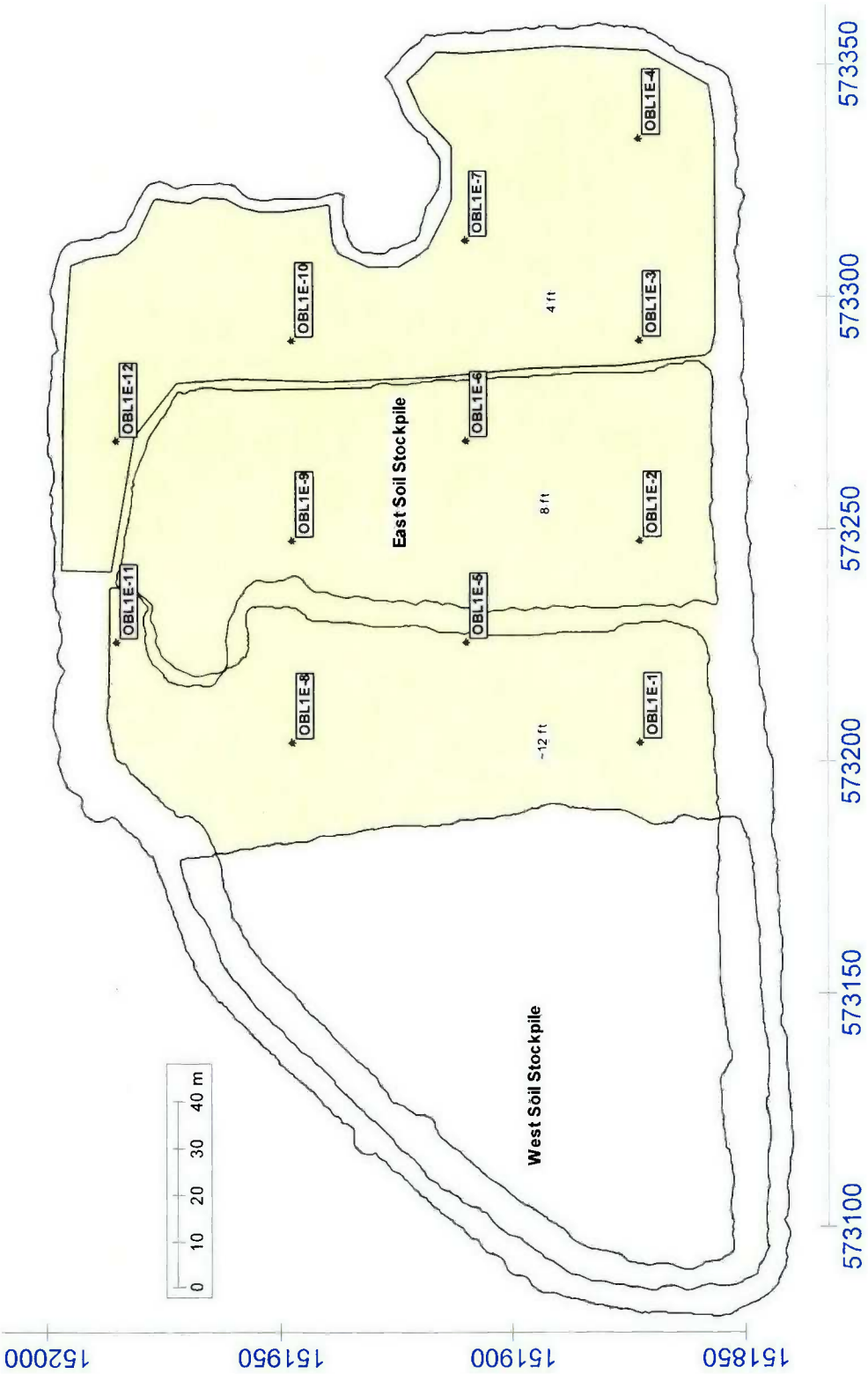


Figure G-8. Verification Sample Locations for 100-D-30/100-D-104 Overburden/Layback (OBEVL2) Soil Stockpile (East) Lift 2 (~ 8 to ~15 ft Above Surface Grade).

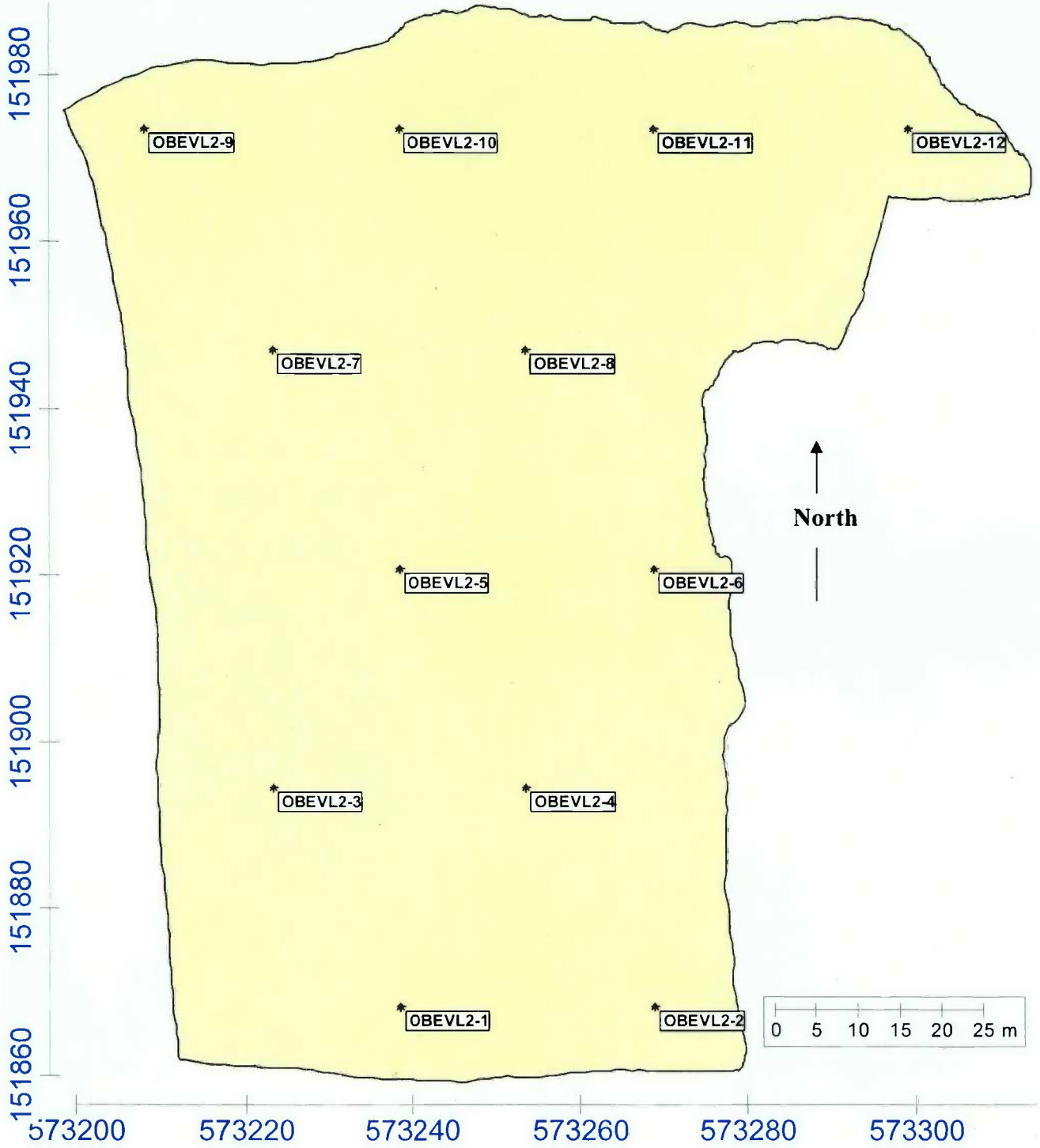


Figure G-9. Verification Sample Locations for 100-D-30/100-D-104 Overburden/Layback (OB3VL1) Soil Placed in Stockpile 3 (Lift 1, ~8 ft).

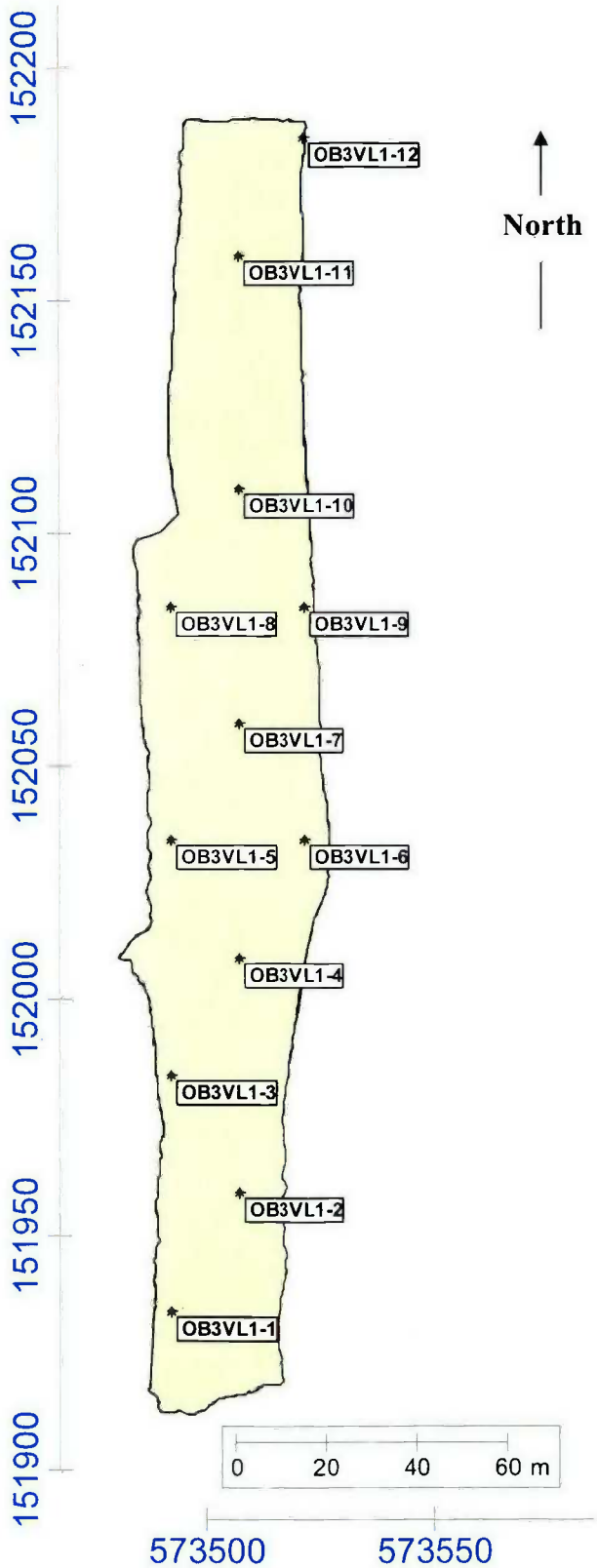


Figure G-10. Verification Sample Locations for 100-D-30/100-D-104 Overburden/Layback (OB3VL2) Soil Placed in Stockpile 3 (Lift 2, ~8 to 16 ft).

