0076728

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Richland Operations Office
P.O. Box 550
Richland, Washington 99352

MAR 27 2008

08-AMRC-0145

Mr. Nicholas Ceto, Program Manager
Office of Environmental Cleanup
Hanford Project Office
U.S. Environmental Protection Agency
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EDMC

Dear Mr. Ceto:

TRANSMITTAL OF APPROVED CLEANUP VERIFICATION PACKAGE FOR THE 118-F-8:4 FUEL STORAGE BASIN WEST SIDE ADJACENT AND SIDE SLOPE SOILS, CVP-2007-00004, REVISION 0

This letter transmits the approved "Cleanup Verification Package for the 118-F-8:4 Fuel Storage Basin West Side Adjacent and Side Slope Soils," CVP-2007-00004, Revision 0, for your use. Mr. R. A. Lobos, of your staff, has reviewed this document. If you have questions, please contact me or your staff may contact Chris Smith, of my staff, on (509) 372-1544.

Sincerely,

Joe R. Franco, Assistant Manager
for the River Corridor

AMRC:DCS

Enclosure

cc w/encl:
R. A. Lobos, EPA
Administrative Record, H6-08 100-FR-1

cc w/o encl:
J. M. Capron, WCH

CVP-2007-00004
Rev. 0

Cleanup Verification Package for the 118-F-8:4 Fuel Storage Basin West Side Adjacent and Side Slope Soils

Prepared for the U.S. Department of Energy by Washington Closure Hanford

November 2007

EXECUTIVE SUMMARY

This cleanup verification package documents completion of remedial action, sampling activities, and compliance with cleanup criteria for the 118-F-8:4 Fuel Storage Basin West Side Adjacent and Side Slope Soils (118-F-8:4 waste site). The 118-F-8:4 waste site, part of the 100-FR-1 Operable Unit, is located in the 100-F Area of the Hanford Site in southeastern Washington State. The fuel storage basin was a rectangular-shaped concrete basin located on the south side of the 105-F Reactor building. It served as an underwater collection, storage, and transfer facility for irradiated fuel elements discharged from the reactor. The reactor was in operation between February 1945 and June 1965.

Remediation of the 118-F-8:4 waste site began on March 14, 2007, and was completed on June 22, 2007. Remedial action activities involved removing the uncontaminated overburden, the buried contaminated material, and the underlying contaminated soil for disposal.

Following excavation, verification sampling was performed to determine if the remedial action was adequate to support interim site closure. Results of the verification sampling, laboratory analyses, data evaluations, and modeling for the 118-F-8:4 waste site indicate that all remedial action objectives for direct exposure, protection of groundwater, and protection of the Columbia River have been met (see Table ES-1).

Table ES-1. Summary of Remedial Action Goals for the 118-F-8:4 Fuel Storage Basin. (2 Pages)

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?	Ref.
Direct Exposure – Radionuclides	Attain 15 mrem/yr dose rate above background over 1,000 years.	The maximum all-pathways dose rate calculated by RESRAD is 1.70 and 1.31 mrem/yr at year zero (2007) from the overburden stockpile area and combined excavation shallow and deep zone, respectively.	Yes	a
Direct Exposure – Nonradionuclides	Attain individual COC/COPC RAGs.	All individual COC concentrations are below the direct exposure criteria.	Yes	a, b
Nonradionuclide Risk Requirements	Attain hazard quotient of <1 for all individual noncarcinogens.	All individual hazard quotients are <1.	Yes	c
	Attain a cumulative hazard quotient of <1 for noncarcinogens.	The cumulative hazard quotient (3.9×10^{-2}) is <1.		c
	Attain an excess cancer risk of $<1 \times 10^{-6}$ for individual carcinogens.	All individual excess carcinogenic risk values are $<1 \times 10^{-6}$.		c
	Attain a total excess cancer risk of $<1 \times 10^{-5}$ for carcinogens.	The cumulative excess carcinogenic risk value (2.6×10^{-7}) is $<1 \times 10^{-5}$.		c
Groundwater/River Protection – Radionuclides	Attain single COC/COPC groundwater and river protection RAGS.	Cesium-137, cobalt-60, nickel-63, and strontium-90 are calculated to reach groundwater in the 1,000 years of the RESRAD model run. However, none of these constituents is predicted to migrate to groundwater (and thus the Columbia River) at concentrations exceeding groundwater or river criteria within 1,000 years. Therefore, residual concentrations achieve the remedial action objectives for groundwater and river protection.	Yes	a
	Attain national primary drinking water regulations:[d] 4-mrem/yr (beta/gamma) dose rate to target receptor/organs.	All organ-specific doses are below the 4-mrem/yr dose standard.		e

Table ES-1. Summary of Remedial Action Goals for the 118-F-8:4 Fuel Storage Basin. (2 Pages)

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?	Ref.
	Meet drinking water standards for alpha emitters: the more stringent of 15 pCi/L MCL or 1/25th of the derived concentration guide for DOE Order 5400.5.[f]	RESRAD modeling indicates that the alpha-emitting COCs will not impact groundwater. Therefore, the alpha activity is 0 pCi/L for all years.	Yes	e
	Meet total uranium standard of 21.2 pCi/L.[g]	The total uranium COCs (uranium-233/234, uranium-235, and uranium-238) are present at concentrations less than natural background.	Yes	a
Groundwater/River Protection – Nonradionuclides	Attain individual nonradionuclide groundwater and river cleanup requirements.	Residual concentrations of lead, mercury, and Aroclor-1260 exceeded soil RAGs for the protection of groundwater and/or the Columbia River. However, it is predicted that these constituents will not migrate to groundwater (and thus the Columbia River) at concentrations exceeding groundwater or river criteria within 1,000 years. Therefore, residual concentrations achieve the remedial action objectives for groundwater and river protection.	Yes	h
Other Supporting Information	Sample design calculation brief.			i
	Variance sampling calculation briefs			j, k

[a] *118-F-8:4 105-F Fuel Storage Basin Cleanup Verification RESRAD Calculation Brief,* Calculation No. 0100F-CA-V0303, Rev. 0 (Appendix C).
[b] *118-F-8:4 105-F Fuel Storage Basin Cleanup Verification 95% UCL Calculation,* Calculation No. 0100F-CA-V0294, Rev. 0 (Appendix C).
[c] *118-F-8:4 Hazard Quotient and Carcinogenic Risk Calculations,* Calculation No. 0100F-CA-V0296, Rev. 0 (Appendix C).
[d] "National Primary Drinking Water Regulations" (40 *Code of Federal Regulations* 141).
[e] *118-F-8:4 105-F Fuel Storage Basin Comparison to Drinking Water Standards (MCL) Calculation Brief,* Calculation No. 0100F-CA-V0304, Rev. 0 (Appendix C).
[f] *Radiation Protection of the Public and the Environment* (DOE Order 5400.5).
[g] Based on the isotopic distribution of uranium in the 100 Areas, the 30 µg/L MCL corresponds to 21.2 pCi/L. Concentration-to-activity calculations are documented in *Calculation of Total Uranium Activity Corresponding to a Maximum Contaminant Level for Total Uranium of 30 Micrograms per Liter in Groundwater* (BHI 2001).
[h] *100 Area Analogous Sites RESRAD Calculations* (BHI 2005).
[i] *Shallow and Deep Zone, Overburden Sampling Plan,* Calculation No. 0100F-CA-V0307, Rev. 0 (Appendix C).
[j] *100-F-8:4 Fuel Storage Basin BCL Variance Calculation,* Calculation No. 0100F-CA-V0302, Rev. 0 (Appendix C).
[k] *100-F-8:4 Fuel Storage Basin Shallow Zone Variance Calculation,* Calculation No. 0100F-CA-V0301, Rev. 0 (Appendix C).

COC = contaminant of concern
COPC = contaminant of potential concern
MCL = maximum contaminant level (drinking water standard)
RAG = remedial action goal
RESRAD = RESidual RADioactivity (dose model)

A comparison against ecological risk screening levels has been made for the site contaminants of concern and other constituents. Screening levels were not exceeded for the site constituents, with the exception of aluminum, antimony, boron, manganese, mercury, selenium, and vanadium. Exceedance of screening values does not necessarily indicate the existence of risk to ecological receptors. It is believed that the presence of these constituents does not pose a risk to ecological receptors because concentrations of aluminum, antimony, manganese, and vanadium are below site background levels; mercury and selenium are within the range of Hanford Site background levels; and boron concentrations are consistent with concentrations at other locations on the Hanford Site (no established background value is available for boron). A more complete quantitative ecological risk assessment will be presented in the baseline risk assessment for the river corridor portion of the Hanford Site and will be used to support the final closeout decision for this site.

