0084497

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

10-AMCP-0050

DEC 18 2009

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

Dear Mr. Faulk:

REMAINING SITES VERIFICATION PACKAGE FOR THE 200-N-3 WASTE SITE LOCATED IN THE 200-CW-3 OPERABLE UNIT, DOCUMENTATION FOR WASTE SITE RECLASSIFICATION FORM 2009-027, DOE/RL-2009-87, REVISION 0

This letter transmits the Remaining Sites Verification Package for the 200-N-3 Waste Site Located in the 200-CW-3 Operable Unit, Documentation for Waste Site Reclassification Form 2009-027, DOE/RL-2009-87, Revision 0 for your review and approval.

The Waste Site Reclassification Form proposes changing the status of the 200-N-3 Waste Site to "No Action."

If you have any questions, please contact me, or your staff may contact Al Farabee, of my staff, on (509) 376-8089.

Sincerely,

for

Matthew S. McCormick, Assistant Manager
for the Central Plateau

AMCP:FMR

Attachment

cc: See Page 2

RECEIVED
JAN 06 2010
EDMC

cc w/attach:
G. Bohnee, NPT
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DOE/RL-2009-87
Revision 0

Remaining Sites Verification Package for the 200-N-3 Waste Site Located in the 200-CW-3 Operable Unit

Documentation for Waste Site Reclassification Form 2009-027

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

U.S. DEPARTMENT OF ENERGY

Richland Operations Office

P.O. Box 550
Richland, Washington 99352

Approved for Public Release;
Further Dissemination Unlimited

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Remaining Sites Verification Package for the 200-N-3 Waste Site Located in the 200-CW-3 Operable Unit

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Assistant Secretary for Environmental Management

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Richland Operations Office

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Waste Site Reclassification Form

Date Submitted: 08/06/2009	**Operable Units:** 200-CW-3	**Control Number:** 2009-027
Originator: Crane, T	**Waste Site ID:** 200-N-3	
Phone: 376-9789	**Type of Reclassification Action:**	
	Closed Out: ☐ Interim Closed Out: ☐	
	No Action: ☒ RCRA Postclosure ☐	
	Rejected: ☐ Consolidated ☐	

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 Conditions:

(Summarize status of investigation/remediation of the waste sites.)

The 200-N-3 waste site consists of several 12-meter wide pits located southwest of the 212-P building. The pits contain gravel sized rock as well as some metal pipes, wood, electrical insulators, metal cans and drums. The pits were believed to be a source of rock for the Hanford railroad track beds. The results of the focused sampling performed per DOE/RL-2007-54, Sampling and Analysis Plan for Remediation of 200 North Area Waste Sites Located in the 200-CW-3 Operable Unit, identified no contaminants above the Remedial Action Goals (RAGs) and compliance with the Remedial Action Objectives (RAOs).

The waste site confirmatory sampling results support a reclassification of this site to no action. The current site conditions achieve the RAOs and the corresponding RAGs established in the Remedial Design/Remedial Action Work Plan for 200 North Area Waste Sites located in the 200 CW 3 Operable Unit (DOE/RL 2007-55) 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 the waste site sampling after remediation are used to make reclassification decisions for the 200-N-3 waste site in accordance with the TPA MP 14 (DOE RL 2007) process.

Basis for Reclassification:

(For closeout, reference supporting documentation, as listed in Table 3.)

The current site conditions achieve the remedial action objectives and the corresponding remedial action goals specified in the Remaining Sites ROD. These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil [i.e., surface to 4.6 meters (15 feet)] and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. There is no deep zone for the 200-N-3 waste sites therefore no institutional controls are required. The basis for reclassification to no action is described in detail in the Remaining Sites Verification Package for the 200-N-3 Waste Site located in the 200-CW-3 Operable Unit (DOE/RL-2009-87), U.S. Department of Energy, Richland Operation Office, Richland, Washington.

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.

DOE Project Manager	Signature: Scott McCauley	Date: 12/18/09
Ecology Project Manager	Signature	Date
EPA Project Manager	Signature	Date

REMAINING SITES VERIFICATION PACKAGE FOR THE 200-N-3 WASTE SITE LOCATED IN THE 200-CW-3 OPERABLE UNIT

EXECUTIVE SUMMARY

This report summarizes characterization data collected for waste site 200-N-3, shows the comparison of data against applicable clean-up goals and objectives, provides justification for the selected alternative, and provides the basis for reclassification of the waste site status.

The 200-N-3 waste site is a collection of three outdoor depressions or pits located southwest of the 212-P facility in Hanford's 200 North Area. According to records, the pits were originally created when the soil and rock was excavated for use as railroad track bed material. Non-dangerous, non-radioactive solid debris was later placed in the three pits. The waste site was added to the Waste Identification Data System (WIDS) in 1994.

In July 2009, the 200-N-3 waste site was investigated through field observations and focused sampling and analysis for the purpose of determining if hazardous or radiological contaminants were present. This investigative activity was performed in accordance with *Sampling and Analysis Plan* (DOE/RL-2007-54) and *Remedial Design/Remedial Action Work Plan for 200 North Area Waste Sites located in the 200-CW-3 Operable Unit* (DOE/RL-2007-55).

The data collected was found to meet (be in compliance with) remedial action goals (RAGs) and to satisfy remedial action objectives (RAOs). Residual soil concentrations of the potential constituents of concern support future land uses that can be represented (or bounded) by a rural-residential scenario. Results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil [i.e., surface to 4.6 meters (15 feet)] and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. There is no deep zone for the 200-N-3 waste site therefore no institutional controls are required. These results support the "no action" determination described 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) (EPA 1999). As the objective of this process, the status of 200-N-3 will be formally changed to "no action" in accordance with the reclassification process described in TPA-MP-14, *Maintenance of the Waste Identification Data System (WIDS)* (DOE-RL 2007); the reclassification form is included with this report.

CONTENTS

1.0 STATEMENT OF PROTECTIVENESS 1

2.0 GENERAL SITE INFORMATION AND BACKGROUND 1

3.0 SUMMARY OF REMEDIAL ACTION OBJECTIVES FOR THE 200-N-3 WASTE SITE 2

4.0 PRE-REMEDIATION WASTE SITE CHARACTERIZATION AND CONCEPTUAL MODEL CONFIRMATION SAMPLING 5
- 4.1 Geophysical Survey Results 5
- 4.2 Contaminants of Concern 6
- 4.3 Waste Site Sample Design for Waste Site Characterization and Conceptual Model Confirmation Activities 6
- 4.4 Sample Summary 7

5.0 DATA EVALUATION 8

6.0 DATA QUALITY ASSESSMENT 8

7.0 SUMMARY SUPPORTING NO ACTION RECLASSIFICATION 10

8.0 REFERENCES 12

APPENDICES

A COMPARISON OF MAXIMUM CONFIRMATORY SAMPLE ANALYSES TO 100 AREA RADIONUCLIDE SOIL CONCENTRATIONS CORRESPONDING TO AN EQUIVALENT DOSE OF 15 MREM/YR ..... APP A-1

