Cleanup Verification Package for the 118-B-6, 108-B Solid Waste Burial Ground

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

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EXECUTIVE SUMMARY

This cleanup verification package documents completion of remedial action for the 118-B-6, 108-B Solid Waste Burial Ground (also referred to as the 118-B-6 site). The 118-B-6 site is located within the 100-8C-2 Operable Unit in the 100-B/C Area of the Hanford Site in southeastern Washington State. The site consisted of two concrete pipes 5.5 m (18 ft) long by 1.8 m (6 ft) in diameter that were buried vertically in the ground. The two pipes were capped by a concrete pad measuring approximately 4.6 m (15 ft) by 3 m (10 ft) with two pear-shaped steel lids that provided access to the caissons. The site was located approximately 107 m (350 ft) northeast of the B Reactor. The site was used for the disposal of wastes from the "metal line" of the P-10 Tritium Separation Project. The site was active from 1950 through 1953.

The concrete caissons and pad were removed, and the sample results for the excavated waste site including the waste staging pile area verify attainment of the remedial action goals. Results of the sampling, laboratory analyses, and data evaluations for the 118-B-6 site indicate that all remedial action objectives and goals for direct exposure, protection of groundwater, and protection of the Columbia River have been met (see Table ES-1).

The site meets cleanup standards and has been reclassified as "interim closed out" in accordance with the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1989) and the Waste Site Reclassification Guideline TPA-MP-14 (RL-TPA-90-0001) (DOE-RL 1998). A copy of the waste site reclassification form is included as Attachment ES-1.

Table ES-1. Summary of Cleanup Verification Results for the				
118-B-6 Burial Ground.				

Regulatory Requirement	Remedial Action Goals	Results	Remedial Action Objectives Attained?	Røf.
Direct Exposure Radionuclides	 Attain 15 mrem/yr dose rate above background over 1,000 years. 	 Maximum dose rate calculated by RESRAD is 6.23 mrem/yr. 	Yes	a
Direct Exposure - Nonradionuciides	1. Attain Individual COC RAGs.	 All individual COC concentrations are below background; therefore, direct exposure RAGs are met. 	Yes	ь
Meet Nonradionuciide Risk Requirements	 Hazard quolient of <1 for noncarcinogens. 	 All individual COC concentrations are below background; therefore, excess risk calculations are not required. 	Yes	b
	 Cumulative hazard quotient of <1 for noncarcinogens. 	 All individual COC concentrations are below background; therefore, excess risk calculations are not required. 		b
	 Excess cancer risk of <1 x 10⁻⁸ for individual carcinogens. 	 There are no carcinogenic nonradionuclide COCs for this site. 	NA	
	 Attain a total excess cancer risk of <1 x 10⁻⁵ for carcinogens. 	 There are no carcinogenic nonradionuclide COCs for this site. 	NA	
Groundwater/ River Protection – Radionuclides	 Attain single COC groundwater and river protection RAGs. 	 Groundwater and river RAGs for tritium, the sole radionuclide COC, have been attained. 		a
	 Attain National Primary Drinking Water Standards: 4 mrem/yr (beta/gamma) dose rate to target receptor/organs. 	 The organ-specific dose rate is below the 4 mrem/yr dose rate limit. 	Yes	a
	 Meet drinking water standards for alpha emitters: the more stringent of the 15 pCi/L MCL or 1/25th of the derived concentration guide per DOE Order 5400.5. 	3. There are no alpha-emitting COCs for this site.	NA	
	 Meet total uranium standard of 21.2 pCl/L^c 	 Uranium is not a COC for this site. 	NA	
Groundwater/ River Protection – Nonradionuclides	 Attain Individual nonradionucide groundwater and river cleanup requirements. 	 All the groundwater and river RAGs have been attained. 	Yes	b
Other supporting Information	1. Sampling plan (Appendix C).			đ

 118-8-6 Burial Ground RESRAD Calculation Brief, 1008-CA-V0276, Rev. 0, Washington Closure Hanford, Richland, Washington.
 118-8-6 Burial Ground Cleanup Verification 95% UCL Calculations, 01008-CA-V0274, Rev. 1, Washington Closure Hanford, Richland, Washington.

^a The EPA has promutgated a drinking water MCL of 30 µg/L for total uranium (40 CFR 141.66). Based on the isotopic distribution of urankum on the Hanford Site, the 30 µg/L MCL corresponds to 21.2 pCl/L. Concentration-to-activity calculations are documented in the Cabulation of Total Uranium Activity Corresponding to a Maximum Contaminant Level for Total Uranium of 30 Micrograms per Liter in Groundwater calculation brief (BHI 2001). * 118-B-6 Burial Ground Shallow, Deep Zone, and Stockpile Sampting Plan, 0100B-CA-V0271, Rev. 0, Washington Closure

Hanford, Richland, Washington.

COC = contaminant of concern

RAG = remedial action goal

MCL = maximum contaminant level RESRAD = RESidual RADioactivity (dose model)

NA = not applicable

Attachment ES-1

Waste Site Reclassification Form

Date Submitted: 5/1/06	Operable Unit(s): 100-BC-2	Control Number: 2006-005			
<u>Originator:</u> R. A. Carlson <u>Phone</u> : 948-6650	Waste Site ID: 118-B-6, 108-B Solid Waste Burial Ground Type of Reclassification Action: Rejected □ Closed Out □ Interim Closed Out □ No Action □	Lead Agency: EPA			
rejected, closed out, or no a	ment among the partles listed below authorizing classifica action and authorizing backfill of the site, if appropriate. Fi .) of no action or closed-out sites will occur at a future data	inal removal from the			
<u>Description of current waste site condition</u> : Remedial action at this site has been performed in accordance with remedial action objectives and goals established by the U.S. Environmental Protection Agency and the Washington State Department of Ecology, in concurrence with the U.S. Department of Energy, Richland Operations Office. The selected remedial action involves (1) excavating the sile 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 Areas of the Hanford Site, and (3) backfilling the site with clean soil to adjacent grade elevations. The excavation and disposal activities have been completed.					
Basis for reclassification: The results of verification sampling of the soils at the 118-B-6 waste site demonstrated that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also showed that residual contaminant concentrations are protective of groundwater and the Columbia River. The waste site has a deep zone; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are required. The basis for reclassification is described in detail in the <i>Cleanup Verification Package for the 116-B-6, 108-B Solid Waste Burial Ground</i> (CVP-2006-00002), Washington Closure Hanford, Richland, Washington.					
D. C. Smith DOE Project Manager	Signature	6/1/06 Date			
NA Ecology Project Manager D. A. Faulk EPA Project Manager	Signature Signature	Date Date Date			

CVP-2006-00002 Rev. 0

CONTENTS

1.0	INTRODUCTION1
2.0	SITE DESCRIPTION AND SUPPORTING INFORMATION
3.0	REMEDIAL ACTION FIELD ACTIVITIES
4.0	CLEANUP VERIFICATION DATA EVALUATION
5.0	EVALUATION OF REMEDIAL ACTION GOAL ATTAINMENT 10 5.1 DIRECT EXPOSURE SOIL REMEDIAL ACTION GOALS ATTAINED 10 5.1.1 Radionuclides 10 5.2 Nonradionuclides 11 5.2 GROUNDWATER REMEDIAL ACTION GOALS ATTAINED 12 5.2.1 Radionuclides 12 5.2.2 Nonradionuclides 12 5.3 COLUMBIA RIVER REMEDIAL ACTION GOALS ATTAINED 13 5.3.1 Radionuclides 13 5.3.2 Nonradionuclides 14 5.4 WAC 173-340 THREE-PART TEST FOR NONRADIONUCLIDES 14
6.0	RADIONUCLIDE RISK INFORMATION
7.0	STATEMENT OF PROTECTIVENESS16
8.0	REFERENCES17

APPENDICES

A	SUMMARY OF VERIFICATION SOIL SAMPLING AND ANALYTICAL RESULTS	A-i
в	DATA QUALITY ASSESSMENT	B-i
с	RESRAD INPUT PARAMETERS AND CALCULATION BRIEF EXCERPTS	C-)

C1	118-B-6 Buria) Ground Shallow, Deep Zone, and Stockpile	
	Sampling Plan, 0100B-CA-V0271	C-45
C2	118-B-6 Burial Ground Cleanup Verification 95% UCL Calculations,	
	0100B-CA-V0274	C-55
C3	118-B-6 Burial Ground RESRAD Calculation Brief,	
	0100B-CA-V0276	C-63

FIGURES

1.	Hanford Site Map and 118-B-6 Site Plan.	3
	118-B-6 Pre-Remediation Topographic Plan.	
	118-B-6 Post-Remediation Topographic Plan	
	RESRAD Analysis - All-Radionuclides, All-Pathways Dose Rate Estimate	
5.	RESRAD Analysis - Radionuclide Risk, All Pathways	16

TABLES

1.	Summary of Remedial Action Goals.	2
2.	Cleanup Verification Data Set.	
3.	Attainment of Nonradionuclide Direct Exposure Standards.	
4.	Estimated Peak Radionuclide Groundwater Concentrations (Shallow	
	Zone, Deep Zone, BCL Overburden, and Staging Pile Impacts) Compared	
	to RAGs.	12
5.	Attainment of Nonradionuclide Remedial Action Goals for Protection of	
	Groundwater and the Columbia River	13
6.	Application of the WAC 173-340 Three-Part Test	14

ACRONYMS AND ABBREVIATIONS

BCL COC	below cleanup level contaminant of concern
DQA	data quality assessment
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
RAG	remedial action goal
RDR/RAWP	remedial design report/remedial action work plan
RESRAD	RESidual RADioactivity dose assessment model
ROD	record of decision
SAP	sampling and analysis plan
UCL	upper confidence limit
WAC	Washington Administrative Code

CVP-2006-00002 Rev. 0

1.0 INTRODUCTION

The purpose of this cleanup verification package is to document that the 118-B-6 Solid Waste Burial Ground site was remediated in accordance with the *Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-2, 100-HR-2, and 100-KR-2 Operable Units, Hanford Site (100 Area Burial Grounds), Benton County, Washington (ROD) (EPA 2000).* Remedial action objectives and goals for the 118-B-6 site were established by the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy, Richland Operations Office, in concurrence with the Washington State Department of Ecology. These goals and objectives are documented in the 100 Area Burial Grounds ROD (EPA 2000) and the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP) (DOE-RL 2005). The ROD (EPA 2000) provides the U.S. Department of Energy, Richland Operations Office the authority, guidance, and objectives to conduct this remedial action.

The preferred remedy specified in the ROD (EPA 2000) and conducted for the 118-B-6 site included (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 (ERDF) at the 200 Areas of the Hanford Site, and (3) backfilling the site with overburden and clean soil to average adjacent grade elevation. Excavation was driven by remedial action objectives for direct exposure, protection of groundwater, and protection of the Columbia River. For the respective points of compliance, remedial action goals (RAGs) summarized in Table 1 were established for the radionuclide and nonradionuclide contaminants of concern (COCs). Waste site COCs were identified in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2005) and are listed in Table 1.

Soil cleanup levels were established in the interim action ROD based on a limited ecological risk assessment. Although not required by the ROD (EPA 2000), a comparison against ecological risk screening levels has been made for the site COCs, as identified in the RDR/RAWP. None of the COC concentrations exceeded screening values. A baseline risk assessment for the river corridor portion of the Hanford Site began in 2004, which includes a more complete quantitative ecological risk assessment. That baseline risk assessment will be used as part of the final closeout decision for this site.

COCs	Direct Exposure RAG	Groundwater Protection RAG (pCi/L)	Columbia River Protection RAG (pCi/L)
	Rad	tionuclides	
Tritium	15 mrem/yr (cumulative)*	20,000 mrem/yr (cumulative)	20,000 mrem/y r (cumulative)
COCs	Direct Exposure RAGs (mg/kg)	Soil RAG for Groundwater Protection (mg/kg)	Soll RAG for Columbia River Protection (mg/kg)
	Nonr	adionuciides	
Lead	353 ^b	10.2°	10.2°
Mercury	24 ^d	0.33°	0.33 ^e

Table 1. Summary of Remedial Action Goals.

⁹ Lookup values that correspond to the 15 mrem/yr dose rate are based on a generic site model and are presented in the Remedial Design Report/Remedial Action Work Plan for the 100 Area (RDR/RAWP) (DOE-RL 2005).

^b 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. (EPA 1994).

⁶ Where cleanup levels are less than background, cleanup levels default to background (WAC 173-340-700[4][d]) (1996). * WAC 173-340 Method B noncarcinogenic cleanup limit.

COC = contaminant of concern

RAG = remedial action goal

WAC = Washington Administrative Code

2.0 SITE DESCRIPTION AND SUPPORTING INFORMATION

The 118-B-6 site is located in the 100-BC-2 Operable Unit of the 100-B/C Area approximately 107 m (350 ft) northeast of the B Reactor (Figure 1). The site consisted of two concrete pipes 5.5 m (18 ft) long by 1.8 m (6 ft) in diameter that were buried vertically in the ground. One of the concrete caissons was filled with waste and capped, while the other was partially filled with waste, covered with a thin layer of concrete, and left for future use. The caissons were covered by a concrete pad, measuring approximately 4.6 m (15 ft) by 3 m (10 ft), with two pear-shaped steel lids that provided access to the concrete burial pipes. The site was used for the disposal of wastes such as spent lithium-aluminum alloy, lead from pots, mercury from manometers and Toepler pumps, aluminum cladding, and wastes generated as a result of the P-10 Tritium Production Project.

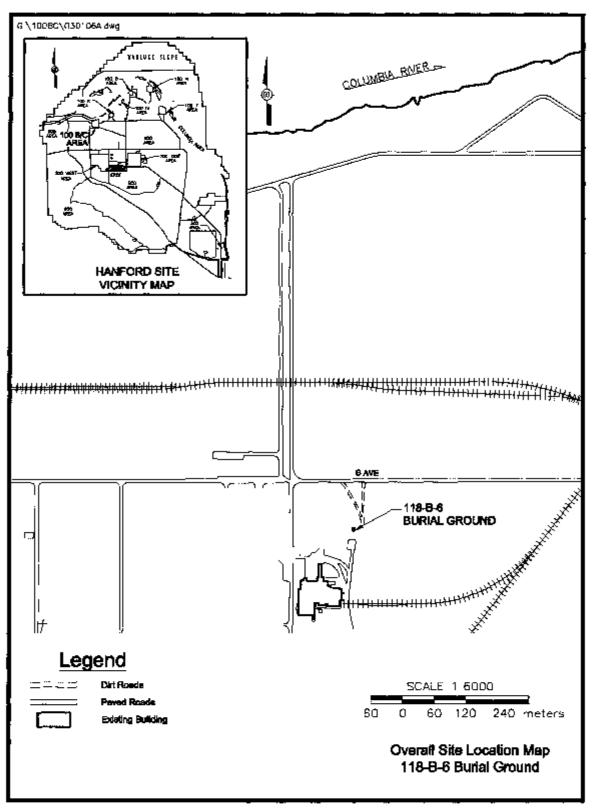


Figure 1. Hanford Site Map and 118-B-6 Site Plan.

3.0 REMEDIAL ACTION FIELD ACTIVITIES

3.1 EXCAVATION AND DISPOSAL

Remedial action at the 118-B-6 site began in November 2004. Excavation of the site involved removing the uncontaminated overburden, caissons, concrete pad, buried materials, and underlying contaminated soil. Contaminated materials were disposed at ERDF.

In December 2004, the majority of excavation was completed. However, leach tests done on soil samples taken from the bottom of the excavation showed levels of tritium that required an additional 1.5 m (5 ft) of soil removal. This additional excavation was completed in June 2005, with focused sampling results indicating that no further remediation was required. Pre- and post-remediation topographic maps are shown in Figures 2 and 3, respectively. At the conclusion of excavation activities, the elevation of the bottom of the excavation was at 136 m (446 ft). The excavation was approximately 885 m² (9,523 ft²) in area with a depth of approximately 7 m (23 ft). Approximately 577 metric tons (636 tons) of material from the site was disposed at ERDF.

3.2 CLEANUP VERIFICATION SAMPLING AND ANALYSIS

Final cleanup verification samples were collected on January 9, 2006. Verification sample data were used in calculations for this site (see Appendices A and C). The verification samples were submitted to offsite laboratories for analysis using approved EPA analytical methods, as required per the *100 Area Burial Grounds Remedial Action Sampling and Analysis Plan* (SAP) (DOE-RL 2001). Each verification sample was a composite formed by combining soil collected at four randomly selected nodes within each sampling area. The sample design methodology and sample location figures are presented in the calculation brief for verification sample design in Appendix C.

The division of the site excavation into shallow zone and deep zone decision units as shown on the sample design figures in Appendix C is 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-B-6 site consisted of both a shallow and a deep zone decision unit. The site was excavated to a depth of approximately 7 m (23 ft), with the shallow zone consisting of the excavation sidewalls to a depth of 4.6 m (15 ft) and the deep zone consisting of the excavation sidewalls below 4.6 m (15 ft) together with the floor of the excavation. All deep zone samples were collected below 4.6 m (15 ft).

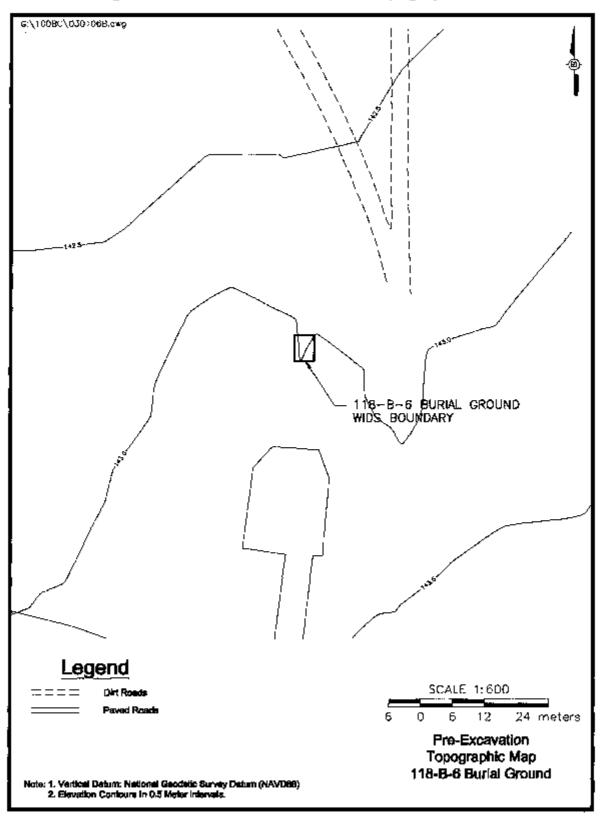


Figure 2. 118-B-6 Pre-Remediation Topographic Plan.

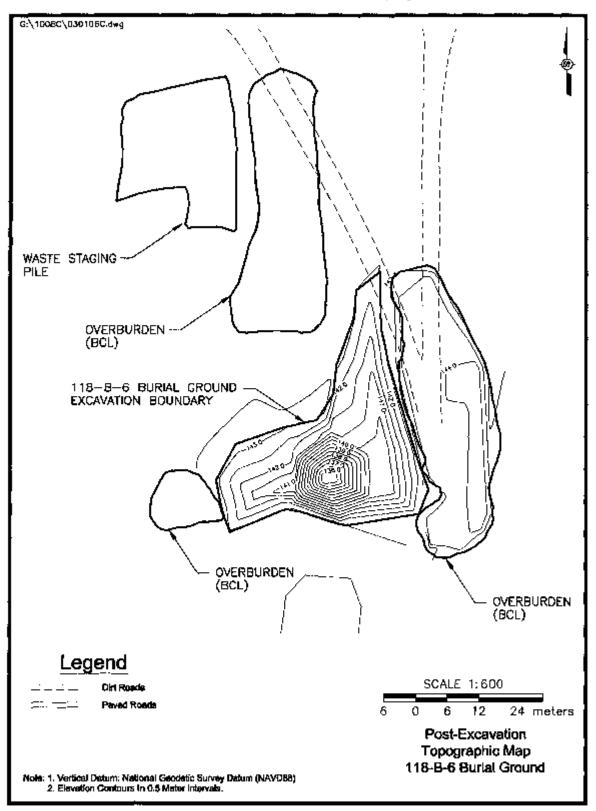


Figure 3. 118-B-6 Post-Remediation Topographic Plan.

As specified in the SAP (DOE-RL 2001), four composite samples were collected from each of the shallow zone, deep zone, below cleanup level (BCL) overburden, and staging pile decision units.

4.0 CLEANUP VERIFICATION DATA EVALUATION

This section presents the evaluation and modeling of the 118-B-6 cleanup verification data for comparison with the data quality criteria and RAGs.

4.1 DATA QUALITY ASSESSMENT PROCESS

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-B-6 site determined 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 cleanup verification sample analytical data are stored in the Environmental Restoration project-specific database for data evaluation prior to archiving in the Hanford Environmental Information System and are summarized in Appendix A. The detailed DQA is presented in Appendix B.

4.2 CONTAMINANTS OF CONCERN 95% UPPER CONFIDENCE LIMIT

The primary statistical calculation to support cleanup verification is the 95% upper confidence limit (UCL) on the arithmetic mean of the data. The 95% UCL values for each COC are computed for each decision unit (e.g., for the shallow zone, deep zone, BCL overburden, and staging pile, as appropriate). Prior to calculating the 95% UCL, the individual sample results are reviewed and, as appropriate, adjusted per the SAP (DOE-RL 2001) and RDR/RAWP (DOE-RL 2005).

Verification sampling summary statistics (95% UCL values) are listed in Table 2. Individual sample cleanup verification results are presented in Appendix A.

Radionuclides: The laboratory reported value is used in the calculation of the 95% UCL. In cases where the laboratory does not report a value for data qualified with a "U" (i.e., less than the detection limit), half of the minimum detectable activity is used in the calculation of the 95% UCL.

Nonradionuclides: For data flagged with a "U" (i.e., less than detection), a value equal to one-half the practical quantitation limit is used in the calculation of the 95% UCL, as required by Washington State Department of Ecology regulations (Washington Administrative Code [WAC] 173-340-740[7][g]).

For nonradionuclides, if greater than half of the sample results for a given COC are below detection, then the statistical value is set equal to the maximum concentration detected (i.e., versus computing a 95% UCL).

Statistical calculations are presented in the 118-B-6 cleanup verification 95% UCL calculation brief (Appendix C). Table 2 summarizes the cleanup verification data set used for RESidual RADioactivity (RESRAD) modeling. It should be noted that the tritium activity in the deep zone (1,996 pCi/g) exceeds the lookup value of a generic waste site (15.8 pCi/g) presented in Table 2-7 of the RDR/RAWP (DOE-RL 2005). However, RESRAD predicts that the tritium groundwater protection RAG (20,000 pCi/L) will not be exceeded because the area of the 118-B-6 deep zone (56 m²) is significantly smaller than the generic waste site (10,000 m²) and will, therefore, cause much less impact to groundwater. Additional protection is provided because the 100-B/C Area will continue to be under institutional controls in the future, preventing mobilization of tritium by Irrigation water and allowing tritium, with a half-life of 12.3 years, to decay.

Radionuciide COCs	Radionuclide Activity ^a (pCi/g)			
	Shallow Zone	Staging Pite	BCL Overburden	Deep Zone
Tritium	160	36.7	238	1,996
Nonradionuciide COCs	Nonradionuclide Concentration ^a (mg/kg)			
	Shallow Zone	Staging Pile	BCL Overburden	Deep Zone
Lead	6.7	5.2	6.5	4.9
Mercury	0.08	0.02 (ND)	0.03	0.02 (ND)

Table 2. Cleanup Verification Data Set.

⁸ The shallow, staging pile, BCL overburden, and deep zone concentrations are from the 118-B-6 Burial Ground Cleanup Verification 95% UCL Celculations, Calculation No. 0100B-CA-V0274, Rev. 1. Refer to Appendix C for additional details on determination of statistical values.

BCL = below cleanup level

COC = contaminant of concern

ND = not detected (in all samples in the data set)

4.3 SITE-SPECIFIC CLEANUP VERIFICATION MODEL

The statistical values summarized in Table 2 were evaluated and used to develop a site-specific cleanup verification model. The 118-B-6 site cleanup verification model

comprises three depth intervals: (1) the shallow zone and overburden, (2) the contaminated deep zone, and (3) the uncontaminated deep (vadose) zone. Based on the conservative assumption that residual contaminant levels in the deep zone data set extend uniformly to groundwater (as discussed in the RDR/RAWP [DOE-RL 2005]), residual soil activities of tritium would result in prediction of a groundwater concentration exceeding the RAG. Because this approach is overly conservative, test pit and borehole data from analogous sites at the 100-B/C Area were used to develop a refined model of the deep zone, including an underlying portion of uncontaminated vadose zone soil. A schematic cross section of this site-specific cleanup verification model is included in the RESRAD calculation in Appendix C.

A test pit was dug in the bottom of the initial excavation (4.6 m [18 ft]) at the 118-B-6 site. Tritium samples were taken in the soil at three depths below the ground surface as follows:

- 6.4 m (21 ft) below ground surface: 7,540 pCi/g
- 8.2 m (27 ft) below ground surface: 1,560 pCi/g
- 9.4 m (31 ft) below ground surface: 237 pCi/g

Additional excavation of 1.5 m (5 ft) (final depth of 7 m [23 ft] below ground surface) was completed to reduce the residual concentration of tritium. After final excavation was complete the statistical concentration of tritium in the deep zone was 1,990 pCi/g, as determined in the 95% UCL (Appendix C).

Because the concentrations in the test pit decreased from 7,540 pCi/g to 237 pCi/g within 3 m (10 ft), it was believed to be reasonable to apply the analogous site model based on the 116-C-1 Liquid Waste Disposal Trench. The 118-B-6 site is analogous to the 116-C-1 Liquid Waste Disposal Trench site where the hexavalent chromium values were demonstrated to reach zero within 3 m [10 ft]). Because hexavalent chromium and tritium both have coefficient distribution (k_d) values of zero, the concentration of tritium (like the concentration of hexavalent chromium) would be expected to decrease to zero within 3 m (10 ft) below the bottom of the final excavation. Therefore, a contaminated deep zone thickness of 6.8 m (22 ft) and an uncontaminated vadose zone (below the contaminated zone) of 11 m (36 ft) was used for RESRAD modeling.

4.4 RESRAD MODELING

The individual radionuclide cleanup verification statistical values (Table 2) were entered into the RESRAD computer code, Version 6.30 (ANL 2005), to estimate the dose rate and to estimate the impact on groundwater and the river from residual COC concentrations. The direct radiation exposure dose rate to the resident living in his or her basement (rural-residential scenario) was conservatively estimated by substituting (for analysis purposes) a case where the resident is standing on level ground with the soil containing concentrations representative of residual (i.e., post-cleanup) shallow zone soils. This is conservative because it ignores the potential shielding effects of

concrete basement walls and any clean backfill between residual soils and the basement walls.

The RESRAD modeling methodologies, results, input values, and the site-specific cleanup verification model are included in the RESRAD calculation brief (Appendix C). Because tritium is the only radionuclide COC, a comparison to drinking water standards (maximum contaminant level) calculation brief was not necessary, and is therefore not included in Appendix C. Specific results from the calculations are discussed in the RAG evaluation section (Section 6.0).

5.0 EVALUATION OF REMEDIAL ACTION GOAL ATTAINMENT

This section demonstrates that remedial actions at the 118-8-6 site have achieved the applicable RAGs. Sections 5.1, 5.2, and 5.3 address attainment of direct exposure RAGs, groundwater protection RAGs, and Columbia River protection RAGs, respectively. Section 5.4 documents application of the WAC 173-340 three-part test to the shallow zone, deep zone, BCL overburden, and staging pile. This test is required for nonradionuclide COCs only and is based on the most restrictive RAG for each zone.

5.1 DIRECT EXPOSURE SOIL REMEDIAL ACTION GOALS ATTAINED

5.1.1 Radionuclides

The results of the RESRAD dose rate estimates for the site, all-pathways scenarios are presented in Figure 4. This dose rate represents the dose contributions from soils at relevant time periods. The dose rate is largest at present (year 2006), 6.23 mrem/yr, and decreases to 0 mrem/yr in 1,000 years for the shallow zone, deep zone, BCL overburden, and staging pile. The estimated dose rate in the year 2018 is 2.02 x 10⁻⁵ mrem/yr for the site. The 2018 date corresponds to the 30-year site cleanup schedule of the *Hanford Federal Facility Agreement and Consent Order* (Ecology et a). 1989). All dose rate estimates are less than the 15 mrem/yr RAG. The RESRAD computations are presented in detail in the referenced calculation briefs summarized in Appendix C.

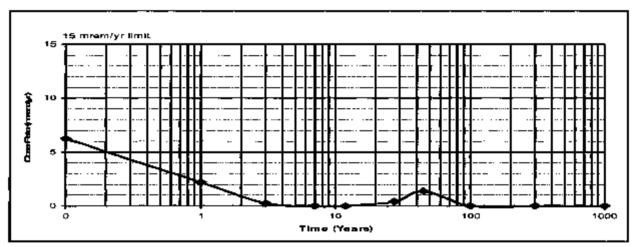


Figure 4. RESRAD Analysis – All-Radionuclides, All-Pathways Dose Rate Estimate.