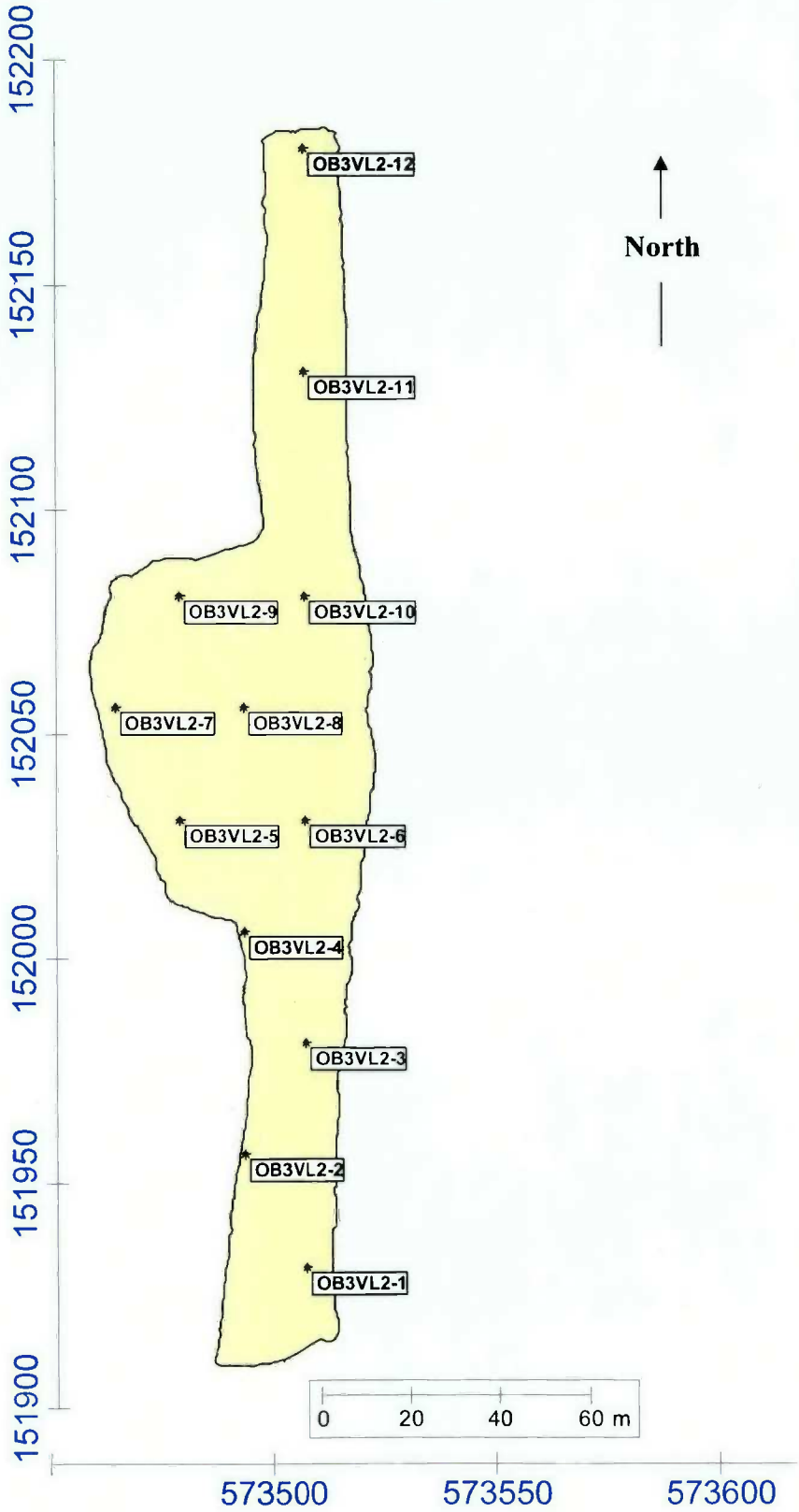


Figure G-11. Verification Sample Locations for 100-D-30/100-D-104 Overburden/Layback (OB3EVL1) Soil Placed East of Stockpile 3 (Lift 1, ~8 ft).

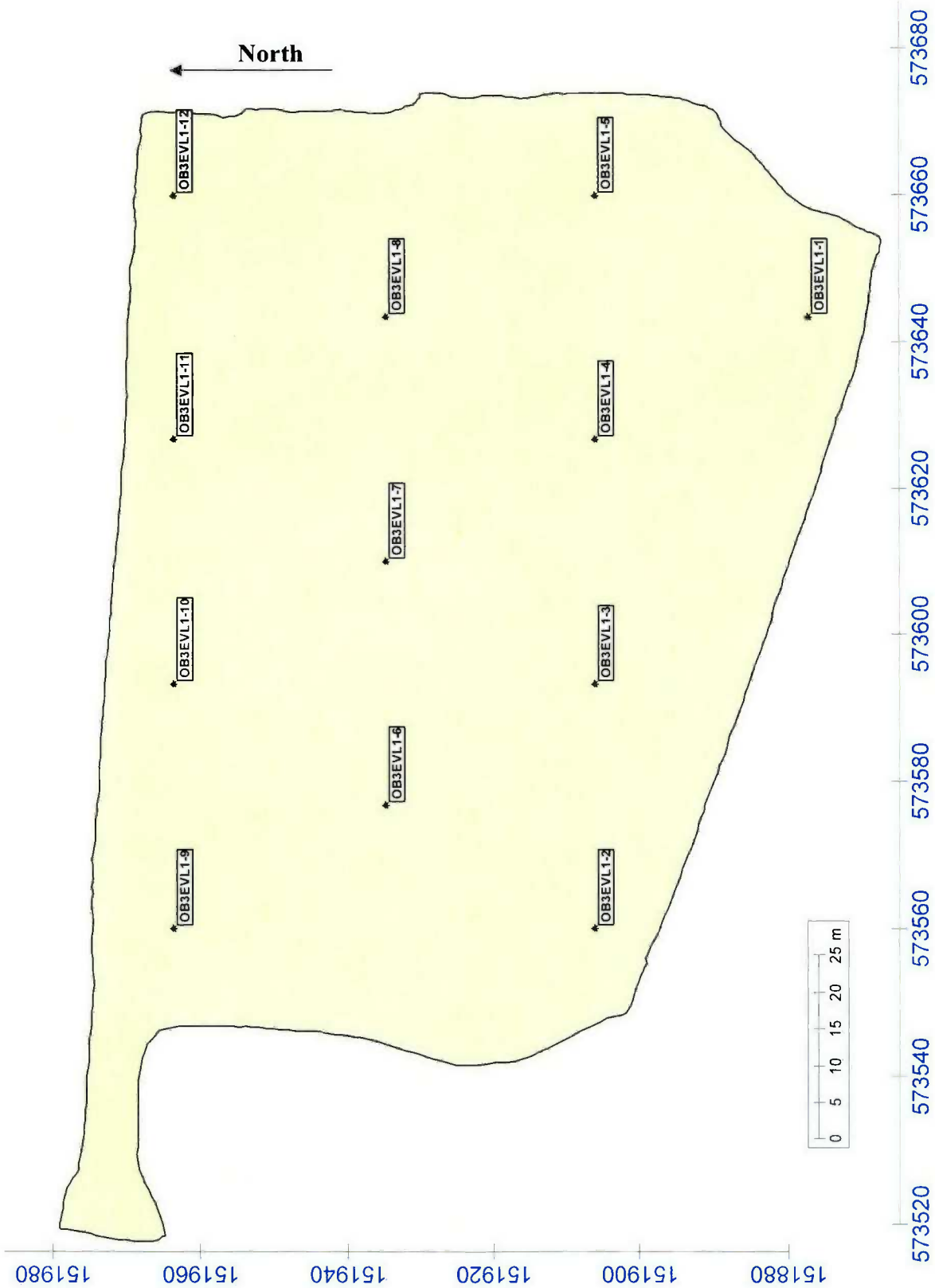


Figure G-12. Verification Sample Locations for 100-D-30/100-D-104 Overburden/Layback (OB3EVL2) Soil Placed East of Stockpile 3 (Lift 2, ~8 to 16 ft).

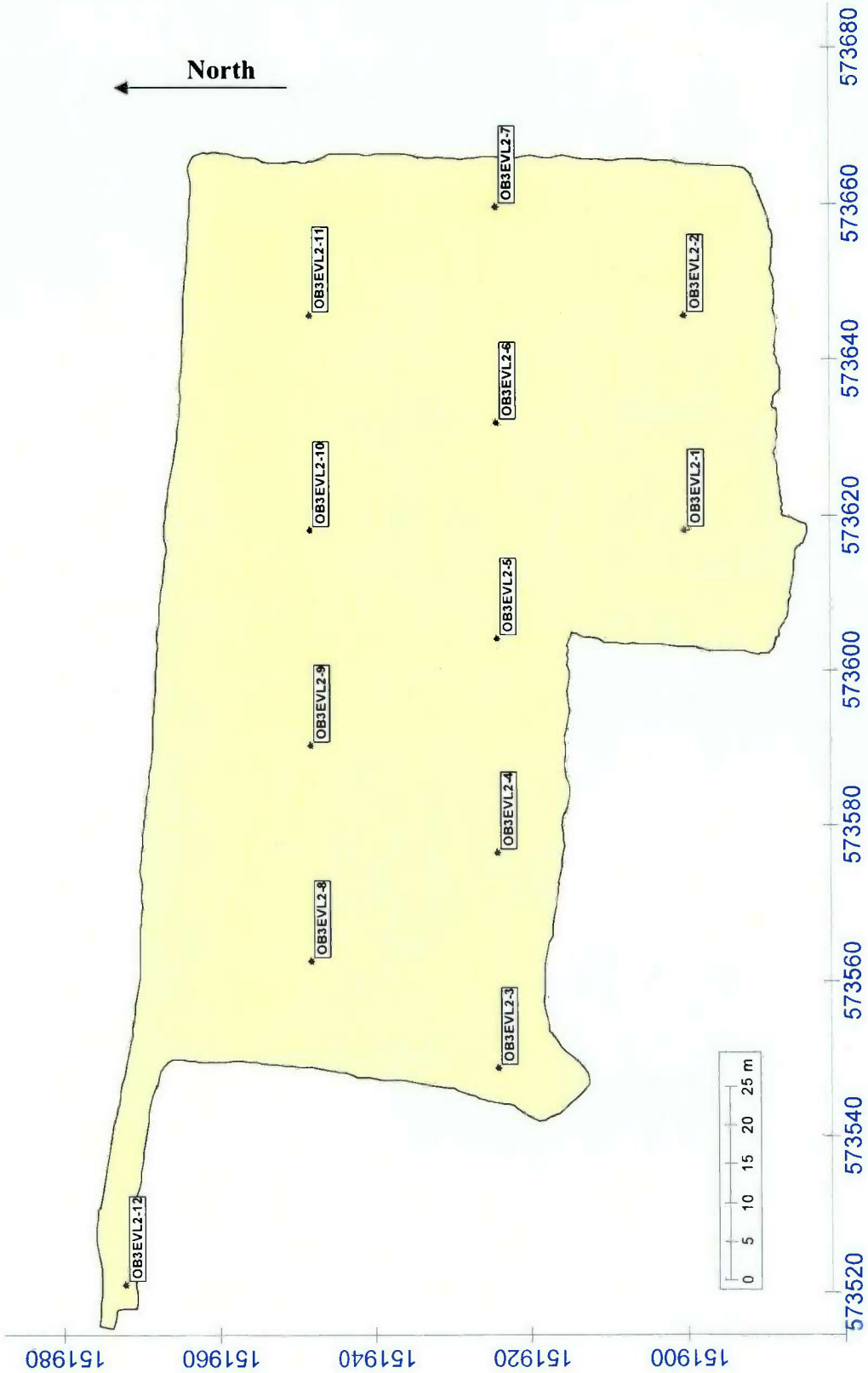


Figure G-13. Verification Sample Locations for 100-D-30/100-D-104 Overburden/Layback (120DL1) Soil Placed East in 120-D-1 Waste Site Excavation (Lift 1, ~8 ft).