This evaluation supports a reclassification of this waste site to Interim Closed Out, in accordance with the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1989) and the *Tri-Party Agreement Handbook Management Procedures,* Waste Site Reclassification Guideline TPA-MP-14 (DOE-RL 2007). A copy of the waste site reclassification form is included as Attachment ES-1.

Attachment ES-1. Waste Site Reclassification Form.

Date Submitted: 11/05/07 Originator: L. M. Dittmer Phone: 372-9227	**WASTE SITE RECLASSIFICATION FORM** Operable Unit(s): 100-FR-1 Waste Site Code: 118-F-8:4 Type of Reclassification Action: Closed Out ☐ Interim Closed Out ☒ No Action ☐ RCRA Postclosure ☐ Rejected ☐ Consolidated ☐	Control Number: 2007-027

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

Description of current waste site condition:

The 118-F-8:4 Fuel Storage Basin West Side Adjacent and Side Slope Soils were portions of the 118-F-8:3 waste site deferred for remediation in December 2002. The site has been remediated and was backfilled during October 2007. Remediation, verification sampling, and RESidual RADioactivity (RESRAD) modeling have been performed in accordance with remedial action objectives and goals established by the *Action Memorandum, USDOE Hanford 100 Area National Priorities List (NPL) 105-F and 105-DR Reactor Buildings and Ancillary Facilities, Hanford Site, Benton County, Washington, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Richland Operations Office, Richland, Washington*. The selected remedy involved (1) excavating the site to the extent required to meet specified soil cleanup levels, (2) disposing of contaminated excavation materials at the Environmental Restoration Disposal Facility at the 200 Area of the Hanford Site, (3) demonstrating through verification sampling and RESRAD modeling that cleanup goals have been achieved, and (4) proposing the site for reclassification as Interim Closed Out.

Basis for reclassification:

In accordance with this evaluation, the verification sampling and modeling results support a reclassification of this site to Interim Closed Out. The current site conditions achieve the remedial action objectives established in the Action Memorandum. The results show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. The basis for reclassification is described in detail in the *Cleanup Verification Package for the 118-F-8:4 Fuel Storage Basin West Side Adjacent and Side Slope Soils* (CVP-2007-00004), Washington Closure Hanford, Richland, Washington. The cleanup verification package does not demonstrate the acceptability of unrestricted access to deep zone soils (i.e., below 4.6 m [15 ft]); therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are required.

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

Deed restrictions to prevent uncontrolled drilling or excavation into the deep zone (greater than 4.6 m [15 ft] below the ground surface).

S. L. Charboneau DOE Federal Project Director (printed)	Signature	3/3/08 Date
NA Ecology Project Manager (printed)	Signature	Date
R. A. Lobos EPA Project Manager (printed)	Signature	3/4/08 Date

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ACRONYMS AND ABBREVIATIONS

BCM	bank cubic meters
BCY	bank cubic yards
BCL	below cleanup level
CFR	*Code of Federal Regulations*
COC	contaminant of concem
DQA	data quality assessment
EPA	U.S. Environmental Protection Agency
FSB	fuel storage basin
GPERS	Global Positioning Environmental Radiological Surveyor
LARADS	Laser-Assisted Ranging and Data System
MCL	maximum contaminant level (drinking water standard)
RAG	remedial action goal
RDL	required detection limit
RDR/RAWP	remedial design report/remedial action work plan
RESRAD	RESidual RADioactivity dose assessment model
SAP	sampling and analysis plan
UCL	upper confidence limit
WAC	*Washington Administrative Code*

1.0 STATEMENT OF PROTECTIVENESS

This report demonstrates that the 118-F-8:4 Fuel Storage Basin West Side Adjacent and Side Slope Soils (118-F-8:4 waste site) was remediated in accordance with the *Removal Action Work Plan for 105-DR and 105-F Building Interim Safe Storage Projects and Ancillary Buildings* (DOE-RL 2002) and meets the objectives and goals for interim closure as established in the Action Memorandum (EPA et al. 1998) and, by reference, the *100 Area Remedial Action Sampling and Analysis Plan* (100 Area SAP) (DOE-RL 2005a) and the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (100 Area RDR/RAWP) (DOE-RL 2005b).

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 acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated due to the presence of residual activities from multiple radionuclides; therefore, institutional controls to prevent uncontrolled drilling/excavation into the deep zone (i.e., below 4.6 m [15 ft]) are required. The 118-F-8:4 waste site is verified to meet protectiveness standards in accordance with the Action Memorandum (EPA et al. 1998).

2.0 BACKGROUND AND GENERAL SITE INFORMATION

The 118-F-8:4 waste site is located southwest of the 105-F Building (Figure 1) near the former location of the fuel storage basin (FSB). The FSB held dichromate-treated reactor cooling water and served as an underwater collection, storage, and transfer facility for irradiated fuel elements discharged from the reactor. The water was primarily contaminated by activated elements spilled into the FSB during fuel discharge and fission products, uranium, and transuranics introduced by fuel cladding failures. The FSB was approximately 23.8 by 21.6 by 6.4 m (78 by 71 by 21 ft) deep. Construction of the 105-F Reactor began in December 1943, with operations commencing in February 1945. The 105-F Reactor was retired in June 1965. Deactivation of the FSB occurred in 1970. Deactivation was accomplished by pumping the majority of the water from the basin and filling it with sand.

Decontamination and decommissioning of the FSB was completed in December 2002. The soils directly below the FSB were excavated to support interim closure (BHI 2004a). Concurrent with these activities, the Remedial Action/Waste Disposal Project began excavation and removal of the 105-F pipelines (100-F-19:2). The Remedial Action/Waste Disposal Project pipeline removal activities encroached on the east, south, and a small portion of the southwest side-slope soils of the FSB (Figure 2). Cleanup verification of these soils was documented with the interim closure of the 100-F-19:2 waste site (BHI 2003).

Figure 1. Location of the 118-F-8:4 Fuel Storage Basin West Side Adjacent and Side Slope Soils (Post-Remediation Boundary).