5.1.2 Nonradionuclides

5.1.2.1 Direct Comparison to RAGs. Table 3 compares the cleanup verification statistical values presented in Table 2 to the direct exposure RAGs presented in Table 1.

Table 3.	Attainment of Nonradionuclide Direct Exposure Standards.	
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Nonradionuclides		<u> </u>	Direct Exposure		
Nonrationuclides	RAG (mg/kg)	Shallow Zone	Staging Pile	BCL Overburden	RAGs Attained? [*]
Lead	ad 353°		5.2	6.5	Yes
Mercury			0.02 (ND)	0.03	Yes

* Criterion is comparison to the cleanup criteria (RAG).

^b 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. (EPA 1994).

(EPA 1994). ^o Noncarcinogenic cleanup level calculated per *Washington Administrative Code* 173-340-740(3), Method B, 1996.

BCL = below cleanup level

ND = not detected (in all samples in the data set)

RAG = remedial action goal

5.1.2.2 NoncarcInogenic Hazard Quotient RAG Attained. For noncarcinogenic COCs, WAC 173-340 specifies the evaluation of the hazard quotient, which is given as daily intake divided by a reference dose. For cleanup actions under the ROD (EPA 2000), a comparable conservative approach is used to demonstrate attainment of the noncarcinogenic risk requirements.

Lead and mercury, the only nonradionuclide COCs for this site, were detected below background in all decision units; therefore, calculation of excess risk is not required.

5.1.2.3 Carcinogenic Risk RAG Attained. For individual nonradionuclide carcinogenic COCs, the WAC 173-340 Method B cleanup limits are based on an incremental cancer risk of 1 x 10^{-6} . For nonradionuclide carcinogenic COCs, the total excess cancer risk must be less than 1 x 10^{-5} (EPA et al. 1998).

There are no nonradionuclide carcinogenic COCs at this site; therefore, the calculation for carcinogenic risk is not required.

5.2 GROUNDWATER REMEDIAL ACTION GOALS ATTAINED

5.2.1 Radionuclides

The estimated groundwater concentrations for all of the radionuclide COCs contributed by the site soils are shown in the RESRAD calculation brief (Appendix C). Table 4 shows the total peak concentration predicted for tritium and provides the individual RAGs for comparison. Tritium is not predicted to exceed the RAGs; therefore, the RAGs are attained.

Table 4. Estimated Peak Radionuclide Groundwater Concentrations (Shallow Zone, Deep Zone, BCL Overburden, and Staging Pile Impacts) Compared to RAGs.

Radionuciide	Peak Concentration	RAG	RAGS Attained?
	(pCi/L)	(pCi/L)	(Yes/No)
Tritlum	18,500	20,000	Yes

BCL = below cleanup level

RAG = remedial action goal

The tritium concentrations in groundwater were calculated by the RESRAD model. Tritium was calculated to reach groundwater within 1,000 years at concentrations below the drinking water RAG of 20,000 pCi/L. Because tritium is the only radionuclide COC, a comparison to drinking water standards (maximum contaminant level) calculation brief was not necessary.

5.2.2 Nonradionuclides

Table 5 illustrates the comparison of cleanup verification statistical values to the groundwater protection RAGs. The table shows that the residual concentration (statistical value) of lead and mercury for the site is less than the listed groundwater protection soil RAG.

Table 5. Attainment of Nonradionuclide Remedial Action Goals for	
Protection of Groundwater and the Columbia River.	

Nonradio- nuclides	Soil RAG for Groundwater Protection (mg/kg)	Soil RAG for Columbia River Protection (mg/kg)	Cleanup Verification Data Value (mg/kg)	Groundwater and/or River Protection RAGs Exceeded?	Does RESRAD Predict Migration to Groundwater in 1,000 Years?
		Shallo	w Zone		
Lead	10.2ª	10.2ª	6.7	No	NA
Mercury	0.33*	0.33 ^a	0.08	No	NA
		Waste St	taging Pile		
Lead	10.2*	10.2ª	5.2	No	NA
Mercury	0.33°	0.33°	0.02 (ND)	No	NA
		BCL Ov	erburden		
Lead	10.2ª	10.2 ^a	6.5	No	NA
Mercury	0.33ª	0.33ª	0.03	No	NA
		Deep	zone		
Lead	10.2ª	10.2 ^ª	4.9	No	NA
Mercury	0.33 ^a	0.33 ^a	0.02 (ND)	No	NA

^a Where cleanup levels are less than background or required detection limits, cleanup levels default to background (WAC 173-340-700[4][d]).

BCL = below cleanup level

NA = Not applicable. RESRAD modeling was not performed because residual concentrations meet the groundwater and river protection RAGs.

ND = not detected (in all samples in the data set)

RAG = remedial action goal

RESRAD = RESidual RADioactivity (dose model)

WAC

Washington Administrative Code

5.3 COLUMBIA RIVER REMEDIAL ACTION GOALS ATTAINED

5.3.1 Radionuclides

The river protection RAGs for radionuclides are identical to the groundwater protection RAGs. The RESRAD modeling results were compared to the groundwater protection RAGs in Table 4.

The results indicated that radionuclides are not predicted to reach groundwater (and, by extension, not predicted to reach the Columbia River) at levels above 4 mrem/yr; therefore, the Columbia River protection RAGs have been attained.

5.3.2 Nonradionuclides

Table 5 illustrates the comparison of cleanup verification statistical values to the Columbia River protection RAGs. The table shows that the residual concentration (statistical value) of lead and mercury for the site is less than the listed river protection soil RAGs.

5.4 WAC 173-340 THREE-PART TEST FOR NONRADIONUCLIDES

Sections 5.1, 5.2, and 5.3 looked separately at compliance with direct exposure RAGs, groundwater protection soil RAGs, and Columbia River protection soil RAGs. Section 5.4 documents application of the WAC 173-340 three-part test for nonradionuclides using the most restrictive RAGs applicable to each decision unit (i.e., shallow zone, deep zone, BCL overburden, and staging pile). The most restrictive RAG is defined as the lowest of the direct exposure, groundwater protection, and river protection RAGs. The direct exposure, groundwater protection, and river protection RAGs are applicable to the shallow zone, BCL overburden, and staging pile. Groundwater and river protection RAGs are applicable to the shallow zone, BCL overburden, and staging pile. The WAC 173-340 three-part test consists of the following criteria: (1) the cleanup verification statistical 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%.

Table 6 summarizes the results of the WAC 173-340 three-part test (WAC 173-340-740[7]) for the shallow, deep zone, BCL overburden, and staging pile sample data sets. For lead and mercury, the table lists the most restrictive applicable RAG (selected from the RAGs in Table 1), the maximum detected value, the total number of samples collected, and the number of samples exceeding the most restrictive RAG. The final column of the table describes the result of applying the three WAC 173-340 criteria using the values listed in the preceding columns. Table 6 shows that lead and mercury pass the WAC 173-340 three-part test for all data sets.

Nonradionuclides	Most Stringent Applicable RAG (mg/kg)	Statistical Value (mg/kg) ^a	Maximum Detected (mg/kg) ^a	Total Number of Samples ^c	Number Exceeding Criteria ^d	RAGs Attained? (Yes/No)	
		Shalk	ow Zone				
Lead	10.2 ^e 6.7 7.7		4	0	Yes		
Mercury	0.33 ^ª	0.08	0.08	4	0	Yes	

Table 6. Application of the WAC 173-340 Three-Part Test. (2 Pages)

Nonradionuclides	Most Stringent Applicable RAG (mg/kg)	Statistical Value (mg/kg)*	Maximum Detected (mg/kg) ⁵	cted Number Exceeding		RAGs Attained? (Yes/No)
		Waste S	taging Pile			
Lead	10.2°	5.2	6.1	4	0	Yes
Mercury	0.33"	0.02 (ND)	(ND)	4	0	Yes
	•	BCL O	verburden			
Lead	10.2°	6.5	7.0	4	0	Yes
Mercury	0.33 ^e	0.03	0.03	4	0	Yes
		Deej	o Zone			
Lead	10.2 ⁸	4.9	5.1	5	0	Yes
Mercury	0.33°	0.02 (ND)	ND	5	0	Yes

Table 6. Application of the WAC 173-340 Three-Part Test. (2 Pages)

^{*} Criterion is comparison to the cleanup criteria (RAG).

^b Criterion is no single detection can exceed two times the cleanup criteria.

⁵ The total number of samples includes field duplicate samples, which are included in the evaluation as separate samples.

⁴ Criterion is the percentage of samples exceeding the cleanup criteria must be less than 10%.

* Where cleanup levels are less than background or required detection limits (RDLs), cleanup levels default to background or RDLs per 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 project managers.

BCL = below cleanup level

ND = not detected (in all samples in the data set)

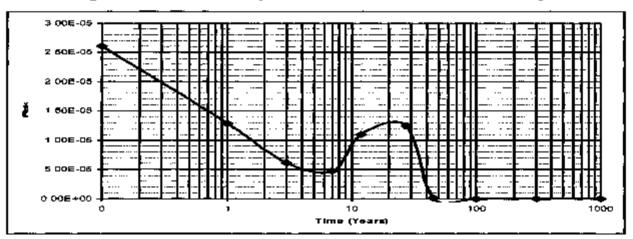
RAG = remedial action goal

WAC = Washington Administrative Code

6.0 RADIONUCLIDE RISK INFORMATION

The radionuclide RAG for direct exposure is derived from the ROD (EPA 2000) and is expressed in terms of an allowable radiation dose rate above background (i.e., 15 mrem/yr). The RAG evaluation (Section 5.0) involved using the RESRAD model to estimate total annual radiation dose rates for 1,000 years for comparison to the RAG. Radiation presents a carcinogenic risk, and the RESRAD model also calculates the excess lifetime cancer risk associated with the estimated radiation dose rates using the EPA's Health Effects Assessment Summary Tables (update dated April 16, 2001, "Update of Radionuclide Carcinogenicity Slope Factors," available on the Internet at www.epa.gov/radiation/heast). The "National Oil and Hazardous Substances Pollution Contingency Plan" (40 *Code of Federal Regulations* 300) presents a target range for residual risk of 10⁻⁴ to 10⁻⁶. Figure 5 illustrates excess lifetime cancer risk for the shallow zone, staging pile, BCL overburden, and deep zone as estimated using the RESRAD model. It should be noted that the increased risk predicted in the middle years of the curve in Figure 5 is caused by summing all of the tritium sources (shallow,

zone, staging pile, BCL overburden, and deep zone) in the risk calculation. The depth of the deep zone tritium causes it to be mobilized to groundwater and affect risks at later years. Tritium from the other sources affects risk by direct exposure while deep zone tritium affects risk due to drinking water ingestion. Therefore, there is an increase in the curve when deep zone tritium is predicted to reach groundwater. Because of radioactive decay, the risk decreases over time. The estimated risk is (argest, 2.61×10^{-5} , at present (year 2006), and decreases to 0 in 1,000 years. The estimated risk in 2018 is 1.10×10^{-5} .





7.0 STATEMENT OF PROTECTIVENESS

This cleanup verification package demonstrates that remedial action at the 118-B-6 site has achieved the remedial action objectives and corresponding RAGs established in the ROD (EPA 2000) and RDR/RAWP (DOE-RL 2005). The remaining soils at the 118-B-6 site have been sampled, analyzed, and modeled. The results of this effort indicate that the materials from the 118-B-6 site containing COCs at concentrations exceeding RAGs have been excavated and disposed at ERDF. These results also indicate that residual concentrations will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site pose no threat to groundwater or the Columbia River. Institutional controls are required for the site to prevent drilling or excavation into deep zone soils. The 118-B-6 site is verified to be remediated in accordance with the ROD (EPA 2000) and may be backfilled.

8.0 REFERENCES

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CVP-2006-00002 Rev. 0

APPENDIX A

SUMMARY OF VERIFICATION SOIL SAMPLING AND ANALYTICAL RESULTS

CVP-2006-00002 Rev. 0

Sampling	Sampling HEIS Sample			Leac	l	Mercury Tritiun				1 ·	
Area	Number	Date	mg/kg	Ø	PQL	mg/kg	Q	PQL	pCi/g	Q	MDA
A1	J10VP6	1/9/2006	7.7		1.8	0.02	U	0.02	0.720	ΠĴ	3.1
A2	J10VP7	1/9/2006	5.6	1	1.8	0.08		0.02	1.22	UJ	3.0
A3	J10VP8	1/9/2006	3.3		1.7	0.02	U	0.02	241	J	4.1
A4	J10VP9	1/9/2006	3.3		1.7	0.02	U	0.02	4.52	J	3.1

Table A-1. 118-B-6 Shallow Zone Sample Data.

Table A-2. 118-B-6 Deep Zone Sample Data.

Sampling	HEIS	Sample	e Lead			Mercury			Tritlum		
Area	Number	Date	mg/kg	a	PQL	mg/kg		PQL	pCi/g	Q	MDA
A2	J10VN6	1/9/2006	3.2		1.7	0.02	U	0.02	800	J	3.2
Duplicate of J10VN6	J10VN7	1/9/2006	3.9		1.7	0.02	U	0.02	764	J	3 .1
A1	J10VN4	1/9/2006	4.7		1.8	0.02	U	0.02	165	<u> J</u>	4 .1
A3	J10VN2	1/9/2006	5.1		1.8	0.02	U	0.02	220	IJ	2.9
A4	J10VN3	1/9/2006	3.1		1.8	0.02	U	0.02	2780	J	4.6
Split of J10VN6	J10WM7	1/9/2006	2.5		1.0	0.035	U	0.035	53.3		0.0320

The following acronyms apply to all tables in this appendix: BCL = below cleanup level

HEIS = Hanford Environmental Information System

= estimate J

ł

MDA = minimum detectable activity

PQL = practical quantitation limit

Q = qualifier

ü = undetected

Sampling	HEIS	Sample	Lead		Mercury			Tritium			
Area	Number	Date	mg/kg	a	PQL	mg/kg	Q	PQL	pCi/g	Q	MDA
A1	J10VP3	1/9/2006	4.0		1.8	0.02	U	0.02	28.6	J	3.7
A2	J10VP2	1/9/2006	3.2		1.7	0.01	U	0.01	42.3	J	3.7
A3	J10VP4	1/9/2006	6.1		1,7	0.01	U	0.01	23.1	J	3.8
A4	J10VP5	1/9/2006	3,1		1.7	0.02	U	0.02	16.0	L,	2.8

Table A-3. 118-B-6 Waste Staging Pile Sample Data.

Table A-4. 118-B-6 BCL Overburden Sample Oata.

Sampling	HEIS	Sample		Lead		Mercury			Tritlum		
Area	Number	Date	mg/kg	Q	PQL	mg/kg	Q	PQL	pCi/g	Q	MDA
A1	J10VP1	1/9/2006	4.7		1.8	0.03	\top T	0.02	232	J	4.0
	J10VP0	1/9/2006	4.4		1.8	0.02		0.01	256	J	3.2
A3	J10VN9	1/9/2006	, 5.9		1.8	0.02	U	0.02	1.14	UJ	3.0
A4	J10VN8	1/9/2006	7.0	1-1	1.7	0.03		0.02	2.02	ŪJ	3.5

CVP-2006-00002 Rev. 0

APPENDIX B

DATA QUALITY ASSESSMENT

CVP-2006-00002 Rev. 0

B1.0 DATA QUALITY ASSESSMENT FOR THE 118-B-6 SITE

B1.1 OVERVIEW

This data quality assessment (DQA) was performed to compare the verification sampling approach and resulting analytical data with the sampling and data quality requirements specified by project objectives and performance specifications. The DQA involves a review of the sampling process as documented in the field logbook (WCH 2006) as well as a scientific and statistical evaluation of the data to determine if they are of the right type, quality, and quantity to support their intended use (i.e., closeout decisions). The DQA completes the data life cycle (i.e., planning, implementation, and assessment) that was initiated by the data quality objectives process.

This DQA was performed in accordance with WCH-EE-01, *Environmental Investigations Procedures.* The DQA is also based on guidelines presented in *Guidance for Data Quality Assessment: Practical Methods for Data Analysis* (EPA 2000). Statistical tests used in this DQA were performed as specified in the *100 Area Burial Grounds Remedial Action Sampling and Analysis Plan* (SAP) (DOE-RL 2001) and the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2005).

All of the analytical data are evaluated and a portion validated for compliance with quality assurance (QA) project plan requirements (DOE-RL 2001). Data evaluation is performed to determine if the laboratory carried out all steps required by the SAP and the laboratory contract governing the conduct of analysis and reporting of the data. This evaluation also examines the laboratory data to determine if an analyte is present or absent in a sample and the degree of overall uncertainty associated with that determination. Data validation was done in accordance with validation procedures (BHI 2000a, 2000b) as part of data evaluation. The appropriate statistical test is performed on the adjusted raw analytical data (see calculation briefs in Appendix C) to determine statistical values for each contaminant. The number of samples collected for cleanup verification is then evaluated to confirm assumptions concerning contaminant variability.

The DQA for the 118-B-6 site determined that the data are of the right type, quality, and quantity to support site cleanup verification decisions within specified error tolerances. All analytical data were found acceptable for decision-making purposes. The evaluation verified that the sample design was sufficient for the purpose of clean site verification. Additional quality requirements of the QA project plan included data acquisition requirements. The cleanup verification sample analytical data are stored in the Environmental Restoration project-specific database prior to archiving in the Hanford Environmental Information System and are summarized in Appendix A.

The following subsections describe the DQA results for the 118-B-6 site, including formal data validation, supplementary data evaluation, and field QA/quality control (QC)

program results. The statistical evaluation of the data is provided in the calculation brief excerpts included in Appendix C.

B1.2 LABORATORY QUALITY ASSURANCE/QUALITY CONTROL ANALYSIS

All verification samples are subject to laboratory-specific QA requirements, including instrument procurement, maintenance, calibration, and operation. Additional laboratory requirements for internal QC checks are performed as appropriate for the analytical method at a rate of 1 per sample delivery group (SDG), or 1 in 20, whichever is more frequent. Laboratory internal QC checks include the following:

- <u>Laboratory Contamination</u>. Each analytical batch contains a laboratory (method) blank (material of similar composition as the samples with known/minimal contamination of the analytes of interest) carried through the complete analytical process. The method blank is used to evaluate false-positive results in samples due to contamination during handling at the laboratory.
- <u>Analytical Accuracy</u>. For most analyses, a known quantity of representative analytes of interest (matrix spike [MS] and matrix spike duplicate [MSD]) is added to a separate aliquots of a sample from the analytical batch. The recovery percentage of the added MS is used to evaluate analytical accuracy. For analyses not amenable to MS techniques (e.g., tritium analysis) or where analytical recovery is corrected via internal standards (e.g., alpha spectral analyses), accuracy is evaluated from recovery of the QC reference sample (e.g., laboratory control sample [LCS] or blank spike sample).
- <u>Analytical Precision</u>. Separate aliquots removed from the same sample container (duplicate or replicate samples) are analyzed for each analytical batch. The replicate sample results (evaluated by relative percent difference [RPD]) are used to assess analytical precision.
- <u>QC Reference Samples</u>. A QC reference sample is prepared from an independent standard at a concentration other than that used for calibration, but within the calibration range. Reference samples provide an independent check on analytical technique and methodology.

Verification sample laboratories are also subject to periodic and random assessments of the laboratory performance, systems, and overall program. These assessments are performed by the Washington Closure Hanford Quality Assurance and Services group to ensure that the laboratories are performing to meet laboratory contract requirements.

81.3 DATA VALIDATION RESULTS

The laboratory data from SDG K0167 were validated to Level C per WCH-EE-01, Procedure 2.5, "Data Package Validation Process." Level C validation procedures are specified in *Data Validation Procedure for Radiochemical Analysis* (BHI 2000a) and *Data Validation Procedure for Chemical Analysis* (BHI 2000b).

Under the Level C validation procedure, the following items were reviewed, as appropriate, for each analytical method:

- Sample holding times
- Method blanks
- MS recovery
- Surrogate recovery
- Tracer and/or carrier recovery (applies only to radionuclides)
- Sample duplicates or MS/MSD
- Associated LCS results
- Data package completeness
- Achievement of practical quantitation limits (PQLs) as specified in the SAP (DOE-RL 2001).

Data flagged as estimated (i.e., "J") indicate that the associated concentration is an estimate but that the data may be used for decision-making purposes. Data flagged as below detection limits (i.e., "U") indicate the contaminant was analyzed for but not detected and the concentration is below the minimum detectable activity (MDA) for radionuclides or the PQL (i.e., reporting limit) for nonradionuclides. For nonradionuclides, nondetects are reported as the PQL. For radionuclides, nondetects report the actual value obtained from analysis (positive or negative but less than the MDA) except for limited analyses where no value can be calculated. In these cases, the MDA is reported. This situation is applicable for sample results that are below detection limits. All other validated results are considered accurate within the standard errors associated with the methods.

The adequacy of laboratory QA/QC was evaluated for precision, accuracy, completeness, and target detection limits (TDLs) pursuant to the SAP. The data validation reported that, of the data given formal validation, the laboratory met the majority of the standards for performance for precision (\pm 30%), accuracy (\pm 30% or \pm 20% for analysis by gamma spectroscopy), detection limits, and completeness (>90%).

SDG K0167 consisted of samples J10VP6, J10VP7, J10VP8, J10VP9, J10VN6, J10VN4, J10VN2, J10VN3, J10VP3, J10VP2, J10VP4, J10VP5, J10VP1, J10VP0, J10VN9, and J10VN8. In addition, a duplicate (J10VN7) to J10VN6, and an equipment blank, J10VN5, were collected. Samples were analyzed for lead, mercury, and tritium.

The DQA noted no major deficiencies. A summary of minor deficiencies noted during validation of SDG K0167 include the following.

B1.3.1 Sample Holding Times

No deficiencies were noted.

B1.3.2 Method Blanks

The PQL and/or TDL requirements identified in the SAP (DOE-RL 2005a) were used to evaluate the method blanks. For radionuclides, the correct term analogous to the nonradionuclide PQL is MDA.

No deficiencies were noted.

B1.3.3 Equipment Blanks

No deficiencies were noted.

B1.3.4 Matrix Spike Recovery

All tritium results from SDG K0167 were qualified as estimated and flagged as "J," due to the lack of an MS analysis.

Matrix spikes for radionuclides are not typically done by the laboratory. Other accuracy measures, such as blind audit samples against known standards, are used to access laboratory accuracy for radionuclides. This issue is minor and does not impact the quality or usability of the cleanup verification data.

B1.3.5 Surrogate Recovery

No deficiencies were noted.

B1.3.6 Tracer Recovery

No deficiencies were noted.

B1.3.7 Sample Duplicates/Matrix Spike Duplicate

In SDG K0167, an RPD of 42.9% was calculated for the lead result in the duplicate. No qualification was assigned to the data. This out-of-limit RPD is likely due to sample heterogeneity. Heterogeneity of soil samples is well known. Contaminants are not always distributed evenly throughout the sample. It is likely that the individual sample aliquots did not have equivalent amounts of inert material, such as rock. This out-of-limit RPD does not affect data quality or usability.

B1.3.8 Associated Batch Laboratory Control Sample Results

No deficiencies were noted.

B1.3.9 Data Package Completeness

SDG K0167 met the completion requirements of the SAP (DOE-RL 2005a).

B1.3.10 Achievement of Target Detection Limits

The nonradionuclide PQL and radionuclide MDA (listed as PQL in the SAP) TDL goals identified in the SAP (DOE-RL 2005a) were used to develop the required detection limits submitted to the laboratory by the project.

All analytes met the TDLs.

B1.4 DATA EVALUATION

The formal data validation described in the previous section included evaluation of SDG K0167; however, a DQA is required for all SDGs. A split sample (J10WM7) of J10VN6, was collected and submitted for analysis in SDG J00045. Supplementary data evaluation was performed on all the SDGs, whether validated or unvalidated. The following paragraphs include the results of the data evaluation of all remaining SDGs associated with the verification sampling of the 118-8-6 site.

To ensure adequate data quality, DQA investigators reviewed the study objectives in the SAP (DOE-RL 2001) to determine the context for assessing the data. The context for assessing the data includes evaluating the sample data using a comparison of analytical results to the precision, accuracy, representativeness, comparability and completeness (PARCC) parameters as specified in the SAP. This section summarizes the results of the PARCC parameter comparison and presents an evaluation of the affected data.

B1.4.1 Supplemental Data Evaluation

In accordance with Appendix G of the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2005), the following evaluations were performed:

- Assessment of detection limits
- Laboratory accuracy and precision via MS, MSD, or duplicates and LCSs.
- Contamination during sampling via equipment blanks
- Sampling heterogeneity via field duplicates
- · Sampling and laboratory variability via field splits.

The following additional information was evaluated because this information directly affects data quality.

B1.4.2 Sample Holding Times

No deficiencies were noted.

B1.4.3 Method Blanks

No deficiencies were noted.

B1.4.4 Matrix Spike, Tracer, Carrier Recovery

No deficiencies were noted with the contaminants of concern (COCs).

B1.4.5 Sample Duplicates, Matrix Spike/Matrix Spike Duplicate Results

No deficiencies were noted.

B1.4.6 Associated Batch Laboratory Control Sample Results

No deficiencies were noted.

B1.4.7 Data Package Completeness

All data packages were complete.

B1.4.8 Achievement of Target Detection Limits

All analytes met the TDLs.

B1.5 FIELD QUALITY ASSURANCE/QUALITY CONTROL

Field QA/QC measures were used to assess potential cross-contamination of the collected samples. The QA/QC sample results are used to assess analytical precision and accuracy and contamination. Equipment blanks are used to assess contamination from cleaning the equipment, field duplicates are used to assess precision, and field splits are used to assess accuracy.

B1.5.1 Equipment Blank Samples

No COCs were detected in the equipment blank for nonradionuclides or radionuclides.

B1.5.2 Field Duplicate Samples

A duplicate (J10VN7) of sample J10VN6 was collected to provide a relative measure of the degree of local heterogeneity in the sampling medium, unlike laboratory duplicates which are used to evaluate precision in the analytical process. Field duplicates are evaluated by computing the RPD of the duplicate samples for each COC, as needed. Only analytes with values above five times the detection limits for both the main and duplicate samples are compared. None of the analytes required calculation of the RPDs. The SAP (DOE-RŁ 2001) requires a minimum of 1 field duplicate for every 20 (or less) field samples. As shown in Appendix A, sufficient field duplicates were taken. Based on the validation criteria (BHI 2000a, 2000b) and U.S. Environmental Protection Agency functional guidelines for precision, the data are usable.

B1.6 SUITABILITY OF DATA

The conclusion of the DQA is that the data are of the right type, quality, and quantity to support the intended use. Detection limits, precision, accuracy, and SDG completeness were analyzed to determine if any analytical results should be rejected as a result of QA/QC deficiencies. All COC analytical data were found acceptable for decision-making purposes, and the raw data are acceptable for calculating the required statistical values.