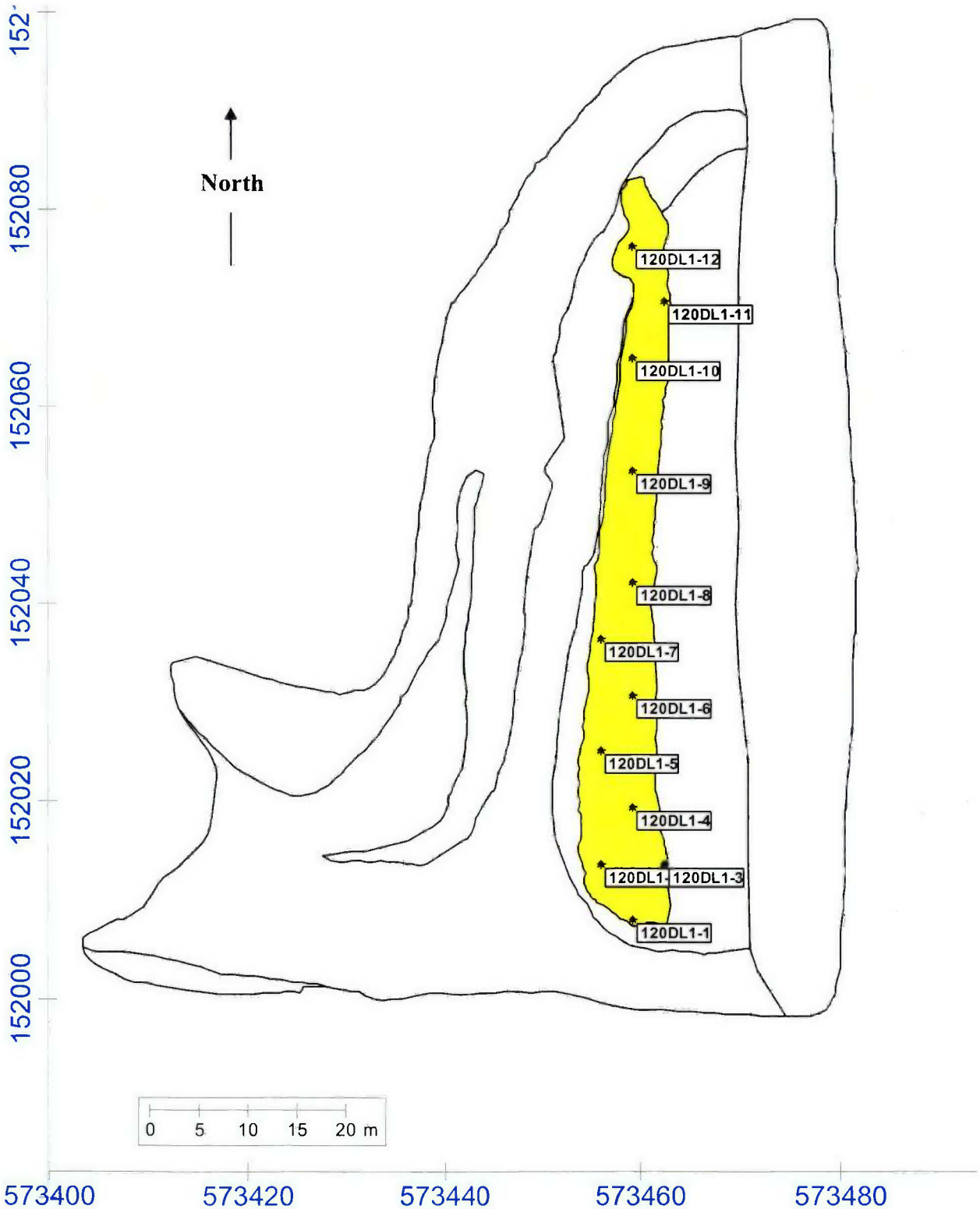


Figure G-14. Verification Sample Locations for 100-D-30/100-D-104 Overburden/Layback (120DL2) Soil Placed East in 120-D-1 Waste Site Excavation (Lift 2, ~16 ft).

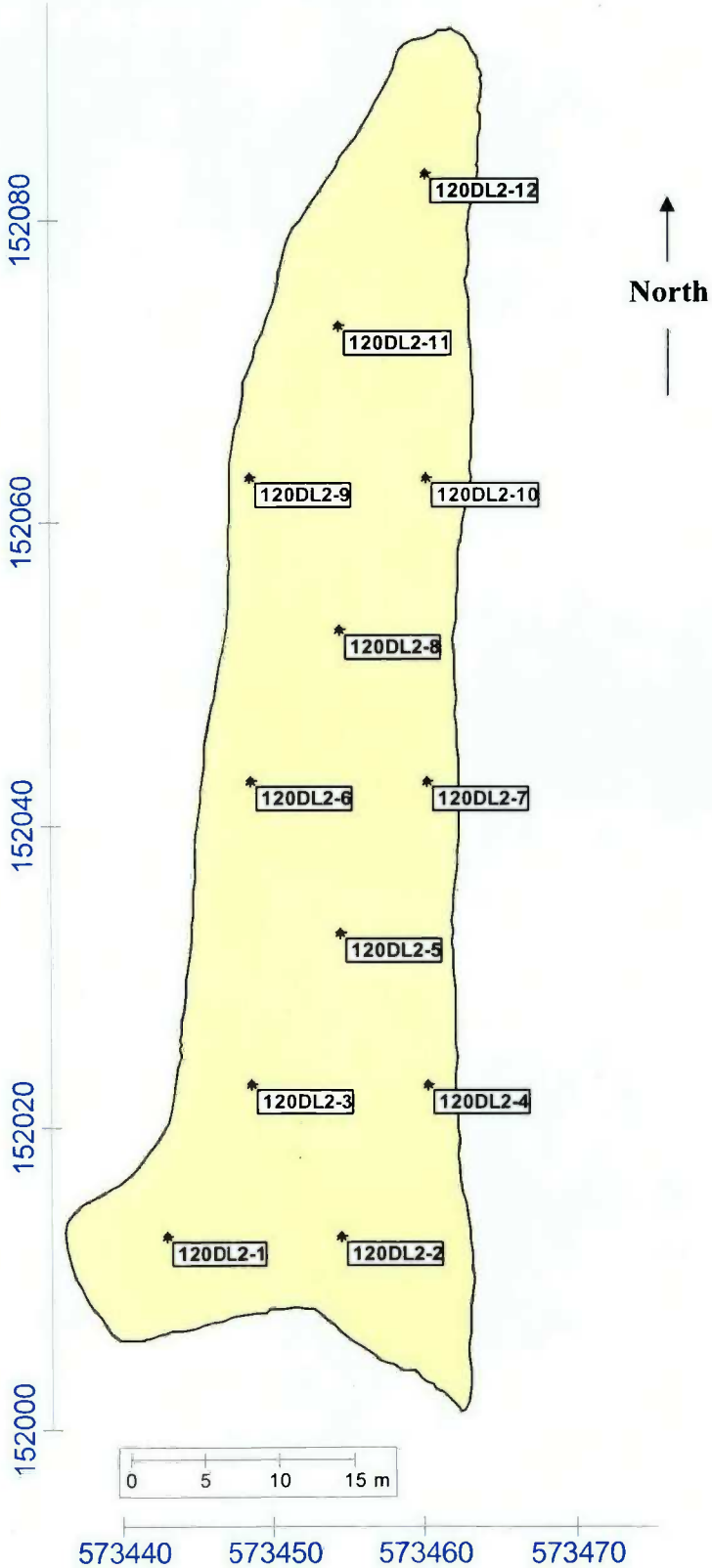


Figure G-15. Verification Sample Locations for 100-D-30/100-D-104 Overburden/Layback (120DL3) Soil Placed East in 120-D-1 Waste Site Excavation (Lift 3, ~24 ft).

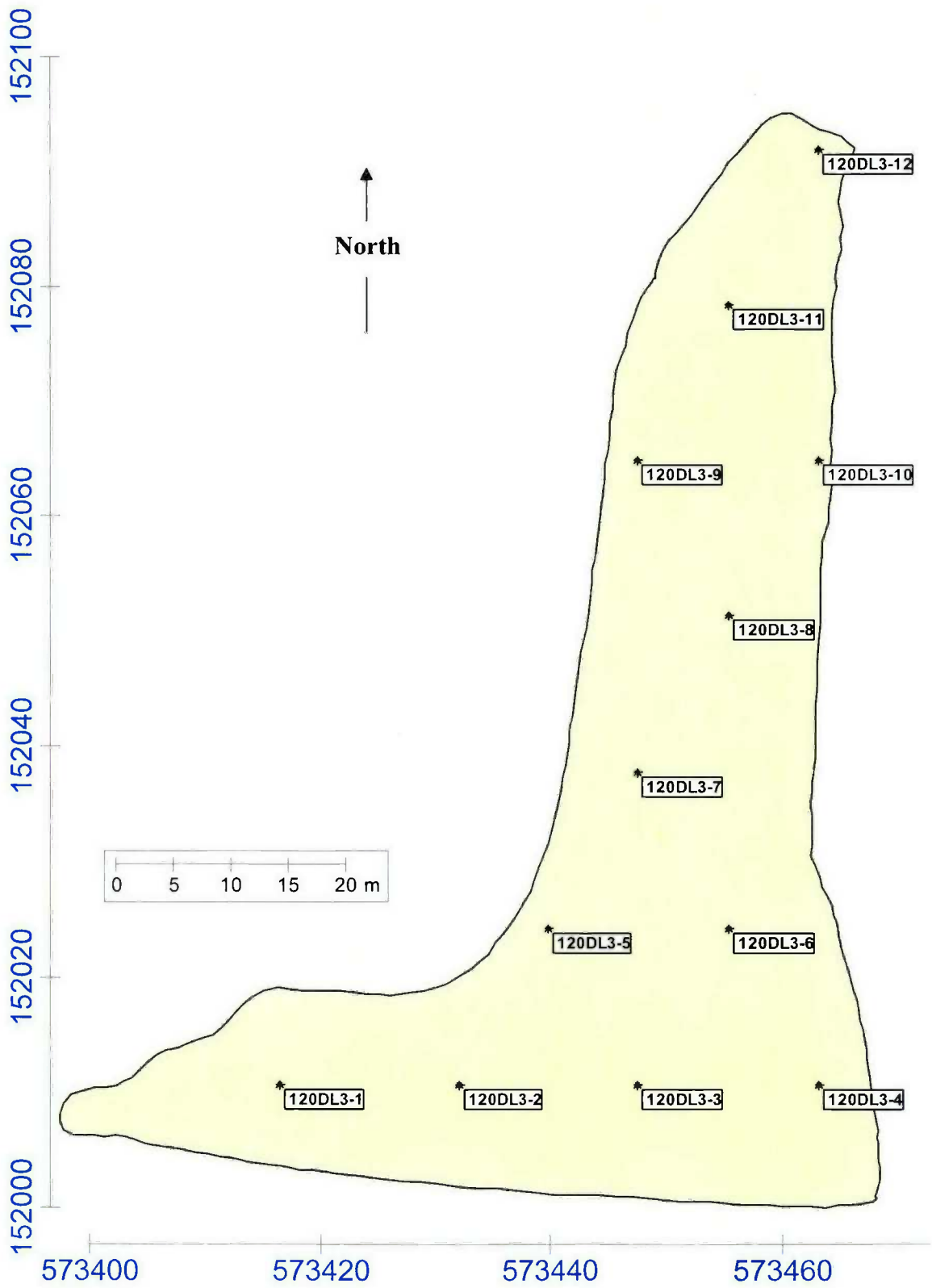


Figure G-16. Verification Sample Locations for 100-D-30/100-D-104 Overburden/Layback (183DVL1) Soil Placed East in South Portion of 183-D Clearwell (Lift 1, ~8 ft).