B COMPARISON OF MAXIMUM CONFIRMATORY SAMPLE ANALYSES TO NONRADIONUCLIDE DIRECT EXPOSURE CLEANUP LEVELS ..... APP B-1

C COMPARISON OF MAXIMUM CONFIRMATORY SAMPLE ANALYSES TO SOIL ACTIVITIES CALCULATED BY RESRAD TO BE PROTECTIVE OF 100 AREA GROUNDWATER ..... APP C-1

D SUMMARY OF COMPARISON OF MAXIMUM CONFIRMATORY SAMPLE ANALYSES TO 100 AREA NONRADIONUCLIDE CLEANUP LEVELS FOR PROTECTION OF GROUNDWATER AND THE COLUMBIA RIVER ..... APP D-1

E WASTE CHARACTERIZATION AND CONCEPTUAL MODEL CONFIRMATION SAMPLING DATA SUMMARY ..... APP E-1

FIGURES

Figure 1. 200-N-3 Waste Site Location Map. 4
Figure E-1. Photos from 200-N-3 Confirmatory Sampling Evolution ..... APP E-1

TABLES

Table 1. Summary of Attainment of Remedial Action Objectives for the 200-N-3 Waste Site 2
Table 2. Comparison of Maximum Soil Analyses to Remedial Action Goals for the 200-N-3 Waste Site 11

Table A-1. Comparison of Maximum Soil Analyses to 100 Area Radionuclide Soil Concentrations Corresponding to an Equivalent Dose of 15 mrem/yr. ..... APP A-1
Table B-1. Comparison of Maximum Confirmatory Sample Analyses to Nonradionuclide Direct Exposure Cleanup Levels. ..... APP B-1
Table C-1. Comparison of Maximum Confirmatory Sample Analyses to Soil Activities Calculated by RESRAD to be Protective of 100 Area Groundwater. ..... APP C-1
Table D-1. Summary of Comparison of Maximum Confirmatory Sample Analyses to 100 Area Nonradionuclide Cleanup Levels for Protection of Groundwater and the Columbia River.. ..... APP D-1
Table E-1. Radiological Survey Results ..... APP E-2
Table E-2. Results for Shallow Zone Radionuclide COPCs ..... APP E-3
Table E-3. Results for Shallow Zone Nonradionuclide COPCs ..... APP E-4

WASTE SITES VERIFICATION PACKAGE FOR THE 200-N-3 WASTE SITES LOCATED IN THE 200-CW-3 OPERABLE UNIT

1.0 STATEMENT OF PROTECTIVENESS

This report demonstrates that the 200-N-3 waste site meets the objectives for the 'no action' remedy described in the *Remedial Design/Remedial Action Work Plan for 200 North Area Waste Sites located in the 200-CW-3 Operable Unit* (RD/RAWP) (DOE/RL-2007-55) 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 presented show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil [i.e., surface to 4.6 meters (15 feet)] and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. These results support the "no action" determination and reclassification to "no action" status in accordance with the process described in TPA-MP-14, *Maintenance of the Waste Identification Data System (WIDS)* (DOE-RL 2007). There is no deep zone for the 200-N-3 waste site therefore no institutional controls are required.

Soil cleanup levels were established in the Remaining Sites ROD (EPA 1999) based on a limited ecological risk assessment. These soil cleanup levels are referred to as Look-Up Values. A baseline risk assessment for the river corridor portion of Hanford began in 2004 and includes a more complete quantitative ecological risk assessment. When complete, this risk assessment will be used to support evaluation of waste sites including 200-N-3 for final closure.

2.0 GENERAL SITE INFORMATION AND BACKGROUND

The Waste Information Data System (WIDS) describes the 200-N-3 site as a series of pits located southwest of the 212-P building, northwest of the intersection of two gravel roads, one leading to 212-P and the other leading to 212-N. Each pit is approximately 12 meters across with soil containing large amounts of gravel sized rock. Some metal pipes, wood, electrical insulators, metal cans and rusted drums were noted during a site visit in 2004. The total dimension of the waste site according to WIDS is 80 meters (269.03 feet) long and 20 meters (65.62 feet) wide. No signs or postings distinguish the area.

The exact source and extent of contamination is unknown. Notations in WIDS suggest the pits were used as a source of rock for the Hanford railroad track beds. Notes from a site visit in 1996 suggested the depressions that make up the site were still visible. Noted depressions were still visible during walk-through preparations for confirmatory sampling activities. No historical or visual evidence exists of backfilling, compacting or turning the debris.

In general industry, ballast is a common term for heavy materials especially that used as the base material for roads and railroads. A "ballast pit" is a source for this material. Drawings from the 1950's and historical references suggest the site identified as 200-N-3, was the latter type of ballast pit – a source of gravel base material for the nearby railroad tracks. Later, it appears that the depressions left from removed earth, were used as a dumping area for general debris. All historical sources were consistent in their exertions that the site was not known or suspected to contain radiological contamination.

3.0 SUMMARY OF REMEDIAL ACTION OBJECTIVES FOR THE 200-N-3 WASTE SITES

The results from the confirmatory sampling and analysis of the 200-N-3 waste site indicate compliance with the remedial action objectives (RAOs) and the remedial action goals (RAGs) identified in the Remaining Sites ROD (EPA 1999) and the RD/RAWP (DOE/RL-2007-55). Table 1 summarizes the confirmatory sampling results against the applicable criteria. Detailed analysis results are presented by Hanford Environmental Information System (HEIS) numbers in Appendix F.

Table 1. Summary of Attainment of Remedial Action Objectives for the 200-N-3 Waste Site

Regulatory Requirement	Remedial Action Goals [a]	Results	Remedial Action Objectives Attained?
Direct Exposure – Radionuclides	Attain 15-mrem/year dose rate above background over 1,000 years.	Residual concentrations of radionuclide COPCs are below background or less than one-tenth the single radionuclide soil concentration equivalent to a 15 mrem/year dose rate calculated by RESRAD (see Appendix A).	Yes
Direct Exposure – Nonradionuclides	Attain individual COPC RAGs.	All individual COPC concentrations are below the direct exposure criteria presented in Appendix B.	Yes
Risk Requirements – Nonradionuclides	Attain a hazard quotient of <1 for all individual noncarcinogens.	No COPCs were detected above Hanford Specific background value (see Appendix B and Appendix E).	Yes
	Attain a cumulative hazard quotient of <1 for non-carcinogens.	No COPCs were detected above background levels therefore there is no cumulative hazard quotient.	
	Attain an excess cancer risk of <1 x 10^{-6} for individual carcinogens.	There is no excess cancer risk for the COPCs because no carcinogens were detected above background levels.	
	Attain a cumulative excess cancer risk of <1 x 10^{-5} for carcinogens.	There is no cumulative excess cancer risk for the COPCs because no carcinogens were detected above background levels.	
Groundwater/River Protection – Radionuclides	Attain single COPC groundwater and river protection RAGs.	Maximum residual concentrations of radionuclide COPCs were detected below groundwater and river protection exposure criteria (Table 2 and Appendix C). Values calculated by RESRAD that are protective of the groundwater are also protective of the Columbia River, since contaminant access to the Columbia River is through the groundwater. ***NOTE:*** *For uranium-233/234 and uranium-238, the groundwater MCL of 21.2 pCi/L corresponds to a soil concentration of 0.185 pCi/g. However, the Hanford specific background for these uranium isotopes is 1.1 pCi/g. The RAG therefore defaults to 1.1 pCi/g.* [d]	Yes
	Attain national primary drinking water standards 4 mrem/yr (beta/gamma) dose rate to target receptor/organs.	Maximum residual concentrations of beta/gamma radionuclide COPCs were detected below groundwater and river protection exposure criteria (Table 2 and Appendix A, Footnote a).	