B2.0 REFERENCES

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APPENDIX C

RESRAD INPUT PARAMETERS AND CALCULATION BRIEF EXCERPTS

RESRAD INPUT PARAMETERS FOR THE SHALLOW ZONE - RADIONUCLIDES

1RESRAD, Version 6.30Tw Limit = 0.5 year03/02/200614,21Page 1Summary : Tritium at 118-B-6 Shallow Zone with Irrigation - Rural Residential ScenarioFile : Run#1_118-B-6_S2_With_Irrigation.RAD

Dose Conversion Factor (and Related) Parameter Summary	2 3								
Site-Specific Parameter Summary	-								
Summary of Pathway Selections	7								
Contaminated Zone and Total Dose Summary	8								
Total Dose Components									
Time = 0.000E+00	9								
Time \$ 1.000E+00	10								
Time = 3.000B+00	11								
Time = 7.000E+D0	12								
Time = 1.200E+01	13								
Time = 2.7608+01	14								
Time = 4.500E+01	15								
Time = 1,000E+02	16								
Time = 3.000B+D2	17								
Time ⊐ 1.000B+03	18								
Dose/Source Ratios Summed Over All Pathways	19								
Single Radionuclide Soil Guidelines 19									
Dose Per Muclide Summed Over All Pathways 20									
Soil Concentration Per Nuclide 20									

1RESRAD. Version 6.30T* Limit = 0.5 year03/02/200614:21Page2Summary : Tritium at 118-B-6 Shallow Zone with Irrigation - Rural Residential ScenarioFile : Run#1_118-B-6_52_With_Irrigation.RAD

Dose Conversion Factor (and Related) Parameter Summary File: HEAST 2001 Morbidity

	FILE: BEAST ZOUT MODULATCY						
0	9	з	Currept	•		3	Parameter
Menu	Parameter	з	Value	3	Default	3	Name
AAAAA	алалалалалалалалалалалалалалалалалалал	АÅ	AAAAAAAAA	A.A.Z	AAAAAAAAAA	AA.	AAAAAAAAAAAAA
B-1	³ Dose conversion factors for inhalation, mrem/pCi:	3		з		2	
в-1	у н-3	9	6.400E-08	3	6.400E-09	3	DCF2 { 1 }
	9 2	9		э		3	
D-1	Dose conversion factors for ingestion, mrem/pC1:	8		\$		3	
D-1	» н-3	7	6.4008-08	•	6.400B-D8	•	DCF3 { 1 }
	3	з		3		3	
D-34	* Food transfer factors:	з		3		3	
D-34	* H-3 , plant/soil concentration ratio, dimensionless	з	4.800E+00	3	4.800E+00	3	RTF(1,1)
D-34	H-3 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3	1.2008-02	t	1.2008-02	3	RTP (1,2)
D-34	3 H-3 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	9	1.000E-02	,	1.0008-02	3	RTF(1,3)
	\$	3		2		2	
D-5	Bioaccumulation factors, fresh water, L/kg:	3		3		3	
D-5	³ H-3 , fish	3	1.000E+00	3	1.000E+00	3	BIOFAC(1,1)
D-5	* H-3 , crustacea and mollueks	з	1.000E+00	з	1.000E+00	2	BIOFAC(1,2)
i fiii	<u></u>	ÍΙ	ffífffff i	fīi	í í í í í í í í í í í í í í	ΪÍ	í í í í í í í í í í í í í í í í í í í

IRESRAD, V	ersion 6 30	T = Limit = 0.5 yes	Ar D3/D2/2	2006 14 21	Page	3
Summary	Tritium at	118-B-6 Shallow Zone w	with Irrigation -	- Rural Res:	identia1	Scenario
File	Զար∦l_118-թ	-6_SZ_With_Irrigation	RAD			

\$1te-51	pecific Parameter Summary	
ο,	User ' Used by RESRAD	Paxameter
Menu ^s Parameter	Input ' Default ' (If different from user input)) ? Name
	8 300E+02 > 1 000E+04 +	
R011 * Area of contaminated zone (m**2)		AREA
AD11 ³ Thickness of contaminated tone (m)	³ 4 6008+00 ³ 2 0008+00 ³	* THICKO
R011 Length parallel to aguifer flow (m)	3 250E+01 * 1 0D0E+02 *	° LC%PAQ
R011 * Basic radiation dose limit (mmem/yr)	1 500E+01 * 2 500E+01 ·	' BROL
RD11 ' Time since placement of material (yr)	3 0 DQOE+00 3 0 0DOE+00 3	* TI
R011 ' Times for calculations (yr)	1 000E+00 * 1 000E+00 /	³ T(2)
RD11 3 Times For calculations (yr)	3 0008+00 3 000E+00 3	• T(3)
R011 * Times for calculations (yr)	' 7 DOOE+DC ' 1 ODOE+O1 '	° T(4)
R011 > Times for calculations (yr)	1 2008+01 * 3 000B+01 *	+ T(5)
R011 * Times for calculations (yr)	2 76DE+D1 > 1 DD0E+02 3	• T(6)
R011 * Times for calculations (yr)	4 500E+01 * 3 000E+02 *	· T(7)
ROll > Times for calculations [yr]	1 000E+02 1 000E+03 ·	* T(B)
R011 ⁴ Times for calculations (yr)	3 00DE+02 * D 0D0E+0D	• T(9)
ROll > Times for calculations (yr)	3 1 000E+03 3 0 000E+00 3	• T(10)
	, , , , , , , , , , , , , , , , , , ,	3
R012 ' Initial principal redionuclide (pCi/g) H-3	• 1 600E+02 • D 000E+00 •	* S1(1)
R012 ¹ Concentration in groundwater (pCi/L) H-3	not used > 0 0008+00 >	יבן באי
5	• • • •	3
R013 ' Cover dapth (m)	3 0 000E+D0 3 0 000E+O0 3	 COVER0
R013 ' Density of cover material (g/cm**3)	' not used > 1 500E+00 '	' DENSCV
R013 ³ Cover depth erosion rate (m/yr)	* not used * 1 000E-03 *	* vcv
R013 ' Density of contaminated zone (g/cm**3)	> 1 6008+00 > 1 5008+00 >) DENSCZ
R013 ³ Contaminated zone erosion rate (m/yr)	• 0 00DE+00 • 1 000E-03 •	> vcz
R013 ³ Contaminated zone total porosity	> 4 000B-01 > 4 000B-01 > ···	* TPCZ
R013 * Contaminated zone field capacity	* 1 5DOE-02 ' 2 DODE-D1 '	' PCCZ
R013 ³ Contaminated zono hydraulic conductivity (m/yr)	2 500E+02 * 1 000E+01 *	' RCCZ
R013 ? Contaminated some b parameter	2 4 0508+00 2 3 3008+00 2	, BC2
R013 * Average annual wind speed (m/sec)	* 3 400E+00 * 2 000E+00 *	> WIND
R013 ' Humidity in air (g/m**3)	, 8 000E+00 , 8 000E+00 ,	, HUNCLD
RD13 * Evaporranepiration coefficient	• 9 1006-01 • 5 0008-01 •	, EVAPTE
R013 ³ Precipitation (m/yr)	1 60CE-C1 * 1 000E+00 *	PRECIP
RD13 * Irrigation (m/yr)	> 7 6002-01 3 2 000E-01 3	, BI
R013 • Irrigation mode	' overhead ' overhead '	1 IDITCH
R013 ¹ Runoff coefficient	3 2 000B-01 * 2 000E-61 *	' RUNDFF
R013 * Watershed area for nearby stream or pond (m**2)	1 000E+06 3 1 000E+06 3) WAREA
R013 ¹ Accuracy for water/soil computations	1 000E-03 1 000E-03 *	1 852
1	1 7 Y	د
R014 ' Density of saturated zone (g/cm**3)	' 1 600E+00 ' 1 500E+00 '	1 DENSAQ
R014 ³ Saturated zone total porcenty	3 4 000B-01 3 4 000E-01 3	4 TPSZ
R014 ' Saturated zone effective porosity	2 5COE-01 2 000E-01 2	¹ EPSZ
R014 ³ Saturated some field capacity	· 1 500E-01 · 2 000E-01 ·	1 PCSE
R014 ' Seturated zone hydraulic conductivity (m/yr)	3 5 530B+03 3 1 000E+02 3	4 HCSZ
R014 ' Saturated zone hydraulic gradient	• 1 25DE-D3 • 2 0DQE-Q2 •	3 HGWT
R014 ³ Saturated zone b parameter	³ 4 050B+00 ³ 5 300E+00 ³	' BSZ
R014 ' Water table drop rate (m/yr)	' 1 DODE-D3 ' 1 ODDE-03 '	, MML
R014 ' Well gung intake depth (m below water table)	4 600E+00 * 1 000E+01 *	' DWIEWY
R014 ' Model Nondispersion (ND) or Mass-Balance (XB)	'MD 'MD '	* MODEL
R014 * Well pumping rate low*3/yr)	2 500E+02 > 2 500E+02 /	NVW 1
3	1 1 1	- UNI 8
RD15 * Number of unsaturated zone strata	1 ,1 ,	3 NS

IRESRAD Version 6 30 Tw Limit = 0 5 year 03/02/2006 14 21 Page 4
Summary Tritium at 118-B-5 Shallow Zone with Irrigation - Rural Residential Scenario
File Run#1_118 B-6_SZ_With_Irrigation RAD

	Site-Specific	Par	ameter S	um	nar	y (conti	nuer	3)	
D	د		User				1	Used by RESRAD	Paracoter
Menu		3	Input					If different from user input)	
	цалалалалалалалалалалалалалалалалалалал								
	Onsat zone 1, thickness (m)		7805+D1						• H(1)
	<pre>Onsat zone 1, soil demanty (g/cm**3)</pre>		600E+00						DENSUS(1)
	Some to the second seco		000E-01		_				* TPUZ(1)
	* Unsat zone 1, effective porosity		500e-01						* EPUZ(1)
	Uneat zone 1, field capacity		500£-01						PCUZ(1)
	Unsat zone 1, soil-specific b parameter		050E+00						* BUZ(1)
	' Unsat zone 1, hydraulic conductivity (m/yr)		500E+02	3	2	0008+01			> HCUZ(1)
	1	3					\$,
	Distribution coefficients for H-3	3		2	_		3		3
RD16		-	000E+00		-				BCNUCC (1)
R016			0006+00						* DCNUCU(1,1)
R016 -			0006+00						> DCNOC51 [1]
R016			0006+00						* ALEACH(1)
R016			0006+00		D				SOLOBKI 1)
-	1				_		3		,
	Inhalation rate (m**3/yr)		3006+03						' INHALR
	Mass loading for inhalation (g/m**3)		0006-04						> MUINH
	Exposure duration		000E+01						* ED
	Shielding factor, inhalation		0000-01						, знъз
	Shielding factor external gamma	-	000E-01						· SHF1
	Fraction of time spent indoors		0008-01						' FIND
	Praction of time spent outdoors (on site)	_	000E-01		_				3 POTO
	Shape factor flag external gamma		D00E+0D		1	-			1 FS
	Radii of shape factor array (used if FS = -1)	•		1	_		?		3
R017 *		-	ot used		-				* RAD_SHAPE 1
R017 4						071E+01			¹ RAD_SHAPE(2)
RD17 4			ot used		-	000E+00			RAD_SHAPE(3)
RD17 *						D008+00			3 RAD_SHAPE(4)
R017 *					-	0008+00			1 RAD_SHAPE(5)
R017 *					-	000E+00			RAD_SHAPE(6)
R017 4						000E+00			1 RAD_SHAPE{ 7}
N017 -	· · · · · · · · · · · · · · · · · · ·		ot used		-	000E+D0			' RAD_SHAPE(8)
R017 *			ot used		-	000E+00			' RAD_SHAPE(9)
R017					-	GODE+DO			1 RAD_SHAPE(10)
R017 4			ot used		-	000E+00			RAD_SHAPE(11)
R017 %		<u>`</u> "	ot used	3	0	0008-00	, 1		<pre>1 RAD_SHAPE(12) </pre>
-							•		1

 1RESRAD, Version 6 10
 T* Limit = 0 5 year
 03/02/2006 14 21 Page 5

 Summary
 Tritum at 118-B-6 \$hallow Zone with Irrigation
 Rural Residential Scenario

 File
 Run#1_118-B-6_SZ_With_Irrigation RAD

Site-Specifi	c Parameter	Storepa	ry loont	(nued			
0 *	> User	3	-	•	Used by RESRAD	3	Parameter
Mény ¹ Paramétér	Input	3	Default	• (If	different from user inco	at '	Name
ал			NAAAAAA	алалал	алалалаладаалаларалала	LARA	алалалалалала
8027 ¹ Practions of annular areas within AREA	3	3				,	
R017 Ring 1	> not used	, 1	. DOD x +0D	3		د	FRACA 1
8017 ' Fing 2	* not used	+ 2	732E-01	•		3	PRACA (2)
RO17 ' Ring 3	> not used	• •	} 000E+00	•		3	FRACA (3)
R017 * Ring 4	' not used	, , (00DE+D0	,		,	FRACA I 41
RD17 ° Ring 5	, uct nseq		000E+00			,	PRACA (5)
RD17 ' Ring 6	3 DOE USed		000 <u>e</u> +00				FRACA (6)
R017 * Rang 7	* not used		OODE+DO				PRACA 71
RD17 Rang 6	¹ not used		0008+00				FRACA [8]
R017 * Rang 9	> not used		DODE+DD				PRACA [9]
RD17 > Ring 10	' not used		000E+00		-		FRACA (10)
R017 * Ring 11	1 not used		000E+00				FRACA (11)
RO17 > Ring 12	• not used		0005+00				PRACA [12]
-	1			5			
R018 * Fruits, vegetables and grain consumption (kg/yr							DIET(1)
ROIB > Leafy vegetable consumption (kg/yr)	≥ 2 700E+0						DIET (2)
R018 * Milk consumption (L/yr)	³ 1 DOOE+0:						DIET(3)
R018 ' Meat and poultry consumption (kg/yr)	• 3 600E+0						DIEP(4)
R018 ' Fish consumption (kg/yr)	3 1 97¢E+D	-					DIET (5)
R018 ' Other seafood consumption (kg/yr)	* 9 000E-0						OIET(6)
R018 ³ Soil ingestion rate (g/yr)	7 300E+0 د				-		SOIL
R018 ' Drinking water intake (L/yr)	7 300B+D						IWI
ROIS ² Contamination fraction of drinking water	* 1 000E+0						PDW
R018 ' Contamination fraction of household water	' not used						FEERW
R018 * Contamination fraction of livestock water	■ 1 000E+0						PT/W
R018 ³ Contamination fraction of irrigation water	1 000E+0						FIRM
R018 * Contamination fraction of aquatic food	י 5 מממב-¢: י_ז	د د <u>ا</u> 1-4		;	0.4157-00		FR9
RD18 ³ Contamination fraction of plant food RD18) Contamination Stateling of more	1 31			3	0 4158+00		FPLANT
RD18 > Contamination Fraction of meat R018 * Contamination fraction of milk	₹-1	1. د +-1			0 415E-01		FMEAT
NOTO - CONCEDENTACION TRECTON OF WITH	3 1-1	3		;	D 415g-01	;	PNILE
R019 * Livestock fodder intake for meat (kg/day)	- 9 6 8000+0		8000-01	,			GFIS
R019 * Livestock fodder intake for milk (kg/day)	* 5 500E+0;						LPTG
Rolp > Livestock water intake for mest (L/day)	> 5 000E+0						LWIS
R019 * Livestock water intake for milk (L/day)	3 1 600E+0;				-		CMI6
Rolp > Livestock soil intake (kg/day)	> 5 000B-0						LSI
R019 ' Mass loading for foliar deposition (g/m**3)	> 1 DOOB-0	-					MLFD
R019 ' Depth of soil mixing layer (m)	• 1 500E-0		-				
RG19 ³ Depth of roats [m]	3 9 000B-0						DRCOT
R019 ' Drinking water fraction from ground water	7 1 000E+0						FONDY
R019 J Household water fraction from ground water	, wor need				-		PCWHH
R019 ' Livestock water fraction from ground water	3 1 DQQB+0						FGWLM
R019 ' Irrigation fraction from ground water	1 000E+0				-		PGNIR
3	3	נ '		د		1	
R19B * Wet weight crop yield for Non-Leafy (kg/m**2)	2 7 000E-0	1 , 7	00DE-01	,		3	YV (])
R29B ' Wet weight grop yield for Leafy (hg/m* 2)	1 500E+0	د ۱	500E+00	a	-		YV (2)
R19B ' Wet weight crop yield for Fodder [kg/m**2]	, 1 100B+00				-	-	YV (3)
R198 * Growing Season for Non Leafy (years)	• 1 700E-0:	1 * 1	700E-01				TE(1)
R199 ' Growing Season for Leafy (years)	\$ 2 500B-0	1 3 2	500E-01	3		-	TE(2)
R19B * Growing Season for Fodder (years)	• 8 000E-D	2 " 8	000E-02	9		3	TE(3)

IRESRAD, Version 6 30 To Limit = D 5 year 03/02/2006 14 21 Page 6
Summary Tritium at 118-B-6 Shallow 2one with Irrigation - Rural Residential Scenario
Pile Run#1_118-B-6_SZ_With_Irrigation RAD

	Parameter Summary (continued)	
0, ,	' User ' Used by RESRAD	• Parameter
Menu Parameter	Input Default ' (If different from user input)	
	айлаалаалалалалалалаларалалалалалалалала	
R198 • Translocation Factor for Non-Leafy	* 1 DOOE-D1 * 1 ODOE-O1 *	* TTV(1)
R19B > Translocation Factor For Leafy	· 1 000E+00 · 1 000E+00 ·	' TIV(2)
R19B * Translocation Factor for Fodder	1 DOOE+OD 1 DOOE+OD 1	* TIV(3)
R198 * Dry Foliar Interception Fraction for Non-Leafy		3 ROAY (1)
R19B ' Dry Poliar Interception Fraction for Leafy	³ 2 500E-01 ⁴ 2 500E-01 ³	* RDRY (2)
R198 ' Dry Foliar Interception Fraction for Fodder	³ 2 500E-01 ³ 2 500E-01 ³	* RDRY(3)
R198 'Wet Foliar Interception Fraction for Non-Leafy	2 500E-01 * 2 500E-01 *	RMET(1)
R198 > Wet Poliar Interception Fraction for Leafy	³ 2 500E-01 ³ 2 500E-01 ³	RNET(2)
R19B ¹ Wet Foliar Interception Practics for Fodder	2 500E-01 / 2 500E-01 /	RWET(3)
R19B > Weathering Removal Constant for Vegetation	2 000B+01 2 000E+01 3	WLAN
	- • •	-
C14 ¹ C-12 concentration in water (g/cm**3)	3 not used = 3 0000 not used = 3 0000 not used = 3 0000 not used =	C12WTR
C14 ' C-12 concentration in contaminated soil (q/q) C14 ' Fraction of vegetation carbon from soil	* not used * 2 000E-02 *	• C12CZ
Cl4 ³ Fraction of vegetation carbon from soil Cl4 ³ Fraction of vegetation carbon from air		' CSOEL
		* CAIR
C14 * C-14 evasion layer thickness in soil (m) C14 * C-14 evasion flux rate from soil (1/sec)		, DWC
Cl4 ? C-12 evasion flux rate from soil (1/sec)	י not used י 1 000E-07 י מסל used י 1 000E-10 י	' EVSN
Cl4 ' Fraction of grain in beef cattle feed		* REVSN
		> AVPG4
C14 Fraction of grain in mulk cow feed C14 DCF correction factor for gaseous forms of C14	<pre>not used > 2 0008-01 > * not used > 8 894E+01 *</pre>	AVEG5
3		, CO3E
STOR * Storage times of contaminated foodstuffs (days)		* >
STOR ' Fruits, non-leafy vegstables, and grain	* 1 400E+01 * 1 400E+01 *	
STOR ' Leafy vegetables	7 1 000E+00 3 1 000E+00 3	* \$TOR_T(1)
STOR ' Kilk	* 1 000E+00 * 1 000E+00 *	* STOR_T(2)
STOR 3 Meat and poultry	> 2 000E+01 > 2 000E+01 >	<pre>> STOR_T(3) > STOR_T(4)</pre>
STOR ' Fish	* 7 0D0E+00 * 7 D0DE+D0 *	* STOR_T(5)
STOR ¹ Crustaces and mollusks	* 7 000E+00 * 7 000E+00 *	\$10R_7(5)
STOR > Well water	> 1 000E+00 > 1 000E+00 >	¹ STOR_T(7)
STOR ' Surface water	* 1 000E+00 * 1 000E+00 *	3 STOR_T(8)
STOR ¹ Livestock fodder	* 4 500E+01 * 4 500E+01 *	* STCR_T(9)
	· · · · · · · · · · · · · · · · · · ·	316A_1(9)
R021 ³ Thickness of building foundation (m)	¹ not used ¹ 1 500E-01 ¹	1 FLOOR1
ROZ1 3 Sulk density of building foundation (g/cm**3)	3 not used 3 2 400B+00 3	¹ DENSEL
R021 ' Total percently of the cover material	* not used / 4 0008-01 *	' TPCV
R021 ³ Total percently of the building foundation	, bot need , 1 000E-01 ,	, TPFL
RO21 ' Volumetric water content of the cover material	> not used > 5 000B-02 >	1 PH2OCV
R621 > Volumetric water content of the foundation	"not used * 3 000E-02 *	1 PHIOFL
R021 * Diffusion coefficient for radon gas (m/sec)	3 9 3	3
R021 * in cover material	* not used ' 2 000E-06 *	, DILCA
RO21 > up foundation material	'not used '3 000E-07'	1 DIPEL
R021 * in contaminated zone soil	¹ not used ¹ 2 000E 06 ¹	' DIFCZ
R021 " Radon vertical dimension of mixing im)	' not used ' 2 000E+00 '	1 HOLIX
RO21 > Average building air exchange rate (1/br)	'not used '5 000E-01'	· REXG
R021 * Height of the building (room) (m)	" not used " 2 500E+00 '	, HEM
RO21 ' Building interior area factor	'net used '0 000E+00 '	I FAL
RD21 * Building depth below ground surface (m)	1 not used 3-1 000E+0D 3	, DALLE
R021 ' Emanating power of Rn-222 gas	* not used * 2 5DQE-01 *	* EXANA (1)
RD21 ' Emanating power of Rn-22D gas	nat used > 1 500g-01 *	· EMANA (2)
1 ······ ·····························	1 1 1 1)

IRESRAD, Version 6.30 T* Limit = 0.5 year 03/02/2006 14.21 Page 7 Summary * Tritium at 118-B-6 Shallow 2cont with irrigation * Rural Residential Scenario File * Run#1_118-B-6_SZ_With_Irrigation RAD

Site-Specific Parameter Summary (continued)

ō,		•	Geer	a .	-	a .	Used by RESRAD	,	Parameter
Menu ¹	Parameter	3	Input	3	Default		(If different from user in	putj 🦉	Name
алалалал	ла	LAAA /	LAAAAAA A	АÂЛ/	алалалал	AAA/	AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA	алалала	аладалалалала
ማደጥር ካለ	hmber of graphical time points	3	64	3	- · -	3		• • •	NPTS
TITL N	laximum number of integration points for dose	,	9	8				3	LYMAX
	aximum number of integration points for risk	3	33	3		J			KYMAX
ffillf	***************************************	tii:	źffŕfiŕf.	irıi	titfiliji:	ţzi:	ittiitiiiiiiiiiiiiiiitittitti	tifiít	irfiírífíííf

Summary of Pathway Selections

Pathway		User Selection
LAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA	aáaa	ARAAAAAAAAAAAAAAAAAA
1 external gamma	3	active
2 inhalation (w/o radom	۶°	active
3 plant ingestion	,	active
4 - meat ingestion	3	active
5 milk ingestion		active
6 aquatic foods	•	active
7 drinking water	3	active
8 soil ingestion	,	active
9 radon	3	suppressed
Find peak pathway doses	3	active
	fiff	fiffirfiffiffiffi

RESRAD INPUT PARAMETERS FOR THE WASTE STAGING AREA -- RADIONUCLIDES

IRESRAD,	W	ersion 6.30	T~ 1	Limit -	= 0.5 yea	ar -	(03/02/2006	14	4:32	Page	1	
Summary	:	Tritium at	118-B-6	Waste	Staging	Area	with	Irrigation	-	Rura	Resi	dential	Scena
File	:	Run#2_118-E	J−6_Waste	e_Stagi	lng_Area_	_With_	Irrig	gation.RAD					

Dose Conversion Factor (and Related) Parameter Summary Site-Specific Parameter Summary	2 3 7								
Summary of Pathway Selections	ŝ								
Contaminated Zone and Total Dose Summary	а								
Total Dose Components	-								
Time = 0.000E+00	9								
Tlme = 1.000E+00	10								
Time = 3.000E+00	11								
Time = 7.000E+00	12								
Time = 1.200E+01	13								
Time = 2.760E+01	14								
Time = 4.500E+01	15								
Time = 1.000E+02	16								
Time = 3.000E+02	17								
Time = 1.000E+03	18								
Dose/Source Ratios Summed Over All Pathways	19								
Single Radionuclide Soil Guidelines									
Doss Per Nuclide Summed Over All Pathways	20								
Soil Concentration Per Nuclide									

IRESRAD, Version 6.30 T« Limit = 0.5 year 03/02/2006 14:32 Page 2
Summary : Tritium at 118-B-6 Waste Staging Area with Irrigation - Rural Residential Scena
File : Run#2_118-B-6_Waste_Staging_Area_With_Irrigation.RAD

Dose Conversion Factor (and Related) Parameter Summary File: HEAST 2001 Morbidity