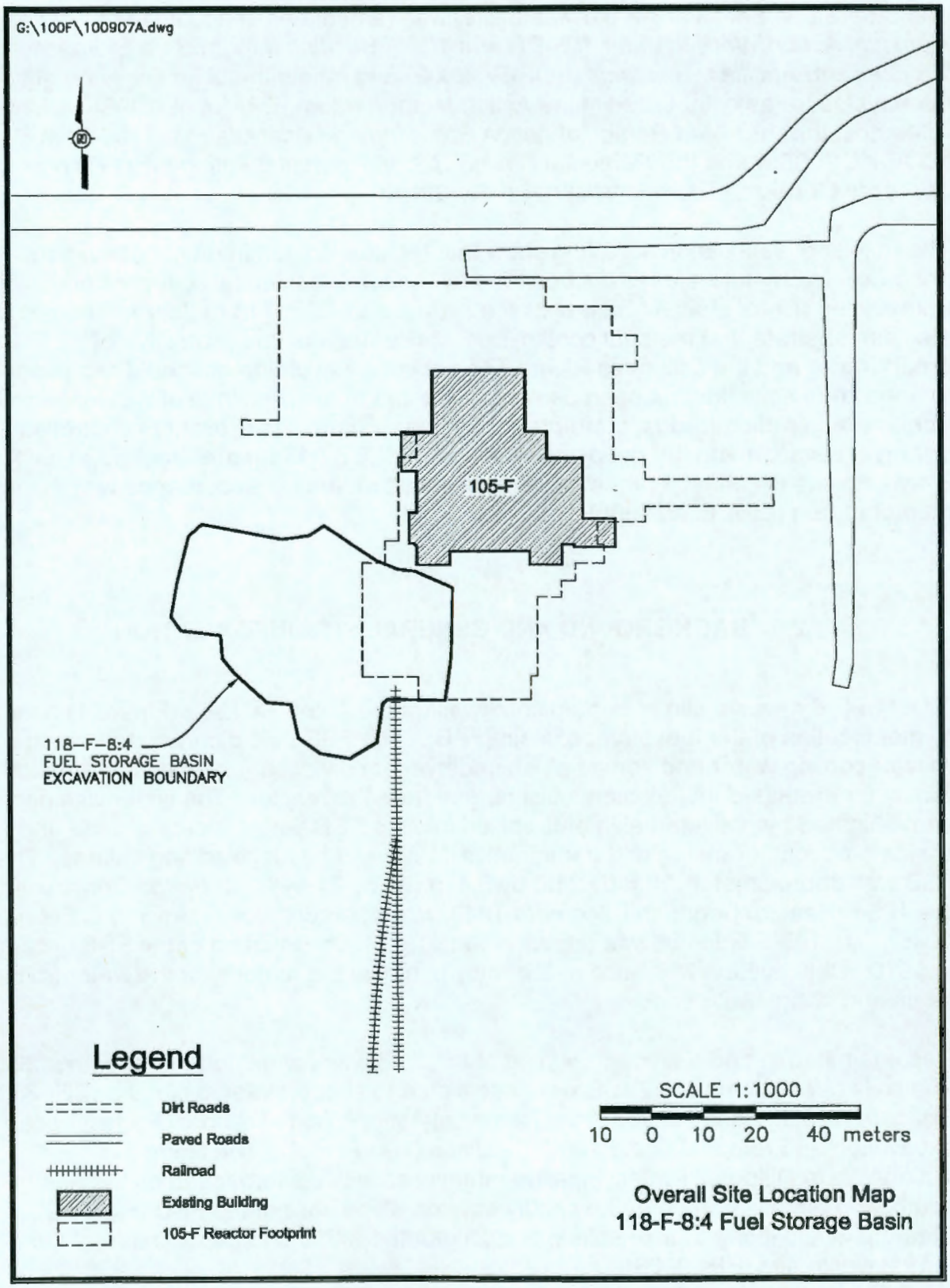
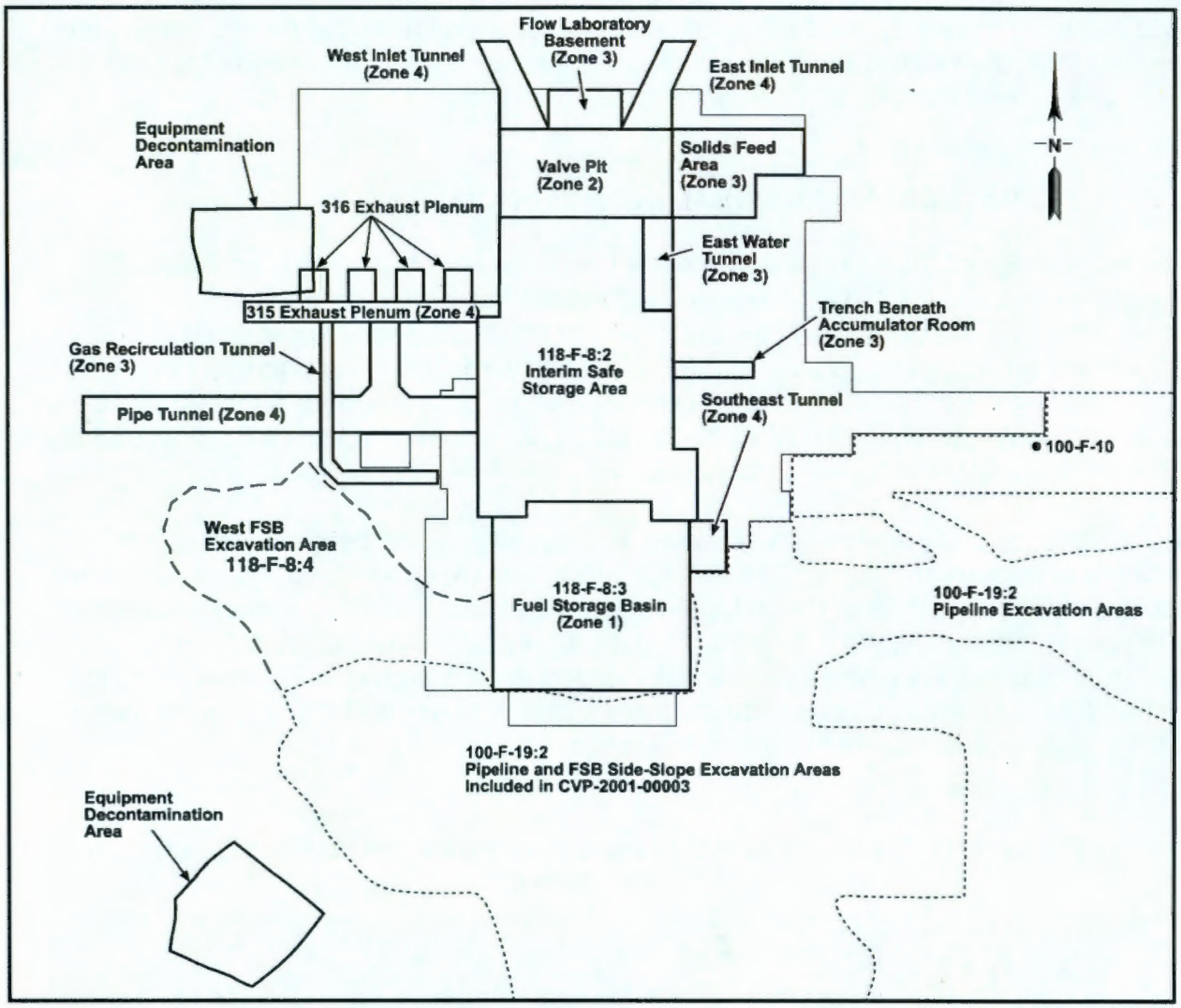


Figure 2. 105-F Reactor Plan View of Below-Grade Structures (Pre-Remediation Boundaries).



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3.0 REMEDIAL ACTION SUMMARY

This section contains specific information about the excavation and disposal activities for the 118-F-8:4 waste site. It also contains information about the types of wastes encountered and the field screening that was conducted.

3.1 EXCAVATION AND DISPOSAL INFORMATION

Remedial action of the 118-F-8:4 waste site began on March 14, 2007, and was completed on June 22, 2007. Excavation of the site involved removing the uncontaminated overburden and the underlying contaminated soil. Approximately 2,950 bank cubic meters (BCM) (3,859 bank cubic yards [BCY]) of uncontaminated overburden soil was removed and stockpiled near the excavation for subsequent use as backfill. Approximately 1,650 BCM (2,158 BCY) of contaminated soil was disposed at the Environmental Restoration Disposal Facility.

At the conclusion of remediation activities, the elevation at the deepest part of the excavation was approximately 118.5 m (389 ft) above mean sea level with a maximum depth of approximately 8 m (26 ft) below ground surface. The remediation excavation was approximately 1,634 m^2 (17,580 ft^2) in area. A post-excavation aerial photograph is shown in Figure 3, and the post-excavation topography is shown in Figure 4. Additional photographs of the remediation activities are included in Appendix A. No anomalies or stained soil were discovered during remediation.

Figure 3. 118-F-8:4 Waste Site Post-Excavation Aerial Photograph (August 2007).