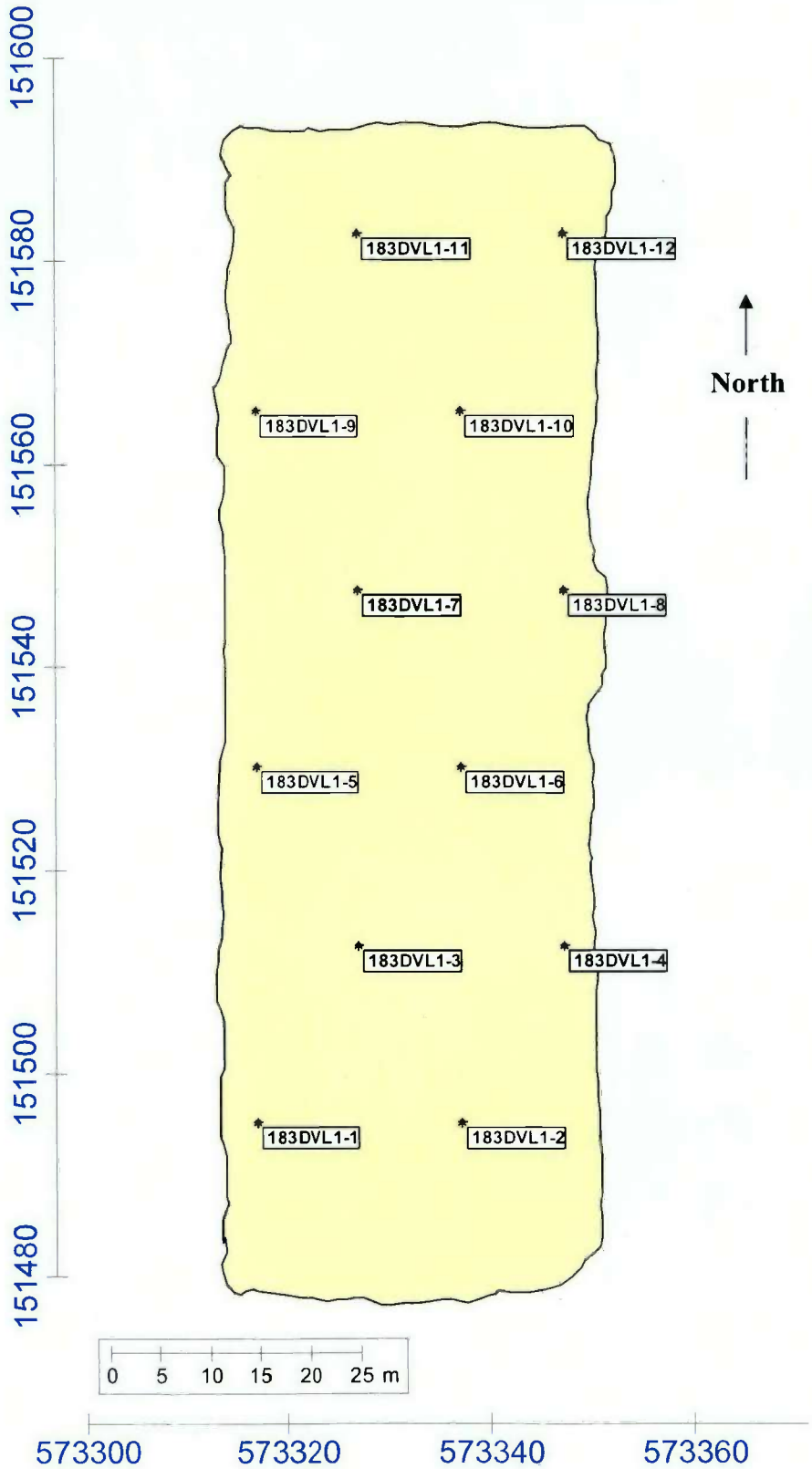


Figure G-17. Verification Sample Locations for 100-D-30/100-D-104 Overburden/Layback (OBVL1) Soil Placed in 100-D-73/100-D-76 Waste Site Excavation (Lift 1, ~8 ft).

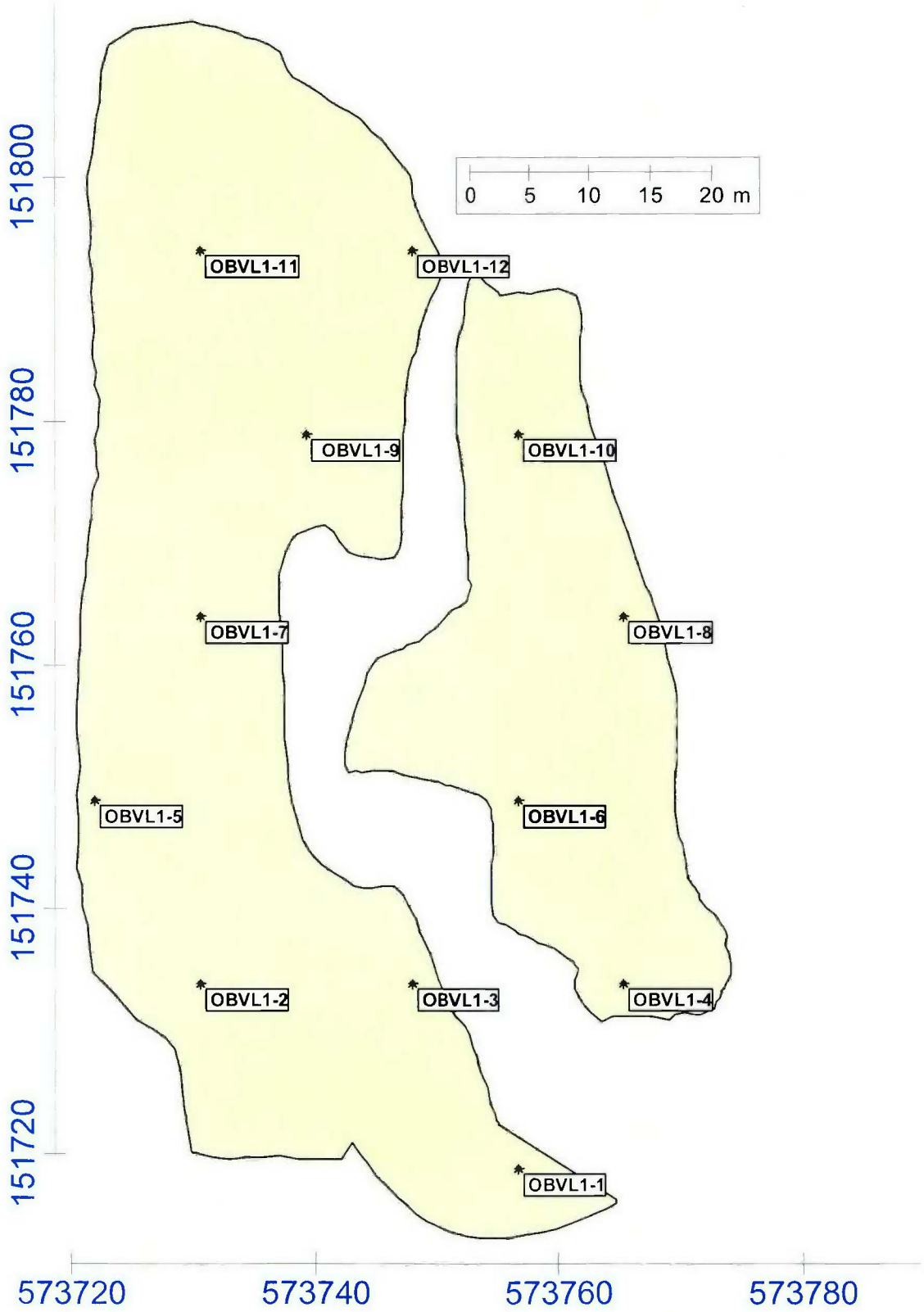


Figure G-18. Verification Sample Locations for 100-D-30/100-D-104 Overburden/Layback (OBVL2) Soil Placed in 100-D-73/100-D-76 Waste Site Excavation (Lift 2, ~8 to 16 ft).

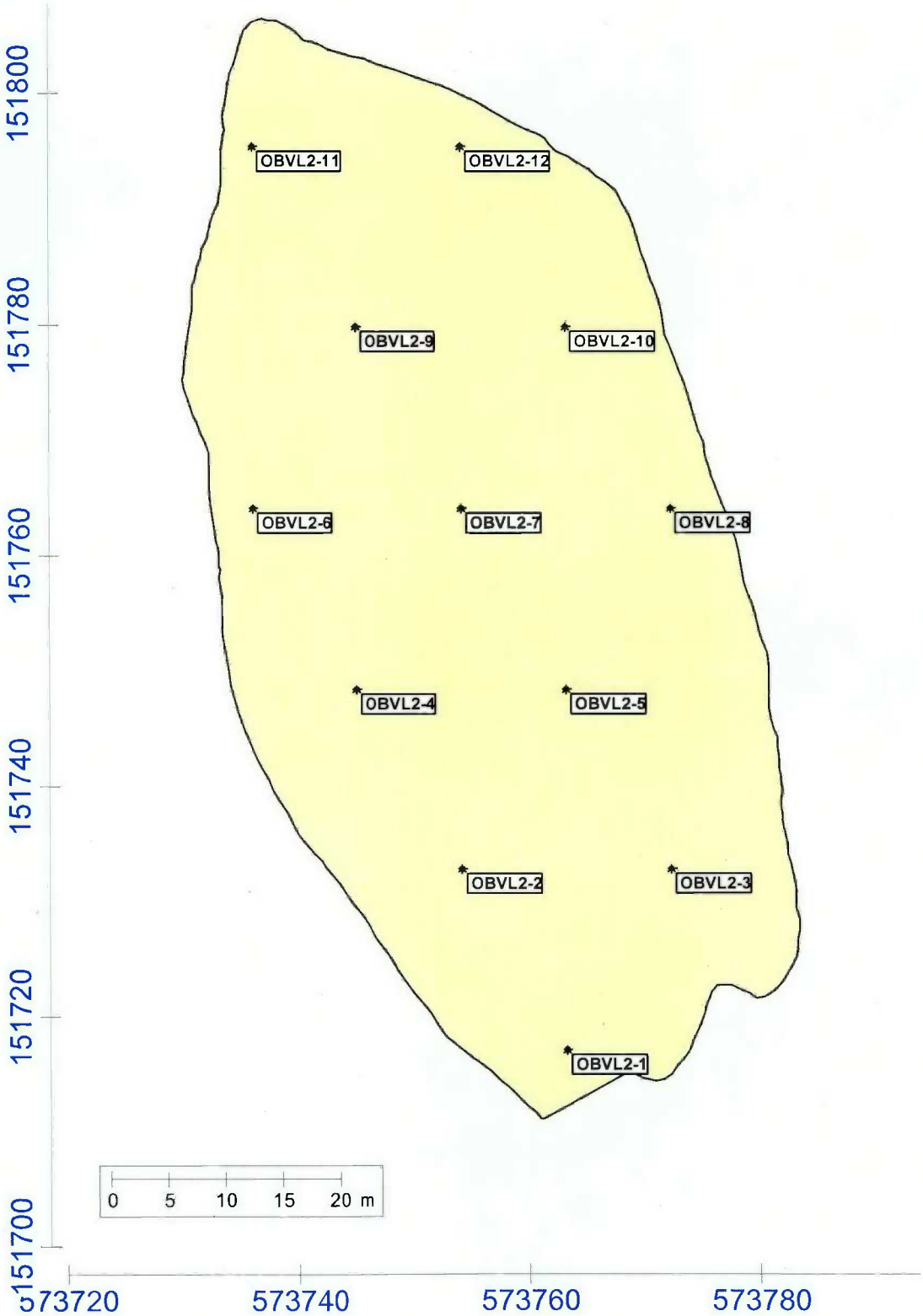


Figure G-19. Verification Sample Locations for 100-D-30/100-D-104 Tier II Overburden/Layback Soil Stockpiles.