п	3	3	Oursent	L		з	Parameter
· · ·	•	-					
Kenu		-	Value	-	Default	-	
AAAA	чалалалалалалалалалалалалалалалалалалал	AA	алаааааааа	AA/	алалалала	AA/	ааааааааааааа
B-1	³ Dose conversion factors for inhalation, mrem/pCi:	,		\$		3	
B-1	а н -3	•	6.400E-08	1	6.400E-08	à	DCF2(1)
	3	•		ļ		э	
D -1	³ Dose conversion factors for ingestion, mrem/pCi:	•		1		э	
D-1	° Н-З	3	6.400E-08	3	6.400E-08	з	DCF3 (1)
	3	з		3		з	
D-34	³ Food transfer factors:	,		\$		3	
D-34	^a H-3 , plant/soil concentration ratio, dimensionless	9	4.800E+00	3	4.800E+00	3	RTF(1,1)
D-34	^a H-3 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	,	1.2005-02	3	1.200E-02	э	RTF(1,2)
D-34	% H-3 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)		1.000B-02	1	1.000E-02	а	RTF(1,3)
	1	3		3		э	
D-5	Bioaccumulation factors, fresh water, L/kg:	3		\$		3	
D-5	'H-3 , fish	3	1.000E+00	٦	1.000E+00	з	BIOFAC(1,1)
D-5	'H-3 , crustacea and mollusks	3	1.000E+00		1.000E+00	3	BIOFAC(1,2)
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0 + - > User - > User - > User > Display MADALAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA	Site-S	pecific Parameter Summary	
AdditAddatAddatAddatAddatAddatAddatAddat	-		
R011 * Area of contaminated cone (m**2) * 4 \$708+02 * 1 0008+00 * * 2 AREA R011 * Length parallel to aquifer Liow (m) * 1 2 Sole+01 * 1 Sol8+00 * * 1 CC2PAQ R011 * Time ince radiation does lans (merm/yr) * 1 5 0008+02 * * 1 CC2PAQ R011 * Time ince radiation does lans (merm/yr) * 1 5 0008+02 * * 7 CT R011 * Times for calculations (yr) * 1 0008+02 * * 7 CT R011 * Times for calculations (yr) * 1 0008+02 * * 7 CT R011 * Times for calculations (yr) * 1 0008+02 * * 7 CT R011 * Times for calculations (yr) * 1 0008+02 * * 7 CT R011 * Times for calculations (yr) * 1 0008+02 * 1 0008+02 * * 7 CT R011 * Times for calculations (yr) * 1 0008+02 * 1 0008+00 * * 7 CT R011 * Times for calculations (yr) * 1 0008+02 * 1 0008+00 * * 7 CT R011 * Times for calculations (yr) * 1 0008+02 * 1 0008+00 * <td< td=""><td></td><td>input perdute fit directure from outer input</td><td></td></td<>		input perdute fit directure from outer input	
2011 ************************************			
R011 Length parallel Co equifer flow (m) 1 250x+01 1 100Dr-02			
R011 Partic radiution does limit (meen/yr) 1:500001 * 2:500000 *			
R011 * Inter since placement of material (yr) 2 6 000±00 * 0 000±00 * * TT R011 * Times for calculations (yr) * 1 000±00 * * TT R011 * Times for calculations (yr) * 1 000±00 * * TT R011 * Times for calculations (yr) * 1 000±00 * * TT R011 * Times for calculations (yr) * 1 200±01 * 3 000±02 * * TT R011 * Times for calculations (yr) * 4 500±01 * 3 000±02 * * TT R011 * Times for calculations (yr) * 1 000±02 * * TT R011 * Times for calculations (yr) * 1 000±02 * * TT R011 * Times for calculations (yr) * 1 000±02 * * TT R012 * Titstal principal radionuclide (pC:/g) H-3 * 3 670±01 * 0 000±00 * * St(1) R013 * Density of cover material (g/cm**1) * not used * 1 500±00 * * St(1) R013 * Density of cover material (g/cm**1) * not used * 1 500±00 * * St(2) R013 Cover depth fml * 0 000±			
R011 * Insets for calculations (yr) * 1 0005400 * 1 0005400 * * 74 3) R011 * Times for calculations (yr) * 3 0005400 * 3 0005401 * * 74 3) R011 * Times for calculations (yr) * 1 2005401 * * 74 3) R011 * Times for calculations (yr) * 1 2005401 * 0005400 * * 74 5) R011 * Times for calculations (yr) * 2 7605401 * 1 0005402 * * 74 7) R011 * Times for calculations (yr) * 1 0005402 * * 74 9) R011 * Times for calculations (yr) * 1 0005402 * 0 0005400 * * 74 9) R011 * Times for calculations (yr) * 1 0005403 * 0 0005400 * * 51 (1) R012 * Initial principal radiomuclide (pC1/g) H-3 * 3 6705401 * 0 0005400 * * 51 (1) R013 * Demaity of cover anterial (g/cm**1) * not wadd * 1 0005-03 * * 51 (1) R013 * Demaity of cover anterial (g/cm**1) * not wadd * 1 0005-03 * * 9005 R013 * Cover depth fml * 1005400 * * 900500 * R013 * Cove			
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R011 * Times for calculations (yr) 3 0008-00 * ???9) R011 * Times for calculations (yr) 1 0008+03 * 0 0008+00 * ??(10) R012 * Tinital principal rationuclude (pC1/g) H-3 * 0 0008+00 * ? 1(1) R012 * Concentration in groundwoter (pC1/L) H-3 * 0 0008+00 * ? 1(1) R013 * Develope rate (pC1/L) H-3 * 0 0008+00 * ? 0008+00 * R013 * Develope rate (pC1/L) H-3 * not used * 1 5008*00 * ? 0008+00 * R013 * Develope rate (m/Yr) * not used * 1 5008*00 * ? 0008+00 * R013 * Develope rate (m/Yr) * not used * 1 5008*00 * ? 0008+00 * R013 * Develope rate (m/Yr) * not used * 1 5008*00 * ? 0008+00 * R013 * Develope rate (m/Yr) * 0 0008+00 * 1 5008*00 * ? 0008+00 * R013 * Developmentated cone hydraulic conductivity (m/Yr) * 1 5008+00 * 2 1008+01 * ? 002 R013 * Contaminated cone hydraulic conductivity (m/Yr) * 2 5008+00 * 5 3000*01 * ? 002 R013 * Neroglitation (m/Yr) * 0 0008+00 * 1 0008+01 * ? 002 R011 * Neroglitation (m/Yr)			
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R012 Concentration in groundweter (pCi/L) H·3 i not used > 0 0008+00 ; i N(1) R013 Cover depth (m) 0 0008+00 > i COVER0 R013 Density of cover dutrial (g/cm**3) i not used > 1 1008+03 > i DENSCV R013 Cover depth erosion rate (m/yr) inct used > 1 1008+03 > i DENSCV R013 Contaminated cone circle (m/yr) inct used > 1 0008+03 > i DENSCV R013 Contaminated cone total gorosity 1 6008+00 > 1 5008+01 > i DENSCZ R013 Contaminated cone total gorosity 1 5008+01 > i DENSCZ i DENSCZ R013 Contaminated cone total gorosity 1 5008+02 > i DECZ i DECZ R013 Contaminated cone by atminitier 4 0008-01 > i DECZ i DECZ R013 Contaminated cone by atminitier 4 0008+01 > i DECZ i DECZ R013 Kunaidity in air (g/m^4) 5 0008+02 > i DECZ i DECZ R013 Kunaidity in air (g/m^4) 5 0008+01 > i DECZ <td>$B012$ 3 Initial principal radionuclide (pCi/s) $H_{\rm e}$ 3</td> <td></td> <td></td>	$B012$ 3 Initial principal radionuclide (pCi/s) $H_{\rm e}$ 3		
N013 Cover depth (m) 0 0008+00 0 0008+00 2 COVER R013 Density of cover material (g/cm**3) 1 not used 1 5008+00 2 DENSCV R013 Density of contaminated zone (g/cm**3) 1 hour used 1 5008+00 7 UCV R013 Density of contaminated zone evosion rate (m/yr) not used 1 5008+00 7 UCV R013 Contaminated zone evosion rate (m/yr) 0 0008+00 1 5008+00 7 UCV R013 Contaminated zone evosion rate (m/yr) 4 0008-01 7 UCZ R013 Contaminated zone total portosity 4 0008-01 7 UCZ R013 Contaminated zone hydrawniber 7 1 5008-01 7 UCZ R013 Contaminated zone hydrawniber 7 1 5008-01 7 UCZ R013 Contaminated zone hydrawniber 7 1 5008-01 7 UCZ R013 Contaminated zone hydrawniber 7 UCZ 7 UCZ R013 Nergeg annual wind speed (m/seci			
K013 * Cover depth (m) * 0 000E+00 * 0 000E+00 * * COVERN R013 * Density of cover material (g/cm**3) * not used * 1 500E+00 * * DENSCV R013 * Cover depth (m) * not used * 1 500E+00 * * DENSCV R013 * Cover depth (m) * not used * 1 500E+00 * * DENSCV R013 * Cover depth (m) * not used * 1 500E+00 * * DENSCV R013 * Contaminated zone erosion rate (m/yr) * 0 000E+00 * 1 500E+00 * * DENSCZ R013 * Contaminated zone bid perosity * 4 000E-01 * * PCZ R013 * Contaminated zone hydraulic conductivity (m/yr) * 2 500E+02 * 1 000E+01 * * PCZ R013 * Contaminated zone bid perod (n/ecc) * 3 000E+00 * 5 500E+00 * * BCZ R013 * Contaminated zone bid perod (n/ecc) * 3 00E+00 * 5 500E+00 * * BCZ R013 * Numidity in air (g/m*3) * 8 000E+01 * 0 * 000E+00 * * BCZ R013 * Numidity in air (g/m*3) * 8 000E+01 * 2 000E+01 * * BCZ R013 * Irrigation (m/yr) * 7 600E+01 * 2 000E+01 * * BCZ R013 * Irrigation (m/yr) * 7 600E+01 * 2	s		
R013 * Density of cover material (g/cm**3) * not used > 1 5008+00 * * DDNSCV R013 * Cover depth aronou rate (m/Yr) * not used > 1 5008+00 * * VCV R013 * Cover depth aronou rate (m/Yr) * 0 0008+00 * 1 5008+00 * * VCZ R013 * Contaminated zone (g/cm**3) * 1 6008+00 * 1 5008+00 * * VCZ R013 * Contaminated zone taile (m/yr) * 0 0008+00 * 1 0008-01 * * VCZ R013 * Contaminated zone taile (m/yr) * 0 0008+00 * 1 0008-01 * * PCCZ R013 * Contaminated zone taile (m/yr) * 1 5008+00 * 5 3008+01 * * PCCZ R013 * Contaminated zone hydrawlice combortivity (m/yr) * 2 5008+00 * 5 1008+01 * * HCCZ R013 * Kverage annual wind speed (m/secl * 3 4008+00 * 5 0008+00 * * HCCZ R013 * Kverage zona (m/yr) * 1 6008-01 * 5 0008+00 * * HCCZ R013 * Frequentiation configure * 9 1088-01 * 5 0008+00 * * HCCZ R013 * Frequentiation (m/yr) * 1 6008-01 * 2 0008+00 * * HCCZ R013 * Frequentiation configure * 0 008-01 * 0 008+00 * * HCCZ R013 * Irrigation (m/yr) <td>8013 ? Cover depth (m)</td> <td></td> <td>1 CONTRIDE</td>	8013 ? Cover depth (m)		1 CONTRIDE
R013 * Cover depth erosion rate (m/yr) * not used * 1 000E-03 * ? VCV R013 * Contaminated zone (g/cm*3) ? 1 600E-03 * ? UCV R013 * Contaminated zone (g/cm*3) ? 1 600E-03 * ? UCV R013 * Contaminated zone (g/cm*3) ? 1 600E-03 * ? UCZ R013 * Contaminated zone (g/cm*3) ? 1 500E-01 * ? PCZ R013 * Contaminated zone (g/cm*3) ? 1 500E-01 * ? PCZ R013 * Contaminated zone (g/cm*3) ? 1 500E-01 * ? PCZ R013 * Contaminated zone (g/cm*3) ? 1 500E-01 * ? PCZ R013 * Contaminated zone (g/cm*3) ? 1 500E-01 * ? PCZ R013 * Contaminated zone (g/cm*3) ? 8 00E+00 * ? 000E-01 * ? PCZ R013 * Numidity in all (g/m*3) ? 00E+00 * ? 00E+00 * ? 00E+00 * ? 00E+00 * ? PCZ R013 * Numidity in all (g/m*3) ? 00E+00 * ? 00E+00 * ? 00E+01 * ? PCZ R013 * Numofi coefficient ? 00E+01 * ? 00E+01 * ? PCZ			
R013 * Density of contaminated zone (g/cm*3) 1 1 6008+00 * 1 5008+00 * 1 5008+00 * 1 5008+00 * 1 5008+00 * 1 5008+00 * 1 5008+00 * 1 5008+00 * 1 5008+00 * 1 5008+00 * 1 5008+01 * * FCZ R013 * Contaminated zone total personate (m/yr) * 0 0008+00 * 1 0008+01 * * FCZ R013 * Contaminated zone total personate (m/yr) * 1 5008+00 * 1 0008+01 * * FCZ R013 * Contaminated zone total personate (m/yr) * 2 5008+02 * 2 0008+01 * * FCZ R013 * Contaminated zone total personate (m/yr) * 2 5008+02 * 2 0008+01 * * FCZ R013 * Contaminated zone total personate (m/yr) * 4 0508+00 * 2 0008+01 * * FCZ R013 * Rumadity in air (g/m*3) * 8 0002+00 * 8 0008+00 * * FCZ R013 * Rumadity in air (g/m*3) * 8 0002+00 * 8 0008+00 * * FCZ R013 * Rumadity in air (g/m*3) * 8 0002+00 * 8 0008+00 * * FCZ R013 * Rumofic coefficient * 9 1008+01 * 2 0008-01 * * FCZ R013 * Rumofic coefficient * 0 002+01 * 2 0008-01 * * FCZ R013 * Rumofic coefficient * 0 002+01 * 2 0008-01 * * FCZ R013 * Rumofic coefficient * 1 0002+06 * 1 0002+00 * * FCZ R013 * Accuracy for water/soll computations * 1 0002+06 * 1 0002+06 * * FCZ R014 * Saturated zone total personaty * 1 6008+00 * 1 5008+00 * * FFSZ R014 * Saturated zone fife/curve (m/yr)			
R013 * Contaminated zone erosion rate (m/yr) * 0 0008+00 * 1 0008-01 * * * VCZ R013 * Contaminated zone total porosity * 4 0008-01 * 1 0008-01 * * * VCZ R013 * Contaminated zone total porosity * 1 5008-02 * 1 0008-01 * * * VCZ R013 * Contaminated zone hydraulic conductivity (m/yr) * 2 5008+02 * 1 0008-01 * * * VCZ R013 * Contaminated zone hydraulic conductivity (m/yr) * 2 5008+02 * 1 0008-01 * * * VCZ R013 * Contaminated zone hydraulic conductivity (m/yr) * 2 5008+02 * 1 0008-01 * * VCZ * VCZ R013 * Average annual wind speed (m*sec) * 4 0508+00 * 2 0008+00 * * VCZ * VCZ R013 * Kumadity in air (g/m*3) * 8 0008+00 * 2 0008+01 *			• •
R013 * Contamnated zone total percently * 4 000E-01 * 4 000E-01 * * PCZ R013 * Contamnated zone field capacity * 1 500E-01 * 2 D00E-01 * * PCZ R013 * Contamnated zone hydraulic conductivity (m/yr) * 2 500E-01 * 2 D00E+01 * * PCZ R013 * Contamnated zone hydraulic conductivity (m/yr) * 2 500E+02 * 1 000E+01 * * BCZ R013 * Average annual wind speed (m/sec) * 4 000E+01 * * BCZ R013 * Kumidity in air (g/m*3) * 8 000E+00 * 2 D00E+00 * * BCZ R013 * Kumidity in air (g/m*3) * 8 000E+00 * 2 D00E+00 * * BUND R013 * Kumidity in air (g/m*3) * 8 000E+00 * 2 D00E+00 * * BUNZD R013 * Kumidity in air (g/m*3) * 1 600E+01 * 2 000E+01 * * BUNZD R013 * Irrigation (m/yr) * 7 600E+01 * 2 000E+01 * * PRECIP R013 * Runoff coefficient * 2 000E+01 * 2 000E+01 * * RI R013 * Runoff coefficient * 1 000E+06 * 1 D00E+06 * * RE R013 * Accuracy for water/soil computations * 1 000E+06 * 1 D00E+06 * * RE R014 * Saturated zone field capacity * 1 500E+00 * * EPS2 R014 * Saturated zone field capacity * 1 500E+01 * * EPS2 <td></td> <td></td> <td></td>			
R013 * Contaminated zone field capacity * 1 5008-01 * 2 0008-01 * 2 0008-01 * * HCC2 R013 * Contaminated zone hydraulic conductivity (m/yr) * 2 5008+02 * 1 0008+01 * * HCC2 R013 * Contaminated zone hydraulic conductivity (m/yr) * 2 5008+02 * 1 0008+01 * * HCC2 R013 * Contaminated zone hydraulic conductivity (m/yr) * 3 4008+00 * 2 0008+00 * * HCC2 R013 * Kumidity in air (g/m^*3) * 8 0008+00 * 3 0008+00 * * HCC2 R013 * Evapotranspiration coefficient * 9 1008-01 * 2 0008-01 * * FXPTR R013 * Tringation mode * 0 008-01 * 2 0008-01 * * FXPTR R013 * Irrigation mode * 0 008-01 * 2 0008-01 * * FXPTR R013 * Irrigation mode * 0 008-01 * 2 0008-01 * * FXPTR R013 * Irrigation mode * 0 008-01 * 2 0008-01 * * FXPTR R013 * Materia direct area for nearby stream or pond (m*2) * 1 0008-06 * 1 2 0008-01 * * FXPTR R013 * Accuracy for water/soil computations * 1 0008-06 * 1 2 0008-01 * * FXPTR R014 * Density of saturated zone (g/cm**3) * 1 6008-01 * 1 2 0008-01 * * FXPT R014 * Saturated zone field capacity * 1 5008-01 * 1 2 0008-01 * * FXPT R014 * Saturated zone field capacity * 1 5008-01 * 1 2 0008-01 * * FXPT R014 * Saturated zone field capacity * 1 5008-01 * 2 0008-01 * * FYPT			
R013 * Contaminated zone hydraulic conductivity (m/yr) * 2 5008+02 * 1 000E+01 * * HC*2 R013 * Contaminated zone hydraulic conductivity (m/yr) * 2 5008+00 * 5 300x+00 * * HC*2 R013 * Average annual wind speed (m/sec) * 3 400E+00 * 5 300x+00 * * HC*2 R013 * Rumaidity in air (g/m**3) * 8 000E+00 * 6 000E+00 * * HC*2 R013 * Buggiting annual wind speed (m/sec) * 8 000E+00 * 6 000E+00 * * HC*2 R013 * Rumaidity in air (g/m**3) * 8 000E+00 * 6 000E+00 * * HC*2 R013 * Evapotranspiration coefficient * 9 100E+01 * 2 000E-01 * * EVAPTR R013 * Irrigation (m/yr) * 7 600E+01 * 2 000E-01 * * RI R013 * Irrigation mode * overhead * overhead * * IDITCH R013 * Muscrifter of means for nearby stream or pond (m**2) * 1 000E+01 * 1 000E+03 * * NNOP* R013 * Accuracy for water/soil computations * 1 000E+01 * 1 000E+03 * * NNOP* R014 * Density of saturated zone fig/cm**3) * 1 600E+00 * 1 500E+01 * * DE*SA R014 * Saturated zone effective porosity * 2 500E-01 * * DE*SZ R014 * Saturated zone field capacity * 1 500E-01 * 2 000E-01 * * DE*SZ R			
R013 • Contamineted cone to parameter 9 4 050m+00 • 5 300m+00 • > BCZ R013 • Kumadity in air (g/m**3) > 8 000m+00 • 2 000m+00 • > WIND R013 • Exapotrinspiration coefficient > 9 100m+01 • 2 000m+00 • > HUMUD R013 • Exapotrinspiration coefficient > 9 100m+01 • 2 000m+00 • > HUMUD R013 • Exapotrinspiration coefficient > 9 100m+01 • 2 000m+01 • > EXAPPTR R013 • Irrigation (m/yr) > 1 600m+01 • 1 000m+00 • > FRIT R013 • Irrigation mode • overNead • overNead • > HINCP R013 • Watersted area for nearby stream or pond (m**2) • 1 000m+06 • 1 000m+06 • > HINCP R013 • Kurated zone total porosity > 1 600m+00 • 1 000m+06 • > HENSAQ R014 * Density of saturated zone (g/cm**3) * 1 600m+01 • > HENSAQ R014 * Saturated zone tife(computations * 1 600m+01 • > TPS2 R014 * Saturated zone field capacity * 1 500m+01 • > HENSAQ R014 * Saturated zone field capacity * 1 500m+01 • > HENSAQ R014 * Saturated zone field capacity * 1 500m+01 • > HENSA R014 * Saturated zone field capacity * 1 500m+01 • > HESZ R0			
R013 * Average annual wind speed (m/Becl * 3 400E+00 * 2 000E+00 * 3 WIND R013 Rumadity in air (g/m*3) * 8 000E+00 * 6 000E+00 * BEXAPPR R013 Precipitation coefficient 9 100E+01 * 1 000E+00 * BEXAPPR R013 Precipitation (m/yr) * 1 600E-01 1 000E+00 * RUMPR R013 Irrigation (m/yr) * 7 600E-01 2 000E-01 * RUMOPP R013 Irrigation (m/yr) * 7 600E-01 2 000E-01 * RUMOPP R013 Runoff coefficient * 2 000E-01 * 2 000E-01 * RUMOPP R013 Runoff coefficient * 2 000E-01 * 2 000E-01 * RUMOPP R013 Watersted area for nearby stream or pond (m**2) * 1 000E+03 * RUMOPP R014 Density of saturated zone (g/cm**3) * 1 600E+00 1 000E+03 * PP\$2 R014 Saturated zone effective porosity * 1 600E+00 1 500E+00 * P\$23 R014 Saturated zone hydraulic oraduent * 1 2500E-01 </td <td></td> <td></td> <td></td>			
R013 * 8 000E+00 * 8 000E+00 * 9 100E-01 * 8 000E+00 R013 Sempotranspiration coefficient > 9 100E-01 > 5 000E+00 * EWAPTR R013 Frequitation (m/yr) > 1 600E+00 > 1 000E+00 * RECIP R013 Irrigation mode > 7 600E+01 2 000E+01 * RI R013 Irrigation mode > 0verhead * RI R013 Hundf coefficient > 2 000E+01 * RI R013 Watersted area for nearby stream or pond (m**2) > 1 000E+05 > 1 000E+06 * RIMOPF R013 Accuracy for water/soil computations * 1 000E+05 > 1 000E+03 * RIMOPF R014 Saturated zone (g/cm**3) * 1 600E+00 > 1 500E+00 * DEMSAQ R014 Saturated zone field capecity * 1 600E+01 * DEMSAQ R014 Saturated zone field capecity * 1 500E+01 * DEMSAQ R014 Saturated zone field capecity * 1 500E+01 * DES2 R014 <td< td=""><td></td><td></td><td></td></td<>			
R013 * Evapotranspiration coefficient > 9 1008-01 * 5 0008-01 * > EVAPTR R013 * Precipitation (m/yr) > 1 6008-01 * 2 0008-01 * > ERI R013 * Irrigation (m/yr) > 7 6008-01 * 2 0008-01 * > RI R013 * Irrigation mode > 0 verhead * overhead * > RI R013 * Bunoff coefficient > 2 0008-01 * 2 0008-01 * > RI R013 * Accuracy for water/soil computations > 1 0008+06 * 1 0008+06 * > REA R014 * Density of saturated zone (g/cm**3) > 1 6008-01 * 2 0008-01 * > EVAPTR R014 * Saturated zone titl porosity > 1 6008-01 * 1 0008-06 * > EVAPTR R014 * Saturated zone field capacity > 1 6008-01 * 1 0008-06 * > EVAPTR R014 * Saturated zone field capacity > 1 6008-01 * 1 0008-03 * > EVAPTR R014 * Saturated zone field capacity > 1 5008-01 * 2 0008-01 * > EVAPTR R014 * Saturated zone hydraulic conductivity (m/yr) > 5 5008-01 * 2 0008-01 * > EVAPTR R014 * Saturated zone hydraulic conductivity (m/yr) > 1 5008-01 * 2 0008-01 * > HCS2 R014 * Saturated zone hy			
S013 Precupitation (m/yr) 1 600E-01 * 1 000E-00 * 3 PRECIP R013 Irrigation mode 3 0 00E-01 * 2 000E-01 * 7 RI R013 Irrigation mode 9 000E-01 * 2 000E-01 * 7 RIMOPP R013 Runoff coefficient * 2 000E-01 * 2 000E-01 * 7 RIMOPP R013 Runoff coefficient * 2 000E-01 * 2 000E-01 * 7 RIMOPP R013 Watershed area for nearby stream or pond (m**2) 1 000E+03 * 1 000E+03 * 7 RIMOPP R014 Saturated zone for water/soil computations * 1 000E+03 * 1 000E-01 * 7 RESC R014 Saturated zone total porosity * 1 600E+00 * 1 500E+00 * 7 RESC R014 Saturated zone field capecity * 1 500E-01 * 2 000E-01 * 7 RESC R014 Saturated zone hydraulic conductivity (m/yr) * 5 530E+03 * 1 000E+02 * * RESC R014 Saturated zone hydraulic conductivity (m/yr) * 5 530E+03 * 1 000E+02 * * RESC R014 Saturated zone hydraulic conductivity (m/yr) * 5 530E+03 * 1 000E+02 * * RESC		3 9 100B-01 3 5 000E-01 3	
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R013 * Watershed area for nearby stream or pond (m**2) > 1 0002+06 - 1 0002+06 - 1 0002+06 > NAREA R013 * Accuracy for water/soil computations > 1 0002+06 - 1 0002+06 > 2P5 * 1 0002+03 * 1 0002+03 * > 2P5 * 8014 * Density of saturated zone (g/cm**3) > 1 6002+00 * 1 5002+00 * > DENSAQ R014 * Saturated zone total perosity > 2 5002+01 * 2 0002+01 * > DENSAQ R014 * Saturated zone field capacity > 2 5002-01 * 2 0002+01 * > EPSZ R014 * Saturated zone field capacity > 1 5002+00 * 1 0002+02 * > PCSZ R014 * Saturated zone hydraulic conductivity (m/yr) > 5 5002+02 * > HCSZ R014 * Saturated zone hydraulic gradient > 1 0002+03 * 1 0002+02 * > HCSZ R014 * Saturated zone hydraulic gradient > 1 2502+00 * 5 3002+02 * > HCSZ R014 * Saturated zone hydraulic gradient > 1 0002+03 * 1 0002+03 * 0002+00 * > HCSZ R014 * Saturated zone b parameter > 4 0502+00 * 5 3002+00 * > HCSZ R014 * Saturated zone b parameter > 4 0502+00 * 1 0002+01 * > BSZ R014 * Water table drop rate (m/yr) > 1 0002+03 * 1 0002+03 * 0002+01 * > DMUT R014 * Weil pump intake depth im below water		• overhead •	, IDILCH
R013 * Accuracy for water/soll computations 1 000E-03 * 1 000E-03 * > IP5 R014 * Density of saturated zone [g/cm**3] 1 600E+00 * 1 500E+00 * > DENSAQ R014 * Saturated zone total perosity 1 600E+00 * 1 500E+00 * > DENSAQ R014 * Saturated zone field capacity 2 500E-01 * 2 000E-01 * > DENSAQ R014 * Saturated zone field capacity * 1 500E-01 * 2 000E-01 * > DENSAQ R014 * Saturated zone field capacity * 1 500E-01 * 2 000E-01 * > DENSA R014 * Saturated zone field capacity * 1 500E-01 * 2 000E-01 * > PCS2 R014 * Saturated zone hydraulic conductivity (m/yr) * 5 500E-01 * 2 000E-02 * > HCS2 R014 * Saturated zone bydraulic oradictivity (m/yr) * 5 500E-00 * 5 300E-02 * > HCS2 R014 * Saturated zone bydraulic oradictivity (m/yr) * 1 250E-03 * 1 000E-02 * > HCS2 R014 * Saturated zone bydraulic oradictivity (m/yr) * 1 000E+00 * 5 300E-00 * > HCS2 R014 * Saturated cone bydraulic oradictivity (m/yr) * 1 000E+00 * 5 300E-00 * > HCS2 R014 * Water table drop rate (m/yr) * 1 000E+00 * 1 000E+01 * > DMT R014 * Weil pumping rate (m/yr) * 1 000E+00 * 1 000E+01 * > DMDEL	R013 ' Runoff coefficient	• 2 000E-01 • 2 000E-01 •	? RENORF
* *	R013 * Watershed area for nearby stream or pond (m**2)	> 1 0D0E+06 > 1 D00E+06 > .	• WAREA
R014 * Density of saturated zone (g/cm**3) * 1 600E+00 * 1 50DE+00 * > DENSAQ R014 * Saturated zone total porosity * 4 000E-01 * 4 000E-01 * > TPS2 R014 * Saturated zone effective porosity * 2 500E-01 * 2 00DE-01 * > EPS2 R014 * Saturated zone field capacity * 1 500E-01 * 2 00DE-01 * > PCS2 R014 * Saturated zone hydraulic conductivity (m/yr) * 5 530E+03 * 1 000E+02 * > PCS2 R014 * Saturated zone hydraulic ordiativity (m/yr) * 5 530E+03 * 2 00DE-01 * > PCS2 R014 * Saturated zone hydraulic ordiativity (m/yr) * 5 530E+03 * 2 00DE-02 * > HCS2 R014 * Saturated zone hydraulic ordiativity (m/yr) * 1 600E+00 * 5 300E-00 * > HCS2 R014 * Saturated zone hydraulic ordiativity * 1 000E+03 * 1 000E+02 * > HCS2 R014 * Saturated zone hydraulic ordiativity * 1 000E+03 * 1 000E+02 * > HCS2 R014 * Saturated zone hydraulic ordiativity * 1 000E+03 * 1 000E+03 * > BSz R014 * Water table drop rate (m/yr) * 1 000E+03 * 1 000E+03 * > CMUEMT R014 * Weil pumping rate (m**3/yrl * 2 500E+02 * 2 500E+02 * </td <td>R013 * Accuracy for water/soil computations</td> <td>- 1 000E-03 / 1 000E-03 /</td> <td>3 EP\$</td>	R013 * Accuracy for water/soil computations	- 1 000E-03 / 1 000E-03 /	3 EP\$
H014 * Saturated zone total porosity 1 4 000E-01 * 4 000E-01 * > TPS2 R014 * Saturated zone effective porosity 2 500E-01 * 2 000E-01 * > EPS2 R014 * Saturated zone field capecity * 1 500E-01 * 2 000E-01 * > PC32 R014 * Saturated zone field capecity * 1 500E-01 * 2 000E-01 * > PC32 R014 * Saturated zone hydraulic conductivity (m/yr) * 5 530E+03 * 1 000E+02 * > HCS2 R014 * Saturated zone hydraulic gradient * 1 250E-03 * 2 000E-02 * > HCS2 R014 * Saturated zone hydraulic gradient * 1 250E-03 * 2 000E-02 * > HCS2 R014 * Saturated zone hydraulic gradient * 1 250E-03 * 2 000E-02 * > HCS2 R014 * Saturated zone hydraulic gradient * 1 250E-03 * 2 000E-00 * > HCS2 R014 * Saturated zone hydraulic gradient * 1 000E+03 * 1 000E-03 * > ESz R014 * Weil pump intake depth in below water table) * 4 600E+00 * 1 000E+01 * > CMUEM R014 * Weil pumping rate (m**3/yrl * 2 500E+02 * 2 500E+02 * > CMUEM R014 * Weil pumping rate (m**3/yrl * 2 500E+02 * 2 500E+02 * > CMU	,	د د	•
R014 * Saturated zone effective porosity > 2 500E-01 * 2 000E-01 * > EPSZ R014 * Saturated zone field capacity * 1 500E-01 * 2 000E-01 * > PCS2 R014 * Saturated zone field capacity * 1 500E-01 * 2 000E-01 * > PCS2 R014 * Saturated zone hydraulic conductivity (m/yr) * 5 530E+03 * 1 000E+02 * > HCS2 R014 * Saturated zone hydraulic oradient * 1 250E-03 * 2 000E-02 * > HCS2 R014 * Saturated zone hydraulic oradient * 1 250E-03 * 2 000E-02 * > HCS2 R014 * Saturated zone hydraulic oradient * 1 250E-03 * 2 000E-00 * > HCS2 R014 * Saturated zone hydraulic oradient * 1 000E+00 * 5 300E-00 * > HSST R014 * Water table drop rate (m/yr) * 1 000E+00 * 1 000E+01 * > DWT R014 * Well pump intake depth im below water table) * 4 600E+00 * 1 000E+01 * > DWT R014 * Weil pumping rate (m**3/yr) * 2 500E+02 * 2 500E+02 * * UW * * 2 500E+02 * 2 500E+02 * * UW	R014 * Density of saturated zone [g/cm**3]	* 1 600E+00 ' 1 50DE+DQ '	DENSAQ
R014 Saturated zone field capacity 1 500E-01 ? 2 00DE-01 ? > PC52 R014 Saturated zone hydraulic conductivity (m/yr) 5 530E+03 * 1 000E+02 * > HCS2 R014 Saturated zone hydraulic oradient > 1 250E-03 * 2 00DE-02 * > HCS2 R014 Saturated zone hydraulic oradient > 1 250E-03 * 2 00DE-02 * > HCS2 R014 Saturated zone hydraulic oradient > 1 000E+00 * 5 300E-00 * > HCS2 R014 Saturated zone hydraulic oradient > 1 000E+00 * 5 300E-00 * > HS3T R014 Water table drop rate (m/yr) > 1 000E+00 * 5 300E-00 * > HS3T R014 Water table drop rate (m/yr) > 1 000E+00 * 1 000E+01 * > DWT R014 Well pump intake depth im below water table) > 4 600E+00 * 1 000E+01 * > DWT R014 Well pumping rate (m**3/yr) > 2 500E+02 * 2 500E+02 * > DWDEL 1 > 2 500E+02 * 2 500E+02 * > DW > DWE	R014 ' Saturated zone total porcenty	4 000E-01 • 4 000E-01 •	> TP\$2
R014 ' Saturated zone bydraulic conductivity (m/yr) ' 5 530E+03 ' 1 000E+02 ' ' HCS2 R014 ' Saturated zone bydraulic gradient ' 1 250E-03 ' 2 000E-02 ' ' HCS7 R014 ' Saturated zone bydraulic gradient ' 1 250E-03 ' 2 000E-02 ' ' HCS7 R014 ' Saturated zone bydraulic gradient ' 1 250E-03 ' 2 000E-02 ' ' HCS7 R014 ' Saturated zone b parameter ' 4 050E+00 ' 5 300E-00 ' ' HCS7 R014 ' Water table drop rate (m/yr) ' 1 000E-03 ' 1 000E+03 ' ' WWT R014 ' Weil pump intake depth im below water table) ' 4 660E+00 ' 1 000E+01 ' ' WWT R014 ' Weil pumping rate (m**3/yr) ' 2 500E+02 ' 2 500E+02 ' ' WW R014 ' Weil pumping rate (m**3/yr) ' 2 500E+02 ' 2 500E+02 ' ' WW	R014 * Saturated zone effective porosity	2 500E-01 2 2 200E-01 3 -···	* EPSZ
R014 * Saturated zone bydraulic gradient > 1 250E-03 * 2 00DE-02 * > BSz R014 * Saturated zone b parameter > 4 050E+00 * 5 300E-00 * > BSz R014 * Water table drop rate (m/yr) > 1 000E+03 * 1 000E+03 * > 0 WIEWT R014 * Weil pump intake depth in below water table) > 4 600E+00 * 1 000E+01 * > 0 WIEWT R014 * Weil pump intake depth in below water table) > 4 600E+00 * 1 000E+01 * > 0 WIEWT R014 * Weil pumping rate (m**3/yrl > 2 500E+02 * 2 500E+02 * > 0 WIEWT	R014 ¹ Saturated zone field capacity		* FC52
R014 ' Saturated zone b parameter ' 4 050E+00 ' 5 300E-00 ' > BSz R014 ' Water table drop rate (m/yr) ' 1 000E-03 \$ 1 000E-03 \$ > UWT R014 ' Weil pump intake depth im below water table) ' 4 600E+00 ' 1 000E-01 * > OWIEWT R024 ' Weil pump intake depth im below water table) ' 4 600E+00 ' 1 000E+01 * > OWIEWT R024 ' Weil pumping rate (m**3/yr) ' 2 500E+02 * 2 500E+02 * ' UW '' Weil pumping rate (m**3/yr) ' 2 500E+02 * 2 500E+02 * '' UW	R014 ³ Saturated zone hydraulic conductivity (m/yr)	3 5 530E+03 * 1 000E+02 *	* HCS2
R014 * Water table drop rate (m/yr) 1 0002-03 > 1 0008-03 > 1 0007 R014 * Weil pump intake depth in below water table) 4 6008+00 > 1 0008-01 > > 3001807 R014 * Weil pump intake depth in below water table) 4 6008+00 > 1 0008-01 > > 3001807 R014 * Weil pump intake (m**3/yr) 3 2 5008+02 > > 0008-01 > R014 * Weil pumping rate (m**3/yr) 2 2 5008+02 > > 000			
R014 Well pump intake depth in below water table) 4 600E+00 * 1 000E+01 * * OWIEWT R014 Well pumping rate (m**3/yr) * 2 500E+02 * 2 500E+02 * * OW R014 Well pumping rate (m**3/yr) * 2 500E+02 * 2 500E+02 * * OW			
R024 ' Model Nondispersion (ND) or Mass-Balance (NE) ' ND ' ND ' ' MODEL R014 ' Well pumping rate (m**3/yrl ' 2 500E+02 ' 2 50E+02 '			
R014 ; Well pumping rate (m**3/yr) ; 2 500E+02 ; 2 500E+000E+02 ; 2 500E+00E+02 ; 2 500E+02 ; 2 500E+0			
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KULS . NUMBER OF UNSALUTATED 2006 SCISIA 1 1 1 2 , NS			
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IFESRAD, Version 6 30 T* Limit = 0 5 year 03/02/2006 14 32 Page 4
Summary Tritium at 118-B-6 Waste Staging Area with Isrigation - Rural Residential Scena
File Run#2_116-B-6_Waste_Staging_Area_With_Irrigation RAD