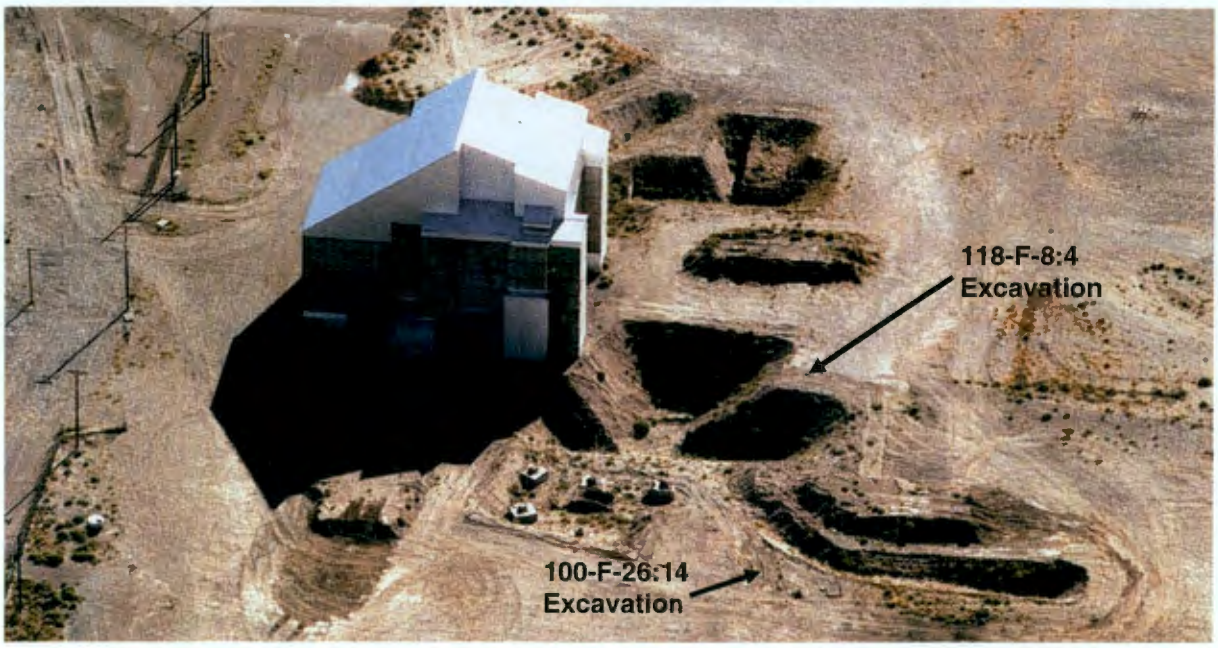
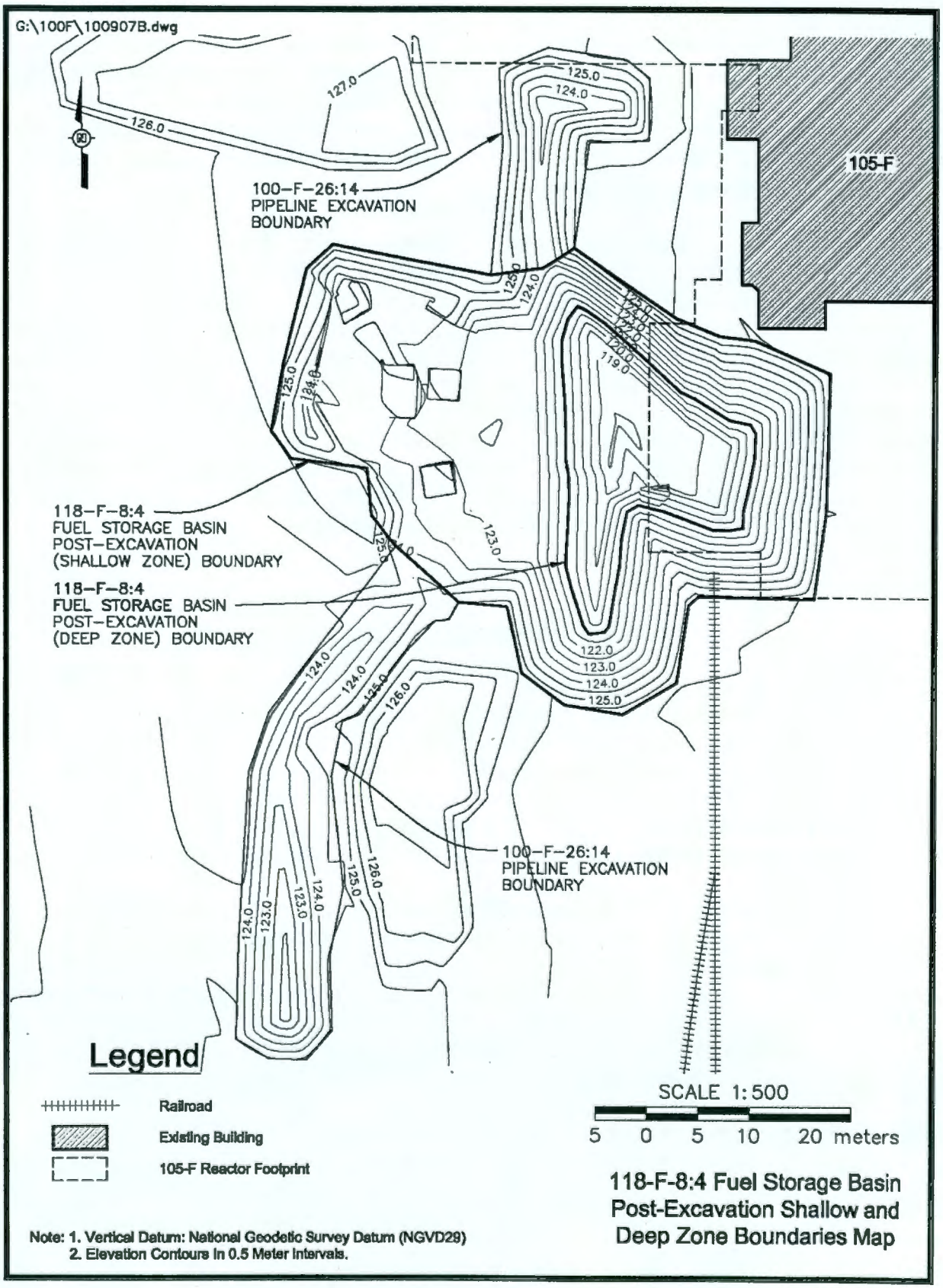


Figure 4. 118-F-8:4 Waste Site Post-Excavation Topography.



3.2 FIELD SCREENING

Radiological field screening was conducted during and after the site remedial actions as specified in the 100 Area SAP (DOE-RL 2005a). Field screening was used to guide the excavation and quickly assess the presence and level of contamination. Field screening at the site included using a Global Positioning Environmental Radiological Surveyor (GPERS) with instrumentation specific to the detection of radiation associated with gamma-emitting radionuclides.

The GPERS survey demonstrated that excavation was effective in remediating the 118-F-8:4 waste site. Consistent with the deep zone institutional controls specified for the other FSB subsites (BHI 2004a), the GPERS survey and verification sample results from deep zone sample area A4 indicate levels of contamination that require deep zone institution controls for the 118-F-8:4 FSB subsite. Verification sampling and RESidual RADioactivity (RESRAD) modeling indicate that the 118-F-8:4 FSB deep zone meets the applicable deep zone cleanup goals for protection of groundwater and the river. Institutional controls for prevention of uncontrolled excavation in the deep zone of the area around the 105-F Reactor were already necessary as indicated by the previously submitted cleanup verification package for the FSB (BHI 2004a). The radiological surveys for the 118-F-8:4 FSB are provided in Appendix B.

4.0 SAMPLING ACTIVITIES

Following remediation and field screening of the 118-F-8:4 waste site, verification sampling was conducted between May 31 and June 22, 2007 (WCH 2007a, WCH 2007b). Verification sampling is performed to collect data to determine if the remedial action goals (RAGs) have been met. RAGs are the specific numeric goals against which the verification data are evaluated to demonstrate attainment of the remedial action objectives as established in the Action Memorandum (EPA et al. 1998).

The requirements for verification sampling were established in an interoffice memorandum deferring remediation of the adjacent and side slope areas of the FSB (subsequently assigned to the 118-F-8:4 waste site) (Nielson 2002). As provided in the interoffice memorandum, sampling was performed in accordance with the 100 Area SAP (DOE-RL 2005a), except that the contaminants of concern (COCs) for these areas were those listed in the *Sampling and Analysis Plan for the 105-F Phase IV Fuel Storage Basin* (FSB SAP) (DOE-RL 2000).

The following subsections provide additional discussion of the information used to develop the COCs for verification sampling, as well as the sampling design selection and basis.

4.1 CONTAMINANTS OF CONCERN FOR VERIFICATION SAMPLING

The FSB SAP (DOE-RL 2000) identified the COCs for the side slope soils as americium-241, carbon-14, cobalt-60, cesium-137, europium-152, europium-154, europium-155, helium-3, nickel-63, plutonium-238, plutonium-239/240, strontium-90, uranium-234, uranium-235, uranium-238, hexavalent chromium, mercury, lead, barium, and PCBs. Barium-133 was included as a COC to be consistent with the analytical requirements for the adjacent and related 118-F-8:3 waste site previously interim closed under CVP-2003-00017 (BHI 2004a).