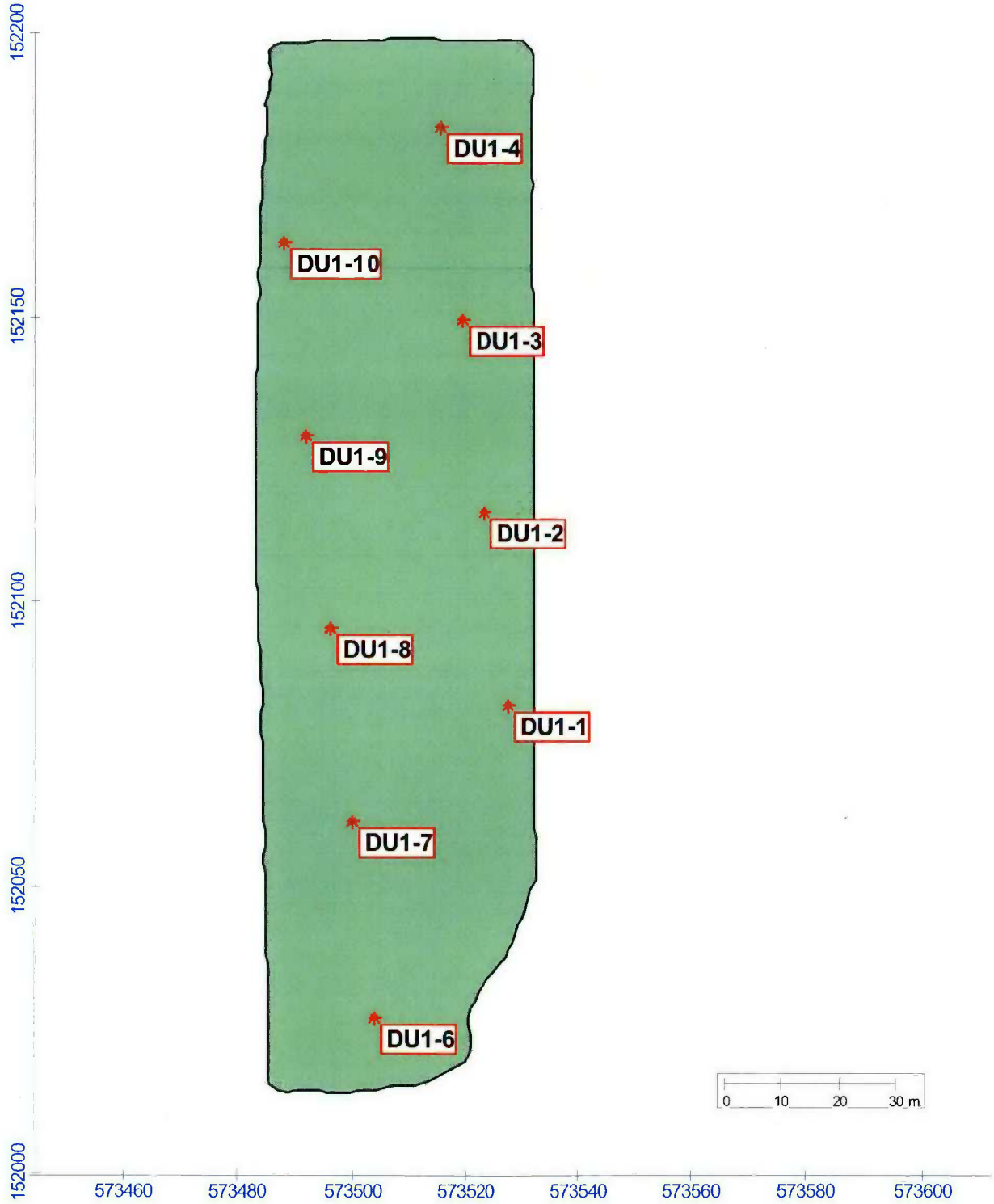
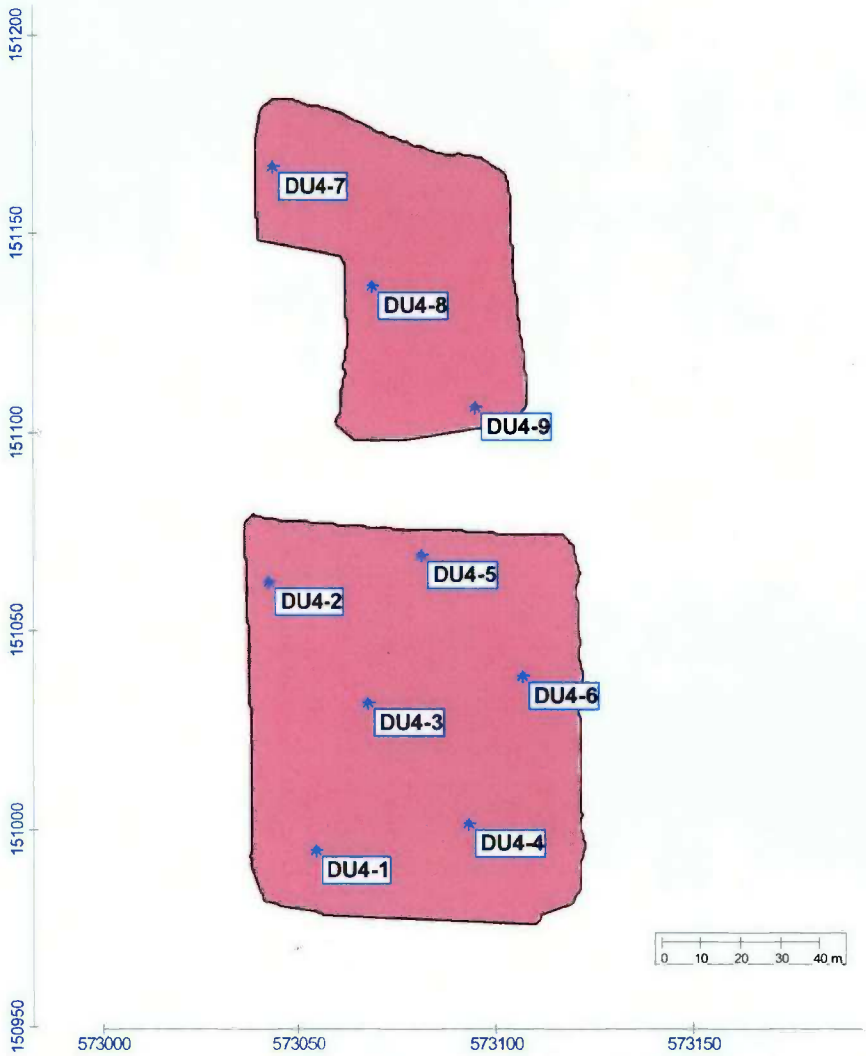


Figure G-20. Verification Sample Locations for 100-D-30/100-D-104 Tier II Overburden/Layback Soil Stockpiles.



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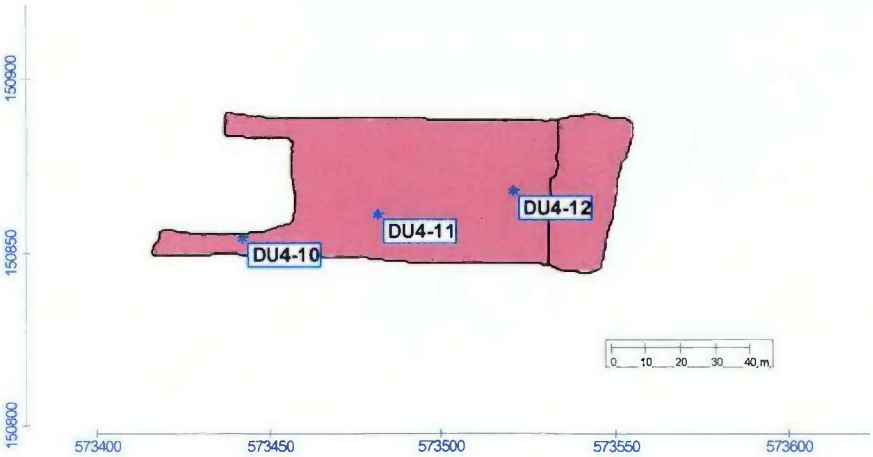


Figure G-21. Verification Sample Locations for 100-D-104/100-D-50:7 Tier II SPA.

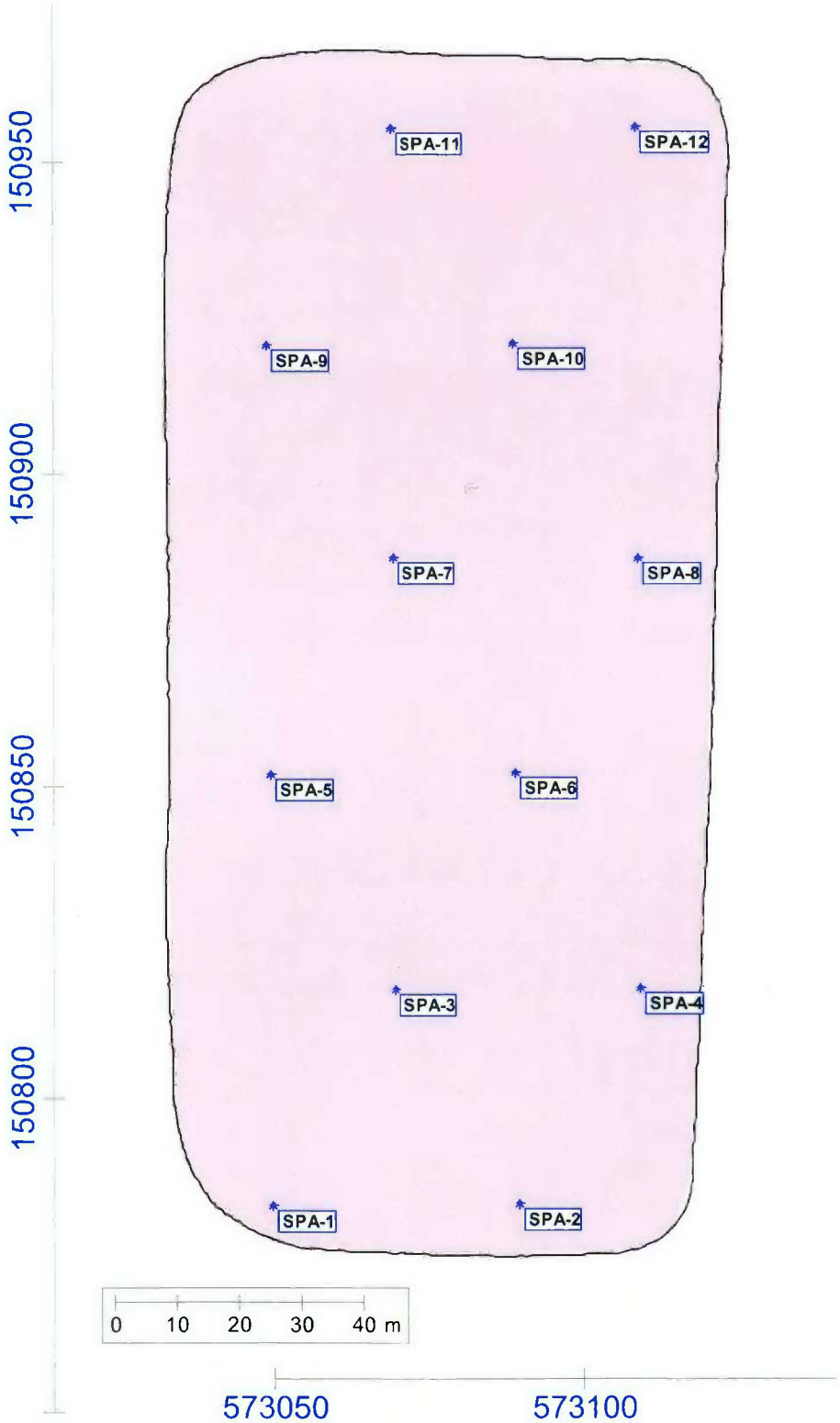


Figure G-22. Verification Sample Locations for 100-D-30 Tier II SPA.