Table 1. Summary of Attainment of Remedial Action Objectives for the 200-N-3 Waste Site

Regulatory Requirement	Remedial Action Goals [a]	Results	Remedial Action Objectives Attained?
	Meet drinking water standards [b] for alpha emitters: the most stringent of 15 pCi/L MCL or 1/25th of the derived concentration guides from DOE Order 5400.5. [c]	Maximum residual concentrations of alpha emitting radionuclide COPCs were detected below groundwater and river protection exposure criteria (Table 2 and Appendix C). RESRAD calculations predict that the only alpha emitting radionuclide COPCs with the potential to reach groundwater within 1,000 years are the uranium isotopes. ***NOTE:*** *For uranium-233/234 and uranium-238, the groundwater MCL of 21.2 pCi/L corresponds to a soil concentration of 0.185 pCi/g. However, the Hanford specific background for these two uranium isotopes is 1.1 pCi/g. The RAG therefore defaults to 1.1 pCi/g.* [d]	Yes
	Meet total uranium standard of 21.2 pCi/L. [d]	For uranium-233/234 and uranium-238, the groundwater MCL of 21.2 pCi/L corresponds to a soil concentration of 0.185 pCi/g (Appendix C). However, the Hanford specific background for these two uranium isotopes is 1.1 pCi/g. The RAG therefore defaults to 1.1 pCi/g. [d]	
Groundwater/River Protection – Non-radionuclides	Attain individual non-radionuclide groundwater and river cleanup requirements.	Maximum detected results for all nonradionuclides are below the RAGs for protection of groundwater. (Appendix D).	Yes

Notes:

[a] Remaining Sites ROD

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

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

[d] Based on the isotopic distribution of uranium in the 100 Areas, 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*, 0100X-CA-V0038 (BHI 2001).

Abbreviations: COPC = contaminant of potential concern; MCL = maximum contaminant level (drinking water standard); RAG = remedial action goal

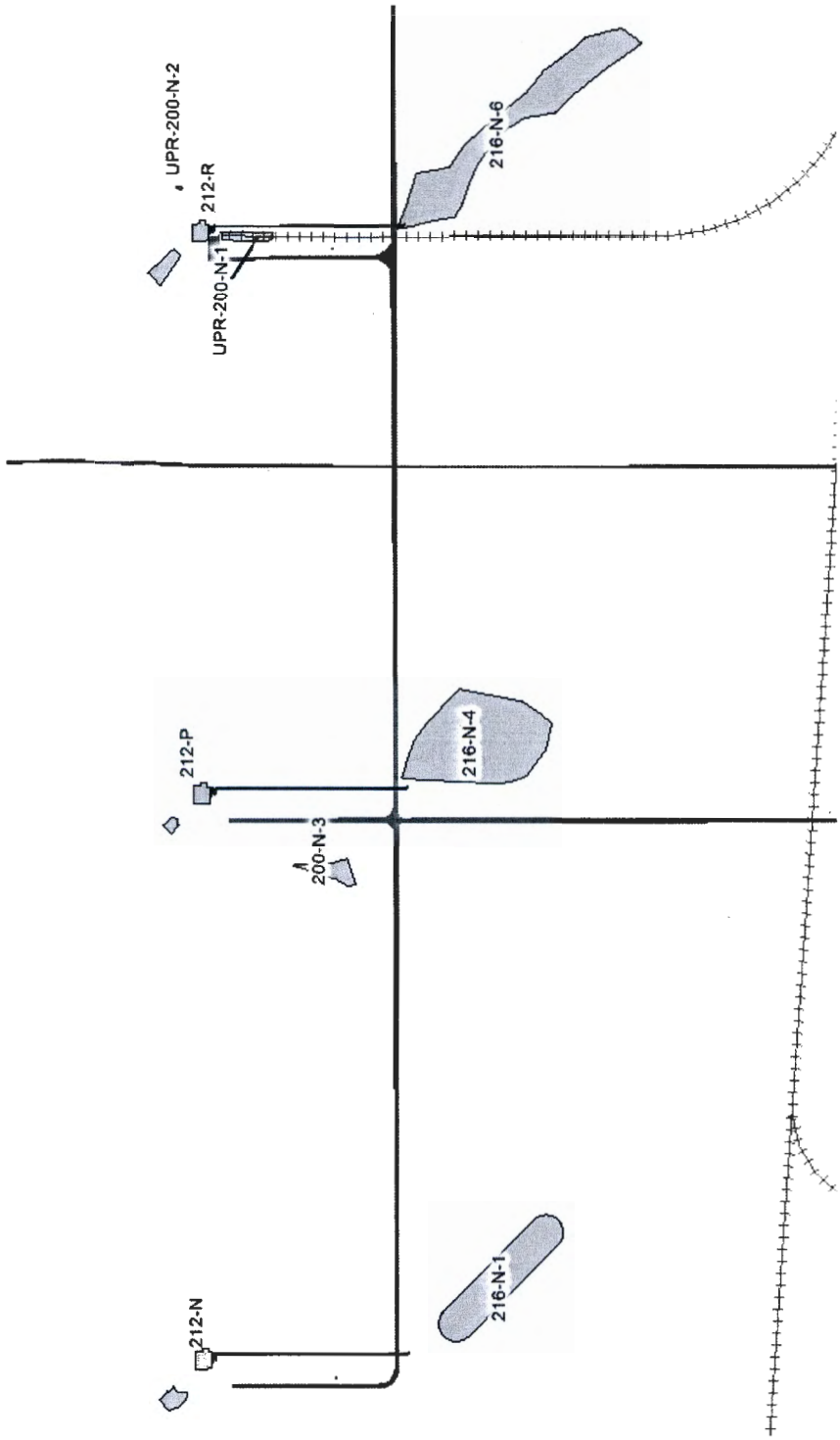

Figure 1. 200-N-3 Waste Site Location Map.

4.0 PRE-REMEDIATION WASTE SITE CHARACTERIZATION AND CONCEPTUAL MODEL CONFIRMATION SAMPLING

To determine if remediation of the 200-N-3 waste site was required, the waste site was characterized in accordance with the remedial design/remedial action work plan (RD/RAWP) and sampling and analysis plan (SAP). Selection of the "no action" remedy was justified through soil sampling and analysis and radiological screening.

4.1 Geophysical Survey Results

The Hanford Site lies in a sediment-filled basin on the Columbia Plateau in southeastern Washington. The 200-CW-3 operable unit waste sites are located in the 200 North Area which is situated on the 200 Areas Plateau north of a relatively flat prominent terrace (Cold Creek Bar), on a flood channel formed during the late Pleistocene flooding. The elevation in the vicinity ranges from approximately 180 m (593 ft) in the northern part of the unit to about 170 m (560 ft) above mean sea level (msl) in the southern part. There are no natural surface drainage channels within the 200 North area.