4.2 SAMPLING DESIGN SELECTION AND BASIS

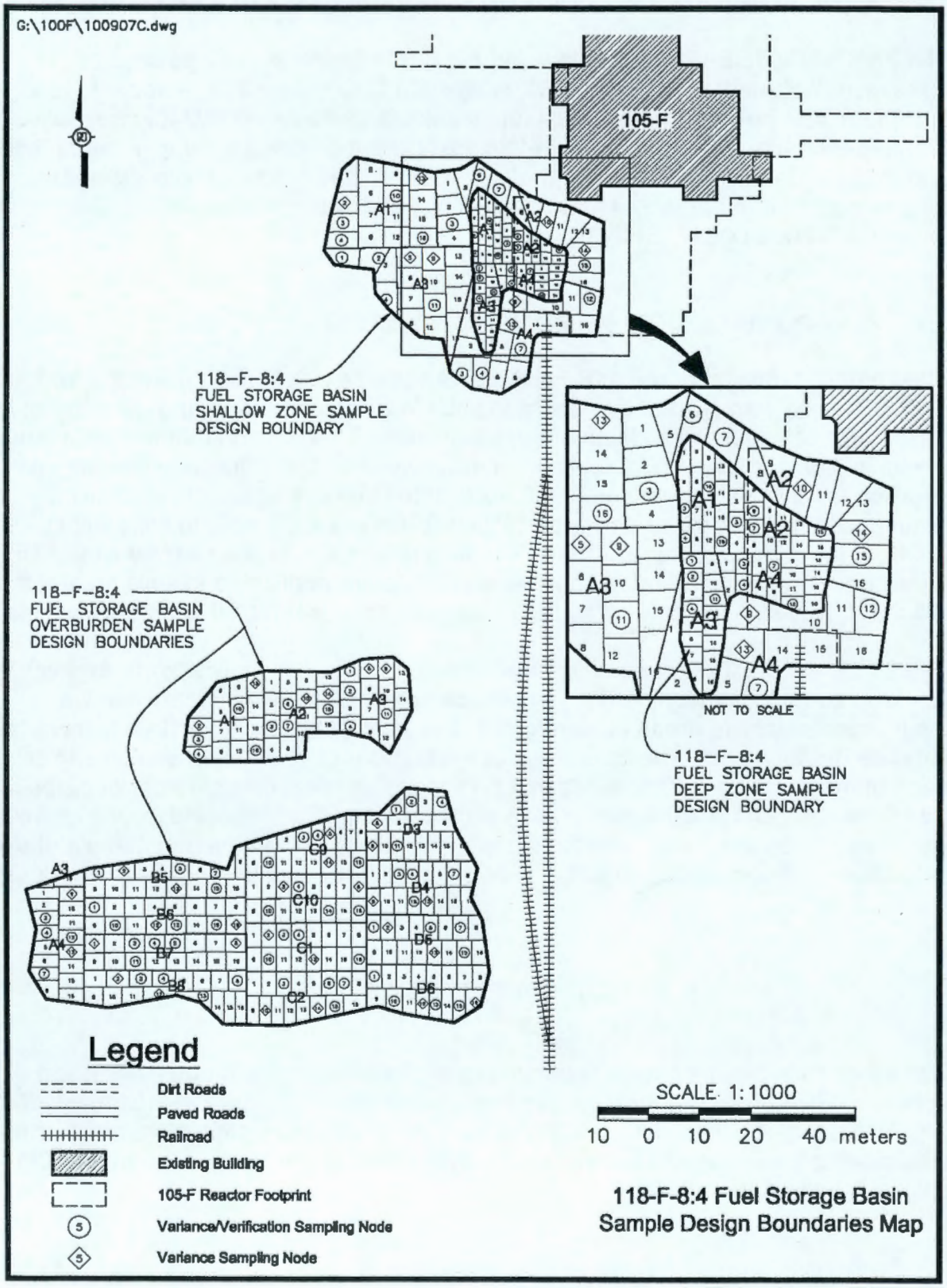
The sampling design for the 118-F-8:4 waste site was established using the 100 Area SAP. The site was divided into decision units (e.g., shallow zone and deep zone) based on the size of the site and depth of the excavation. This division determines the number of verification samples to collect in each decision unit. The division of the site into decision units is also a function of the applicable RAGs. The direct exposure, groundwater protection, and river protection RAGs are applicable to soils within 4.6 m (15 ft) of the ground surface. This soil zone is referred to as the shallow zone. The groundwater protection and river protection RAGs are applicable to soils greater than 4.6 m (15 ft) below the ground surface. This soil zone is referred to as the deep zone.

The 118-F-8:4 waste site contains three decision units: (1) shallow zone excavation, (2) deep zone excavation, and (3) overburden stockpiles, which combines two overburden stockpile areas (also referred to as below cleanup level [BCL] stockpiles) into one decision unit. The calculation of the number of verification samples to collect in each of the decision units resulted in 4 composite samples collected per decision unit for the shallow and deep zones and 16 composite samples collected for the overburden stockpile. This calculation, and the sample locations, is located in the sample design calculation in Appendix C. Figure 5 provides an overview of the three sample designs.

5.0 SAMPLING RESULTS

The verification samples were submitted to offsite laboratories for analysis using approved EPA analytical methods, as required per the 100 Area SAP (DOE-RL 2005a). The laboratory-reported data results from the verification sampling were used in the statistical calculations and are included with the 95% upper confidence limit (UCL) calculations in Appendix C.

Figure 5. General Overview of Sample Designs for the 118-F-8:4 Waste Site.



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 COC are computed for each of the 118-F-8:4 waste site decision units as specified by the 100 Area RDR/RAWP (DOE-RL 2005b). When a nonradionuclide COC was detected in fewer than 50% of the verification samples collected, the maximum detected value was used for comparison against the RAGs.

Comparisons of the statistical results for site COCs with the RAGs (cleanup criteria) for each of the 118-F-8:4 waste site decision units (shallow zone excavation, deep zone excavation, and overburden stockpiles) are listed in Tables 1, 2, and 3. The standard laboratory analysis performed to quantify the concentrations of the COCs also detected other analytes. These were not included in the statistical calculations unless they exceeded an applicable RAG. The only non-COC analyte to which this applied was selenium. It was detected above the river protection RAG in a duplicate sample (J15511) in the shallow zone.

Initial results for the smaller of the two overburden stockpiles indicated that one area (sample area A1) contained elevated carbon-14 levels. Additional remediation was completed in this area. Following additional remedial excavation, resampling was done on October 22, 2007. The sample (J15690) was analyzed for carbon-14 and tritium. The original cleanup verification sample (J15574) result for carbon-14 was replaced with the resampling data (J15690); the tritium data for the original sample (J15574) was used for statistical calculations (tritium was not detected in either sample).

6.0 DATA EVALUATION

This section demonstrates that remedial actions at the 118-F-8:4 FSB have achieved the applicable RAGs, comply with ecological screening levels, and comply with applicable nonradionuclide risk requirements and *Washington Administrative Code* (WAC) 173-340-740(7)(e) three-part test criteria. This section also describes the RESRAD modeling performed that predicts the dose rate, the excess lifetime cancer risk, and the impact on groundwater and the river from residual radionuclide COC concentrations.