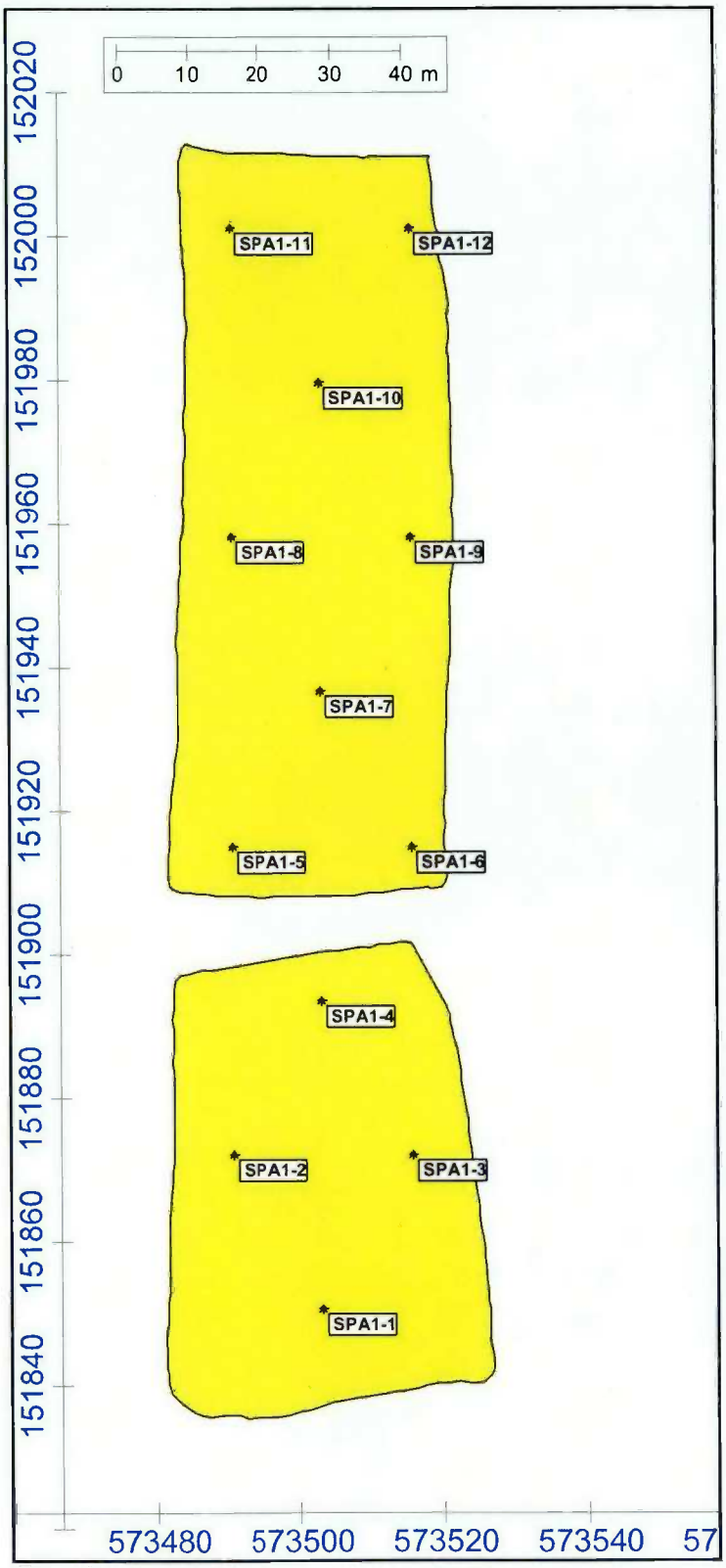
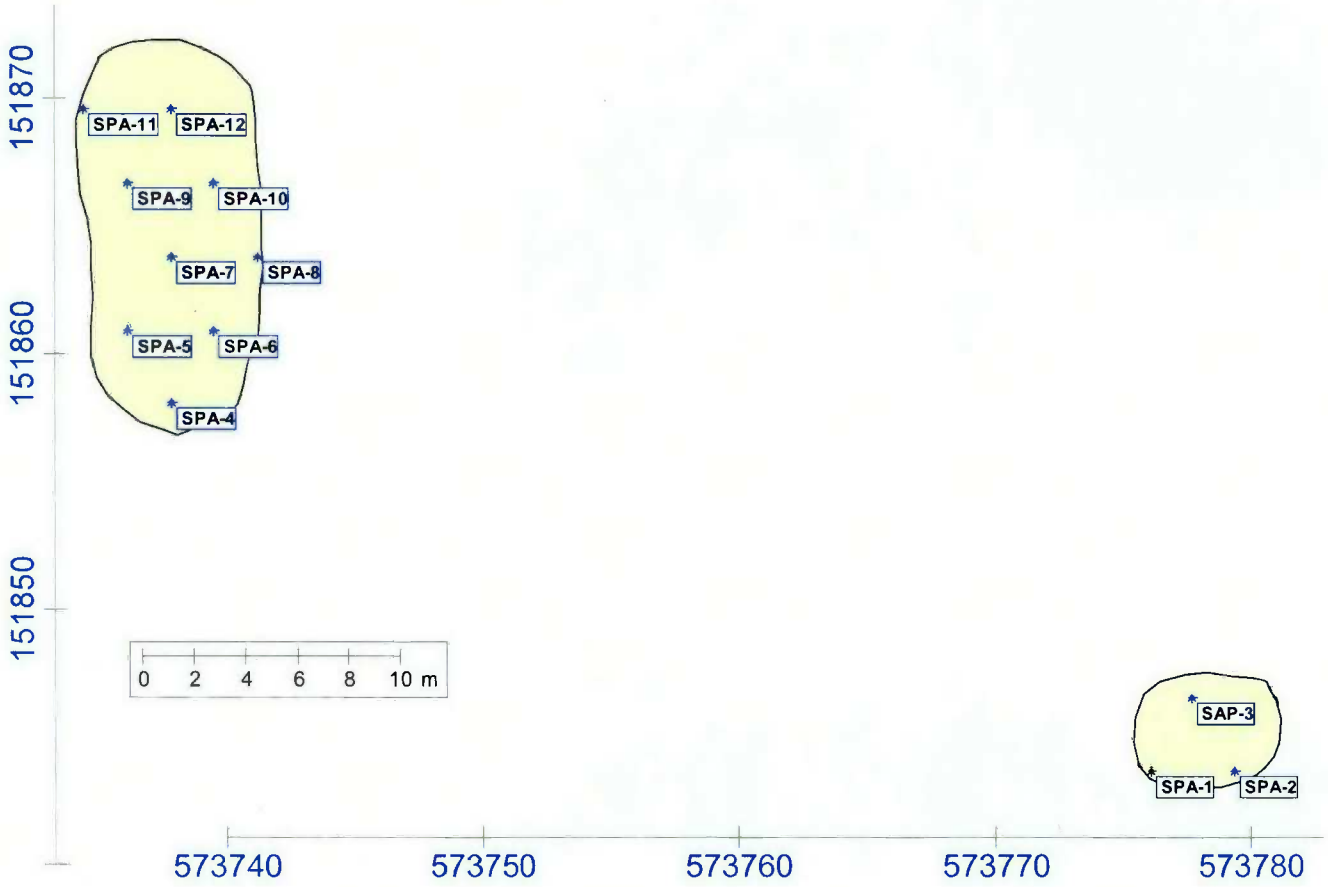


Figure G-23. Verification Sample Locations for the Two 100-D-30 SPAs.



APPENDIX H

DATA QUALITY ASSESSMENT

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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 designs (WCH 2013g, 2013h, 2014e, 2014f, and 2014g). This DQA was performed in accordance with site-specific data quality objectives found in the *100 Area Remedial Action Sampling and Analysis Plan* (100 Area SAP) (DOE-RL 2009).

A review of the sample designs (WCH 2013g, 2013h, 2014e, 2014f, and 2014g), the field logbooks (WCH 2013a, 2013b, 2013c, 2013d, 2013e, 2013f, 2014a, 2014b, and 2014c), and applicable analytical data packages has been performed as part of this DQA. All samples were collected and analyzed per the sample design.

To ensure quality data, the 100 Area SAP (DOE-RL 2009) data assurance requirements and the data validation procedures for chemical analysis (BHI 2000) is used, as appropriate. This review involves evaluation of the data to determine if they are of the right type, quality, and quantity to support the intended use (i.e., closeout decisions). The DQA completes the data life cycle (i.e., planning, implementation, and assessment) that was initiated by the data quality objectives process (EPA 2006).

Verification data from samples collected at the 100-D-30 and 100-D-104 excavation and related sites were provided by the laboratory in 26 sample delivery groups (SDGs). Due to the large amount of data this DQA will be presented by sampling areas (excavation, staging pile areas, and overburden).

100-D-30 AND 100-D-104 EXCAVATION DATA

Verification data from the excavation area(s) of the 100-D-30 and 100-D-104 were provided by the laboratories in nine SDGs: JP0793, JP0794, JP0795, JP0803, JP0804, JP0805, JP0806, JP0809, and JP0813. SDG JP0809 was submitted for third-party validation. No major deficiencies were identified in the analytical data set. Minor deficiencies for the 100-D-30 and 100-D-104 excavation data set are discussed as follows below. If no comments are made about a specific analysis, it should be assumed that no deficiencies affecting the quality of the data were found.

Minor Deficiencies – Excavation Data

SDG JP0793

This SDG comprises 12 samples (J1T119 through J1T130) collected from the excavation area. All of these samples were analyzed for inductively coupled plasma (ICP) metals, mercury, and hexavalent chromium. Minor deficiencies are as follows.

In the ICP metals analysis, serial dilution of a digestate indicated physical and chemical interferences are present for several analytes. The laboratory has qualified the associated data with "X" qualifiers. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, low levels of manganese, nickel, and copper were detected in the method blank (MB). These detections were less than half of the reporting limits and will not impact the field sample data. The data are usable for decision-making purposes.

In the ICP metals analysis, iron and aluminum were detected in the MB at concentrations greater than the reporting limits. Field sample results for iron and aluminum are more than 20 times the MB results; therefore, there is no impact on the field sample data. The data are usable for decision-making purposes.

In the ICP metals analysis, the matrix spike (MS) results for beryllium and calcium are outside the quality control (QC) limits. The laboratory has qualified the associated data with "N" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

SDG JP0794

This SDG comprises 12 samples (J1T131 through J1T142) collected from the excavation area. All of these samples were analyzed for ICP metals, mercury, and hexavalent chromium. Minor deficiencies are as follows.

In the ICP metals analysis, serial dilution of a digestate indicated physical and chemical interferences are present for several analytes. The laboratory has qualified the associated data with "X" qualifiers. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, a low level of cadmium was detected in the MB. This detection was less than half of the reporting limits and will not impact the field sample data. The data are usable for decision-making purposes.

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

SDG JP0795

This SDG comprises 12 samples (J1TLL1 through J1TLL9, J1TLM0 through J1TLM2) collected from the excavation area. All of these samples were analyzed for ICP metals, mercury, and hexavalent chromium. Minor deficiencies are as follows.

In the ICP metals analysis, serial dilution of a digestate indicated physical and chemical interferences are present for several analytes. The laboratory has qualified the associated data with "X" qualifiers. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, a low level of aluminum was detected in the MB. This detection was less than half of the reporting limits and will not impact the field sample data. The data are usable for decision-making purposes.

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

SDG JP0803

This SDG comprises two samples (J1TPW5, J1TPW6) collected from the excavation area. All of these samples were analyzed for ICP metals, mercury, nitrate, nitrite, hydrogen ion concentration, and hexavalent chromium. Minor deficiencies are as follows.

In the ICP metals analysis, serial dilution of a digestate indicated physical and chemical interferences are present for several analytes. The laboratory has qualified the associated data with "X" qualifiers. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the relative percent difference (RPD) calculated for arsenic is outside the QC limits. The laboratory has qualified all of the associated data with "M" flags. Acceptable laboratory control sample (LCS) recovery indicates that the analytical system was operating within control. The qualified data may be considered estimated. Estimated data are usable for decision-making purposes.

In the 9056M IC anions analysis, the holding times for nitrate, nitrite, and orthophosphate were exceeded. This result was expected and method 353.2 was also performed to ensure quality nitrate and nitrite data. Orthophosphate is not a regulated compound. The 9056M data nitrate, nitrite, and orthophosphate may be considered estimated. Estimated data are usable for decision-making purposes.

In the 9056M IC anions analysis, the MS recovery for fluoride is outside the QC limits. The laboratory has qualified the associated data with "N" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

SDG JP0804

This SDG comprises 13 samples (J1TLM3 through J1TLM9, J1TLN0 through J1TLN5) collected from the excavation area. This SDG contains one field duplicate pair (J1TLN4/J1TLN5). All of these samples were analyzed for ICP metals, mercury, and hexavalent chromium. Minor deficiencies are as follows.

In the ICP metals analysis, serial dilution of a digestate indicated physical and chemical interferences are present for several analytes. The laboratory has qualified the associated data with "X" qualifiers. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, iron was detected in the MB at a concentration greater than the associated reporting limit. Field sample results for iron are more than 20 times the MB results; therefore, there is no impact on the field sample data. The data are usable for decision-making purposes.

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

SDG JP0805

This SDG comprises 13 samples (J1TLN6 through J1TLN9, J1TLP0 through J1TLP8) collected from the excavation area. This SDG contains one field duplicate pair (J1TLP5/J1TLP8). All of these samples were analyzed for ICP metals, mercury, and hexavalent chromium. Minor deficiencies are as follows.