The vadose zone beneath the 200 Areas ranges in thickness from approximately 55 m (180 ft) beneath the former U Pond in the 200 West Area to approximately 104 m (341 ft) in the southern portion of the 200 East Area to 49 m (160 ft) along the western part of the 200 North Area. Basalt of the Columbia River Basalt Group and a sequence of overlying sediments comprise the local geology. Sediments in the vadose zone consist primarily of the Hanford formation, Plio-Pleistocene unit/early Palouse soil, and Ringold Formation.

Groundwater beneath the Hanford Site is found in an upper primarily unconfined aquifer system and in deeper confined aquifers within the basalt. The Columbia River is the primary discharge area for both the unconfined and confined aquifer. The unconfined aquifer in the 200 North area of the Central Plateau occurs in the Hanford Formation. In general, groundwater flow through the Central Plateau occurs in a predominantly easterly direction from the 200 West Area to the 200 East Area.

The nearest natural surface water body to the 200 North area is West Lake (the 216-N-8 Pond) located approximately 0.8 km (0.5 mi) east. The potential for natural groundwater recharge within the 200 North area is limited to precipitation infiltration. Estimates of recharge from precipitation at the Hanford Site range from 0 to 10 cm/yr (0 to 4 in/yr).

The subject waste site, 200-N-3, is a series of pits located southwest of the 212-P building, northwest of the intersection of two gravel roads. Each pit is approximately 12 meters across with soil containing large amounts of gravel sized rock and miscellaneous debris (see photos in E-1). The total dimension of the waste site according to WIDS is 80 meters (269.03 feet) long and 20 meters (65.62 feet) wide. This site was not associated with an operational effluent discharge line, and as a result, would not have contributed to a continuously saturated area of the surface area soils. In addition, the absence of a re-occurring liquid discharge (or any known liquid discharge) to this area, vertical migration and distribution of COPCs through the sediments of the vadose zone would have been restricted.

4.2 Contaminants of Concern

The contaminants of potential concern (COPCs) for the 200-N-3 waste site were identified based on existing information for the site and the COPCs listed in the Remaining Sites ROD. The COPC list identified in the *Sampling and Analysis Plan for Remediation of 200 North Area Waste Sites located in the 200-CW-3 Operable Unit* (SAP) (DOE/RL-2007-54) includes americium-241, cobalt-60, cesium-137, europium-152, europium-154, europium-155, tritium, strontium-90, plutonium-238, plutonium-239/240, nickel-63, thorium-232, technetium-99, uranium-233/234, uranium-235, uranium-238, hexavalent chromium, mercury, lead, barium, trivalent chromium, cadmium, antimony, arsenic, manganese, zinc, and polychlorinated biphenyls (PCBs).

4.3 Waste Site Sample Design for Waste Site Characterization and Conceptual Model Confirmation Activities

Judgment/focused sampling and field screening were determined to be appropriate for the waste site investigations in the 200-CW-3 OU based on EPA guidance (EPA/240-R-02-005, *Guidance on Choosing a Sampling and Design for Environmental Data Collection*), the decision rules and conceptual models developed to support the Remaining Sites ROD, and the nature/process knowledge of these waste sites.

The 200-CW-3 waste sites have attributes such as visible surface debris, known discharge release points in engineered structures such as ponds, or subsurface debris that can be identified by surface geophysics techniques, or have a primary constituent which has a gamma and/or beta emitter that can be identified by surface/near surface radiological surveys. When combined with process knowledge, these physical attributes support the use of focus or judgment sampling (versus statistical methodologies) to select potential "worst-case" candidate sites. The 200-N-3 waste site lacks some physical attributes such as engineered structure, but does have identified lateral dimensions (visible depressions) that define the sampling boundaries and support focused sampling.

Even in locations where radiological contamination is not expected, radiological field screening is used to establish site radiological contamination levels. Data from field screening alone is not sufficient to support final no-action decisions in accordance with the Remaining Sites ROD. Field screening can, however, assist in the focus or judgment sampling for sites with indicator constituents. Although a negative result cannot be used to support a final no-action decision, it can be used to focus the area of potential contamination. Positive results (contamination detected above background readings) serve several purposes including providing bases for focused sample collection and providing an "indicator" of chemical contamination.

The specific sampling design for the 200-N-3 waste site is detailed in the *Sampling and Analysis Plan*, DOE/RL-2007-54, and follows the conceptual site model for surface and subsurface areas (burn pits, construction lay down yards, dumping areas, and minor burial pits) developed with data quality objectives for the Remaining Sites ROD. The conceptual model for this type of site includes the physical components and sample media at the site, sampling access, spatial boundaries, spatial distribution of contaminants and the nature of contaminant locations. The following elements make up the sampling approach for the subject waste site (from SAP DOE/RL-2007-54):

- Performance of radiological field screening of ground surface to guide focused sampling.
- Performance of test pit (sample location) sampling technique or another comparable technique, sampling to a depth of 15 feet.
- Performance of radiological field surveys from each test pit (sample location) or direct push at every foot in depth (or other sampling technique).
- Use of Cs-137 or Sr-90 (as appropriate) as an indicator for each sample.
- Excavation and use of radiological field screening techniques to determine the extent of contamination spread in support of future remedial actions as applicable.

Based on the sampling design, the combination of the radiological surveys and samples taken from the most likely candidate locations for contamination, the characteristics of the 200-N-3 are consistent with a surface-level non-radiological debris dump site. No source of contamination or contributor exists or remains in the surrounding media. The findings from these sampling activities are considered representative of the waste site and are adequate to conclusively support a decision of no action.

4.4 Sample Summary

In July 2009, focused, discrete samples were collected from three sample locations in the 200-N-3 waste site, at locations 1, 2 and 4, based on the presence of debris at these locations. Based on the decision process for focused sampling established in the SAP, soil samples were not collected from location 3 due to the absence of radiological dose or contamination, soil discoloration and debris. At locations 1, 2, and 4, radiological screening was performed prior to and during sampling. Surveys were performed at one foot increments to a depth of 15 feet as prescribed by the SAP. Survey readings did not exceed background (see table E-1).

The analytical results from the sampling campaign were compared to the Deep Zone [≥ 4.6 meters (15 feet) below surface to groundwater] and Shallow Zone [surface to 4.6 meters (15 feet)] Look-Up Values, to determine whether further remediation was required. The analytical results from the soil samples are below their applicable Look-Up Values. As described previously, implementation of the focused sampling method employs both radiological surveys and observational techniques to determine actual locations for discrete samples and analysis. As identified in table E-1, radiological surveys were taken at 1-foot intervals to a depth of 15 feet. No survey readings were above background levels. Additionally, no staining, discoloration or saturated media were identified during the observational phase of the sampling at each 1-foot interval. As a result, discrete samples were only obtained at the 15-foot depth to verify that no potential COPCs were present at the concentrations that would exceed the look-up values in the shallow zone and potentially migrate to the deep zone.

Results for the 200-N-3 waste sites waste characterization/conceptual model remedy confirmation sampling and analysis data are presented in Appendix E. The Hanford Environmental Information System (HEIS) sample numbers are listed for each sample with a description of the sample.