Table 1. Comparison of Statistical Contaminant Concentrations to Action Levels for the 118-F-8:4 Shallow Zone Excavation Verification Sampling. (2 Pages)

COC	Statistical Result (pCi/g)	Generic Site Lookup Values[a] (pCi/g)			Does the Statistical Result Exceed Lookup Values?	Does the Statistical Result Pass RESRAD Modeling?
		Shallow Zone Lookup Value[b]	Groundwater Protection Lookup Value	River Protection Lookup Value		
Americium-241	0.110 U	2.38	--[c]	--[c]	No	--
Barium-133	0.020 U	11.8	--[c]	--[c]	No	--
Carbon-14	-0.325 U	5.16	--[c]	--[c]	No	--
Cesium-137	0.281	6.2	--[c]	--[c]	No	--
Cobalt-60	0.019 U	1.4	--[c]	--[c]	No	--
Europium-152	0.160	3.3	--[c]	--[c]	No	--
Europium-154	0.061 U	3.0	--[c]	--[c]	No	--
Europium-155	0.050 U	125	--[c]	--[c]	No	--
Nickel-63	1.26 U	4,013[d]	--[c]	--[c]	No	--
Plutonium-238	0.023 U	37.4	--[c]	--[c]	No	--
Plutonium-239/240	0.063 U	33.9	--[c]	--[c]	No	--
Strontium-90	0.151 U	4.5	--[c]	--[c]	No	--
Tritium	2.85 U	15.8	15.8	15.8	No	--
Uranium-233/234	0 (<BG)	1.1[d]	1.1[d]	1.1[d]	No	--
Uranium-235	0 (<BG)	0.84	0.27	0.5	No	--
Uranium-238	0 (<BG)	1.1[d]	1.1[d]	1.1[d]	No	--
COC	**Statistical Result (mg/kg)**	**Remedial Action Goals[a] (mg/kg)**			**Does the Statistical Result Exceed RAGs?**	**Does the Statistical Result Pass RESRAD Modeling?**
		Direct Exposure	**Soil Cleanup Level for Groundwater Protection**	**Soil Cleanup Level for River Protection**		
Barium	70.1	5,600	132[d]	224	No	--
Hexavalent chromium	0.26	2.1[f]	4.8	2	No	--
Lead	9.0	353	10.2[d]	10.2[d]	No	--
Mercury	0.41	24	0.33[d]	0.33[d]	No	--
Selenium	1.5	400	5	1	Yes	Yes[i]
Aroclor-1016	0.014 U	5.6[g]	0.112	0.017[e]	No	--
Aroclor-1221	0.014 U	0.5[h]	0.017[e]	0.017[e]	No	--

Table 1. Comparison of Statistical Contaminant Concentrations to Action Levels for the 118-F-8:4 Shallow Zone Excavation Verification Sampling. (2 Pages)

COC	Statistical Result (mg/kg)	Remedial Action Goals[a] (mg/kg)			Does the Statistical Result Exceed RAGs?	Does the Statistical Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Aroclor-1232	0.014 U	0.5[h]	0.017[e]	0.017[e]	No	--
Aroclor-1242	0.014 U	0.5[h]	0.017[e]	0.017[e]	No	--
Aroclor-1248	0.014 U	0.5[h]	0.017[e]	0.017[e]	No	--
Aroclor-1254	0.014 U	0.5[h]	0.017[e]	0.017[e]	No	--
Aroclor-1260	0.014 U	0.5[h]	0.017[e]	0.017[e]	No	--

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

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

[c] The 100 Area RDR/RAWP (DOE-RL 2005b) does not provide soil cleanup levels for this contaminant to be protective of groundwater and the Columbia River. Based on the lowest radionuclide soil partitioning coefficient (for strontium-90 [25 mL/g]), this contaminant is not predicted to migrate more than 3 m (10 ft) vertically in 1,000 years (BHI 2005). The vadose zone underlying this waste site is approximately 7.8 m (25 ft) thick. Therefore, residual concentrations of this contaminant are predicted to be protective of groundwater and the Columbia River.

[d] The calculated cleanup level is below the Hanford-Site specific statistical soil background. The value presented is the Hanford Site-specific statistical soil background (DOE-RL 2005b) per WAC 173-340-700[4][d] (1996).

[e] Where cleanup levels are less than required detection limits (RDLs), cleanup levels default to RDLs (WAC 173-340-740[3], 1996, and DOE-RL 2005b).

[f] Carcinogenic cleanup level calculated based on the inhalation exposure pathway; WAC 173-340-750(3), 1996.

[g] Noncarcinogenic cleanup level calculated from WAC 173-340-740(3), Method B, 1996.

[h] Carcinogenic cleanup level calculated per WAC 173-340-740(3), Method B, 1996.

[i] Based on *100 Area Analogous Sites RESRAD Calculations* (BHI 2005), selenium with a soil partitioning coefficient of 150 mL/g will not migrate more than 1 m (3.3 ft) in 1,000 years. The vadose zone underlying this waste site is approximately 7.8 m (25 ft) thick. Therefore, residual concentrations of this contaminant are predicted to be protective of groundwater and the Columbia River.

-- = not applicable
BG = background
COC = contaminant of concern
RAG = remedial action goal
RESRAD = RESidual RADioactivity (dose-assessment model)
U = undetected (in all samples in the data set)
WAC = *Washington Administrative Code*

Table 2. Comparison of Statistical Contaminant Concentrations to Action Levels for the 118-F-8:4 Deep Zone Excavation Verification Sampling. (2 Pages)

COC	Statistical Result (pCi/g)[b]	Generic Site Lookup Values[a] (pCi/g)		Does the Statistical Result Exceed Lookup Values?	Does the Statistical Result Pass RESRAD Modeling?
		Groundwater Protection Lookup Value	River Protection Lookup Value		
Americium-241	0.081	--[c]	--[c]	No	--
Barium-133	0.022 U	--[c]	--[c]	No	--
Carbon-14	0.070 U	--[c]	--[c]	No	--
Cesium-137	4.52	--[c]	--[c]	No	--
Cobalt-60	0.186	--[c]	--[c]	No	--
Europium-152	3.01	--[c]	--[c]	No	--
Europium-154	0.181 U	--[c]	--[c]	No	--
Europium-155	0.057 U	--[c]	--[c]	No	--
Nickel-63	18.7	--[c]	--[c]	No	--
Plutonium-238	0.056 U	--[c]	--[c]	No	--
Plutonium-239/240	0.520	--[c]	--[c]	No	--
Strontium-90	2.20	--[c]	--[c]	No	--
Tritium	1.38 U	15.8	15.8	No	--
Uranium-233/234	0 (<BG)	1.1[d]	1.1[d]	No	--
Uranium-235	0 (<BG)	0.27	0.5	No	--
Uranium-238	0 (<BG)	1.1[d]	1.1[d]	No	--
COC	**Statistical Result (mg/kg)**	**Remedial Action Goals[a] (mg/kg)**		**Does the Statistical Result Exceed RAGs?**	**Does the Statistical Result Pass RESRAD Modeling?**
		Soil Cleanup Level for Groundwater Protection	**Soil Cleanup Level for River Protection**		
Barium	52.6	132[d]	224	No	--
Hexavalent chromium	0.26	4.8	2	No	--
Lead	5.5	10.2[d]	10.2[d]	No	--
Mercury	0.05	0.33[d]	0.33[d]	No	--
Aroclor-1016	0.014 U	0.112	0.017[e]	No	--
Aroclor-1221	0.014 U	0.017[e]	0.017[e]	No	--

Table 2. Comparison of Statistical Contaminant Concentrations to Action Levels for the 118-F-8:4 Deep Zone Excavation Verification Sampling. (2 Pages)

COC	Statistical Result (mg/kg)	Remedial Action Goals[a] (mg/kg)		Does the Statistical Result Exceed RAGs?	Does the Statistical Result Pass RESRAD Modeling?
		Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Aroclor-1232	0.014 U	0.017[e]	0.017[e]	No	--
Aroclor-1242	0.014 U	0.017[e]	0.017[e]	No	--
Aroclor-1248	0.014 U	0.017[e]	0.017[e]	No	--
Aroclor-1254	0.014 U	0.017[e]	0.017[e]	No	--
Aroclor-1260	0.049	0.017[e]	0.017[e]	No	Yes[f]

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

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

[c] The 100 Area RDR/RAWP (DOE-RL 2005b) does not provide soil cleanup levels for this contaminant to be protective of groundwater and the Columbia River. Based on the lowest radionuclide soil partitioning coefficient (for strontium-90 [25 mL/g]), this contaminant is not predicted to migrate more than 3 m (10 ft) vertically in 1,000 years (BHI 2005). The vadose zone underlying this waste site is approximately 7.8 m (25 ft) thick. Therefore, residual concentrations of this contaminant are predicted to be protective of groundwater and the Columbia River.

[d] The calculated cleanup level is below the Hanford-Site specific statistical soil background. The value presented is the Hanford Site-specific statistical soil background (DOE-RL 2005b) per WAC 173-340-700[4][d]) (1996).

[e] Where cleanup levels are less than required detection limits (RDLs), cleanup levels default to RDLs (WAC 173-340-740[3], 1996, and DOE-RL 2005b).