Site-Specific	Par	ameter Su	uzhi	18 5	y (cont)	nued)			
C 3	3	User				•	Used by RESRAD	,	Parameter
Menu ^a Parameter	,	Input	з	Г	lefault	3 (1f	different from user input)		Name
ал		лаалалаа	٨A	AA	AAAAAAA	ААААА	алалалалалалалалалалалалалал	٨Ŵ	алаалаалалаа
RD15 ³ Cosat zone 1, thickness (m)	• 1	780B+01	з	4	0006+00	3	· · -		H(1)
R015 ' Oneat zone 1, soil density (g/cm**3)	ני	60DE+DO	3	I	500E+00	•		з	DRNSUZ(1)
RD15 ³ Unset zone 1, total porosity	2.4	000R-01	3	4	000E-01	3		3	TPUZ(1)
R015 ' Unsat zone 1 effective porceity	1 2	500B-D1	з	2	0006-01	,		з	EPUZ(1)
R015 ' Unsat zone 1, field capacity	• 1	500E-01	3	2	000E-01	•		з	FCU2(1)
RD15 ' Unsat zone 1, soil-specific b parameter	* 4	050B+00	з	5	300E+00	3			BOZ(1)
R015 ' Unsat zone 1, hydraulic conductivity (m/yr)	• 2	500E+D2	3	l	00GE+01	•		з	HCUZ(1)
3			3			a –		э	
R016) Distribution coefficients for H-3			3			•		3	
R016 * Contaminated zone (cm**3/g)	۵ ۵	000E+00	3	0	000E+00			3	DENUCE (1)
R016 ' Unsaturated zone 1 (cm**3/g)	1 0	CQ08+00	3	D	0008+00	3			DENJEU(1,1)
R016 * Saturated some [cm**3/g)	• 0	000E+00	1	0	0002+00	•		,	000000\$(1)
R016 ³ Leach rate (/yr)	3 Q	0008+00	3	D.	0006+00	3	3 9698-02	*	ALEACH (1)
R016 * Solubility constant	• 0	00DE+00	3	D	0 0 08+00	,	not used	з	SOLUER(1)
>	3		\$					7	
R017 * Inhalation rate (m**3/yr)	7 7	300 2+0 3	•	в	4008+03	,		3	INHALR
R017 * Mass loading for inhalation (g/m**3)	* 1	0008-04	2	l	0008-04	3		3	MLINH
R017 > Exposure duration	• 3	0002+01	3	3	0008+01	3		*	ED
R017 * Shielding factor, inhalation	2.4	0008-01	3	4	DODE-D1	,		3	SKF 3
R017 > Shielding factor, external gemme	· 6	0008-01	5	7	000E-01			¥	SHF1
R017 * Fraction of time spent indoors	3 6	0008-01	3	5	0008-01	3		3	FIND
R017 ¹ Fraction of time spent outdoors (on site)	* 2	000E-01	5	2	500E-01	*		3	P0T0
R017 * Shape factor flag, external gamma	3 1	0008+00	3	1	0008+00	3	>0 shows citcular ARBA	3	FS
R017 ' Radii of shape factor array (used if FS1)	4		,					3	
R017 > Outer annular radius (m), ring 1	3 R	ot used	3	5	000E+01	2		1	RAD_SHAPE(1]
R017 • Outer annular radius (m) ring 2	3 13	ot used	3	7	D71B+D1	>		3	RAD_SHAPE(2)
R017 ¹ Outer annular radius (m), ring 3	' г	ot used	3	0	000E+00	3		3	RAD_SKAPE(3)
R017 ' Outer annular radius (m), ring 4	מ י	ot used	3	a.	0008+00	>		3	RAD_SHAFE(4)
R017 🌯 Outer annular radius (m), ring 5	°л.	beeu jo	,	a.	0002+00	+		3	RAD_SHAPE(51
R017 ¹ Outor annular radius (m), ring 6	'л	ot used	3	0	000E+00	3		2	RAD_SHAPE(6]
R017 / Outer annular radius (m), ring 7	з ъ	ot used	3	a.	8002+00	3	-	3	RAD_SHAPE(7)
R017 * Outer annular radius (m), ring 8	° 1	ot used	•	ð.	000E+00	1		3	RAD_SMAPE(8)
RD17 ? Outer Annuler radius (m), ring 9	ъ	ot used	3	٥.	000E+00	3		3	RAD_SKAPE(9]
R017 * Outer annular radius (m), ring 10	1 n	beer to	7	σ	0008+00	3		3	RAD_9HAPE(10)
RQ17 ³ Outer annular radius (m), ring 11	зд	ot used	э.	Q.	00+3000	3			RAD_SHAPE(11)
R017 - Outer annular radrus (m) ring 12	з ń	oĽ u≴eđ	,	α.	0008+CD	3		3	RAD_SHAPE(12)
د	3					3		3	

Site-Specific	Parameter S	azmen	ary (cont	inued)		
D ,	• Veer	,	-	• Used	by RESRAD	¹ Parameter
Menu * Parameter	Input	3	Default	' If different	from user input	¹ Name
ኯኯኯኯቚቚ፞ኯ ኯኯኯኯኯኯኯኯኯኯኯኯኯኯኯኯኯኯኯኯኯኯኯኯኯኯኯኯኯኯ	алаалалалаал	AAA.	алалалаа	алааалалалалалал	алалалалаалалааа	алалалалалала
R017 * Fractions of annular areas within AREA	,	3		3		3
R017 * Ring 1	* not used	3	1 0 00E+D0	,		¹ FRACA(1)
R017 7 Ring 2	» not used	3	2 7328-01	•		FRACA(2)
RO17 * Ring 3	³ not used	3) DOD 8 +00	د		¹ FRACA (3)
R017 * Ring 4	' not used	•	000E+DO	•		FRACA(4)
R017 ' R10g 5	> not used	3	3 0008+00	•		PRACA(5)
R017 * Ring 6	* not used	3	1 000E+DO	,		¹ FRACA (6)
RD17 · Ring 7	' not used	ر د	000E+00	د		PRACA (7)
R017 * R109 B	* not used	3	0008+00	,		¹ FRACA (B)
RQ17 3 Ring 9	¹ not used	. • •	000E+DQ			PRACA(9)
RO17 * Ring 10	¹ not used	3 1	0008+00	,		* FRACA(10)
R017 * Ring 11	¹ not used		000E+00	•		PRACA (11)
R017 * Ring 12	¹ not used	3 1	0008+00	د		* FRACA (12)
1	,	,		3		3
ROIB ' Fruits, vegetables and grain consumption (kg/yt)	³ 1 1006+02	. a :	1 600E+02	د		' DIET(1)
R018 'Leafy vegetable consumption (kg/yr)	3 Z 700E+D0	1 1	1 4008+01	3) DIET(2)
R018 ³ Milk consumption (L/yr)	' 1 000E+D2		200E+D1	+		DINT(3)
ROIB ' Meat and poultry consumption (kg/yr)	3 600E+01	, د	5 300E+01	,		DIET(4)
R018 * Fish consumption (kg/yr)	1 970E+D1		5 400B+D0	3		DIFT(S)
2018 ³ Other saafood consumption (kg/yr)	3 9 000E-01	, a ;	000E-01	3		DIET(6)
ROIS Soil ingestion rate (g/yr)	3 7 30DE+D1	3	3 650B+D1	3		, SOIL
R018 ³ Drinking water intake (L/yr)	* 7 300E+D2		5 100E+02	3		7 DNI
R018 * Contamination fraction of drinking water	3 1 00DE+00	3	L 0006+00	1		FDW
R018 ^o Contamination fraction of household water	I not used	. e (L 0008+00	3		3 PHEW
R018 ³ Contamination fraction of livestock water	3 1 000B+00	3	L 000E+00	1		, FLW
R018 * Contamination fraction of irrigation water	7 1 00DE+00					FIRM
R018 ³ Contamination fraction of aquatic food	• 5 000E-01					, FR9
R018 * Contamination fraction of plant food	3-2	٠. «	L	з D 2.		FPLANT
R018 ¹ Contamination fraction of meat	₹-1	3-3	L		• ·	FMEAT
R018 > Contamination fraction of milk	<u>-1</u>	- -				* FMILX
1	, -	3	-	1		3
R019 ³ Livestock fodder intake for meat (kg/day)	* 6 800E+01	• •	600E+01	,	:	· LF15
RD19 * Livestock fodder intake for milk (kg/day)	3 5 50DE+01					* LF16
R019 ' Livestock water intake for meat (L/day)	* 5 000E+01					2 LWI5
R019 ¹ Livestock water intake for milk (L/day)	> 1 600€+02					• LW16
R019 ' Livestock soil intake (kg/day)	* 5 0D0E-01					LSI
R019 ' Mass loading for foliar deposition (g/m**))	* 1 000E-04					MLFT
R019 ' Depth of soil mixing layer (m)	3 1 500E-01					, DW
R019 ' Depth of roots (m)	* 9 000E-01					DROOT
R019 ' Drinking water fraction from ground water	> 1 000E+00					FONDW
R019 ' Household water fraction from ground water	' not used					FGMHH
R019 ° Livestock water fraction from ground water	* 1 000E+00					PGWLW
2019 7 Irrigation fraction from ground water	3 1 000E+00					FGWIR
i i i i i i i i i i i i i i i i i i i	1 0002,000	, '	~~~B+04	,		- POWIK
R19B > Wet weight crop yield for Non-Leafy (kg/m+*2)	> 7 0D0E-01	, ·	0008-01			· · YV(1)
R19B * Wet weight crop yield for Leafy (kg/m**2)	> 1 500E+0D					, XA(3) XA(3)
R193 * Wet weight crop yield for Podder (kg/m**2)	3 1 100E+00		+ -			
	· 1 700E+00					, AA(3) AA(3)
R19B * Growing Season for Non-Leafy (years) R19B * Growing Season for Leafy (years)	· 2 500E-01					' TE(1)
R19B 'Growing Season for Leafy (years) R19B 'Growing Season for Fodder (years)	3 000E-01					¹ TE(2)
arse - drawing season for robber (years)	- 0 0000-02	- (0002-04	-		• TE(3)

1RESRAD. Version 6 30 T* Limit = 0 5 year 03/02/2006 14 32 Page 6 Summary Tritium at 118-8-6 Waste Staging Area with Trigation - Rural Residential Scena File Run#2_118-8-6_Waste_Staging_Area_with_Irrigation Ran

Site-Spacific	Parameter Summary (continued)	
0 ,	JUSer JUSed by RESRAD	³ Parameter
Menu ¹ Parameter	' Input ' Default ' (If different from user input)	 Name
алалайалалалалалалалалалалалалалалалала	алалалалалалалалалалалалалалалалалалал	аллалалалалала
R198 ³ Translocation Pactor for Non-Leafy	* 1 000E-01 * 1 000E-01 *	7 TIV(1)
R19B * Translocation Factor for Leafy	1 DODE+DO > 1 DDOE+QD >	• TTV(2)
R19B ' Translocation Pactor for Fodder	* 1 000E+00 * 1 0D0E+00 *	* TTV(3)
R19B ³ Dry Poliar Interception Fraction for Non-Leafy	, 2 200E-01 , 3 200E-02 ,	* RDRY (1)
R198 ' Dry Foliar Interception Fraction for Leafy	2 50DB-D1 2 500B-01 3	* RDRY(2)
R198 ' Dry Foliar Interception Fraction for Fodder	• 2 500E-01 • 2 500E-01 •	* RDRY (3)
R19B ' Wet Foliar Interception Fraction for Non-Leafy	2 5008-D1 2 500E-02 2	RNET(1)
R19B * Wet Foliar Interception Fraction for Leafy	° 2 500E-01 ° 2 500E-01 °	> RWET (2)
R19B ' Wet Poliar Interception Praction for Podder	2 500E-01 2 500E-01 3	RHET(3)
R19B * Weathering Removal Constant for Vegetation	\$ 2 000E+01 \$ 2 0D0E+02 \$	> WEAM
3	נ נ	9
C14 * C-12 concentration in water (g/cm**3)	' dor used ' 2 DOOB-05'	C12WTR
C14 ³ C-12 concentration in contaminated soil (g/g)	• not used • 3 000E-02 •	• C12Cz
C14 > Fraction of vegetation carbon from soil	'not used ' 2 DOOB-02 '	, CROIF
Cl4 ³ Fraction of vegetation carbon from air	' not waed ' 9 800E-01 '	? CAIR
Cl4 ³ C-14 evasion layer thickness in soil (m)	* not used * 3 000E-01 *	* DMC
Cl4 * C-l4 evasion flux rate from soil (l/sec)	" not used " 7 D008-07 "	* EVSN
Cl4 ¹ C-12 evasion flux rate from soil (1/sec)	opt used * 1 000E-10 ،	> REVEN
Cl4 ³ Fraction of grain in heef cattle feed	, not need , 8 0008-01 ,	AVFG4
C14 Fraction of grain in milk cow feed	* not used * 2 DODE-D1 *	AVEG5
Cl4 ' DCP correction factor for gaseous forms of Cl4	* not used \$ 8 694E+01 \$	 CO2F
, , , , , , , , , , , , , , , , , , ,	3 1 3	,
STOR ³ Storage times of contaminated foodstuffs (days)	د د	3
STOR ' Fruits, non-leafy vegetables, and grain	» 1 4008+01 ° 1 4008+01 ° ···	STOR_T(1)
STOR ' Leafy vegetables	* 1 000E+GO * 1 000E+DO *	STOR_T(2)
STOR Milk	, 1 000E+00 , 1 000B+00 ,	* SIOE_T [3)
STOR * Meat and poultry	2 000E+01 3 2 000E+D1 3	' STOR_T(4)
STOR ' Pish	• 7 000E+00 • 7 000E+00 •	• STOR_T(5)
STOR ' Crustaces and mollusks	› 7 000E+0D › 7 000E+00 ›	' STOR_T(6)
STOR * Well water	, 1 050E+00 , 1 000E+00 ,	3 STOR_T(7)
STOR > Surface water	1 000E+00 1 000E+00 *	• STOR_T(8)
STOR * Livestock fodder	• 4 500E+01 • 4 50DE+01 • -	' STOR_T(9)
3	1 1	3
R021 ¹ Thickness of building foundation (m)	act used > 1 500E-01 >	• FLOOR1
R021 * Bulk density of building foundation (g/cm**3)	' not used ' 2 400E-00 '	1 DENSPL
RD21 ³ Total porosity of the cover material	, not used , 4 0002-01 ,	· TPCV
R021 ' Total porosity of the building foundation	' not used > 1 000E-01 '	' TEFL
R021 ' Volumetric water content of the cover material	* not used * 5 000E-02 *	PH2DOV
ROZ1 ³ Volumetric water content of the foundation	' not used ' 3 000E-02 '	, bhjolf
R021 ³ Diffueion coefficient for radom gas (m/sec)		2
RO21 ' in cover material	* not used * 2 000E-06 *	' DIPCV
R021 ' in foundation material	' not used > 3 000E-07 >	' DIFFL
R021 ' in contaminated zone soil	" not used " 2 000E-06 "	³ DIFÇZ
R021 * Radon vertical dimension of mixing (m)	, uat heed , 5 0006+00 ,	, BUIX
R021 ' Average building air exchange rate (1/hr)	' not used ' 5 000E-01 '	" REXC
R021 ³ Height of the building (room) (m)	' not used ' 2 5008+00'	' HRM
R021 * Building interior area factor	' not used ' D 0008+00 '	* FAI
R021 > Building depth below ground surface (m)	* not used *-1 000E+00 *	? DMPL
2021 ' Emanating cover of Rn-222 gas	' not used ' 2 5DOE 01 '	EMANA (1)
R021 * Emanating power of En-220 gas	* not used * 1 500E-01 ?	PMANA (2)
3	, 1 1	

1RE\$RAD, Version 6 30 Tw limit = 0 5 year 03/02/2006 14.32 Page 7 Summary - Tritium at 110-B-6 Waste Staging Area with Irrigation - Rural Residential Scena File : Run#2_118 E-6_Naste_Staging_Area_With_Irrigation.RAD

	Sat	s-Specific	Pare	ameter	ຽງມະຫນ	ary (cont	170edi			
0	3		,	User			,	Used by RESRAD	+	Parameter
Menu	* Parameter		3	Input		Detault	* (If	different from user 1	.nput) 🌯	Name
AAAA	адаалалалалалалалалалалалалалалалалалал	araraaraaa	aáaai	алалала	aaaa	алалалал	aaaaaa	алалалалалалалалалалалал	AAAAAAAA	алаалалалал
TITL	* Number of graphical time points			64	•					APTS .
TITL	> Maximum number of integration points f	for dose	3	9	,		,		> I	YMAX
TITL	? Maximum number of integration points f	or risk		33	•		,		יי	YMAX
īitti	irfifitfitfitfitififififitititfititfiti	ifftfftiir	ftfi	itiri if	firi	iiistiiti	fjitfr:	fitfitijiitijfitijitiii	fztfftff	tiffiffiff

Summary of Pathway Selections

Pethway	 User Selection 				
алалалалалалалалалалалалалалал	алалалалалалалалала				
l -· external gamma	Bottve				
2 inhalation (w/o radon)	active				
3 plant ingestion	> ective				
4 meat ingestion	' active				
5 milk ingeetion) 9001V8				
6 aquátic foods) active				
7 drinking water	' active				
8 - soil ingestion	¹ ective				
9 radon	 suppressed 				
Find peak pathway doses	¹ active				
<u>íttftíftítttftítiffiftíttíttíttittittittittittittittitti</u>					

RESRAD INPUT PARAMETERS FOR THE BCL STOCKPILE (OVERBURDEN) -- RADIONUCLIDES

IRESRAD, Version 6.30 T* Limit = 0.5 year 03/02/2006 14:26 Page 1
Summary : Tritium at L18-B-6 Waste Staging Area with Irrigation - Rural Residential Scena
File : Run#3_118-B-6_BCL_stockpile_With_Irrigation.RAD

Dose Conversion Factor (and Related) Parameter Summary Site-Specific Parameter Summary Summary of Pathway Selections	2 3 7
Contaminated Zone and Total Dose Summary	B
Total Dose Components	
Time = 0.000E+00	9
Time = 1.000E+00	10
Time = 3.0008+00	11
Time = 7.000B+00	12
Time = 1.200E+01 ,	13
Time = 2.760E+01	14
Time = 4.500B+01	15
Time = 1.000E+02	16
Time = 3.000E+02	17
Time = 1.000E+03	18
Dose/Source Ratios Summed Over All Pathways	19
Single Radionuclide Soil Guidelines	19
Dose Per Nuclide Summed Over All Pathways .,	20
Soil Concentration Par Nuclide	20

IRESRAD, Version 6.30 T* Limit = 0.5 year 03/02/2006 14:26 Page 2
Summary : Tritium at 119-B-6 Waste Staging Area with Irrigation - Rural Residential Scena
File : Run#3_118-B-6_BCL_Stockpile_With_Irrigation.RAD

Dose Conversion Factor (and Related) Parameter Summary File: MEAST 2001 Morbidity

		r -				
¢	3	3	Current	з	Parameter	
Menu	Parameter	3	Value	а	Default ³ Name	
AAAA	айлалалалалалалалалалалалалалалалалалал	٩AĂ	алаааааааа	AÅ/	алаалалалалалалалалалалал	4
B-1	Pose conversion factors for inhalation, mrem/pCi:	а		ð	3	
B-1	• н-3	7	6.400E-08	3	6.40DE-08 * DCF2(1)	
	3	3		3	3	
p-1	Dose conversion factors for ingestion, mrem/pCi:	3		3	3	
D-1	• H-3	з	6.400E-08	3	6.400E-08 * DCF3(1)	
	1	3		9	9 E	
D-34	³ Food transfer factors:	3		3	ذ	
D-34	³ H-3 , plant/soil concentration ratio, dimensionless	3	4.800E+00	3	4.800E+00 3 RTF(1,1)	
D-34	³ H-3 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	4	1.200E-02	3	1,200E-02 3 RTF(1.2)	
D-34	¹ H-3 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3	1.000E-02	3	1.00DE-02 ° RTF(1.3)	
	*	3		3	3	
D-5	³ Bioaccumulation factors, fresh water, L/kg:	3		3	3	
Ď-5	Ϋ́H-3 , fish	3	1.000E+00	3	1.000E+00 3 BIOFAC(1,1)	
D5	³ H-3 , crustacea and mollusks	3	1.000E+00	3	1.000E+00 3 BIOFAC(1,2)	
ÍÍÍ:	tıffffffffffffffffffffffffffffffffffff	ÍÍI	íiííííííí	íŢį	fiiiiiiiiiiiiiiiiiiiiiiiiiiiiii	t

 IRESRAD. Version 6 30
 T* Limit = 0 5 year
 03/02/2006 14 26 Page 3

 Summary
 Tritium at 118-8-6 Waste Staging Area with Irrigation - Rural Residential Scena

 File
 Run#3_118-8-6_BCL_Stockpile_With_Irrigation RAD

	pacific Parameter Summary		
0 ,	₹ User P	* Used by RESRAD	¹ Parameter
Menu ? Parameter		IIf different from user input)	
ал			
R011 ³ Area of contaminated zong (m ⁺ [*] 2)	• 1 492E+03 • 1 000E+04		AREA
R011 * Thickness of contaminated zone (m)	3 4 600E+DO 3 2 0D0E+00		J THICKO
R011 ' Length parallel to aquifer flow (m)	* 2 180E+01 * 1 00DE+D2		1 LCZPAQ
RD11 > Basic radiation dose limit (mrem/yr)	> 1 500E+01 - 2 500E+01		' BRDL
R011 * Time since placement of material (yr)	> 0 000E+00 7 D 0D0E+00		' TI
ROll ' Times for calculations (yr)	1 000E+00 1 000E+00		7 T(2)
RO11 · Times for calculations (yr)	3 DODE+DO 3 3 ODOE+OO		¹ T(3)
RO11 ³ Times for calculations (yr)	* 7 000E+00 * 1 000E+01		¹ T(4)
ROll ' Times for calculations (yr)	1 200E+D1 3 000E+01		• T(5)
	• 2 760E+01 • 1 000E+02		¹ T(6)
ROll ¹ Times for calculations (yr)	³ 4 500E+01 ³ 3 000E+02		· T(7)
R011 ' Times for calculations (yr)	³ 1 DODE+D2 ³ 1 ODOE+03		* T(8)
R011 ³ Times for calculations (yr) R011 ³ Times for calculations (yr)	3 000E+02 * 0 000E+00 3 1 000E+03 * 0 000E+00		7 T(9)
XVII · TIMPE for calculations (yr)	, 1 DADE+D3 - D ADAE+QA		* T(10)
		•	-
R012 ' Initial principal radionuclide (pCi/g) H-3	2 3905+02 > 0 000E+00		• S1(1)
R012 Concentration in groundwater (pCi/L) H-3	inctused i D 0005+00	·	³ W1(1)
_			,)
R013 ' Cover depth (m)	* 0 0002+00 * 0 D002+0D		* COVERÔ
R013 * Genericy of cover material (g/cm**3)	• not used • 1 500E+00		* DENSCV
R013 ' Cover depth erosion rate (m/yr)	' not used ' 1 000E-03		* VCV
R013 * Density of contaminated zone (g/cm**3)	7 1 6008+00 > 1 5008+00		DENSCZ
RD13 ³ Contaminated zone erosion rate (m/yz)	* 0 000E+C0 ' 1 000E-03		' VCZ
R013 * Contaminated zone total porosity	4 000B-01 3 4 D008-01		A LECS
R013 ' Contaminated zone field capacity	• 1 500E-01 • 2 000E-01		3 FOCZ
R013 > Contaminated zone hydraulic conductivity (m/yr)			* HCCZ
R013 ¹ Contaminated zone b parameter	* 4 050E+00 ' 5 300E+00		, BC2
R013 * Average Addug2 wind Speed (m/set)	3 400E+00 3 2 000E+00		* WIND
ROI3 ' Humidity in air (g/m**3)	> 6 000E+0D 3 8 D00E+00		* HUNID
R013 ' Evapotronspiration coefficient	• 9 100E-01 • 5 000E-D1		* EVAPTE
ROI3 ³ Precipitation (m/yr)	* 1 600g-01 * 1 000g+00		* PROCIP
R013 ' Irrigation (m/yr)	• 7 6DOB-01 • 2 DODE-D1		, kI
R013) Irrigation mode	• overhead • overhead		> IDITCH
R013 / Runoff Coefficient	2 000B-01 3 2 000B-01		* RUNOFF
R013 ' Watershed area for nearby stream or pond (m**2)			WAREA
R013 Accuracy for water/Soil computations	3 000E-03 1 000E-03		* EPS
2014) Barantes of anti-state (-1		•	, , , , , , , , , , , , , , , , , , , ,
R014 ' Density of seturated zone (g/cm**3)	<pre>> 1 600E+00 > 1 500E+00</pre>		* DEN(SAC
R014 ' Saturated zone total porosity	3 4 DOOB-01 3 4 OODE-01		1 TPSZ
R014 > Saturated zone effective percentry	* 2 500E-01 * 2 000E-01		1 EP52
R014 > Saturated zone field capacity	³ 1 500E-01 ³ 2 000E-01		FCSZ
R014 * Saturated zone hydraulic conductivity (m/yr)	³ 5 530±+03 ³ 1 000±+02		, BCSZ
R014 > Saturated zone hydraulic gradient	* 1 250E-03 * 2 000E-02		1 HOWT
R014 > Saturated zone b parameter	¹ 4 05D2+00 ¹ 5 3D0E+00		BS2
R014 * Water table drop rate (m/yr)	* 1 000E-03 * 1 000E-C3		1 VWT
RD14 > Well pump intake depth (in helow water table)	, 4 000E+00 , 1 000E+01	-	DWIEWT
R014 * Model Nondispersion (ND) or Mass-Balance (MB)	MD		3 NODEL
R014 ' Weil pumping rate (m**3/yr)	* 2 500E+02 * 2 500E+02		אטי
		·	
R015 ' Number of unseturated zone strata	• 1 • 1		* NS