5.0 DATA EVALUATION

Results for the 200-N-3 waste site sampling and analysis for verification of remedy completion are provided in Appendix E. As shown in Table 2 all detected analytes were reported at concentrations below direct exposure, groundwater protection, and river protection RAGs, or below the Hanford Specific Background default value RAGs in the case of uranium-233/234 and uranium-238.

Nonradionuclide risk requirements for the 200-N-3 waste site include an individual and cumulative hazard quotient of less than 1.0, individual contaminant carcinogenic risks of less than 1×10^{-6}, and a cumulative carcinogenic risk of less than 1×10^{-5}. Risk values are not calculated for constituents that are either not detected or are detected at concentrations below Hanford Site or Washington State background values (Appendix E).

- All individual hazard quotients for noncarcinogenic constituents were less than 1.0. No COPCs were detected above their Hanford Specific Background value, therefore no hazard quotient calculation was required.

- The cumulative hazard quotient for all noncarcinogenic constituents was less than 1.0. Again, no COPCs were detected above their Hanford Specific Background value, therefore no cumulative hazard quotient calculation was required.

- No carcinogens were detected above the Hanford Specific Background values. Therefore the individual carcinogenic risk values for carcinogenic constituents are all below 1×10^{-6} and the cumulative excess carcinogenic risk value for carcinogenic constituents are all below 1×10^{-5}.

6.0 DATA QUALITY ASSESSMENT

A data quality assessment (DQA) review was performed to compare the sampling approach and analytical data with the sampling and data requirements specified by the SAP (DOE/RL-2007-54). This review involves evaluation of the data to determine if they are of the right type, quality, and quantity to support the intended use (EPA 2000). The assessment review completes the data life cycle (i.e., planning, implementation, and assessment) that was initiated by the data quality process.

Level C data validation as defined in the contractor's validation procedures, which are based on EPA functional guidelines [e.g., *Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses* (Bleyler 1988a); *Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses* (Bleyler 1988b)], was performed for the entire sampling and analysis data package for the confirmatory samples collected for 200-N-3. Level C validation is a review of the quality control (QC) data and specifically requires verification of deliverables and requested versus reported analyses and qualification of the results based on: analytical holding times; method blank results; matrix spike/matrix spike duplicate; surrogate recoveries; duplicates; and analytical method blanks.

Specific data quality objectives for the site are found in the SAP (DOE/RL-2007-54). All samples were collected per the sample design described in Section 4.3. The COPCs for 200-N-3 are in listed Section 4.2.

All of the sampling and analysis data generated from the confirmatory sampling of 200-N-3 waste sites are tracked through the following HEIS numbers: B20XC5, B20XC6, B20XC7, B20XC8, B20XC9, B20XF1 (equipment blank), B20XF2 (trip blank), and B20XF3 (field blank). All of the 200-N-3 sampling and analysis data were found to be useable for decision-making purposes as provided in the following summary:

HEIS Identification Numbers: B20XC5, B20XC6, B20XC7, B20XC8, B20XC9, B20XF1 (equipment blank), B20XF2 (trip blank), and B20XF3 (field blank)

Blanks: Trip, field, and equipment blanks with complete analyses were acceptable

Field Duplicates: All duplicates were acceptable.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) and Laboratory Control Standard/Laboratory Control Standards Duplicate (LCS/LCSD): MS/MSD and LCS/LCSD were run to an acceptable percentage recovery test as a result for calculation or relative percent difference (RPD) for QC purposes based on laboratory QA/QC procedures.

Radiochemistry, ICP Metals, PCB, and Chromium (VI) Analyses: Analytical reports submitted for validation and verified for completeness based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage was 100%. The data has been determined to be useable for decision-making purposes. Detailed notes, copies of chains of custody, and validation information are provided in letter report number 3B700-09-005.

Field Screening: Relative to analytical data in sample media, physical data and/or field screening results are of lesser importance in making inferences of risk. Because of the secondary importance of such data, no validation for physical property data and/or field screening results was performed. However, field quality assurance/quality control (QA/QC) was reviewed to ensure that the data are useable. Field instrumentation, calibration, and QA checks were performed in accordance with the following.

- Calibration of radiological field instruments on the Hanford Site is performed under contract by Pacific Northwest National Laboratory, as specified in their program documentation.

- Daily calibration checks are performed and documented for each instrument used to characterize areas that are under investigation. These checks are made on standard materials that are sufficiently like the matrix under consideration that direct comparison of data can be made.

The review and approval of completed field radiation surveys by the radiological controls organization represents the data validation and usability review for handheld field radiological measurements.

The DQA review for these waste sites found the analytical results to be accurate within the standard errors associated with the methods, including sampling and sample handling. The data are of the correct type, quality, and quantity to support the intended use. Detection limits, precision, accuracy, and sampling data group completeness were assessed to determine if any analytical results should be rejected as a result of quality assurance and quality control deficiencies. All analytical data were found acceptable for decision-making purposes. All of the sampling analytical data are stored in the Hanford Environmental Information System (HEIS) and are summarized in Appendix E. All qualifiers have also been added accordingly into the data for Appendix E.

7.0 SUMMARY SUPPORTING NO ACTION RECLASSIFICATION

In July 2009, focused and discrete soil samples were collected from the 200-N-3 waste site. The analytical results were compared to the Deep and Shallow Zone Look-Up Values to determine whether further remediation was required. The analytical results from the soil samples are below the applicable Look-Up Values.

The analytical results from the soil samples meet the remedial action objectives for direct exposure, groundwater protection, and river protection. In accordance with this evaluation, the sampling results support reclassification of the 200-N-3 waste site to 'no action' status, as recorded on the Waste Site Reclassification Form included with this report. Per TPA-MP-14, 'no action' status indicates that a waste site does not require any further remedial action under RCRA Corrective Action, CERCLA, or other cleanup standards based on an assessment of quantitative data collected for the waste site.

Table 2. Comparison of Maximum Soil Analyses to Remedial Action Goals for the 200-N-3 Waste Site *