[f] Based on *100 Area Analogous Sites RESRAD Calculations* (BHI 2005), Aroclor-1260 with a soil partitioning coefficient of 530 mL/g will not migrate more than 1 m (3.3 ft) in 1,000 years. The vadose zone underlying this waste site is approximately 7.8 m (25 ft) thick. Therefore, residual concentrations of this contaminant are predicted to be protective of groundwater and the Columbia River.

-- = not applicable
BG = background
COC = contaminant of concern
RAG = remedial action goal
RESRAD = RESidual RADioactivity (dose-assessment model)
U = undetected (in all samples in the data set)
WAC = *Washington Administrative Code*

Table 3. Comparison of Statistical Contaminant Concentrations to Action Levels for the 118-F-8:4 Overburden/BCL Verification Sampling. (2 Pages)

COC	Statistical Result (pCi/g)	Generic Site Lookup Values[a] (pCi/g)			Does the Statistical Result Exceed Lookup Values?	Does the Statistical Result Pass RESRAD Modeling?
		Shallow Zone Lookup Value[b]	Groundwater Protection Lookup Value	River Protection Lookup Value		
Americium-241	0.027 U	2.38	--[c]	--[c]	No	--
Barium-133	0.018 U	11.8	--[c]	--[c]	No	--
Carbon-14	-0.7 U	5.16	--[c]	--[c]	No	--
Cesium-137	0.184	6.2	--[c]	--[c]	No	--
Cobalt-60	0.016	1.4	--[c]	--[c]	No	--
Europium-152	0.240	3.3	--[c]	--[c]	No	--
Europium-154	0.050 U	3.0	--[c]	--[c]	No	--
Europium-155	0.044 U	125	--[c]	--[c]	No	--
Nickel-63	0.637 U	4,013	--[c]	--[c]	No	--
Plutonium-238	0.008 U	37.4	--[c]	--[c]	No	--
Plutonium-239/240	0.154	33.9	--[c]	--[c]	No	--
Strontium-90	0.036 U	4.5	--[c]	--[c]	No	--
Tritium	0.857 U	15.8	15.8	15.8	No	--
Uranium-233/234	0 (<BG)	1.1[d]	1.1[d]	1.1[d]	No	--
Uranium-235	0 (<BG)	0.84	0.27	0.5	No	--
Uranium-238	0 (<BG)	1.1[d]	1.1[d]	1.1[d]	No	--
COC	**Statistical Result (mg/kg)**	**Remedial Action Goals[a] (mg/kg)**			**Does the Statistical Result Exceed RAGs?**	**Does the Statistical Result Pass RESRAD Modeling?**
		Direct Exposure	**Soil Cleanup Level for Groundwater Protection**	**Soil Cleanup Level for River Protection**		
Barium	67.8	5,600	132[e]	224	No	--
Hexavalent chromium	0.27	2.1[f]	4.8	2	No	--
Lead	5.5	353	10.2[e]	10.2[e]	No	--
Mercury	0.57	24	0.33[e]	0.33[e]	Yes	Yes[g]
Aroclor-1016	0.016 U	5.6[h]	0.112	0.017[e]	No	--
Aroclor-1221	0.016 U	0.5[i]	0.017[e]	0.017[e]	No	--
Aroclor-1232	0.016 U	0.5[i]	0.017[e]	0.017[e]	No	--

Table 3. Comparison of Statistical Contaminant Concentrations to Action Levels for the 118-F-8:4 Overburden/BCL Verification Sampling. (2 Pages)

COC	Statistical Result (mg/kg)	Remedial Action Goals[a] (mg/kg)			Does the Statistical Result Exceed RAGs?	Does the Statistical Result Pass RESRAD Modeling?
		Direct Exposure	Soil Cleanup Level for Groundwater Protection	Soil Cleanup Level for River Protection		
Aroclor-1242	0.016 U	0.5[i]	0.017[e]	0.017[e]	No	--
Aroclor-1248	0.016 U	0.5[i]	0.017[e]	0.017[e]	No	--
Aroclor-1254	0.016	0.5[i]	0.017[e]	0.017[e]	No	--
Aroclor-1260	0.016 U	0.5[i]	0.017[e]	0.017[e]	No	--

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

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

[c] The 100 Area RDR/RAWP (DOE-RL 2005b) does not provide soil cleanup levels for this contaminant to be protective of groundwater and the Columbia River. Based on the lowest radionuclide soil partitioning coefficient (for strontium-90 [25 mL/g]), this contaminant is not predicted to migrate more than 3 m (10 ft) vertically in 1,000 years (BHI 2005). The vadose zone underlying this waste site is approximately 7.8 m (25 ft) thick. Therefore, residual concentrations of this contaminant are predicted to be protective of groundwater and the Columbia River.

[d] The calculated cleanup level is below the Hanford-Site specific statistical soil background. The value presented is the Hanford Site-specific statistical soil background (DOE-RL 2005b) per WAC 173-340-700[4][d]) (1996).

[e] Where cleanup levels are less than required detection limits (RDLs), cleanup levels default to the RDLs (WAC 173-340-740[3], 1996, and DOE-RL 2005b).

[f] Carcinogenic cleanup level calculated based on the inhalation exposure pathway; WAC 173-340-750(3), 1996.

[g] Based on *100 Area Analogous Sites RESRAD Calculations* (BHI 2005), mercury with a soil partitioning coefficient of 30 mL/g will not migrate more than 2 m (6.6 ft) in 1,000 years. The vadose zone underlying this waste site is approximately 7.8 m (25 ft) thick. Therefore, residual concentrations of this contaminant are predicted to be protective of groundwater and the Columbia River.

[h] Noncarcinogenic cleanup level calculated from WAC 173-340-740(3), Method B, 1996.

[i] Carcinogenic cleanup level calculated per WAC 173-340-740(3), Method B, 1996.

-- = not applicable
BCL = below cleanup level
BG = background
COC = contaminant of concern
RAG = remedial action goal
RESRAD = RESidual RADioactivity (dose-assessment model)
U = undetected (in all samples in the data set)
WAC = *Washington Administrative Code*

6.1 COMPARISON OF SAMPLE DATA TO RAGS

Evaluation of the results listed in Tables 1, 2, and 3 from the verification sampling at the 118-F-8:4 waste site indicates that all COCs were undetected and/or quantified below RAGs and lookup values, except for Aroclor-1260, mercury, and selenium. Residual concentrations of Aroclor-1260 in the deep zone decision unit (0.049 mg/kg) slightly exceed the soil RAGs for groundwater and river protection (both 0.017 mg/kg). Residual concentrations of mercury in the shallow zone and overburden decision units (0.41 mg/kg and 0.57 mg/kg, respectively) slightly exceed the soil RAGs for groundwater and river protection (both 0.33 mg/kg). Residual concentrations of selenium in the shallow zone decision unit (1.5 mg/kg) slightly exceed the soil RAG for river protection (1 mg/kg).

Data were not collected on the vertical extent of contamination for this area, but given the soil-partitioning coefficient for these contaminants (Aroclor-1260, 530 mL/g; mercury, 30 mL/g; and selenium, 150 mL/g), they would not be expected to migrate more than 2 m (6.6 ft) vertically in 1,000 years (BHI 2005). The vadose zone underlying the 118-F-8:4 waste site excavation is approximately 7.8 m (26 ft) thick. Therefore, residual concentrations of this contaminant are predicted to be protective of the Columbia River.

6.2 COMPARISON OF SAMPLE DATA TO ECOLOGICAL RISK SCREENING LEVELS

A comparison against ecological risk screening levels has been made for the site COCs and other constituents. Screening levels were not exceeded for the site constituents, with the exception of aluminum, antimony, boron, manganese, mercury, selenium, and vanadium. Exceedance of screening values does not necessarily indicate the existence of risk to ecological receptors. It is believed that the presence of these constituents does not pose a risk to ecological receptors because concentrations of aluminum, antimony, manganese, and vanadium are below site background levels; mercury and selenium are within the range of Hanford Site background levels; and boron concentrations are consistent with concentrations at other locations on the Hanford Site (no established background value is available for boron). A more complete quantitative ecological risk assessment will be presented in the baseline risk assessment for the river corridor portion of the Hanford Site and will be used to support the final closeout decision for this site.