IRESRAD, Version 6 30 T* Limit = 0 5 year 03/02/2006 14 26 Page 4
\$ummary Tritium at 118-B-6 Waste Staging Area with Trigation - Ruzal Residential Scena
File Run#3_118-B-6_2CL_Stockpile_With_Irrigation RAD

Sate-Specific	Parameter	Samma TV	[contarmed]
orce-opecarae	reramerer	activity.	10000 Lange Lang

	c Perameter Summary (continued)	
0,	• User • • • Used by RESRAD	Parameter
Menu ? Parameter	Input ' Default ' (If different from user input	
	ал	
R015 'Unsat zone 1, thickness (m)	1 780B+01 1 4 000E+00	• H(1)
R015 ' Dnsat zone 1, soil density (g/cm**3)	1 600E+0D 1 500E+DO >	³ DENSUZ (1)
R015 ' Unsat zone 1. total porosity	' 4 000E-C1 ' 4 000E-D1 '	• TPUZ(1)
R015 * Unsat zone 1, effective porosity	2 500E-01 2 000E-01	 EPUZ (1)
R015 * Unsat zone 1. field capacity	' 1 500E-01 ' 2 DODE-D1 '	³ FCUE(1)
R015 'Unsat zone 1, soil-specific b paramoter	4 050E+00 3 5 300E+00 3	' BUZ(1)
R015 > Unsat zone 1, hydraulic conductivity (m/yr)	2 500E+02 1 DOOE+01 2	ំ HCU2(1)
د	1 1 1	3
R015 > Distribution coefficients for H-3	1))	•
R016 ⁴ Contaminated zone (cm**3/g)	• 0 000E+00 • 0 30DE+GO •	* DCMDCC(2)
RD15 > Unsaturated zone 1 (cm**3/g)	, 0 000£+00 , 0 000 £+20 ,	 DCNUCU(1,1)
RD16 * Saturated zone (cm**3/g)	• D DGOE+OD • O DODE+DO >	P DONUCS(1)
R015 ¹ Leach rate (/yr)	, 0 000E+00 , 0 000E+00 , 8 969E-05	* ALEACH(1)
RD16 > Solubility constant	, 0 0008+00 , 0 0008+00 , vor fraeg	, aornak(j)
1	1 1 7	3
RD17 ³ Inhalation rate (M**3/yr)	° 7 3008+03 ° 8 4008+03 ° ~-	INHALR
RD17 * Mass loading for inhalation (g/m**3)	' 1 DOOE-04 ' 1 CODE-04 '	* NLINH
R017 ' Exposure duration	• 3 000E+01 • 3 000E+01 •	7 ES
RD17 ³ Shielding factor, inhaletion	3 4 00DB-D1 3 4 00DE-01 3	* SHF3
R017 ' Shielding factor, external gamma	* 8 000E-01 * 7 000E-01 *	' SHF1
RQ17 ³ Fraction of time spent indoors	, 000E-01 , 2 000E-01 ,	· FIND
R017 ' Fraction of time spent outdoors (on site)	• 2 GODE-D1 • 2 SOOE-G1 •	> FOLD
R017 ⁹ Shape factor flag, external gamma	, $0.00E+00$, $0.00E+00$, >0 shows circular AREA	" (°S
R017 ? Radii of shape factor array (used if FS = -1)	7 7 1	3
R017 * Outer annular radius (m), ring 1	• not used • 5 000E+01 •	? RAD_\$HAPE(1)
RG17 3 Outer annular radius (m), ring 2	<pre>> not used > 7 0718+01 *</pre>	* RAD_SHAPE(2)
R017 🐐 Outer annular radius (m), ring 3	* not used * 0 0008+00 *	RAD_SHAPB(3)
R017 ³ Outer annular radius (m), ring 4	• πot used • 0 000E+00 •	RAD_SHAPE(4)
R017 > Outer annular radius (m), ring 5	' not used ' D 0000+00 '	RAD_SHAPE(5)
R017 * Outer annular radius (m), ring 6	" not used " 0 000E+00 "	> RAD_SHAPB(6)
R017 ³ Outer annular radius (m), ring 7	• not used • 0 000E+00 ·	RAD_SHAPE(7)
Rôl? > Outer annular radius (m), ring 6	* not used > D 0D02+00 *	* RAD_SHAPE(8)
R017 * Outor annular radius (m), ring 9	* not used * 0 000E+00 *	* RAD_SHAPE(9)
RO17 > Duter annular radius (m), ring 1D	not used > 0 0008+00 *	* RAD_SHAPE(10)
R017 * Outer annular radius (m), ring 11	' not used ' D 000E+00 '	RAD_SHAPB(11)
2017) Outer Annular radius (m), ring 12	• not used • 0 000€+00 •	* RAD_SHAPE(12)
•	۲ ۶ ۶	3

IRESRAD.	Version 6 30 Tw Limit = 0 5 year	03/02/2006 14 26 Page 5
Summary	 Tritium at 118-8-6 Waste Staging Area w: 	ith Irrigation - Rural Residential Scena
File	Ron#3_119-B-6_BCL_Stockpile_With_Irright	tion RAD

Site-Specific	: Parameter 9	ວັນສາຫລ	ry (cont	1 nued)		
د <u>0</u>	ہ Oser				y RESRAD	Parameter
Neou Parameter	' Input	з	Default		from user input) 🎙	
алалабалалалалалалалалалалалалалалалала	AAAAAAAAAAAAA	aaaa	AAAAAAAA	ая́аалаалаалаалаала	аалалалааалалалаа	AAAAAAAAAAAAAAAA
R017 ' Fractions of annular areas within AREA	,	3		3		
R017 * R1ng 1	' not used	• 3	. 000E+DG	s –	د	FRACA (1)
R017 * Ring 2	not used	- a - 2	: 732 6 01	· -	*	FRACA [2]
Rôl7 V Ring 3	' not used	э (0005+00	3	4	FRACAL 31
R017 ^o Ring 4	not used د		000E+0C			FRACA (4)
R017 * Ring 5	? not used		0005+00			FRACA (S)
R017 * Ring 6	 not used) 000 8+0 0		د	PRACAL 61
9017 3 Ring 7	' not used		0048+00			FRACA (7)
R017 * Ring B	* not used					FRACA I 81
R017 Bing 9	' not used		0008+00			FRACA 91
R017 * Ring 10	' not used					FRACA(10)
R017 * Rang 11	' not used	-				PRACA (11)
RD17 3 Ring 12	¹ not used		0006+00			FRACA 12
-				3	د .	
RD18 ' Fruits, vegetables And grain consumption (kg/yr)						DIET(1)
R018 · Leafy vagetable consumption (kg/yr)	? 2 700B+00					DIFT(2)
R018 ' Milk consumption (L/yr)	* 1 000E+02					DIET(3)
RD18 ' Meat and poultry consumption (kg/yr)	3 6006+03					DIET(4)
R016 ' Fish consumption (kg/yr)	* 1 970E+0					DIET(5)
R01B ¹ Other seafood consumption (kg/yr)	9 000E-01					DIET(6)
R016 ³ Soll ingestion rate (g/yr)	7 300E+02					SOLL
R018 ' Drinking water intake (L/yr)	* 7 300E+02					DW1
R018 ' Contamination fraction of drinking water	> 1 000E+Q(FIN
R018 • Contamination fraction of household water	Deau Jon *					PHIM
R018 ³ ContaminAtion fraction of livestock water	> 1 000€+00					PLW
R019 * Contamination fraction of irrigation water	* 1 000E+00					FIRW
R018 ³ Contamination fraction of aquatic food	> 5 000E-01 →-1	1-1				FR9
R018 > Contamination fraction of plant food R018 > Contamination fraction of meat	₹-1 ₹-1	1-1	-	4 44	• 002+00 • 6E-D1	FPLANT
A018 > Contamination fraction of meac	a-1	1-1				
	3	1			د 10–40	PMILK
R019 • Givestock fodder intake for meat (kg/day)	* 6 800E+01		6000.01			LF15
R019 - Givestock Focker intake for milk (kg/day)	3 5 500E+01					LPIS
R019 * Livestock water intake for meat (L/day)	+ 5 000E+01	-				
RD19 > Livestock water intake for milk (L/day)	3 1 600B+02					LWIS LWIG
R019 * Livestock soil intaks (kg/day)	3 5 DOOL-01					LSI
R019 ¹ Mass loading for foliar deposition (g/m**3)	3 1 000E-04					MLFD
RD19 ' Depth of soil mixing layer (m)	> 1 500g-01					DN
R019 ' Depth of roots (m)	· 9 000E-01					DROOT
R019 ³ Drinking water fraction from ground water	1 000E+00					FGNDW
R019 ' Household water fraction from ground water	' not used					FGWHH
R019 ' Livestock water fraction from ground water	1 000E+00					FGNLM
RG19 ¹ Irrigation fraction from ground water	3 1 DGOE+00					FGWIR
·····	3	, `		,	د	10111
R198 ¹ Wet weight crop yield for Non-Losfy (kg/m [*] 2)	• 7 000E-01		0008-01	• _	,	YV (1)
R19B ' Wet weight crop yield for Leafy (kg/m**2)	3 1 500B+0{					YV(2)
R198 "Wet weight crop yield for Fodder (kg/m**2)	• 1 100E+01					YV(3)
R19B ' Growing Season for Non-Leafy (years)	1 700x-01					TE(1)
R19B ' Growing Season for Leafy (years)	2 50DE-DI					TE(2)
R19B ' Growing Season for Fodder (years)	· 8 000E-02					TE(3)

1RESRAD, Version 6 30 Tw Limit = 0 5 year 03/02/2006 14 26 Fage 6 Summary Tribium at 118-B-5 Waste Staging Area with Irrigation - Rural Residential Scena File Run#3_118-B-6_BCL_Stockpile_With_Irrigation RAD

Site-Specific	c Parameter Summary (continued)	
D 3	1 User 3 Used by RESRAD	Parameter
Menu * Parameter	> Input > Default ' (if different from user input)	Name
	<i>че</i> лалалалалалалалалалалалалалалалалалала	
R19B * Translocation Factor for Non-Leafy		• TIV(1)
R19B ² Translocation Factor for Leafy		• TIV(2)
R198 ? Translocation Pactor for Fodder		" TIV(3)
R19B * Dry Foliar Interception Fraction for Non-Leafy		<pre>RORY(1)</pre>
R19B ' Dry Poliar Interception Praction for Leafy		7 RDRY (2)
R198 * Dry Foliar Interception Fraction for Fodder		RDRY(3)
R19B ' Wet Foliar Interception Fraction for Non-Leafy		> RWET [1]
R19B ' Wet Foliar Interception Fraction for Leafy		* RMET (2)
R19B ' Wet Foliar Interception Fraction for Fodder		* RWET(3)
R19B > Weathering Removal Constant for Vagetation		• WLAM
-		3
Cl4 ³ C-12 concentration in water (g/cm ^{**} 3)		C12WDR
C14 ' C-12 concentration in contaminated soil (0/0)		* c12cz
C14 ' Fraction of vegetation carbon from soil		, CSOIP
Cl4 ³ Praction of vegetation tarbon from air		• CAIR
C14 ° C-14 evasion layer thickness in soil (m)		, Ш9С
C14 ³ C-14 evasion flux rate from soil (1/sec)		> EVEN
Cl4 ' C-12 evasion flux rate from soil (1/sec)		REVSN
C14 * Fraction of grain in beef cattle feed		> AVPG4
Cl4 ? Fraction of grain in milk cow Feed		* AVEG5
Cl4 * DCF correction factor for gaseous forms of Cl4		• CO2F
-		3
STOR * Storage times of contaminated foodstoffs (days)	5 3 5 5 10 - 1 - 1 - 1 - 1 - 1 - 1	1
STOR ' Fruits, non-leafy vegetables, and grain		'STOR_T 1}
STOR ' Leafy vegetables		* STOR_T12}
STOR * Kilk		> STOR_T131
STOR ' Meat and poultry		* STOR_14}
STOR * Fish		" STOR_T(5)
STOR ' Crustaces and mollus)s STOR ' Well water		' STOR_T(6)
		* STOR_T(7)
STOR ^a Surface water STOR ^a Livestock fodder		¹ STOR_TIB)
STOR ' Livestock fodder	³ 4 500E+01 * 4 500E+01 *	1 STOR_T(9)
*		
R021 ¹ Thickness of building foundation (m)		> FLOOR L
R021 ¹ Bulk density of building foundation (g/cm ^{**} 3)		' DENSFL
R021 • Total porosity of the cover material		1 TPCV
R021 ' Total porosity of the building foundation R021 ' Volumetric water content of the cover material		> TPPL
		¹ PH2OCV
R021 ³ Volumetric water content of the foundation	not used * 3 000E-02 *	PH2OPL
R021 'Diffusion coefficient for radom gas (m/sec) R021 ' in cover material		
R021 * in foundation material	+-	, DIBAT
RD21 3 in contaminated zone soil		
R021 * Radon vertical dimension of mixing (m)		DIFCZ
R021 · Average building air exchange rate (1/br)		· HOLA
R021 > Height of the building (room) (m)		HRX HRX
RO21 * Building interior area factor		· FAI
RD21 > Building depth below ground surface (m)		DMFL
R021 * Emanating power of An-222 gas		"EMANA (1)
RD21 > Emanating power of Rn-220 gas		· EMANA (2)
ND21 - Emanating power of An-220 gas		3

IRESRAD, Version 6.30 T* Limit = D 5 year 03/02/2006 14.26 Page 7
Summary : Tritium at 113-B.6 Waste Staging Area with Irrigation - Rural Residential Scena
File · Run43_118-S-6_BCL_Stockpile_With_Irrigation RAD

Site-Specific Parameter Summary (continued)										
0	3		3	User	3		,	Used by RESRAD	1	Parameter
Kenu			7	Input				different from user input		Name
АЛЛАЛАЛАЛЛАЛЛАЛЛАЛЛАЛЛАЛЛАЛЛАЛЛАЛЛАЛЛАЛ										
TITL	Number of graphical time points		*	64			•		,	NPTS
TITL	Maximum number of integration points for	dosé	3	9	3		3		3	LYMAX
	Maximum number of integration points for			33			•			XYMAX
fițį	ıfıfıtiffiilititffitffitffitfitititititititi	fifiti	tı1t:	fittitt	iiifi	tfrífííir	frfiff	£fffffffffffffffffffffffffffffff	İÍII	111111111111111

Summary of Pathway Selections

Pachway		User	Selection
ararrarrarrarrarrarrarrarrarrarrar	alaas	محجج	лалалалалал
l external garra	3	a	CLIVE
2 … inhalation (w/o tadon)	ነት	а	ctive
3 plant ingestion	3		ictive
4 meat ingestion	1	a	ctive
5 milk ingestion	3	a	ictave
6 aquatic foods	2	a	ictavê
7 - drinking water	3	a	ctive
8 soil ingestion	3	a	ctive
9 rados	3	BUT	pressed
Find peak pathway doses	3		CTAVE
ritiitiifiifiifiifiiiiiiiiiiiii	rifíf	iitii	fitifitiriff

CVP-2006-00002 Rev. 0

RESRAD INPUT PARAMETERS FOR THE DEEP ZONE -- RADIONUCLIDES

CVP-2006-00002 Rev. 0 IRESRAD, Version 6.30 Tw Limit = 0.5 year 03/02/2006 14:37 Fage 1
Summary : Tritium at 118-B-6 Deep Zone with Trrigation - Rural Residential Scenario
File : Run#4_118-B-6_DZ_With_Irrigation.RAD

Dose Conversion Factor (and Related) Parameter Summary Site-Specific Parameter Summary Summary of Pathway Selections												
Contaminated Zone and Total Dose Summary												
Total Dose Components												
Time ≤ 0.000E+00	9											
Time = 1.000E+00	10											
Time = 3.000E+00	11											
Time = 7.000E+00	12											
Time = 1,200E+01	13											
Time = 2,760E+01	14											
Time = 4.500E+01	15											
Time = 1.000E+02	16											
Time = 3.000E+02	17											
Time = 1.000E+03	18											
Dose/Source Ratios Summed Over All Pathways	19											
Single Radiopuclide Soil Guidelines	19											
Dose Per Muclide Summed Over All Pathways	20											
Soil Concentration Per Nuclide	20											

1RESRAD, Version 6.30T< Limit = 0.5 year</th>03/02/200614:37Page2Summary : Tritium at 118-B-6 Deep Zone with Irrigation - Rural Residential ScenarioFile : Run#4_118-B-6_DZ_With_Irrigation.RAD

Dose Conversion Factor (and Related) Parameter Summary File: HEAST 2001 Morbidity

a.		J	Current	4	³ Parameter	
Menu	s Paraméter	د	Value	3		
				-		
AAAA	\^^^^^^^^	AA	aaaaaaaaaa	AA/	ааааааааааааааааааааааааааааа	,
B-1	³ Dose conversion factors for inhalation, mrem/pCi:	3		3	ذ	
B-1	эн-3	3	6.400E-08	3	6.400E-08 ³ DCF2(1)	
	ð	J		د	a	
D-1	* Dose conversion factors for ingestion, mrem/pCi:	J		٦	а	
P−1		J	6.400E-08	٦	6.400B-08 ³ DCF3(1)	
	3	3		3	3	
D-34	³ Food transfer factors:	3		3	٤	
D-34	³ H-3 , plant/soil concentration ratio, dimensionless	3	4.800E+00	3	4.800E+00 3 RTF(1,1)	
D-34	³ H-3 , beef/livestock-intake ratio, {pCi/kg}/(pCi/d)	3	1.2005-02	3	1.2006-02 ³ RTP(1,2)	
D-34	⁸ H-3 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	я	1.000E-02	1	1.000E-02 ³ RTF(1,3)	
	3	J		د	3	
₽-5	Bioaccumulation factors, fresh water, L/kg:	з		3	3	
10-5	νH-3 , fish	3	1.000E+00	3	1.000E+00 3 BIOFAC(1,1)	
D-5	* H-3 , crustacea and mollusks	3	1.000E+00	3	1.000E+00 3 BIOFAC(1,2)	
iííí	triffttttiffffttttiffttiififfftfiffttifftttifftfiffttiffttifftifftifft	ÍΙ	ifiiiiiiff	ÍI	íiíiiiííííííííííííííííííííííííííííííííí	

IRESRAD, Verbion 6 30 T* Limit = D 5 year 03/02/2006 14 37 Page 3
Summary Tritium at 118-2-6 Deep Zone with Irrigation - Rural Residential Scenario
File Run#4_118-8-6_D2_With_Irrigation RAD

91te-5	pocific Parameter Summary	
¢ +	' User ' Used by RESRAD	Parameter
Menu ³ Parameter	Input ? Default ? (If different from user input)	
R011 ' Area of contaminated zone (m**2)	лабалалалалалалалалалалалалалалалалалал	
RO11 ³ Thickness of contaminated zone (m ⁻²)	• 6 900Σ+00 • 2 000E+00 ·	AREA
		> THICED
R011 ' Length parallel to aguifer flow (m)		* LCZPAQ
R011 ' Basic radiation dose limit (mrem/yr)	* 1 500E+01 * 2 500E+01 *	, BBDL
ROll ' Time Since placement of material (yr)	• 0 000€+00 • 0 000E+00 •	• TI
R011 ' Times for calculations (yr)	' 1 000E+00 ' 1 DC0E+00 '	• T(2)
ROll ³ Times for calculations [yr]	• 3 000E+00 • 3 000E+00 •	3 T(3)
R011 ' Times for calculations (yr)	3 7 000E+00 3 1 DO0E+01 3	* T[4]
R011 3 Times for calculations [yr]	* 1 200E+01 ' 3 000E+01 '	3 T(5)
RD11 * Times for calculations (yr)	2 760E+01 3 1 000E+02 3	• T(6]
R011 ' Times for calculations (yr)	3 4 500E+01 3 DOOE+02 3	* TL 71
ROll ? Times for calculations (yr)	• 1 000E+02 • 1 000E+03 •	3 T(8]
R011 * Times for calculations (yr)	3 0D0E+02 * 0 00DE+0D *	' TI 9)
ROLL ' Times for calculations (yr)	* 1 000E+03 * 0 000E+00 *	· T(10)
\$	3 J J	1
R012 * Initial principal radionuclide (pC)/g) H-3	• 1 996E+03 • 0 000E+00 •	· S1(1)
R012 > Concentration in groundwater (pCi/L) H-3	<pre>' not used ' 0 000E+00 '</pre>	' W1(1)
a	د د ه	1
R013 ' Cover depth (m)	* 4 600E+00 * 0 000E+00 *	1 COVERO
R013 ' Density of cover material (g/cm**3)	> 1 600E+00 3 1 500E+00 3	PENSCV
R013 ' Cover depth erosion rate (m/yr)	• D 000E+0D • 1 00DE-03 •	1 VCV
Roll ' Density of contemnated zone (g/cm**3)	3 1 500E+00 3 1 500E+00 3	* DENSC2
R013 . Contaminated zone erosion rate (m/yr)	· > DODE+00 · 1 000B-03 ·	, ACZ
R013 3 Contaminated zone total porceity	, 4 000E-01 , 4 000E-01 ,	> TPCZ
R013 * Contaminated zone field capacity	³ 1 500E-01 ³ 2 CODE-01 ³	, ACCZ
R013 ³ Contaminated sone hydraulic conductivity (m/yr)		1 HCC2
R013 * Contaminated zone b parameter	1 6 854- 48 1 5 308- 46 1	BC2
R013 * Average annual wind speed (m/sec)	³ 4 0508+00 ³ 5 3008+00 ³	
		' WIND
R013 ³ Humidity in air (g/m ³ 3)	, 8 000E+00 , 8 000E+00 ,	' HUMID
RD13 * Evapotranspiration coefficient	9 100g-01 > 5 000g-01 >	EVAFTR
R013 * Precipitation (m/yr)	' 1 600E-D1 ' 1 000E+D0 '	PRECIP
RD13 ³ Irrigation (m/yr)	3 7 600B-01 3 2 000E-01 3	' RI
R013 * Irrigation mode	? overhead ? overhead ?	, IDILCH
AD13 > Runoff coefficient	, 2 000E-01 , 2 000E-01	1 RUNOFF
RD13 * WaterBhed area for nearby stream or pond (m**2)		* WAREA
R013 ' Accuracy for water/soll computations	* 1 000E-03 * 1 0D0E-03 *	° E62
3	נ נ נ	,
R014 ⁴ Density of saturated zone (g/cm**3)	7 2 600B+00 3 1 5D0B+00 3 ···-	* DENSAQ
R014 ³ Saturated zone total porosity	* 4 000E-01 * 4 000E-02 *	PPS2
R014 ' Saturated some effective poroaity	2 500E-01 ¹ 2 000E-01 ¹	* EPSZ
R014 ⁴ Saturated some field capacity	1 500B-01 3 2 DD0E-01 3	* FCSZ
R014 ¹ Saturated zone hydraulic conductivity (m/yr)	• 5 530E+03 • 1 000E+02 •	> HCS2
R014 ' Saturated zone hydraulic gradient	3 1 250E-03 3 2 D008-02 3	HGWT
R014 ³ Saturated zone b parameter	* 4 050E+00 * 5 300E+00 *	3 BSZ
R014 ' Water table drop rate (m/yr)	* 1 000E 03 * 1 000E 03 *	* VWT
R014 ' Well pump intake depth (m below water table)	* 4 600E+00 * 1 000E+01 *	INTENT
R014 ' Model Nondispersion (ND) or Mass-Balance (MB)	נ סדאני	* MODEL
R014 ' Well pumping rate (m**3/yr)	* 2 5D02+02 * 2 500g+02 *	* UM
i ser pumping race (mr. 5751)	3 6 6	,
R015 ' Number of unsaturated zone strata	»1 »1 »	" NS

Site-Specific	Davemaken	Currenter	(continued)
sice-specific	Parameter	Summery	(coaciavea)

	arce-apeurro					ary (cour			
ġ,				Jeer	÷		•	Used by RESRAD	Parameter
	arameter	3						(If different from user input)	
алалалалалалалалалалалалалалалал	алалалалалалалалалалалалалал							алалалалалалалалалалалалалалалал	Алалалалалалаа
R015 ^{>} Unsat zonę 1, tbicku	ese (m)	3	1 1	1008+D1	, s	4 000E+00	1	·	3 FC 11
R015 • Unsat zone 1, soil 🕸	ensity (g/cm**3)		1.6	500E+00	э ;	L 500E+00			DENSU2(1)
R015 * Unsat zone 1, total ;	porosity	3	4 (000E-01	۰.	4 000€-01			TPUZ (1)
R015 > Unsat zone 1 effect:	Lve porosity		2 5	500g-01	3.3	2 000g-01			2 DPUZ(1)
R015 ¹ Unsat zone 1. field (Capacity		1 5	500E-01	• ;	2 000E-01	•		* FCUZ (1)
R015 > Unsat zone 1, soil-s;		3	4 (050E+00	3	5 3008+00			3 BUZ (1)
R015 * Unsat zone 1. hydrau						1 0D0E+01			> HCU2 (1)
3					•		٠.		3
R016 > Distribution coefficie	ents for M-3	,			3		,		1
R016 ¹ Contaminated zone (am**3/4}	±	0 (000E+00	۱	000E+00	. a .		' DENUCC 1)
R016 ' Unsaturated zone 1	(cm**3/o)		D	0002+00	3 1	0 0002+00			> DCNUCU: 1.1)
R016 Sacurated zone (cm [*])						0 000E+00			· DENUCS(1)
R016 1 Leach rate (/yr)						0008+00			ALEACH(1)
R016 ' Solubility constant						DOGE+00			<pre>> SOLUBK(1)</pre>
)		3			1	r Dealton			1
R017 ' Inbalation rate (m**3)	turn	3	т ;	000.03	3	8 400E+D3	,		¹ DHEALR
- R017 * Mass loading for inhal						L 000E-04			* MLINH
R017 - Mass loading for Isma. R017 - Boposure duration	Tacion (g/m=-3/					000E+04			1 BD
R017 * Shielding factor, inh	1					000E401			, 2863 2
R017) Shielding factor, exte						7 000E-01			'SHF1
R017 * Fraction of time spent					-	5 QCOB-D1			1 LIND
R017 * Fraction of time spent					-	2 500E-01			' FOTD
RD17 ' Shape factor flag, ext			1 (1 QODE+DQ			¹ FS
R017 * Radii of shape factor					3		,		1
R017 ' Outer annuler zadius						5 00 05+01			' RAD_SHAPE(1)
RD17 * Outer annular radius						7 071 2 +D1			RAD_SHAPB(2)
R017 ¹ Outer annular vadius	a (m), ring 3	- a -	not	: used	• •	0008+00			RAD_SHAPE(3)
RD17 3 Outer annular radius	8 (m) ring 4	3	not	used :	, (1 00DE+D0			RAD_SHAPE(4)
R017 * Outer annular radius	s (m) ring 5	•	not	. used	" (1 OODE+OO	3		* RAD_SHAPE(5)
R017 ¹ Outer annular radius	s (m) zing 6	3	not	: used	• (000E+00			'RAD_SHAPE(6)
R017 ¹ Outer Annular radius	s (m), ring 7	3	лat	used :	з (0008+00	,	-	1 RAD_SHAPE(7)
R017 ' Outer annular radius	s (m) ring 8		not	used	, (0002+90	,		1 RAD_SHAPE(8)
R017 ¹ Outer angular radius	; (m) ring 9	з.	not	used) د	0008+00	3		' RAD SHAPE(9)
R017 ' Outer annular radius	a (m), ring 10	7	лоі	used	7 (0002+00	•		RAD SHAPB(10)
R017 ' Outer angular radius	–					0008+00			RAD_SHAPE(11)
R017 ' Outer annular radius						0008+00			1 RAD_SHAPE(12)
د	· · · ·	_ a _			•		Ŧ		,

 IRESRAD, Version 6 30
 Tw Limit = 0 5 year
 03/02/2005
 14 37
 Page 5

 Summary
 Triblum at 118-8-6 Deep Zone with Irrigation - Rural Residential Scenario Filo
 Run#4_118.8-6_02_With_Irrigation RAD