Contaminant of Concern	Hanford Site-Specific Background Activity (pCi/g)	Maximum Soil Analyses (pCi/g)	Remedial Action Goals (pCi/g)			Does the Maximum Exceed RAGs?
			Direct Exposure (pCi/g)	Soil Cleanup Level for Groundwater Protection (pCi/g)	Soil Cleanup Level for River Protection (pCi/g)	
Americium-241	N/A	0.26	31.1	1,577,000	1,577,000	No
Cesium-137	1.1	U	6.2	NA [c]	NA [c]	No
Cobalt-60	0.008	U	1.4	NA [c]	NA [c]	No
Europium-152	N/A	U	3.3	NA [c]	NA [c]	No
Europium-154	0.033	U	3.0	NA [c]	NA [c]	No
Europium-155	0.054	U	125	NA [c]	NA [c]	No
Nickel-63	N/A	U	4,026	NA [c]	NA [c]	No
Plutonium-238	0.004	U	37.4	1,123	1,123	No
Plutonium-239/240	0.025	2.4 [e]	33.9	718,600	718,600	No
Strontium-90	0.18	U	4.5	NA [c]	NA [c]	No
Technetium-99	N/A	U	15	15 [b]	15 [b]	No
Throium-232	1.3	0.282	1.3	NA [c]	NA [c]	No
Tritium (H-3)	N/A	U	510	35.5	106.7	No
Uranium-233/234	1.1	0.26	1.1	1.1 [a]	1.1 [a]	No
Uranium-235	0.11	0.17	1.0	1.0 [b]	1.0 [b]	No
Uranium-238	1.1	0.2	1.1	1.1 [a]	1.1 [a]	No
Contaminant of Concern	**Hanford Site-Specific Background Activity (mg/kg)**	**Maximum Soil Analyses (mg/kg)**	**Remedial Action Goals (mg/kg)**			**Does the Maximum Exceed RAGs?**
			Direct Exposure (mg/kg)	**Soil Cleanup Level for Groundwater Protection (mg/kg)**	**Soil Cleanup Level for River Protection (mg/kg)**	
Antimony	5 [d]	0.37	32	6.0 [b]	6.0 [b]	No
Arsenic	6.5	2.95	6.5 [d]	6.5 [d]	6.5 [d]	No
Barium	132	52.20	5,600	NA [c]	NA [c]	No
Cadmium [1]	0.81 [d]	U	80	NA [c]	NA [c]	No
Chromium Total	18.5	4.37	80,000	NA [c]	NA [c]	No
Chromium (VI)	N/A	U	400	8.0	2.2	No
Lead	10.2	8.36	353	NA [c]	NA [c]	No
Manganese	512	271	11,200	NA [c]	NA [c]	No
Mercury	0.33	U	24	NA [c]	NA [c]	No
Zinc	67.8	35.10	24,000	NA [c]	NA [c]	No
Polychlorinated Biphenyls	N/A	U	0.5	NA [c]	NA [c]	No

Notes:

[a] The calculated soil concentration cleanup level of 0.185 pCi/g is below the Hanford Specific Background Activity of 1.1 pCi/g. Therefore the soil concentration protection of groundwater defaults to 1.1 pCi/g.

[b] The remedial action goal is below the practical quantitation limit (PQL). The value presented is the PQL.

[c] NA = Not Applicable. RESRAD predicts constituent will not reach groundwater within 1,000 years based on 100 Area generic site model using soil column layers and depths.

[d] Where cleanup levels are less than background or required detection limit (RDLs), cleanup levels default to background or RDLs per Ecology 1996, WAC 173-340-700(4)(d) and WAC 173-340-707(2), respectively. The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement Project Managers Managers (the basis is documented in DOE/RL-96-17, Rev 5, 2.1.2.1).

[e] The maximum plutonium-239/240 result of 2.4 pCi/g exceeds the Hanford Site-Specific background of 0.025 pCi/g. However, the RESRAD calculation predicts that Plutionium-239/240 will not reach groundwater within 1,000 years based on the 100 Area generic site model using soil column layers and depths.

* Site RAGs are taken from the RD/RAWP (DOE/RL-2007-55), where available, without further consideration of updated toxicity data or amendments (2004) to cleanup regulations in WAC 173-340.

Abbreviations: NA = Not Applicable (see note c above) N/A = Not Available RAG = Remediation Action Goal
U = Analyte was not detected above detection limits. Detection limits are below RAGs.

8.0 REFERENCES

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APPENDIX A

COMPARISON OF MAXIMUM COMFIRMATORY SAMPLE ANALYSES TO 100 AREA RADIONUCLIDE SOIL CONCENTRATIONS CORRESPONDING TO AN EQUIVALENT DOSE OF 15 MREM/YR.

Table A-1. Comparison of Maximum Soil Analyses to 100 Area Radionuclide Soil Concentrations Corresponding to an Equivalent Dose of 15 mrem/yr

Radionuclide	Soil Activity for 15 mrem/yr Dose (except as noted) (pCi/g)	Source of Single Radionuclide Soil Concentration	Maximum Results (pCi/g)
Americium-241	31.1	WDOH/320-015 [c]	0.26
Cesium-137	6.2	WDOH/320-015 [c]	U
Cobalt-60	1.4 [a]	WDOH/320-015 [c]	U
Europium-152	3.3 [a]	WDOH/320-015 [c]	U
Europium-154	3.0 [a]	WDOH/320-015 [c]	U
Europium-155	125 [a]	RESRAD Calc [b]	U
Nickel-63	4,026 [a]	RESRAD Calc [b]	U
Plutonium-238	37.4	RESRAD Calc [b]	U
Plutonium-239/240	33.9	WDOH/320-015 [c]	2.4
Strontium-90	4.5 [a]	WDOH/320-015 [c]	U
Technetium-99	8.5 [a]	WDOH/320-015 [c]	U
Thorium-232	1.0	RESRAD Calc [b]	0.282 (<BG)
Tritium (H-3)	510 [a]	RESRAD Calc [b]	U
Uranium-233/234	0.78	RESRAD Calc [b]	0.26 (<BG)
Uranium-235	0.84	RESRAD Calc [b]	0.017 (<BG)
Uranium-238	0.84	RESRAD Calc [b]	0.2 (<BG)

Notes:

[a] Radionuclide concentrations for beta/gamma in water corresponding to a 4 mrem/yr dose (C4 mrem/yr) from *Soil Screening Guidance for Radionuclides: User's Guide*, EPA/540-R-00-007, U.S. Environmental Protection Agency, Office or Radiation and Indoor Air, Washington D.C.

[b] Per Table 2-2, DOE/RL-96-17, *Remedial Design Report / Remedial Action Work Plan for the 100 Area* , Rev. 5, November 2004

[c] From *State of Washington Department of Health Interim Regulatory Guidance: Hanford Guidance for Radiological Cleanup*, WDOH/320-015, Rev. 1 (WDOH 1997) Washington State Department of Health, Richland, Washington.

Abbreviataions: BG = Hanford Site-Specific Background
U = Analyte not detected above detection limits. Detection limits below RAGs.

APPENDIX B

COMPARISON OF MAXIMUM COMFIRMATORY SAMPLE ANALYSES TO NONRADIONUCLIDE DIRECT EXPOSURE CLEANUP LEVELS

Table B-1. Comparison of Maximum Confirmatory Sample Analyses to Nonradionuclide Direct Exposure Cleanup Levels

Contaminant	Background [g] (mg/kg)	RDL (mg/kg)	Direct Exposure Cleanup Levels [a] (mg/kg)		Direct Exposure Cleanup Level (mg/kg)	Maximum Results (mg/kg)
			Carcinogen	Noncarcinogen		
Metals						
Antimony	5 [b]	0.6	N/A	32	32	0.37
Arsenic	6.5	10	0.667	24	20 [c]	2.95
Barium	132	2	N/A	5,600	5,600	52.20
Cadmium	0.81 [b]	0.5	13.9 [d]	80	13.9	U
Chromium, Total	18.5	1	N/A	80,000	80,000	4.37
Chromium VI	NA	0.5	2.1 [d]	400	400	U
Lead	10.2	5	N/A	353 [e]	353	8.36
Manganese	512	5	N/A	11,200	11,200	271
Mercury	0.33	0.2	N/A	24	24	U
Zinc	67.8	1	N/A	24,000	24,000	35.10
PCBs						
Polychlorinated Biphenyls [f]	NA	0.017	0.5	N/A	0.5	U

Notes:

[a] Calculated using the appropriate formulas from Ecology 1996, WAC 173-340-740, with toxicity values updated through July 2004, from the EPA Integrated Risk Information System (IRIS) at http://www.epa.gov/iris or from the Risk Assessment Information System (RAIS) database of the Oak Ridge National Laboratory (ORNL) on the Internet at http://risk.lsd.ornl.gov.