In the ICP metals analysis, serial dilution of a digestate indicated physical and chemical interferences are present for cobalt, nickel, and zinc. The laboratory has qualified the associated data with "X" qualifiers. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, a low level of calcium was detected in the MB. This detection was less than half of the reporting limits and will not impact the field sample data. The data are usable for decision-making purposes.

In the ICP metals analysis, the RPDs calculated for arsenic and cadmium are outside the QC limits. The laboratory has qualified all of the associated data with "M" flags. An acceptable LCS recovery indicates that the analytical system was operating within control. The qualified data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the MS results for mercury are outside the QC limits. An acceptable LCS recovery indicates that the analytical system was operating within control. The laboratory has qualified the associated data with "N" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

SDG JP0806

This SDG comprises 13 samples (J1TLP9, J1TLR0 through J1TLR9, J1TLT0, J1TLT1) collected from the excavation area. This SDG contains one field duplicate pair (J1TLR5/J1TLT1). All of these samples were analyzed for ICP metals, mercury, and hexavalent chromium. Minor deficiencies are as follows.

In the ICP metals analysis, serial dilution of a digestate indicated physical and chemical interferences are present for zinc. The laboratory has qualified the associated data with "X" qualifiers. These data may be considered estimated. Estimated data are usable for decision-making purposes.

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

SDG JP0809

This SDG comprises 13 samples (J1TLT2 through J1TLT9, J1TLV0, J1TLV4) collected from the excavation area. This SDG contains one field duplicate pair (J1TLT2/J1TLV4). All of these samples were analyzed for ICP metals, mercury, and hexavalent chromium. SDG JP0809 was submitted for third-party validation. Minor deficiencies are as follows.

In the ICP metals analysis, serial dilution of a digestate indicated physical and chemical interferences are present for several elements. The laboratory has qualified the associated data with "X" qualifiers. These data may be considered estimated. Estimated data are usable for decision-making purposes.

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

In the ICP metals analysis, the MS recoveries for antimony (67%), calcium (135%), and silicon (47%) are outside the QC limits. Third-party validation qualified the associated results as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the LCS recovery for silicon (16%) is outside the QC limits. Third-party validation qualified all associated silicon results as estimated with "J" flags. Estimated data are usable for decision-making purposes.

SDG JP0806

This SDG comprises 13 samples (J1TLP9, J1TLR0 through J1TLR9, J1TLT0, J1TLT1) collected from the excavation area. All of these samples were analyzed for ICP metals, mercury, and hexavalent chromium. Minor deficiencies are as follows.

In the ICP metals analysis, serial dilution of a digestate indicated physical and chemical interferences are present for zinc. The laboratory has qualified the associated data with "X" qualifiers. These data may be considered estimated. Estimated data are usable for decision-making purposes.

SDG JP0813

This SDG comprises 14 samples (J1TLV5 through J1TLV9, J1TLW0 - J1TLW8) collected from the excavation area. This SDG contains one field duplicate pair (J1TLW4/J1TLW7). All of these samples were analyzed for ICP metals, mercury, and hexavalent chromium. Minor deficiencies are as follows.

In the ICP metals analysis, serial dilution of a digestate indicated physical and chemical interferences are present for copper and zinc. The laboratory has qualified the associated data with "X" qualifiers. These data may be considered estimated. Estimated data are usable for decision-making purposes.

100-D-30 AND 100-D-104 STAGING PILE AREA DATA

Verification data from the staging pile area(s) (SPA) of the 100-D-30 and 100-D-104 were provided by the laboratories in three SDGs: J01732, JP0789, and JP0796. No major deficiencies were identified in the analytical data set. Minor deficiencies for the 100-D-30 and 100-D-104 SPA data set are discussed as follows below. If no comments are made about a specific analysis, it should be assumed that no deficiencies affecting the quality of the data were found.

Minor Deficiencies – SPA Data

SDG J01732

This SDG comprises 14 samples (J1RH58, J1RH59, J1RH60 through J1RH69, J1RH70, J1RH71) collected from the SPA area. All of these samples were analyzed for ICP metals, mercury, pesticides, polychlorinated biphenyls (PCBs), and hexavalent chromium. Minor deficiencies are as follows.

In the pesticide analysis, the continuing calibration verification sample (CCV) associated with sample J1RH68 for 4,4'- dichlorodiphenyltrichloroethane (DDT) was outside QC limits. The laboratory reanalyzed the sample and CCV with acceptable results. The second analysis is reported for 4,4'-DDT. The data are usable for decision-making purposes.

In the pesticide analysis, the surrogate decachlorobiphenyl was recovered outside the QC limits, biased high, in the LCS. The associated spike compound recoveries for the LCS were within control. There is no impact to the field sample data. The data are usable for decision-making purposes.

In the pesticide analysis, the closing CCV (associated with samples J1RH63 through J1RH69, J1RH70, J1RH71) had RPDs that were outside the QC limits for 4,4'- dichlorodiphenyldichloroethylene (DDD) (17%), 4,4'-DDT (-20%), and methoxychlor(-16%). However the overall mean RPD is less than 15%; therefore, the secondary criteria of the method is met. The data are usable for decision-making purposes.

In the ICP metals analysis, serial dilution of a digestate indicated physical and chemical interferences are present for several elements. The laboratory has qualified the associated data with "X" qualifiers. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, zinc was detected in the MB at a concentration above the projects reporting limit. However, the field sample results for zinc are all more than 20 times the MB detection; therefore, there is no impact on the field sample data. The data are usable for decision-making purposes.

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

SDG JP0789

This SDG comprises 12 samples (J1TM15 through J1TM26) collected from the SPA. All of these samples were analyzed for ICP metals, mercury, and hexavalent chromium. Minor deficiencies are as follows.

In the ICP metals analysis, serial dilution of a digestate indicated physical and chemical interferences are present for cobalt, magnesium, and nickel. The laboratory has qualified the associated data with "X" qualifiers. These data may be considered estimated. Estimated data are usable for decision-making purposes.

SDG JP0796

This SDG comprises 14 samples (J1TM27 through J1TM40) collected from the SPA. All of these samples were analyzed for ICP metals, mercury, nitrate, nitrite, IC anions, pH, and hexavalent chromium. Minor deficiencies are as follows.

In the ICP metals analysis, serial dilution of a digestate indicated physical and chemical interferences are present for several elements. The laboratory has qualified the associated data with "X" qualifiers. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, low levels of copper were detected in the MB. However, the detected concentration is less than half of the reporting limit. There is no significant impact on the field sample data. The data are usable for decision-making purposes.

In the ICP metals analysis, the MS recovery for silicon is outside the QC limits. An acceptable LCS recovery indicates that the analytical system was operating in control. The laboratory has qualified the associated silicon data with "N" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the Method 353.2 analysis for nitrate and nitrite as nitrogen, several of the MS recoveries are outside the QC limits. The laboratory has qualified the associated data with "N" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

100-D-30 AND 100-D-104 OVERBURDEN DATA

Verification data from the overburden area(s) of the 100-D-30 and 100-D-104 were provided by the laboratories in 14 SDGs: JP0582, JP0590, JP0599, JP0618, JP0619, JP0633, JP0652, JP0664, JP0666, JP0692, JP0712, JP0740, JP0763, and JP0764. SDG JP0666 was submitted for third-party validation. No major deficiencies were identified in the analytical data set. Minor deficiencies for the 100-D-30 and 100-D-104 overburden data set are discussed as follows below. If no comments are made about a specific analysis, it should be assumed that no deficiencies affecting the quality of the data were found.

SDG JP0582

This SDG comprises 14 samples (J1RP84 through J1RP97) collected from the overburden areas. All of these samples were analyzed for ICP metals, mercury, and hexavalent chromium. Minor deficiencies are as follows.

In the ICP metals analysis, serial dilution of a digestate indicated physical and chemical interferences are present for several elements. The laboratory has qualified the associated data with "X" qualifiers. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, low levels of barium and nickel were detected in the MB; however, the detected concentration is less than half of the reporting limit. There is no significant impact on the field sample data. The data are usable for decision-making purposes.

In the ICP metals analysis, low levels of iron were detected in the MB at a concentration greater than half of the reporting limit; however, the field sample results for iron are all more than 20 times the MB detection. There is no significant impact on the field sample data. The data are usable for decision-making purposes.

In the ICP metals analysis, the MS recovery for silicon is outside the QC limits. An acceptable LCS recovery indicates that the analytical system was operating in control. The laboratory has qualified the associated silicon data with "N" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the mercury analysis, the RPD calculated for mercury is outside the QC limits. An acceptable LCS recovery indicates that the analytical system was operating in control. The laboratory has qualified the associated data with "M" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

SDG JP0590

This SDG comprises 14 samples (J1RVD0 through J1RVD9, J1RVF0 through J1RVF3) collected from the overburden areas. All of these samples were analyzed for ICP metals, mercury, and hexavalent chromium. Minor deficiencies are as follows.

In the ICP metals analysis, serial dilution of a digestate indicated physical and chemical interferences are present for several elements. The laboratory has qualified the associated data with "X" qualifiers. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the MS recovery for boron is outside the QC limits. An acceptable LCS recovery indicates that the analytical system was operating in control. The laboratory has qualified the associated silicon data with "N" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

SDG JP0599

This SDG comprises one sample (J1RTN6) collected from the overburden areas. This sample was analyzed for ICP metals and hexavalent chromium. Minor deficiencies are as follows.

In the ICP metals analysis, the interference check sample result for zirconium is outside QC limits. However, all other QC parameters are within control and the method requirement is met. The data are usable for decision-making purposes.

SDG JP0618

This SDG comprises 14 samples (J1RXW1 through J1RXW9, J1RXX0 through J1RXX4) collected from the overburden areas. All of these samples were analyzed for ICP metals, mercury, and hexavalent chromium. Minor deficiencies are as follows.

In the ICP metals analysis, serial dilution of a digestate indicated physical and chemical interferences are present for several elements. The laboratory has qualified the associated data with "X" qualifiers. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the MS recovery for boron is outside the QC limits. An acceptable LCS recovery indicates that the analytical system was operating in control. The laboratory has qualified the associated data with "N" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the RPD calculated for molybdenum is outside the QC limits. An acceptable LCS recovery indicates that the analytical system was operating in control. The laboratory has qualified the associated data with "M" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

SDG JP0618

This SDG comprises 14 samples (J1T001 through J1T009, J1T010 through J1R014) collected from the overburden areas. All of these samples were analyzed for ICP metals, mercury, and hexavalent chromium. Minor deficiencies are as follows.

In the ICP metals analysis, serial dilution of a digestate indicated physical and chemical interferences are present for barium, calcium, chromium, iron, manganese, and nickel. The laboratory has qualified the associated data with "X" qualifiers. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, low levels of nickel, zinc, and iron were detected in the MB; however, the detected concentration is less than half of the reporting limit. There is no significant impact on the field sample data. The data are usable for decision-making purposes.

In the ICP metals analysis, the LCS recovery for silver is outside the QC limits, biased high. The laboratory has qualified the associated silver results with "N" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the RPD calculated for molybdenum is outside the QC limits. The laboratory has qualified the associated data with "M" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

SDG JP0633

This SDG comprises 14 samples (J1T0X8 through J1T0X9 and J1T100 through J1T111) collected from the overburden areas. All of these samples were analyzed for ICP metals, mercury, and hexavalent chromium. Minor deficiencies are as follows.

In the ICP metals analysis, serial dilution of a digestate indicated physical and chemical interferences are present for several elements. The laboratory has qualified the associated data with "X" qualifiers. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, low levels of barium were detected in the MB; however, the detected concentration is less than half of the reporting limit. There is no significant impact on the field sample data. The data are usable for decision-making purposes.

In the ICP metals analysis, the MS recoveries for boron and silver are outside the QC limits. Acceptable LCS recoveries indicate that the analytical system was operating in control.

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

SDG JP0652

This SDG comprises 14 samples (J1T4R9, J1T4T0 through J1T4T9, and J1T4V0 through J1T4V2) collected from the overburden areas. All of these samples were analyzed for ICP metals, mercury, and hexavalent chromium. Minor deficiencies are as follows.

In the ICP metals analysis, low levels of barium and zinc were detected in the MB; however, the detected concentration is less than half of the reporting limit. There is no significant impact on the field sample data. The data are usable for decision-making purposes.