6.3 HUMAN HEALTH RISK EVALUATION FOR NONRADIONUCLIDES

The human health risk evaluations are calculated for nonradionuclide COCs only per WAC 173-340-740(3)(a)(iii)(A) and (B). The requirements include a hazard quotient of less than 1.0 for all individual noncarcinogens, a cumulative hazard quotient of less than 1.0, an individual contaminant carcinogenic risk of less than 1×10^{-6}, and a cumulative

excess carcinogenic risk of less than 1×10^{-5}. The details of the hazard quotient calculations are provided in Appendix C.

Hazard quotient calculations were performed for the 118-F-8:4 waste site using the highest of the statistical values from all sampling areas. Risk values were not calculated for constituents that were not detected or were detected at concentrations below Hanford Site or Washington State background values. All individual hazard quotients are below 1.0, and all individual excess carcinogenic risk values are below 1×10^{-6}. The cumulative hazard quotient for the 118-F-8:4 waste site is 3.9×10^{-2} and the cumulative excess carcinogenic risk value is 2.6×10^{-7}, satisfying the criteria of less than 1.0 and less than 1×10^{-5}, respectively. Therefore, nonradionuclide risk requirements are met.

6.4 WAC THREE-PART TEST FOR NONRADIONUCLIDES

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

The application of the three-part test for the 118-F-8:4 waste site is included in the 95% UCL calculation (Appendix C). The results of this evaluation indicate that lead, mercury, selenium, and Aroclor-1260 fail one or more components of the three-part test when compared to the most stringent RAG (soil RAG for the protection of the Columbia River). Lead and mercury are the most mobile of the four analytes having the lowest soil-partitioning coefficient (both 30 mL/g), and neither is expected to migrate more than 2 m (6.6 ft) vertically in 1,000 years (BHI 2005). Therefore, lead, mercury, and the other two less mobile contaminants are not anticipated to migrate to groundwater or the Columbia River in 1,000 years. All of these contaminants satisfy the three-part test criteria in comparison to the direct exposure RAG. Therefore, the requirements of the three-part test are met.

6.5 RESRAD MODELING FOR RADIONUCLIDES

For radionuclide contaminants, RESRAD modeling (ANL 2005) is used to determine contaminant migration and to predict the dose rate, the excess lifetime cancer risk, and the impact on groundwater and the river from residual radionuclide COC concentrations (DOE-RL 2005b). For the 118-F-8:4 waste site, the individual radionuclide cleanup statistical values were entered into the RESRAD computer code with the results included in the RESRAD calculations in Appendix C, as well as summarized in the following sections.

6.5.1 Attainment of Radionuclide Direct Exposure RAG

The direct exposure RAG for radionuclide COCs is expressed in terms of an allowable radiation dose rate above background, which is 15 mrem/yr over 1,000 years. For the 118-F-8:4 waste site, separate RESRAD runs were performed for each of the decision units (shallow zone excavation, deep zone excavation, and overburden stockpiles). The maximum dose rate calculated by RESRAD occurs at the present year (2007) and is 1.70 mrem/yr (from the overburden stockpile). The maximum dose rate in 1,000 years decreases to 0.0591 mrem/yr (from the overburden stockpile); therefore, this requirement is attained.

6.5.2 Attainment of Radionuclide Excess Lifetime Cancer Risk Goal

The "National Oil and Hazardous Substances Pollution Contingency Plan" (40 *Code of Federal Regulations* [CFR] 300) presents a target range for residual radionuclide risk of 10^{-4} to 10^{-6}. The RESRAD model calculates the excess lifetime cancer risk associated with the estimated radiation dose rates. For the 118-F-8:4 waste site, the maximum excess lifetime cancer risk occurs at the present year (2007) and is 1.99×10^{-5} (from the overburden stockpile). The maximum excess lifetime cancer risk in 1,000 years decreases to 1.14×10^{-7} (from the overburden stockpile); therefore, this requirement is attained.

6.5.3 Attainment of Radionuclide Groundwater and River Protection RAGS

The attainment of groundwater and river protection RAGs for radionuclides is determined by four criteria: (1) attain single COC groundwater and river RAGs, (2) attain "National Primary Drinking Water Regulations" (40 CFR 141) 4 mrem/yr (beta/gamma) dose standard to target receptor/organ; (3) meet drinking water standards for nonuranium alpha emitters (the more stringent of 15 pCi/L maximum contaminant level [MCL] or 1/25th of the derived concentration guide [DOE Order 5400.5]), and (4) meet total uranium standard of 21.2 pCi/L.

The first criterion is determined by comparing peak concentrations of radionuclide COCs to the RAGs. The peak concentration is the maximum predicted value from the three decision units, as shown in the MCL calculation in Appendix C. Among the radionuclide COCs for the 118-F-8:4 waste site, cobalt-60, cesium-137, nickel-63, and strontium-90 are calculated by the RESRAD model to reach groundwater in 1,000 years; however, all are at concentrations significantly below the RAGs.

The peak concentration of cobalt-60 reaching the groundwater from the three decision units is predicted to occur in year 7 at 0.00134 pCi/L. Both the groundwater and river protection RAGs for cobalt-60 are 100 pCi/L; therefore, this criterion is attained.

The peak concentration of cesium-137 reaching the groundwater from the three decision units is predicted to occur in year 43 at 0.185 pCi/L. Both the groundwater and river protection RAGs for cesium-137 are 60 pCi/L; therefore, this criterion is attained.

The peak concentration of nickel-63 reaching the groundwater from the three decision units is predicted to occur in year 135 at 11.2 pCi/L. Both the groundwater and river protection RAGs for nickel-63 are 50 pCi/L; therefore, this criterion is attained.

The peak concentration of strontium-90 reaching the groundwater from the three decision units is predicted to occur in year 43 at 0.636 pCi/L. Both the groundwater and river protection RAGs for strontium-90 are 8 pCi/L; therefore, this criterion is attained.

The second criterion, attainment of the National Primary Drinking Water Regulations 4 mrem/yr (beta/gamma) above background dose standard to target receptor/organ, is demonstrated in the MCL calculation provided in Appendix C. The results predict a maximum dose of 1.01 mrem/yr dose to any organ (total body, bone, liver, and gastrointestinal trace [lower large intestine]) within the 1,000 years of the evaluation period. Therefore, this criterion is attained.

The third criterion, meet drinking water standards for nonuranium alpha emitters (the more stringent of 15 pCi/L MCL or 1/25th of the derived concentration guide [DOE Order 5400.5]) is demonstrated in the MCL calculation in Appendix C. The results indicate that the alpha-emitting COCs (americium-241, plutonium-238, and plutonium-239/240) will not impact groundwater. Therefore, concentrations are less than the maximum allowable gross particle activity.

For the last criterion, meet the total uranium standard of 21.2 pCi/L, no uranium isotopes were detected above background levels in the 118-F-8:4 waste site verification samples. Therefore, this standard is met.

7.0 DATA QUALITY ASSESSMENT

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

The DQA for the 118-F-8:4 waste site established that the data are of the right type, quality, and quantity to support site verification decisions within specified error tolerances. All analytical data were found to be acceptable for decision-making purposes. The evaluation verified that the sample design was sufficient for the purpose of clean site verification. The detailed DQA is presented in Appendix D.

8.0 SUMMARY FOR WASTE SITE RECLASSIFICATION

This cleanup verification package demonstrates that remedial action at the 118-F-8:4 waste site has achieved the remedial action objectives and corresponding RAGs established in the Action Memorandum (EPA et al. 1998a) and by reference, the 100 Area SAP (DOE-RL 2005a) and RDR/RAWP (DOE-RL 2005b). The remaining soils at this site have been sampled, analyzed, and modeled. The results indicate that the residual concentrations of COCs at this site do not preclude any future uses (as bounded by a rural-residential scenario) and allow for unrestricted use of the shallow-zone. The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated due to the presence of residual activities from multiple radionuclides; therefore, institutional controls to prevent uncontrolled drilling/excavation into the deep zone (i.e., below 4.6 m [15 ft]) are required. The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River.

In accordance with this evaluation, the verification sampling and modeling results support a reclassification of the 118-F-8:4 waste site to Interim Closed Out.

9.0 REFERENCES

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APPENDIX A

SITE PHOTOGRAPHS

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APPENDIX B

RADIOLOGICAL SURVEYS

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APPENDIX C

CALCULATIONS

(Please See CD for Complete File)

DISCLAIMER FOR CALCULATIONS

The calculations that are provided in the following 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.

APPENDIX D

DATA QUALITY ASSESSMENT

(Please See CD for Complete File)

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