[b] Hanford Site-specific background not available. Value is from Ecology, 1994, *Natural Background Soil Metals Concentrations in Washington State*, Publication No. 94-115, Washington State Department of Ecology, Olympia, Washington.

[c] The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement Project Managers (the basis is documented in DOE/RL-96-17, Rev 5, 2.1.2.1).

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

[e] Calculated using EPA, 1994, *Guidance Manual for the Integrated Exposure Uptake Biokinetic Model for Lead in Children*, EPA/540/R-93/081, Publication No. 9285.7, U.S. Environmental Protection Agency, Washington, D.C.

[f] The soil cleanup value for PCBs is based on the formula presented in WAC 173-340-740(3)(a)(iii)(B), Ecology 1996, and the cancer potency factor for ingestion of PCBs of 2.0 kg-day/mg (soils) from the EPA Integrated Risk Information System (IRIS) on the internet at http://www.epa.gov/iris on January 3, 2006.

[g] Unless otherwise noted, background concentrations are 90th percentile values of the log normal distribution of site-wide soil background data. Source: Hanford Site Background: Part 1 Soil Background for Nonradionuclide Analytes (DOE-RL-92-24)

Abbreviations:
N/A = Not Applicable
NA = Not Available
U = Analyte not detected above detection limits. Detection limits below RAGs
BG = Hanford Site-Specific Background
RDL = Required Detection Limit

APPENDIX C

COMPARISON OF MAXIMUM CONFIRMATORY SAMPLE ANALYSES TO SOIL ACTIVITIES CALCULATED BY RESRAD TO BE PROTECTIVE OF 100 AREA GROUNDWATER

Table C-1. Comparison of Maximum Confirmatory Sample Analyses to Soil Activities Calculated by RESRAD to be Protective of 100 Area Groundwater

Radionuclide	Groundwater MCL [a] (pCi/L)	Soil Concentration Protective of Groundwater [b] (pCi/g)	Maximum Results (pCi/g)
Americium-241	1.2	1,577,000	0.26
Cesium-137	60	NA [c]	U
Cobalt-60	100	NA [c]	U
Europium-152	200	NA [c]	U
Europium-154	60	NA [c]	U
Europium-155	600	NA [c]	U
Nickel-63	50	NA [c]	U
Plutonium-238	1.6	1,123	U
Plutonium-239/240	1.2	718,600	2.4
Strontium-90	8	NA [c]	U
Technetium-99	900	15	U
Thorium-232	2	NA [c]	0.282 (<BG)
Tritium (H-3)	20,000	35.5	U
Uranium-233/234	21.2	1.1 [d]	0.26 (<BG)
Uranium-235	21.2	1.0	0.017 (<BG)
Uranium-238	21.2	1.1 [d]	0.2 (<BG)

Notes:

[a] MCL = Maximum contaminant level calculated from National Bureau of Standards (NBS Handbook 69) maximum permissible concentration (MPC) as cited in EPA/540-R-00-007, the RAG from the RD/RAWP (DOE/RL-2007-55), or the MCL from 40 CFR 141.66.

[b] From DOE/RL-2007-55, Remedial Design/Remedial Action Work Plan for 200 North Area Waste Sites Located in the 200-CW-3 Operable Unit.

[c] RESRAD predicts constituent will not reach groundwater within 1,000 years based on 100 Area generic site model using soil column layers and depths.

[d] The calculated soil concentration cleanup level of 0.185 pCi/g is below the Hanford Specific Background Activity of 1.1 pCi/g. Therefore the soil concentration protection of groundwater defaults to 1.1 pCi/g.

Abbreviations: BG = Hanford Site-Specific Background

APPENDIX D

SUMMARY OF COMPARISON OF MAXIMUM CONFIRMATORY SAMPLE ANALYSES TO 100 AREA NONRADIONUCLIDE CLEANUP LEVELS FOR PROTECTION OF GROUNDWATER AND THE COLUMBIA RIVER

Table D-1. Summary of Comparison of Maximum Confirmatory Sample Analyses to 100 Area Nonradionuclide Cleanup Levels for Protection of Groundwater and the Columbia River

Contaminant	Soil Cleanup Levels (mg/kg)		Maximum Results (mg/kg)
	Protective of Groundwater	Protective of the Columbia River	
Metals			
Antimony	6.0 [a]	6.0 [a]	0.37
Arsenic	6.5 [b]	6.5 [b]	2.95
Barium	NA [c]	NA [c]	52.2
Cadmium	NA [c]	NA [c]	U
Chromium, Total	NA [c]	NA [c]	4.37
Chromium VI	8.0	2.2	U
Lead	NA [c]	NA [c]	8.36
Manganese	NA [c]	NA [c]	271
Mercury	NA [c]	NA [c]	U
Zinc	NA [c]	NA [c]	35.1
PCBs			
Polychlorinated Biphenyl	NA [c]	NA [c]	U

Notes:

[a] The remedial action goal is below the practical quantitation limit (PQL). The value presented is the PQL.

[b] The remedial action goal is below background. The value presented is background.

[c] The RESRAD model predicts the contaminant will not reach the groundwater within a 1,000 year time frame (DOE/RL-2007-55, Table 2-1).

Abbreviations: NA = Not Applicable
U = Analyte not detected above detection limits. Detection limits below RAGs

APPENDIX E

WASTE CHARACTERIZATION AND CONCEPTUAL MODEL CONFIRMATION SAMPLING DATA SUMMARY

200-N-3 in foreground; 212-P in background

Sampling 200-N-3 waste site

Debris found at 200-N-3 waste site

Figure E-1. Photos from 200-N-3 Confirmatory Sampling Evolution.

NOTE: Field work was performed using approved work plans based on WIDS data and historical knowledge, with consideration of potential radiological and hazardous contaminant concerns. Field screening of potential contaminants confirmed work plan assumptions and ensured protection of personnel.

Table E-1. Radiological Survey Results

Excavation Depth (ft below surface)	Radiological Survey Reading Location 1	Radiological Survey Reading Location 2	Radiological Survey Reading Location 3	Radiological Survey Reading Location 4	Background
0	All surface readings < BG	All surface readings < BG	All surface readings < BG	All surface readings < BG	Background dose rate: < 0.5 mrem/hr Background NaI reading: 1800 cpm
1	< BG	< BG	N/A [1]	< BG	
2	< BG	< BG	N/A [1]	< BG	
3	< BG	< BG	N/A [1]	< BG	
4	< BG	< BG	N/A [1]	< BG	
5	1700 cpm (< BG)	1800 cpm (< BG)	N/A [1]	1700 cpm (< BG)	
6	< BG	< BG	N/A [1]	< BG	
7	< BG	< BG	N/A [1]	< BG	
8	< BG	< BG	N/A [1]	< BG	
9	< BG	< BG	N/A [1]	< BG	
10	1600 cpm (< BG)	1700 cpm (< BG)	N/A [1]	1400 cpm (< BG)	
11	< BG	< BG	N/A [1]	< BG	
12	< BG	< BG	N/A [1]	< BG	
13	< BG	< BG	N/A [1]	< BG	
15	1700 cpm (< BG)	1700 cpm (< BG)	N/A [1]	1700 cpm (< BG)	

Notes

- Radiological scans with GM and PAM were performed at each 1-foot increment during excavation, supplemented by 5-second static measurements. Readings with sodium iodide (NaI) detector were performed at each 1-foot increment for sampling verification.
- All readings below background are recorded as "<BG" with exception of NaI readings at depths of 5 ft, 10 ft and 15 ft where numerical results are recorded for information even when they were below background.