In the ICP metals analysis, serial dilution of a digestate indicated physical and chemical interferences are present for several elements. The laboratory has qualified the associated data with "X" qualifiers. These data may be considered estimated. Estimated data are usable for decision-making purposes.

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

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

SDG JP0664

This SDG comprises 14 samples (J1T5J8 through J1T5J9, J1T5K0 through J1T5K9, J1T5L0, J1T5L1) collected from the overburden areas. All of these samples were analyzed for ICP metals, mercury, and hexavalent chromium. Minor deficiencies are as follows.

In the ICP metals analysis, low levels of zinc were detected in the MB; however, the detected concentration is less than half of the reporting limit. There is no significant impact on the field sample data. The data are usable for decision-making purposes.

In the ICP metals analysis, serial dilution of a digestate indicated physical and chemical interferences are present for several elements. The laboratory has qualified the associated data with "X" qualifiers. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, low levels of iron were detected in the MB at a concentration greater than half of the reporting limit. However, the field sample results for iron are all more than 20 times the MB detection. There is no significant impact on the field sample data. The data are usable for decision-making purposes.

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

SDG JP0666

This SDG comprises 14 samples (J1T5L2 through J1T5L9, J1T5M0 through J1T5M5) collected from the overburden areas. All of these samples were analyzed for ICP metals, mercury, and hexavalent chromium. SDG JP0666 was submitted for third-party validation. Minor deficiencies are as follows.

In the ICP metals analysis, serial dilution of a digestate indicated physical and chemical interferences are present for several elements. The laboratory has qualified the associated data with "X" qualifiers. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, zinc was detected in the MB at a concentration less than the practical quantitation limit (PQL). All of the field sample results for zinc are more than 20 times the MB concentration for zinc, with the exception of sample J1T5M5 which is the field blank. Third-party validation has qualified the zinc result for sample J1T5M5 as undetected with "UJ" flags. The data are usable for decision-making purposes.

In the ICP metals analysis, low levels of iron were detected in the MB at a concentration greater than half of the reporting limit; however, the field sample results for iron are all more than 20 times the MB detection. There is no significant impact on the field sample data. The data are usable for decision-making purposes.

In the ICP metals analysis, the LCS and MS recoveries for silicon are outside the QC limits. The laboratory has qualified the associated results with "N" flags. Third-party validation qualified the associated silicon data as estimated with "J" flags. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the MS recoveries for antimony (48%) and silicon (16%) are outside the QC limits. Third-party validation qualified the associated sample results as estimated with "J" flags. Estimated data are usable for decision-making purposes.

SDG JP0692

This SDG comprises 14 samples (J1T772 through J1T785) collected from the overburden areas. All of these samples were analyzed for ICP metals, mercury, and hexavalent chromium. Minor deficiencies are as follows.

In the ICP metals analysis, serial dilution of a digestate indicated physical and chemical interferences are present for several elements. The laboratory has qualified the associated data with "X" qualifiers. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, low levels of barium and chromium were detected in the MB; however, the detected concentrations are less than half of the reporting limit. There is no significant impact on the field sample data. The data are usable for decision-making purposes.

In the ICP metals analysis, zinc was detected in the MB at a concentration less than the PQL. All of the field sample results for zinc are more than 20 times the MB concentration for zinc. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, low levels of iron were detected in the MB at a concentration greater than half of the reporting limit; however, the field sample results for iron are all more than 20 times the MB detection. There is no significant impact on the field sample data. The data are usable for decision-making purposes.

SDG JP0712

This SDG comprises 14 samples (J1T858 through J1T871) collected from the overburden areas. All of these samples were analyzed for ICP metals, mercury, and hexavalent chromium. Minor deficiencies are as follows.

In the ICP metals analysis, serial dilution of a digestate indicated physical and chemical interferences are present for several elements. The laboratory has qualified the associated data with "X" qualifiers. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, zinc was detected in the MB at a concentration less than the PQL. All of the field sample results for zinc are more than 20 times the MB concentration for zinc. These data may be considered estimated. Estimated data are usable for decision-making purposes.

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

In the ICP metals analysis, the LCS recovery for cadmium is outside the QC limits. The laboratory has qualified the associated results with "N" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

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

SDG JP0740

This SDG comprises 14 samples (J1TF63 through J1TF76) collected from the overburden areas. All of these samples were analyzed for ICP metals, mercury, and hexavalent chromium. Minor deficiencies are as follows.

In the ICP metals analysis, serial dilution of a digestate indicated physical and chemical interferences are present for several elements. The laboratory has qualified the associated data with "X" qualifiers. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, zinc was detected in the MB at a concentration less than the PQL. All of the field sample results for zinc are more than 20 times the MB concentration for zinc. These data may be considered estimated. Estimated data are usable for decision-making purposes.

SDG JP0763

This SDG comprises 14 samples (J1TFP4 through J1TFP9, J1TFR0 through J1TFR7) collected from the overburden areas. All of these samples were analyzed for ICP metals, mercury, and hexavalent chromium. Minor deficiencies are as follows.

In the ICP metals analysis, serial dilution of a digestate indicated physical and chemical interferences are present for several elements. The laboratory has qualified the associated data with "X" qualifiers. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, zinc was detected in the MB at a concentration less than the PQL. All of the field sample results for zinc are more than 20 times the MB concentration for zinc. These data may be considered estimated. Estimated data are usable for decision-making purposes.

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

In the ICP metals analysis, the RPDs calculated for cadmium, copper, nickel, and sodium are outside the QC limits. Acceptable LCS results for these analytes indicate that the analytical system was operating within control. The laboratory has qualified the associated data with "M" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

SDG JP0764

This SDG comprises 14 samples (J1TFW8 through J1TFW9, J1TFX0 through J1TFX9, J1TH00, J1TH01) collected from the overburden areas. All of these samples were analyzed for ICP metals, mercury, and hexavalent chromium. Minor deficiencies are as follows.

In the ICP metals analysis, serial dilution of a digestate indicated physical and chemical interferences are present for several elements. The laboratory has qualified the associated data with "X" qualifiers. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, zinc was detected in the MB at a concentration less than the PQL. All of the field sample results for zinc are more than 20 times the MB concentration for zinc. These data may be considered estimated. Estimated data are usable for decision-making purposes.

In the ICP metals analysis, the RPDs calculated for arsenic, barium, and molybdenum are outside the QC limits. Acceptable LCS results for these analytes indicate that the analytical system was operating within control. The laboratory has qualified the associated data with "M" flags. These data may be considered estimated. Estimated data are usable for decision-making purposes.

FIELD QUALITY ASSURANCE/QUALITY CONTROL

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

Field quality assurance (QA)/QC measures are used to assess potential sources of error and cross contamination of samples that could bias results. Field QA/QC samples, listed in the field logbooks (WCH 2013a, WCH 2013b, WCH 2013c, WCH 2013d, WCH 2013e, WCH 2013f, WCH 2014a, WCH 2014b, and WCH 2014c), are shown in Table H-1. The main and QA/QC sample results are presented in Appendix F.

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 (TDL). Relative percent differences of analytes detected at low concentrations (less than five times the TDL) are not considered to be indicative of the analytical system performance. The calculation brief in Appendix F provides details on duplicate pair evaluation and RPD calculation.

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

Sample Area	Main Sample	Duplicate Sample
Excavation Area	J1TLN4	J1TLN5
	J1TLP5	J1TLP8
	J1TLR5	J1TLT1
	J1TLT2	J1TLV4
	J1TLW4	J1TLW7
Staging Pile Area	J1TM28	J1TM29
	J1RW20	J1RW32
	J1RXW1	J1RXX3
Overburden	J1T4R9	J1T4V1
	J1T772	J1T784
	J1T858	J1T870
	J1RP84	J1RP96
	J1T4R9	J1T4V1
	J1T004	J1T013
	J1RVD0	J1RVF2
	J1T5L8	J1T5M4
	J1T0X8	J1T110
	J1TFX1	J1TH00
	J1T5J9	J1T5L0
	J1TFP7	J1TFR6
	J1TF70	J1TF75

In the excavation area duplicate evaluation, the RPD calculated for barium (45.5%) and calcium (31.4%) are above the acceptance criteria of 30%. Similarly, in the overburden sampling the RPD calculated for chromium (52.7%) and arsenic (44.6%) 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 TDL, including undetected analytes (Appendix F). In these cases, a control limit of ±2 times the TDL is used to indicate that a visual check of the data is required by the reviewer. The secondary check flagged the sodium data from the excavation for a visual review. No additional deficiencies were noted. The data are usable for decision-making purposes.

A visual inspection of all of the data is also performed. No additional major or minor deficiencies are noted. The data are usable for decision-making purposes.

Summary

Limited, random, or sample matrix-specific influenced batch QC issues, such as those discussed above, are a potential for any analysis. The number and types seen in these data sets are within expectations for the matrix types and analyses performed. The DQA review of the 100-D-30 and 100-D-104 sampling data found that the analytical results are accurate within the standard errors associated with the analytical methods, sampling, and sample handling. The DQA review for 100-D-30 and 100-D-104 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 F.

REFERENCES

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

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

EPA, 2006, *Guidance on Systematic Planning Using the Data Quality Objectives Process*, EPA QA/G-4, EPA/240/B-06/001, U.S. Environmental Protection Agency, Office of Environmental Information, Washington, D.C.

WCH, 2013a, *100D Field Remediation Project Sampling and Field Notes*, Logbook EL-1607-16, Washington Closure Hanford, Richland, Washington.

WCH, 2013b, *100D Field Remediation Project Sampling and Field Notes*, Logbook EL-1607-18, Washington Closure Hanford, Richland, Washington.

WCH, 2013c, *100D Field Remediation Project Sampling and Field Notes*, Logbook EL-1607-19, Washington Closure Hanford, Richland, Washington.

WCH, 2013d, *100D Field Remediation Project Sampling and Field Notes*, Logbook EL-1607-20, Washington Closure Hanford, Richland, Washington.

WCH, 2013e, *100D Field Remediation Project Sampling and Field Notes*, Logbook EL-1607-21, Washington Closure Hanford, Richland, Washington.

WCH, 2013f, *100D Field Remediation Project Sampling and Field Notes*, Logbook EL-1607-22, Washington Closure Hanford, Richland, Washington.

WCH, 2013g, *Work Instruction for Verification Sampling of the 100-D-30 and 100-D-50:7 Waste Staging Pile Areas,* 0100D-WI-G0129, Rev. 0, Washington Closure Hanford, Richland, Washington.

WCH, 2013h, *Work Instruction for Verification Sampling of the 100-D Overburden Stockpiles from the 100-D-30, 100-D-31:11, 100-D-31:12, 100-D-50:7, 100-D-100, and 100-D-104 Waste Sites,* 0100D-WI-G0125, Rev. 0, Washington Closure Hanford, Richland, Washington.

WCH, 2014a, *100D Field Remediation Project Sampling and Field Notes*, Logbook EL-1607-23, Washington Closure Hanford, Richland, Washington.

WCH, 2014b, *100D Field Remediation Project Sampling and Field Notes*, Logbook EL-1607-24, Washington Closure Hanford, Richland, Washington.

WCH, 2014c, *100D Field Remediation Miscellaneous Sampling Activities*, Logbook EL-1662-02, Washington Closure Hanford, Richland, Washington.

WCH, 2014d, *Backfill Concurrence Checklist, 100-D-30 and 100-D-104,* CCN 0660642, Washington Closure Hanford, Richland, Washington.

WCH, 2014e, *Work Instruction for Verification Sampling of the 100-D-83:5, 186-D Acid Neutralizing System Pipelines and Reactor Cooling Water Pipelines to 105-D Waste Site,* 0100D-WI-G0133, Rev. 0, Washington Closure Hanford, Richland, Washington.

WCH, 2014f, *Work Instruction for Verification Sampling of the 100-D-30/100-D-104 Tier III Excavation,* 0100D-WI-G0132, Rev. 0, Washington Closure Hanford, Richland, Washington.

WCH, 2014g, *Work Instruction for Verification Sampling of Two 100-D-30 Waste Staging Pile Areas,* 0100D-WI-G0143, Rev. 0, Washington Closure Hanford, Richland, Washington.