	Site-Specific			ary (e					
D	1	, Deer	•				by RESRAD	,	Farameter
Menu		' Input	1 	Defay	ple) (If differen	t from user	input)	Name
	AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA	3 3	4444 1	AAAAAA		AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA	AAAAAAAAAAAAA	AAAAAAAA `	алалалалалала
RD17	' Fractions of annular areas within AREA	-		1 0 0DE		-			
R017		' not used							FRACA(1)
R017	-	' not used ' not used		2 732E					PRACA(2)
RD17				0 000e 0 000e					FRACA(3)
R017		' not used ' not used		0 000E					FRACA(4)
RD17		' not used		0 000E					FRACA(5) FRACA(6)
R017		¹ not used		0 000E					PRACAL 6)
R017	-	' not used		0 000P					FRACAI 8)
RD17		¹ not used		0 000E					PRACA(9)
R017		' not used		0 000E					FRACA(10)
R017		¹ not used		0000					FRACA(11)
R017	*	' not used							FRACA (12)
10011	3	3	· .						
RÚ 18	* Fruits, vegetables and grain consumption (kg/yr)	· 1 1008+0	2.3	6005	R+02	•		3	DIET(1)
	* Leafy vegetable consumption (kg/yr)	2 70DB+0							DIE7(2)
	<pre>> Milk consumption (L/yr)</pre>	, 1 000E+0							DIET(3)
	* Meat and poultry consumption (kg/yr)	3 500B+0							DIET(4)
	* Fish consumption (kg/yt)	* 1 970E+0							DIET(5)
	Other seafood consumption (kg/yr)	- 9 000E-0							DIET(6)
	' Soil ingestion rate (g/yr)	7 3DOB+0							SOIL
	¹ Drinking water intake (L/yr)	> 7 300E+0							bwī
	Contamination fraction of drinking water	7 1 000E+0							FDW
	¹ Contamination fraction of household water	* not used							FMEN
	' Contamination fraction of livestock water	3 1 000E+0							FLW
	¹ Contamination fraction of irrigation water	* 1 0DOE+0					·		FIRM
	' Contamination fraction of Aquatic food	3 5 000E-0							PX9
	' Contamination fraction of plant food	·-1	- ı_;				280B • 01		FPLANT
	³ Contamination fraction of meat	≖ -1	· • - :	-		-	280B-D2		FNEAT
	' Contamination fraction of milk	3-1	1_1	-	2		2808-02		PMILX
	د			•	1			,	
R019	³ Livescock fodder inteke for meat (kg/day)	• 6 800E+0	1 • 4	5 BÚÚR	8+01 4			3	LFI5
	* Livestock fodder intake for milk (kg/day)	> 5 500E+0							LTI5
	³ Livestock water intake for meat (L/day)	* 5 000E+0							GWI5
	³ Livestock water intake for milk (L/day)	3 1 600E+0							LWIS
	* Livestock soil intake (kg/day)	3 DOOE-0	1 , 5	5 00DE	s-D1 3	,			LSI
	> Mass loading for foliar deposition (g/m**3)	1 000E-0							MLFD
	Depth of soil mixing layer (m)	3 1 500g-D	1 2 3	1 5003	s-01 -	5			DM
R019	Depth of roots (m)	* 9 DODE-D	1 ' '	OODE	8-D1 3	,			DROOT
R019	> Drinking water fraction from ground water	* 1 0003+0	0 * 3	000e	2+00 ·	•			FGWDW
R019	* Household water fraction from ground water	¹ not used	> :	1 000e	8+00 *	•			FGWHE
R019	¹ Livestock water fraction from ground water	1 000E+D							FGWUW
	> Irrigation fraction from ground water	1 000S+D							FCWIR
	3	3	`,		2	,		•	
R19B	¹ Wet weight crop yield for Non-Leafy (kg/m**2)	* 7 000B-0	1 ' X	3000 f	c-01 *	I		,	YV(1)
R198	' Wet weight crop yield for Leafy (kg/m**2)	¹ 1 3002+D	0 > 3	500e	c+O0 3	ŀ	· •	•	YV (2)
R19B	³ Wet weight crop yield for Podder (kg/m**2)	* 1 100E+0	0 ° 1	100E	×00 ×			د	YV(3)
R198	' Growing Season for Non-Leafy (years)	4 1 700B-0	1 > 1	7006	-01 ⁻	•		,	TE(1)
R198	' Growing Season for Leafy (years)	* 2 5DOE-0	1 ° 2	500E	t-01 '	I		د	TE(2)
R19B	³ Growing Season for Fodder (years)	• 8 000E 0	2 ' E	8 000E	c-02 °	1		,	TE(3)

Site-Specific	Parameter Summary (concluded)	
0 >	> User ' Used by RESRAD	Parameter
Menu Parameter	Input Default * (IF different from user input)	
	araaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa	
R19B ' Translocation Factor for Non-Leafy		TIV(1)
R19B ¹ Translocation Factor for Leafy		TIV (2)
R198 ' Translocation Pactor For Fodder		· 7IV(3)
R19B ' Dry Foliar Interception Fraction for Non-Leafy		RDRY(1)
R19B ' Dry Foliot Intercaption Fraction for Leafy		RDRY (2)
%198 ' Dry Foliar Interception Fraction for Fodder		RDRY(3)
R19B ' Wet Foltar Interception Fraction for Won-Leafy		RWET (1)
A19B ' Wet Poliar Interception Fraction for Leafy		RNET (2)
R19B * Wet Foliar Interception Fraction for Fodder		RWET(3)
R19B 'Weathering Removal Constant for Vegetation	2 000E+01 2 000E+01 '	WLAN
-	······································	
C14 ° C-12 concentration in water (g/cm**3)		C12WTR
Cl4 ? C-12 concentration in contaminated soil (g/g)		01202
C14 ³ Fraction of vegetation carbon from soil		CSOIL
<pre>Cl4 Fraction of vegetation carbon from air</pre>		CAIR
Cl4 * C-l4 evasion layer thickness in soil (m)		DNC
C14 C-14 evasion flux rate from soil (1/sec)	• not used • 7 000E-07 •	EVSN
C14 'C-12 evasion flux rate from soil (1/sec)		ABVSN
C14 * Fraction of grain in beef cattle feed		AVEGA
Cl4 > Praction of grain in milk cow feed	•	AV7G5
C14 * DCF correction factor for gaseous forms of C14		CO2F
,	3 3 3	
STOR * Storage times of contaminated foodstuffs (days)	* * * * *	
STOR * Fruits, non-leafy vogetables, and grain	1 1002-01 1 1005-01	STOR_T(1)
STOR ' Leafy vegetables		9TOR_T(2)
STOR * Milk		STOR_T(3)
STOR * Meat and poultry		' STOR_T(4)
STOR ' Fish		STOR_T(5)
STOR ⁴ Crustacea and mollusks		STOR_T(6)
STOR ' Well water		' \$TOR_T(7)
STOR ' Surface water		STOR_T(8)
STOR Livestock fodder		STOR_T(9)
		1
R021 / Thickness of building foundation (m)		FLOORI
R02] ' Bulk density of building foundation (g/cm**3)		DENSFL
R021 ' Total porosity of the cover material		TPCV
R021 ' Total percenty of the building foundation		TFTL
R021 ³ Volumetric water content of the cover material		PH2CCV
R021 * Volumetric water content of the foundation		PHŻOFL
R021 * Diffusion coefficient for radom gas (m/sec)	3 3 9	
RO21 * in cover material		DIFCV
R021 * in foundation material		DIFFL
R021 3 in contaminated zone soil		DIFCZ
R021 * Radon vertical dimension of mixing (m)		HMIX
R021 * Average building air exchange rate (1/hr)		REAG
RD21 * Height of the building (room) (m)		HRM
R021 * Building interior area factor		FAI
AD21 > Building depth below ground surface (m)		Chart.
R021 * Emanating power of Rn-222 gas		EMANA (1)
R021 * Emphating power of Rn-22D gas		EMANA (2)
3	ר , ג	,

IRESRAD, Version 6 30 T* Limit = 0 5 year 03/02/2006 14:37 Page 7 Summary Tritium at 128-B-6 Deep Zone with Irrigation - Royal Residential Scenario File Run#4_118-B-6_DZ_With_Irrigation.RAD

	Site-Specific	Par	ameter	Summe	iry (cor	(tinued)			
0 P	-	*	User		-		Used by RESRAD	,	Parameter
Menu 3	Parameter	3	քոքան				different from user in		Name
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TITL ' Number	of graphical time points	3	32					• ;	NPTS
ТІТС і Махікы	m number of integration points for dose	,	5	3		,	··	,	LYNAX
	m number of integration points for risk		17						KYNAK
tffflifitftfff	ttistlitlittittittitlislittitittittittittittittittitti	rīiį	fitfitf	İİ11	ififiii	firfiir	iiiiiiiiiiiiiiiiiiiiiiiiiiiiii	iffrffrf	<u>íıiiiiiiii</u>

Summary of Fathway Selections

Pathway	3	User Selection
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA	LAAA Z	алаалалалдалада
1 external gamma	3	active
2 inhalation (w/o radon)	3	active
3 plant ingestion	2	active
4 meat ingestion	3	active
5 milk ingestion	3	active
6 aquatic foods	3	active
7 drinking water	3	active
8 soil ingestion	1	active
9 - radon	3	suppressed
find peak partnay doses	1	#ctive
ttittittittittittittittittitti	fiff	ftfftfftftftftftftft

CVP-2006-00002 Rev. 0

CALCULATION BRIEF EXCERPTS

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.

CALCULATION BRIEFS

The following calculation briefs have been prepared in accordance with WCH-DE-01, *Design Engineering Procedures Manual*, EDPI-4.37-01, "Project Calculations," Washington Closure Hanford, Richland, Washington.

- 118-B-6 Burial Ground Shallow, Deep Zone, and Stockpile Sampling Plan, Calculation No. 0100B-CA-V0271, Rev. 0, Washington Closure Hanford, Richland, Washington.
- 118-B-6 Burial Ground Cleanup Verification 95% UCL Calculations, Calculation No. 0100B-CA-V0274, Rev. 1, Washington Closure Hanford, Richland, Washington.
- 118-B-6 Burial Ground RESRAD Calculation Brief, Calculation No. 0100B-CA-V0276, Rev. 0, Washington Closure Hanford, Richland, Washington.

NOTE: The calculation briefs referenced in this appendix are kept in the active Washington Closure Hanford project files and are available upon request. When the project is completed, the files will be stored in a U.S. Department of Energy, Richland Operations Office repository. Only excerpts of the calculation briefs are included in this appendix.

CVP-2006-00002 Rev. 0

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CALCULATION COVER SHEET

Project Title:	118-B-6 Burial Ground Sample Design	Job No.	14655
Атеж	100-B/C Area		
Dîscipline	Environmental Engineering Calc. No.	0100B-CA-V0271	
Subject	118-B-6 Burial Ground Shallow, Deep Zone, a	nd Stockpile Sampi	ting Plan
Computer Program	Eacel Program No.	Excel 2003	

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

Commiti	ed Calculation	X	Pretiminary		Superseded	
Rev.	Sheet Numbers	Originator	Checker	Reviewer	Approval	Date
0	Covor = 1 Sht Calc = 2 Shta Attach = 1 Sht Attach 2 = 1 Sht Attach 2 = 4 Shts	J.G. Cruz 12/12/07	C.A. Bentz C.A. Bentz (2/12/05	D.L. Bowers 11-18-9	D.N. Swom	12-28-05
_	Total = 9 Shts					
. <u></u>						
		:				
		······	SUMMARY O	F REVISIONS		

*Obtain Cale No from D/S DE01-437.03 January 2003

2916948	Fashington Closur	o Hastor	d i						
	811		CALCULATION S	HEET					
	MI								
Originate	a for change	Date	12/12/2005	Cale No.	01008-C/	100074	Rev. No.	n	
originate				Calc. No.	01000-03	A-40211		-	··· / / .
Project	118-8-6 Burlal	<u>Ground S</u>	Sample Dealgn	Job No.	14655	Checked	CAB	Date	12/05
Subject	118-B-6 Burial	Ground S	Shallow, Deep Zo	me. and Stock	olle Samo	lina Plan	Sheet No.	1 of 2	

<u></u>			id sampling nodes I 2001-35 Rev. 0, for			1	······		
	and Analysia			Verbilization and Cal		<u> </u>			+
Given:	SAD (DOF/R	1-2001-35 Rev	D) requirements	··· · ··	_		_	·+	<u>+</u>
Given.			a (Surface sree of e	nob zeno defermie	and from CAD	<u> </u>			<u>+</u>
			file 18C:121205A					-i	
							Pien	<u> </u>	-i
	-Unep Zone B	ampring Area (Surface area of eac	A ZONE DERAMANEC	I NOM CALL PR				-
	Attachment 3	SH 2014, CAU	5le_18C:121205B	118-8-6 Burlet Gr	une Deep Zor	e sampang P	ian)	<u> </u>	
	-Stocepies (BC	1) Sampling A	ea (Surface erre o	feach zone delem	uned from CAL) program,	_	1	
	Attachment 3,	Sht 3014, CAD	file 18C:121205C,	118-8-8 Burlai Gre	und Slockpile	(BCL) Sampli	ng Plan)	<u> </u>	
			Surface area of ea					5	
	Altachmeni 3,	SINt 40/4, CAD	file 1BC:121205D,	118-8-6 Stirle Gro	kind Stockpile	[Steging Area) Sampling Plan	<u>}i</u>	
					- r			Г	
SAP Requir	enents:							1	
	-Develop a 16	node eampting	grid for the earnpli	ng aree		·		· · · · · · · · · · · · · · · · · · ·	
Shallow Zon	d Use lable 3-2	of the SAP to	determine which for	ur of the sixteen no	dea will be san	haded			
	to callect crear					<u> </u>		+	+
	1							+	1
	Develop a 16	nyte semplin	grid for the sample				— <u>i</u> —––	+-	
hadendan			determine which for		مع الأس معا	<u> </u>	·		-l
	to collect ciew							-+	··· -· -· -· -· -
	THE CONCOLORED		1 deal Page	~i				·+	+
	B			5					-+
			grid for the sampling		<u></u>	l	!	<u> </u>	<u> </u>
Deep <u>Cone</u> :			delermine which for	no neetxie ent to h	des will be san	npied	1		,
	to collect clear	up vertication	Bamples			L	i		··
		L	<u> </u>	<u> </u>					<u></u>
Determinati	on of Shallow 2	<u>Lone Sampling</u>	9 Grid:					_	
			ł		т <u> </u>				1
Shanow Zory	a Sampling Grid	Area determin	ed from Table 3-2,	SAP	i			"f"~~~~	·1··
Altachment 2	2. Number of De	cision Subunit	Based on Area (C	onverted to So Me	levs)	_	+	·+	
	<u> </u>		T	<u> </u>				· † · · - –	- <u>+</u> ·
Total Area:	++•	·· /····· -	···	i	829.57	m ²		- <u>i</u>	+
	sion Subunits (M	. <u> </u>						+	+
nea or nea	ertet Selaniatiz (m			- <u> </u>	829.57	·····			
	<u> </u>	·	_]	_	'		·-···• ·	-}	
Jecision But	unit divided inte	<u>(4 Sempling A</u>	999	'	207.38	<u>m*</u>		;	
	<u> </u>		<u> </u>					1	
Sampling Ar	eas divided into	a 16 node orld	(node numbers 1-1	6):	12,98	m²			
	T		Τ						
Nodes to be	Sampled (as de	termined from	Allachment 1, Tabk	a A-1, Samola Grid	Foint Lookuo	Table)	·	†	<u>+</u>
	iSee Altechmar	1t 3. Sht 1014	18-8-6 Burlal Grou	nd Shalkow Zone 2	anding Plan			- <u>-</u>	· — · · · · ·
	ifor Sample Lot	ation Table	•				— <u>—</u> ———		+
	:						····	÷—	+
	╅━━╾┈┈╍┠┅╍	·· ·· · (· · ·	-f		-i			- <u>-</u>	+
	÷	·— — —	¦				······	- i	-l ·

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	81,	GALCULATION SHEE	т					
	PIL							
Originato	r <u>Ő. Crúz</u> Date	11/8/2005	Calc. No.	0100B-0	CA-V0271	Rev. No(1	
Project	118-B-6 Burial Ground	Sample Design	Job No.	14655	Checked	46_	Date	12/12/05
Subject	118-B-6 Burtal Ground	Shallow, Deep Zone, r	and Stock	oile Sam	oling Plan	Sheet No. 2	2 of 2	

etermination of Deep Zone Sampling Grid:		·
entron ter Alab state and an alab state and a state and a state and a state and a state and a state a state and a state a stat		
Cope Sampling Grid Area datemined from Table 3-2, SAP		i
diachment 2, Number of Decision Suburits Based on Area (Converted to So	- Maham	
discrament 2, harmoes of Decision Subartis Based on Area (Conversa) to 30		
	········	
okal Area;	55.41 m	
rea of Decision Subunits (lotal area 1 eubunit)	<u>65.</u> 41 mi	
	· ··	
ecision Subunite divided into 4 Sampling Areae:	13.85 ² m ²	
empling Areas divided into a 16 node grid (node numbers 1-16):	0.86 m ²	
odes to be Sampled (as determined from Attachment 1, Table A-1, Sample	Grid Point Lookup Table)	,, , , ,
See Attachment 3, Sht 2014, 118-B-8 Burial Ground Deep Zoxe	e Sampling Plan,	
for Sample Location Table		
etermination of Stockpile (BCL) Sampling Orid:		<u> </u>
,,,,,,,_,_,_,_,,_,,	······································	······
tockpile (BCL) Sampling Grid Area determined from Table 3-2, SAP		· · · · · _ · · ·
tachment 2, Number of Decision Subunits Based on Area (Converted to So	Moters)	
otal Area:	1491.14.m ²	
rea of Decision Subunits (total area 1 aubunit)	1491,14 m ²	
		·t
ecision Subunits divided Into 4 Sampling Areas:	372-78im ²	
······		
ampling Areas divided into a 16 node grid (node numbers 1-16);	23.29 m ²	i
odes to be Sampled (as datermined from Attachment 1, Table A-1, Sample	Grid Point Lookup Table)	
See Attachment 3, Sht 3ol4, 118-8-6 Burlai Ground Stockpile (I	BCL) Sempling Plan,	
for Sample Location Table	—. <u> </u>	
etermination of Stockpile (Slaging Area) Sampling Grid;		·
tockpile (Steging Area) Sampling Grid Area determined from Table 3-2, SAF		
ttachment 2, Number of Decision Subunits Besed on Area (Converted to So	Meters)	
olal Area:	496.78 m ²	
rea of Decision Suburits (total area 1 subunit)	435.78 m ²	
acision Subunits divided into 4 Sampling Areas:	121.69 m ²	
Concrete wardening of the of the of the office		··
and the second s	7.60.m2	
ampling Areas divided into a 16 node grid (node numbers 1-16):		·
odes to be Sampled (as determined from Attachment 1, Table A-1, Sample		Į
See Attachment 3. Shi 4of4, 118-B-6 Burial Ground Stockpide (Units Point Lookup (Bbie)	<u></u>
Take Machinent J. Ont YOR, 116-6-0 DURAL SMURG STOCKOGE (Stanino Adal Samnino Plan	1

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	Me		
Originator	S. Crúz Date 12/12/2005	Calc. No. 0100B-CA-V0271	Rev. No. 0
Project	118-B-6 Burlai Ground Sample Design	Job No. 14655 Checked	019 Date /12/05
Subject	118-B-6 Burial Ground Shallow, Deep Zone,	and Stockpile Sampling Plan	Sheet No 1of1

1 ATTACHMENT 1

Sample Grid Point Lookup Table.

Default Plan	Sampfing Area 1	Secepting Area 2	Sampling Area 3	Sempling Area 4	Sampling Area 5	Sampling Arm 6	Ватріїна Агьа Т	Sampling Area b	Bempling Arte 9	Sarapilog Anas 10
Closeotal	3 "		1	4	5_	1	3	3	4	18
Closepul	4	7	11	3	15	15	6	13	10	10
Closeout	16	3	2	7	Ż	10	11	4	3	14
Closeduk	10	16	4	12	1	13	4	8	16	
Not Sampling	2	14	5	θ	53	12	₿	Ż	14	\$
Not Sampling	13	10	9	18	2	16	1	12	5	3
Not Sempling	6	1	10	В	14	4	16	5	ă.	6
Not Sampling	1	9	13	ī	10	5	12	1	1	15
Not Sempling	8	72	7	5	0	2	8	7	15	. 9
Not Sampling	15	ſ₿	15	14	16	6	2	15	11	1
Not Sempling		13	8	10	12	11	13	14	2	12
Not Gampling	5	2	3	11	4	3	₽	10	7	11
Not Sampling	7	11	14	15	11	14	14	6	13	2
Not Benoting	1 11	4	8	2	9	. 7	7	11	9	7
Not Sampling	12	9	15	16	ŝ	B	15	9	6	13
Not Sampling	14	6	12	8	8	9	10	16	12	6

William W	ashington Closure Hawlord					
	ala					
Originator	ME					
Originator	6. Cruz Date 12/12/2005	_Calc. No.	<u>01008-0</u>	CA-V0271	Rev. No.	0
Project	118-B-6 Burial Ground Sample Design	Job No.	14655	Checked	CAB-	Date 12/12/05
Subject	118-B-6 Burial Ground Shallow, Deep Zone,	and Stock	plie Sam	pling Plan	Sheet No.	1011

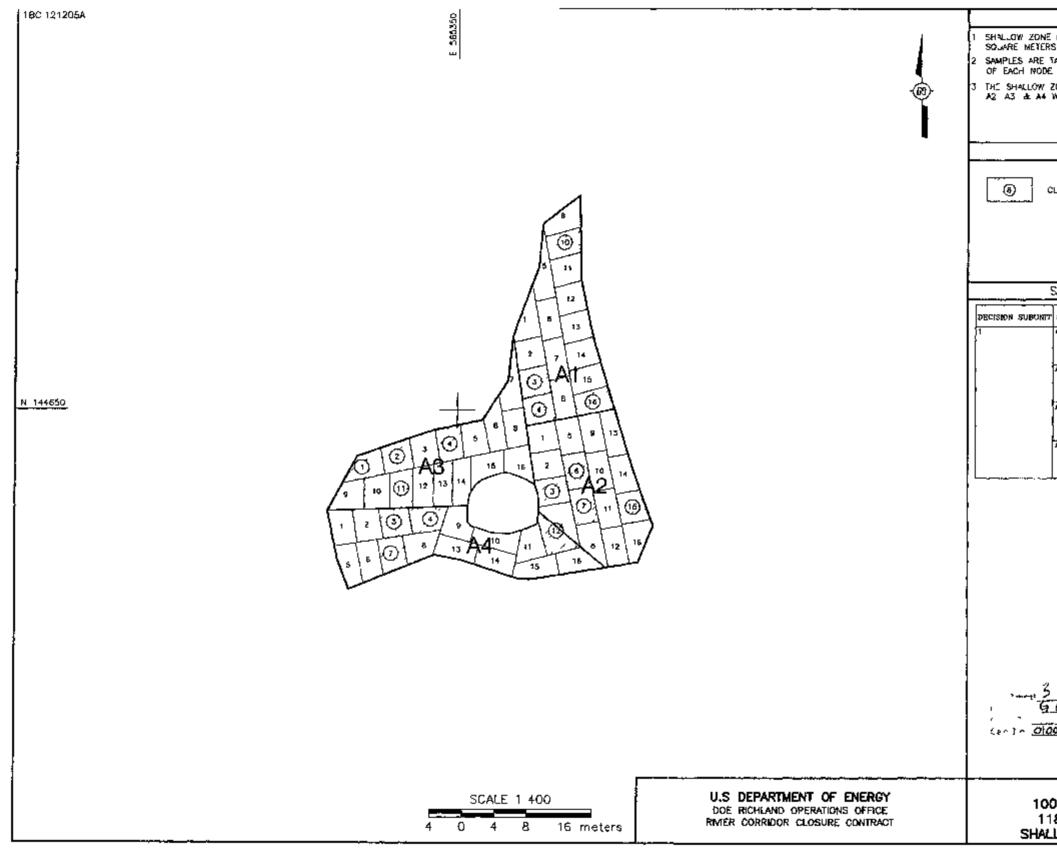
1 ATTACHMENT 2

3 Number of Decision Subunits Based on Area.

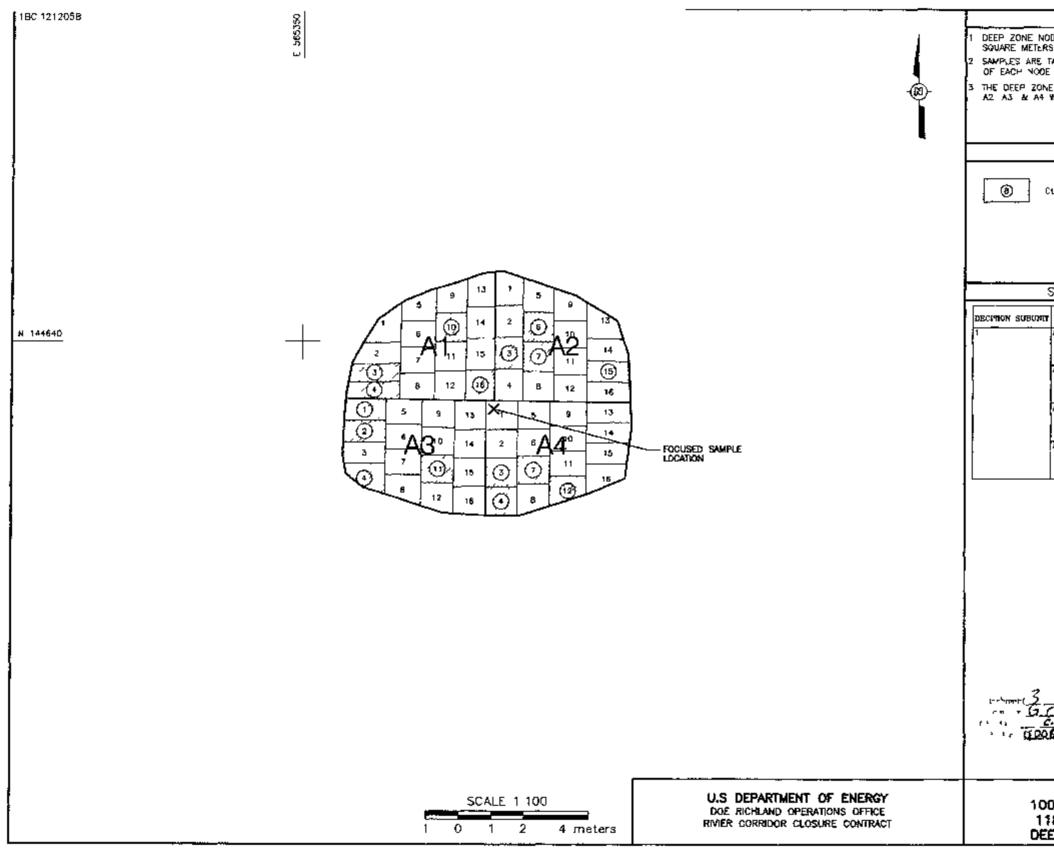
Decision Unit	Weste Site Size	Decision Sebenite	Blocks ^c	Discrete Secoles	Composite Samples
Shallow zone -	Smati < 100.000 R ²		4	16	4
0 LO 15 A	Mexicum >100.000 0° < 400.000 R	4	16	. 64	16.
	Long >400.000 ft		32	128	32
Deep Zons -	Small< 100,000 R ²	1	4	16	4
>15 A	Medium ⇒t00.000 ft ⁹ < 400.000 ft ²	· 4 · ·	16	64	16
	Large >400,000 ft	8	32	128	32
Overbaren/layback	Smaß < 100.000 ft ²	1	4	16 .	4
stockpiles	Medrum, >100,000 ft ² < 400,000 ft ²	4	16	64	16
-	Lerge: >400,000 n ¹	8	32	128	32
Steging pile oreas	Snoell < 100,000 ft ²		4	J6	.4
(residual soil)	Meduan >100.000 ft ² < 400.000 ft ²	4	16	64	16
	Large, >400,000 R ²	18	32	128	32

* This shallow roots, deep more, are bolice involved, and staging pile areas each expressions angle deepton while. For each nember of decrement up to will vary because tedivated wants rise into and the subception, evaluation subception, and/or straining the more than "Areas of expression subception in the exceeduation of a compare has a special subception, and the pile subception of any straining term in the subception of an exceeduation of a compare has a special subception, and the pile subception of a compare has a special subception. The subception of a compare that readows a subset of a compare has not subception of a compare has a special subception.