[1] Soil sampling below grade not performed in sample location 3 in accordance with conceptual model logic rules summarized in sections 4.3 and 4.4 of this report.

Acronyms BG = background
cpm = counts per minute

Table E-2. Results for Shallow Zone Radionuclide COPCs

Contaminants of Potential Concern	Remedial Action Goal – Shallow Zone [<4.6 m (15 ft)] [a] (pCi/g)	Hanford Specific Background Activity [d] (pCi/g)	HEIS # B20XC5 Sample Location #1 Depth: 4.6 Meter (15 Feet) (pCi/g)	HEIS # B20XC6 Sample Location #1 Duplicate Depth: 4.6 Meter (15 Feet) (pCi/g)	HEIS # B20XC7 Sample Location #2 Depth: 4.6 Meter (15 Feet) (pCi/g)	HEIS # B20XC8 Sample Location #4 Depth: Surface (pCi/g)	HEIS # B20XC9 Sample Location #4 Depth: 4.6 Meter (15 Feet) (pCi/g)	HEIS# B20XF1 Equipment Blank (pCi/g)	HEIS# B20XF3 Field Blank (pCi/g)	HEIS# B20XF2 Trip Blank (pCi/g)
Americium-241	31.1	NA	0.068	0.047	0.26	0.078	0.036	U	-----	-----
Cesium-137	6.2	1.1	U	U	U	U	U	U	-----	-----
Cobalt-60	1.4	0.008	U	U	U	U	U	U	-----	-----
Europium-152	3.3	NA	U	U	U	U	U	U	-----	-----
Europium-154	3.0	0.033	U	U	U	U	U	U	-----	-----
Europium-155	125	0.054	U	U	U	U	U	U	-----	-----
Nickel-63	4,026	NA	U	U	U	U	U	U	-----	-----
Plutonium-238	37.4	0.004	U	U	U	U	U	U	-----	-----
Plutonium-239/240	33.9	0.025	0.17	U	2.4	0.02	U	U	-----	-----
Strontium-90	4.5	0.18	U	U	U	U	U	U	-----	-----
Technetium-99	15 [b]	NA	U	U	U	U	U	U	-----	-----
Thorium-232	1.3	1.3	0.241	0.282	0.213	0.234	0.210	0.00001097	-----	-----
Tritium (H-3)	35.5	NA	U	U	U	U	U	U	U	U
Uranium-233/234	1.1 [c]	1.1	0.13	0.14	0.26	0.14	0.15	8.60E-05	-----	-----
Uranium-235	1.0 [b]	0.11	U	U	0.017	U	U	U	-----	-----
Uranium-238	1.1 [c]	1.1	0.17	0.13	0.2	0.11	0.14	U	-----	-----

Notes:

[a] In the shallow zone, cleanup must achieve the direct exposure remedial action objectives (RAO) and the groundwater/Columbia River RAO; therefore, the lowest value among the "protection from Direct Exposure," "Protective of Groundwater," and "Protective of the Columbia River" values is the applicable look-up value.

[b] The remedial action goal is below the practical quantitation limit (PQL). The value presented is the PQL.

[c] The remedial action goal is below background. The value presented is background.

[d] Unless otherwise noted, background concentrations are 90th percentile values of the log normal distribution of the site-wide soild background data. Source: Hanford Site Background: Part 1 Soil Background for Nonradionuclide Analytes (DOE/RL-92-24).

Abbreviations: U = Analyte was not detected above limiting criteria. Limiting criteria below RAGs. NA = Not Available

----- = sampling and analysis not performed for that analyte HEIS = Hanford Environmental Information System

Table E-3. Results for Shallow Zone Nonradionuclide COPCs

Contaminants of Potential Concern	Remedial Action Goal – Shallow Zone [<4.6 m (15 ft)] [a] (mg/kg)	Hanford Specific Background Activity [e] (mg/kg)	HEIS # B20XC5 Sample Location #1 Depth: 4.6 Meter (15 Feet) (mg/kg)	HEIS # B20XC6 Sample Location #1 Duplicate Depth: 4.6 Meter (15 Feet) (mg/kg)	HEIS # B20XC7 Sample Location #2 Depth: 4.6 Meter (15 Feet) (mg/kg)	HEIS # B20XC8 Sample Location #4 Depth: Surface (mg/kg)	HEIS # B20XC9 Sample Location #4 Depth: 4.6 Meter (15 Feet) (mg/kg)	HEIS# B20XF1 Equipment Blank (mg/kg)	HEIS# B20XF3 Field Blank (mg/kg)	HEIS# B20XF2 Trip Blank (mg/kg)
Antimony	6.0 [b]	5 [d]	U	U	U	0.37	U	U	------	------
Arsenic	6.5 [c]	6.5	2.42	2.05	2.39	2.95	2.29	U	------	------
Barium	5,600	132	48.1	38.8	43.4	52.20	48.9	B 0.0013	------	------
Cadmium	80	0.81 [d]	U	U	U	U	U	U	------	------
Chromium (III)	80,000	18.5	4.37	3.33	3.02	3.74	1.64	U	------	------
Chromium (VI)	2.2	NA	U	U	U	U	U	U	------	------
Lead	353	10.2	2.83	2.61	2.43	8.36	1.65	B 3.03E-3	------	------
Manganese	11,200	512	271	211	232	250.0	193	0.018	------	------
Mercury	24	0.33	U	U	U	U	U	U	------	------
Zinc	24,000	67.8	30.1	26.6	27.6	35.10	28.5	B 0.00272	------	------
Polychlorinated Biphenyls	0.5	NA	U	U	U	U	U	U	------	------

Notes:

[a] In the shallow zone, cleanup must achieve the direct exposure remedial action objectives (RAO) and the groundwater/Columbia River RAO; therefore, the lowest value among the "protection from Direct Exposure," "Protective of Groundwater," and "Protective of the Columbia River" values is the applicable look-up value.

[b] The remedial action goal is below the practical quantitation limit (PQL). The value presented is the PQL.

[c] The remedial action goal is below background. The value presented is background.

[d] Hanford-specific background not available; therefore values were taken from Natural Background Soil Metals Concentrations in Washington State, Publication No. 94-115, Washington State Department of Ecology, Olympia, Washington (Ecology 1994).

[e] Unless otherwise noted, background concentrations are 90th percentile values of the log normal distribution of the site-wide soild background data. Source: Hanford Site Background: Part 1 Soil Background for Nonradionuclide Analytes (DOE/RL-92-24).

Abbreviations:
B = Background; Analyte < the RDL but ≥ the IDL/MDL
NA = Not Available
HEIS = Hanford Environmental Information System
N = Spike sample recovery is outside control limits
U = Analyzed for but not detected above limiting criteria