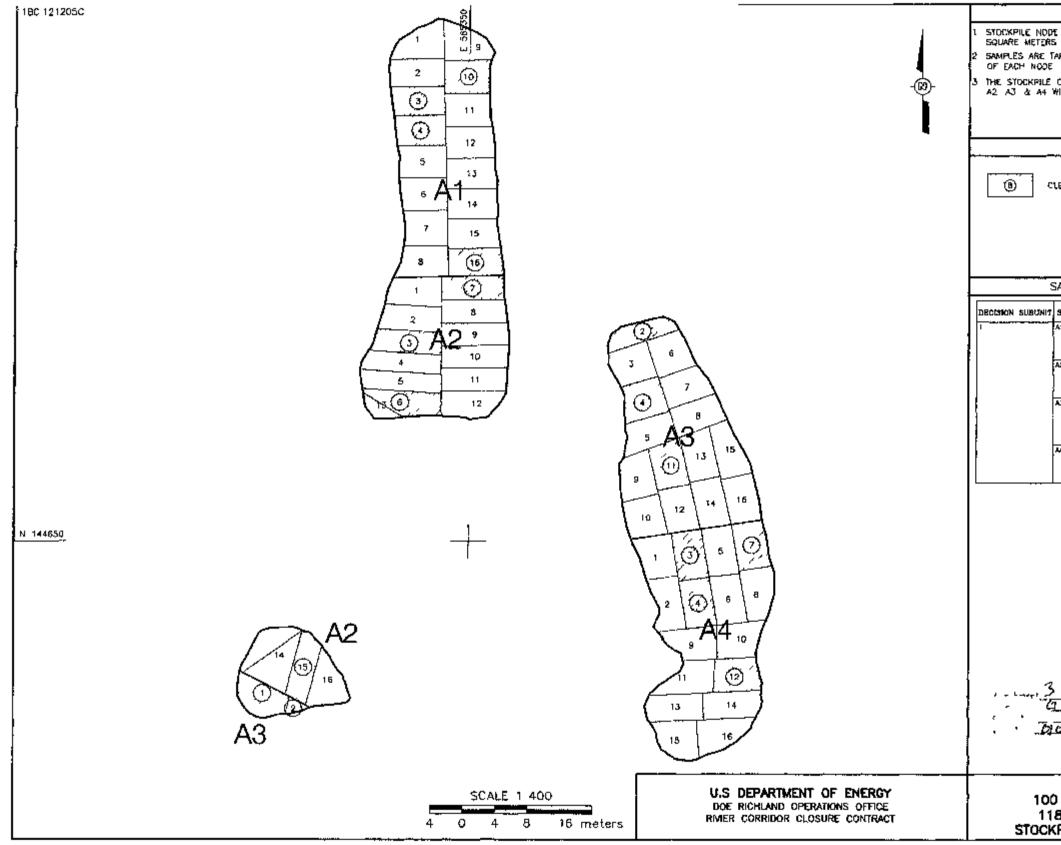
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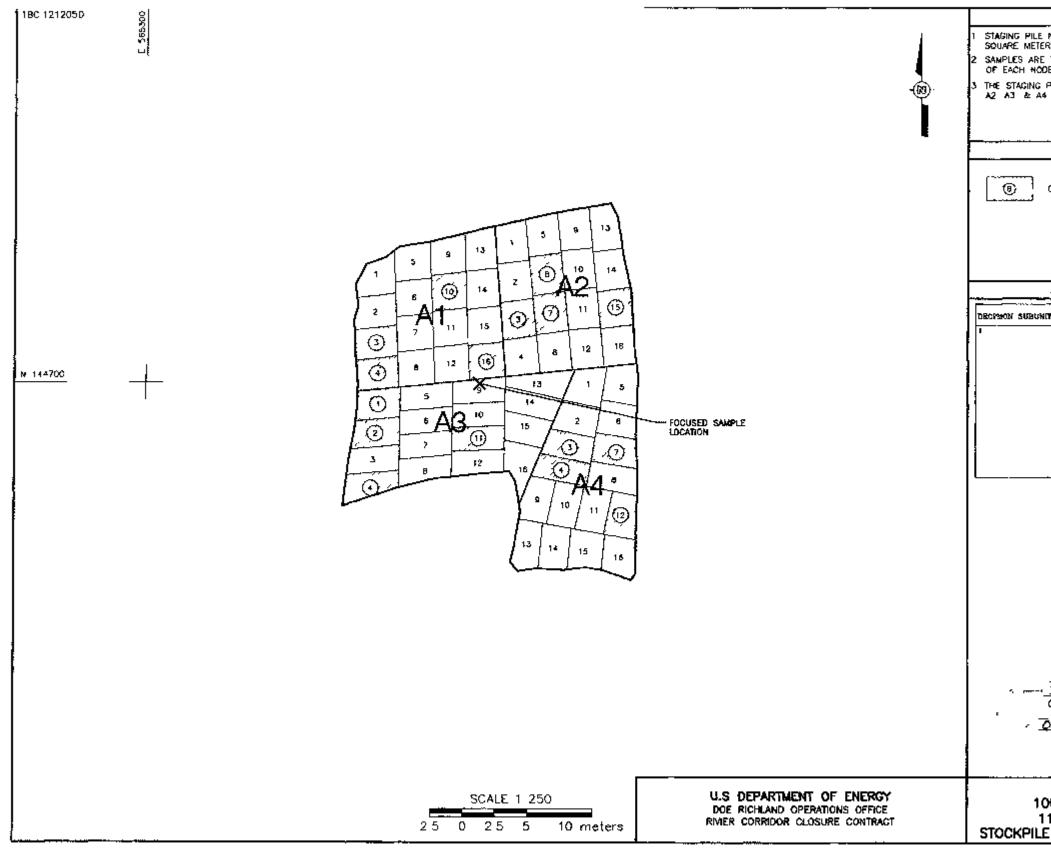
NOTES								
	IW ZONE NODE AREAS ARE APPROXIMATELY 12.96 E MEYERS							
ES ARE 1 VCH NODE	ES ARE TAKEN FROM THE APPROXIMATE CENTER							
	ZONE CONSISTS WITHIN DECISION		AREAS AT					
	LEG	END.						
2) CLEAN UP VERIFICATION SAMPLING NODE							
	SAMPLE LOC	ATION TAB	LE					
SUBURIT	SANPLING AREA	SAMPLE NODE	NORTHING	EASTEND				
	41	S-A1-J	144653 52	565359 52				
		5-A1-4 5-A1-10	144650 07	565360 09 585363 16				
		5-A1-16	144651 07	555356 70				
	*2	5-X2-3 S-X2-6	144639 83	565381 BD 565364 70				
·	1	5-42-7	144638 04	565365 57				
		5-A2-13	14461793	565371.71				
	43	S-43-1 S-43-2	144642 84	58533835 58534270				
I	!	5-43-4	144643 77	365342 10				
		5-A3-11	144640 17	565343 19				
	A4	5-44-3 S-44-4	144635 99	365342 34 565346 76				
		S-M-7	144632 03	565341 97				
	.	5-41-12	144634 83	505302.31				
S (1/2) S (
			ATTACH	MENT 3				
11	100B D AREA RE 8B-6 B LOW ZONE	URIAL GR		۹				



NOTES								
NE NODE AREAS ARE APPROXIMATELY 0.86								
	ARE TAKEN FROM THE APPROXIMATE CENTER							
	e consists of Withing decision		EAS AI					
	LEG	END						
7								
_	LEAN UP YERIFI	CATION SAMPL	ING MODE					
	SAMPLE LOC							
	SAMPLE LUG	AIION IAB	LE					
ບອບກາງ	SAMPLING AREA	SAMPLE NODE	NORTHING	EASTING				
	A1	0-A1-3	144639.03	565352 20 565352 19				
	1	0-41-10	144638 19 144540 46	565354 54				
	A2	D-A1-16 D-A2-3	144839 54	565355 44 566356 32				
	~	D-A2-6	144540 40	565357 22				
i		D-A2-7	144538.53	565357 22				
	A3	D-A2-18 D-A3-1	144639.07 144637.87	565359 39 505351 90				
	~	D-A3-2	144637 19	565351 RD				
		D-A3-4	14463572					
		0-A3-11 0-A4-3	144635.91	56535414 56535610				
	~	0-44-4	14463501	56435610				
		D-A+-7	144635-88	565357-08				
		1 B-44-1Z	14463534	565356 15				
				-				
-			_	11				
_ک		Shr	#tNo <u>2 e</u>	ا بر الن				
6.0	1.60 TC		· (24)	21,25				
<u>_</u>	<u>. A. Out 1 </u>	<u>, 7</u>	_ M	1.05				
0.60	6-CA-V02	CIL	1	-				
			ATTACHI	WENT 3				
		10 1000						
		/c area						
100	d Area re	MEDIAL 8	DESIGN					
	8-8-6 B		OUND					
DE	EP ZONE	SAMPI ING	PI AN					
ي من	DEEP ZONE SAMPLING PLAN							



NOTES								
	DDE AREAS ARE APPROXIMATELY 23.29							
	RS : Takén FROM the approximate center De							
LĒ	CONSISTS OF S WITHIN DECISION		AS A1					
_	LÉG	END		····				
c	CLEAN UP VERIFICATION SAMPLING NODE							
_								
:	SAMPLE LOC	ATION TAB	LE					
NIT	SAMPLING AREA	SAMPLE NODE	NORTHUND	EASTING				
	A1	0-41-3 0-41-4	144705 18	565343.62 565343.90				
		0-41-10	144708 五	585349.80				
	A2	0-A1-16 0 A2-3	144674 50 144874 50	565350 87 365342 63				
	ſ	0-42-6	144567 45 144681 74	565341 53 585350 40				
	}	0-42-15	144634.21	56532975				
	A3	0-43 1	144630 98	565328 53				
		0-43-28	144676.52	565371 36				
		0-40-11	144657 41	565371 42 565374 93				
	w	5 1 1 1	144648 31	565377 38				
		0- 84-4 0-84-7	144642 29	565378 39 565364 95				
		0-44-12	144633.07	565382 87				
	3 <u>C1 CCTZ</u> <u>C2 CCTZ</u> <u>C2 CCTZ</u> <u>C2 CCTZ</u> <u>n · 121/2285</u> <u>12 12/12285</u> <u>12 12/12285</u> <u>12 12/12285</u> <u>12 12/12285</u> <u>12 12/12285</u>							
			ATTACHI	MENT 3				
00	100-B 0 AREA RE 8-8-6 B	C AREA	DESIGN					
	A-8-6 B (PILE (BCL	.) SAMPLI	ING PLA	N				



NOTES							
SOUARE METERS	IODE AREAS ARE	APPROXIMATE	IY 7 60				
2 SAMPLES ARE T OF EACH NODE		E APPROXIMATI	e center				
3 THE STAGING PI A2 A3 & A4 1	ile consists of Within decision		REAS AT				
		END					
	46.9	END.					
0	LEAN UP VERIFI	CATION SAMPL	ing node				
ليتستدعا							
	SAMPLE LOC	ATION TAB	LE				
DECISION SUBUNIT		SAMPLE NODE	WORTHING	PLOTING			
I SCHOOL SCHONLY	ANPLING AREA	3,40012 NOOB 0-41-3	10000000000000000000000000000000000000	EASTING 565317 79			
l.	^	A1-4	144708 73	565317 90			
		0-11 10	144707 15	565325.33			
	A2	0-41-46 0-42-3	144701 64	565325 24 585328 EQ			
	~	0-42-6	144708 53	365330 89			
<u>ا</u> ا	1	0-42-7	144705 47	565331 19			
!		0-47-15	144705 92	56533515			
1 '	143	0-63-1	144696 32	565317 92			
		0-43-2	144595-05	565317 72			
1 1		0-A3-4	14469 77	555317 40			
	A4	0-43-11	144695.63	555325 65			
	,	0- M-3 0-M-4	144694 95	585332 70 565332 08			
		0-#- 7	144594 57	563336 26			
		0-44-12	144559 (2	363335 01			
<u>3</u> <u>6. CR. 11</u> <u>6. CR. 11</u> <u>7. 12/12/05</u> <u>6. CR. 11</u> <u>7. 12/12/05</u> <u>6. CR. 11</u> <u>12/12/05</u> <u>12/12/05</u>							
			ATTACHI	MENT 3			
	100-B	/C AREA					
) AREA RE	MEDIAL C					
	8-B-6 BI (STAGING			PLAN			
STOCKPILE (STAGING AREA) SAMPLING PLAN							

CVP-2006-00002 Rev. 0

CALCULATION COVER SHEET

Projeci T	ille:	100-B/C Area Field	Remediation		Jub No.	14655	
Area Discipline	9	100-B/C Environmental		"Cate. No.	0100B-CA-V0274		
Subject Computer	r Program	Excel	und Cleanup Venfication	95% UCL Calculations Program No.	Excel 2003		
			incurrent compliance wit	h established cleanup love	ls These documents sh	ould be used in	
<u>~</u>	d Calculation	X	Prelindnøry	Superseded	Vaided		
Rev.	Sheet Numbers.	Originator	Checker	Reviewer	Approval	Date	
D	Cover = 1 Sheets = 7	Approved 3/1/2006	Approved 3/2/2006	Approved 3/5/2006	Approved 3/9/2006	1/9/2006	
	Total = 8	J M Capron	T M Blakley	L M Ditimer	D N Strom		
1	Cover = 1 Sheats = 7 Total = 8	/ M 6 3/23/06 M Capton	J. M. Stabler 3/23/16 T. M. Biskley	L M Diller	Dirth D N Strom	4-4-06	
	- 				, , _	 1 	
			SUMMARY OF REV.	ISTONS			
	Replaced cover pa	age for convenience		6 (decision unit names co	mecked)		
I	-						
	·						

* Obtain cale no from DIS

DE01437 03 (12/09/2004)

Originator J M Capron 2010-Project 100-B/C Area Field Remediation Date 03/01/08 Calc No 01008-CA-V0274 Rev. No. Date 3/2/06 Job No. 14655 Checked T M Blakley Subject 118-B-6 Burial Ground Cleanup Ventication 95% UCL Calculations 07 at No. Summery 1 (Purpose: 2 Calculate the 95% upper confidence timit (UCL) to evaluate comphance with cleanup standards for the subject site - Also, calculate the э carcinogenic /isk for appacable normedionucide analytee, perform the Washington Administrative Code (WAC) 173-340 (Model Toxics Control 4 Act (MTCA) S-part test, if required, and calculate the relative percent difference (RPD) for sech contaminant of concern (COC) 5 6 Table of Contents: 7 Sheele 1 to 3 - Calculation Sheet Summary 8 Sheet 4 - Calculation Sheet 118-8-6 Shallow Zone Sample Data 9 Sheet 5 - Calculation Sheet 119-B-6 Deep Zone Sample Data 10 Sheet 6 - Calculation Sheet 118-B-5 Waste Staging Area Sample Date 11 Sheet 7 - Calculation Sheet 118-B-8 SCL Stockpile Sample Data 12 13 iGiven/References: 14 1) Sample Results 16 16 2) All tookup values, remedial action goals (RAGs), and background values are taken from DOE-RL (2001b and 2005) and 17 Ecology (1996) 18 3) DOE-RL, 2001a, 100 Area Bunal Grounds Remedial Action Sampling and Analysis Plan (SAP), DOE/RL-2001-35, Rev 0, 18 U.S. Department of Energy, Richland Operations Office, Richland, Weshington 20 4) DOE-RL, 2001b, Hanford Site Background, Part 1, Soil Background for Normatioactive Analytes, DOE/RL-82-24, Rev. 4, 21 U.S. Department of Energy, Richland Operations Office, Richland, Washington 22 5) DOE-RL, 2005b, Remedial Design Report/Remedial Action Work Plan for the 100 Area (RDR/RAWP), DOE/RL-96-17, Rev 5, 23 U.S. Department of Energy, Richland Operations Office, Richland, Washington 24 6) Ecology, 1992, Statistical Guidance for Ecology Sile Managers, Publication #52-54, Washington State Department of Ecology, 25 Olympia, Washington 28 7) Ecology, 1993, Statistical Guidance for Ecology Site Menagens, Supplement S-6, Analyzing Site or Background Data with Below-27 Detection Lunit or Below-POL Values (Cansored Date Sate), Publication #32-54, Washington State Department of Ecology, Olympia. 28 23 Washington 8) Ecology, 1996, Model Toxics Control Act Cleanup Levels and Risk Calculations (CLARC II), Publication #94-145 Washington State 30 31 Department of Ecology, Olympia, Washington 32 9) EPA, 1994, USEPA Contract Laboratory Program National Functional Guidelinos for Inorganic Data Review. EPA 549/R-94/013, U.S. 33 Environmental Protection Agency, Washington, D.G. 34 10) WAC 173-340, 1996, Model Toxics Control Act.-Cleanup," Washington Administrative Code 35 36 Solution: 37 Catculation methodology is described in Ecology Pub #92-54 (Ecology 1962, 1993), below, and in the RDR/RAWP (DOE-RL 2005) Use date 38 from the attached worksheets to calculate the 95% UCL, hazard quotente, excess carcinogenic risk, perform the WAC 179 340 39 3-part test for nonradionuclides, and calculate the RPD for each COC in the primary-duplicate and primary-splu earnple pairs 40 41 **Calculation Description:** 42 The sucrect calculations were performed on data from sost vanification samples from the 118-B-6 banal ground. The data were entered into an 43 EXCEL 2003 spreadsheet and calculations performed by utilizing the built-in spreadsheet functions and/or creating formulae within the cells. 44 The statistical evaluation of data for use in accordance with the RDR/RAWP (DOE-RL 2005) is documented by this calculation - Split and 45 dupicate SPD results are used in evaluation of data quality and are presented in the cleanup vertication package (CVP) for this are 46 47 46 Mathedology. For nonredixective analytes with <80% of the data below detection limits and ell radionuclide analytes, the statistical value calculated to 49 50 evaluate the effectiveness of cleanup is the 95% UCL. For nonradicective analytes with >50% of the data below detection limits, the 51 maximum value for the data set is used instead of the 95% UCL . All nonradionuclide data reported as being below dataotion limits are set to 52 % the detection limit value for calculation of the statistics (Ecology 1993) For radionuclide data, calculation of the statistics was done on the 63 reported value. In cases where the laboratory does not report a value below the minimum detectable ectivity (MDA), half of the MDA is used 54 w the calculation. For the statistical evaluation of primary-duplicate sample pairs, the samples are averaged before being included in the date 55 set, after adjustments for censored data as described above. 58 57 For nonredenuclides, the WAC 173-340 statistical guidance suggests that a test for distributional form be performed on the data and the 95% 58

CALCULATION SHEET

For nonredenuclides, the WAX 173-340 stansition guidance suggests that a test for distributional form be performed on the data and the 35% (OCL calculated on the appropriate distribution using Ecology software. For nonradionuclide small data sets (n < 10) and all radionuclide data end the 35% (or sats, the calculations are performed assuming nonparemetric distributions, so no test for distribution is performed. For nonradionuclide data end the 35% (or sats, the calculations are performed assuming in onparemetric distribution, so no test for distribution is performed. For nonradionuclide data end the 35% (or sats, the calculations are performed assuming in onparemetric distribution, so no test for distribution is performed. For nonradionuclide data end the software (Ecology 1993)</p>

62

Washington Closure Hanford

Weshington Glosure Henford

CALCULATION SHEET

	Originator J M Capron Arc. Date 03/01/06 Calc. No. 0100B CA-V0274 Rev. No. 0
	Project 100-B/C Areal Field Remaduation Job No. 14655 Checked T M Stabley Jug Date 3/2/5/2
	Subject 118-8-6 Bunal Ground Cleanup Ventication 95% UCL Calculations Sheet No. / 2 of 7
	Summery (continued)
1	The hazard quotient (for shallow zone nonrectionuclide COCa) is determined by dividing the statistical value (derived in this calculation) by the
2	WAC 173-340 non-carcenegenic cleanup imit. The excess nonradionuclide cerceboganic risk is determined by dwiding the statistical value by
з	the WAC 173-340 carcinoganic cleanup limit and then multiplying by 10 ⁶
- 4	
6	The WAC 173-340 3-part test is performed for nonnecionuclide analytes only and determines if
6	1) the 95% UCL value exceeds the most strangent cleanup limit for each non /adionuclude COC,
7	 greater than 10% of the raw data exceed the most stringeni cleanup limit to each non-radionuclide COC.
8	 (he maximum value in the raw data set exceeds two times the most alringent clearup funct for each non rationuclide COC
8	
10	The RPD is calculated when both the primary value and either the duplicate or split values are above detection limits and are greater than 5
12	times the target deteolion limit (TDL). The TOL is a laboratory deteotion limit pro determined for each analytical method, listed in Table II-1 of
	the SAP (DOE-AL 2005a) The RPD calculations use the following
	formula. RPO = $[M-SP((M+S)/2)]^{100}$
15	
16	subara Mija Mann Samala Valua - C. Outd (as dual as la) Samala kiteka
17	where, M - Main Sample Value S = Split (or dupicate) Sample Value
18	For quality assurance/quality control (QA/QC) split and duplicate RPD calculatione, a value less than +/- 30% indicates the data compare

For quality assurance/quality control (QA/QC) split and duplicate RPD calculations, a value less than +/- 30% indicates the data compare 19 tevorably For regulatory splits, a threshold of 35% is used (EPA 1994). If the RPD is greater than 30% (or 35% for regulatory split data), 20 21 22 further investigation regarding the usebility of the data is performed. Additional discussion as necessary is provided in the data quality assessment section of the applicable CVP

23 24 if regulator split comparison is required, an additional parameter is evaluated. A control limit of +/- 2 times the TDL shall be used if either the mean or regulator split value is less than 5 times the TDL and above detection. In the case where only one result is greater than 6 times the 25 TOL and the other is below, the +/- 2 times the TOL orderia applies. Therefore, the following calculation is performed as part of the avaluation 26 27 28 29 for these two cases involving regulator spin data, difference - main - regulator spin. If the difference is greater than +/-2 times the TDL, then further investigation regarding the usability of the data to performed and presented in the applicable CVP data quality assessment section

30 No regulatory split samples were collected for this arte-

31 32

Weatington Closure Herris	12
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CALCULATION SHEET

Originator J. M. Cepton 2716 Project 100-B/C Area Field Remediation

 Data
 03/23/06
 Calc. No. 0100B-CA-V0274

 Job No. 14655
 Checked T. M. Biekley
 The Provide Statements

Hev. No. 1 Date <u>37 2 7 (10</u>) Sheet No. 3 of 7

Subject 118-8-6 Burial Ground Cleanup Varilication 95% UCL Calculationa

Summery	(continued)

1 Results:

2 The results presented in the summary tables that follow are for use in RESidual RADteeptivity dose/risk analysis and the CVP for this site.

4	4 Reads Summary										
6.	Analyte	Shallo	v Zone	Deep	Zone	Waste St	aging Area	BCL 6	ocipilo	Unvite	
Ð	Andaty de	Result	Quelifor	Recuti	Qualifier	Reputt	Qualifier	Asself	Qualifier	Culater	
7	Lead	6.7		.4.9		5.2		8.5		mgrkg	
- a j	Mercury	0.08	i	0.02	ម	0.02	<u></u> u	0.03		mg/kg	
9	Tritium	180		1996		36.7	1	238		pCl/g	

10 BCL = below cleanup level

11 U = undetected

12	WAC 173-340 Evaluation (Shellow 2	lane)	WAC 173-340 Evaluation (Deep Zone)	
13	i			
14	3-Part Test:		<u>3-Pari_Teal:</u>	
15	95% UCL > Cleanup Umil?	NA	95% UCL > Cleanup Limit?	NA
16	> 10% above Cleanup Lunit?	NA	> 10% above Cleanup Limit?	NA
	Any sample > 2x Cleanup Limit?	NA	Any sample > 2x Gleanup Lanit?	NA
18 19 20 21	Because all nonradionuclide COC levi beckoround performance of the 3-car		Because all nonradionuclide COC levels a latekground, performance of the 3-part ter	
23	<u>Alek Estmäte;</u> Norrad noncarchogenic Index sum: Norrad carcinogenic risk;	NA.		
26 27	WAC 173-340 Evaluation (Waste Sta	ging Area)	WAC 173-340 Evoluation (BCL Stockpik	•)
28	3-Part Tesk:		3-Part Test:	
	95% UCL > Cleanup Limit?	NA	95% UCL > Cleanup Limit?	NA
	> 10% above Gleanup Um#?	NA	> 10% above Cleanup Limit?	NA
	Any sample > 2> Cleanup Limit?	NA	Any sample > 2x Cleanup Limit?	NA
32 33 34 35	Because all nonradionuclide COC leve background, performance of the 3-part		Because all nonrationuclide COC levels a insolvground, performance of the 3-part tas of excess risk are not required.	webelow
36 37	<u>Filak Setimate:</u> Nonrad noncercinogenic index ount: Nonrad carcinogenic risk;	NA NA	<u>Alsh Estimate:</u> Nonrad noncarcinogenic Index sum: Nonrad carcinogenic risk:	NA NA

29 Relative Percent Difference Results' QA/QC Analysis

40		Deep	Zone
	Analyle	Duplicate	Split
41		Analysis	Analysia
42,	Lead		
43	Mercury		
44	Tribum		

45 "A blank cell indicates that RPD evaluation was not required.

46 QAQC - quality assurance/quality control

47 RPO - relative percent difference

CALCULATION SHEET

Washington Closure Hankord

Originator J M Capron Fin C	Date 03/01/06	Calo, No. 01008-CA-V0274	Rev. No 0
Project 100-B/C Area Field Remediation	Job No. 14655	Checked T. M. Blakley, 2017	Date 3/2/ 10
Subject 118-8-6 Bunal Ground Cleanup Ve	infloation 95% UCL Calculation	s	Sheet No. 4 of 7

1 118-B-6 Shallow Zone Sample Date

.

2	Sempling	HEIS	Sample	Lead		Mercury			Tritium			
Ę,	Area	Number	Dale	morke	T <u>a</u> T	PQL	mg/kg	G .	POL	pC⊮g	q	NDA
4	A1	J10VP6	1/9/2006	7.7		1,8	50.0	U.	0.02	0 720	UJ.	3.1
\$	A2	J10VP7	1/8/2006	5.6		1.6	0.08	; ;	0.02	1_22	<u>U</u> U	3.0
6	A3	J10VP8	1/9/2006	3.3		1.7	0.02	U:	0.02	241	4	4.1
- 7	A4	J10VP9	1/9/2006	3.3		1.7	0.02	[u]	0.02	4.52	J.	3.1

8 Statictical Computation Input Data

- 8	Sempling	HEIS	Semple	Lead		Mercury	Trillum
10	Area	Number	Date	mgikg		mg/Kg	pCi/g
11	A1	J10VP6	1/9/2006	7.7		0.01	0.720
12	A2	J10VP7	1/8/2008	6,6		0.08	122
13	A3	J10VP8	1/9/2006	3.3	· ·	0.01	241
- 14[A4	J10VP9	1/9/2008	3.3		0.01 ;	4,52

15 Statistical Computations

8		Lend		Mercury		Tritium			
7	Statistical value based on		istā šet. Usē amatno z-stat.	>50% ogni	nucade data sel sored, 95% UCL iot calculated.	Radionucide data set. Las nonparemetro z-stat.			
8	N	4			5 1	4			
9	% - Delection (imit	0%6		75%	<u>+</u>	50%			
oi 👘	mean	5.0		0.03		62	5		
1F	st. dev	2.1		0.04		119			
2	Z-stausbo	1.645		1.645	· • • • • • • • • • • • • • • • • • • •	1.645	<u> </u>		
3,	95% UCL on mean	8.7	+**+	NA	<u>t </u>	160	<u>ι</u>		
	max value;	7.7	<u> </u>	0.08		241			
5	Statistical value	67		0.08		160			
6	Background	NA	1-1	NA		NA	F f		
74	Blatistical value above background	67	1 1	0.06	·[·	160	1		
Most	Stringent Cleanup Limit for	10.2	8G/GW/River	0.83	BG/GW/River				
8 0000	dionuclide and RAG type	1046	Protection		Protection	ļ			
9 WAC	173-340 3-PART Test			1		1			
¢	95% UCL > Cleanup Limit?	NA		NA]			
1	> 10% above Cleanup Lanel?	NA		NA					
2	Any semple > 2X Cleanup Limit?	NA		NA]			
al						1			
4 RESK	EVALUATION								
5 WAC 1	73-340 Non-Carcinogenic Cleanup:	353		24		ļ			
5	Hazard quotient for each nonvacionucide			NA]			
7 WAC 1	173-340 Carcinoganic Cleanup:	NA		NA]			
el	Risk for each carchiogenic nonradionucade.	NA		NA		1			
9									
		Because a	l lead values are	Because a	il mercury values				
D WAC 1	173-340 Compliance? NA	below ba	ckground (10.2	are below t	background (0.33				
1		mg/kg), pari	ormance of the S-	mg/kg), peri	formance of the 3-				
Nonra	d noncarcinogenic	part lesi a	nd calculation of	part test a	nd calculation of	1			
2 index	aum: NA	excess lisk	are not required.	excess risk	beauper ion mail	1			
3 Nonra	d carolnogenic risk: NA								
	ankern und		POL = prector	al numeritetee	here if	-			
4 BG = b	achgradiad		 An - process 		heled.				

46 HEIS = Hanford Environmental Information System

47 J = estimated 48 MDA = minimum detectable activity

49 NA = not applicable

RAG = remarkel action goal

U = undetected

UCL = upper confidence limit WAC = Weshington Admessifiative Code

GALGULATION SHEET

Weshington Closure Harvlord

Organitor J M Capron Mac	Date03/01/06	Cale, No. 01008 CA-V0274	Sev No
Project 100-B/C Area Freid Remechabon	Job No 14665	Checked T M Blakley	Date 7/2/01/ Sheet No. 5 of 7
Subject 118-8-8 Bunal Ground Cleanup Vo	enhoeton 95% UCL Calculator	15	Sheet No. 5 of 7

1 118-8-6 Deep Zone Sample Data

2	Sampling	NEIS	Sample		Leas	1	Ň	ercu	Y	ļ 1	n du	na 🛛
3	Area	Number	Oate	mg/kg	Ι ά	PÓL	mg/kg _	la,	POL.	pÇ#g	0	MDA
- 4	A2	J10VN6	1/9/2006	32	`	17	0.02	<u>. n</u> .	0.02	800	1	32
5	Duplicate of J10VN6	J10VN7	1/9/2006	39		17	0.02	νį	0.02	784	J	31
- ej	Al	JIOVNA	1/\$/2008	47		1B	0.02	ΙŪΪ	0.02	165	ाग	41
-7[A9	J10VN2	1/9/2008	51		16	002	N (0.02	220	J	29
- el	A4	J10VN3	1/9/2006	31	· -	18	0.02	ΓÜΤ	0.02	2780	J	46

9 Statistical Computation Input Data

· ·									
10	Sampling	HEIG	Sample	Lend	M4	ercury	— — 'n	dijum 👘	
11	Area	Number	Date	mg/kg		marka		pCVg	
12	A2	J10VNO J10VN7	1/9/2006	36		0.01	i	782	
13	A1	J10VN4	1/9/2008	47		0.01		166	·
14	A3	JIOVNE	1/8/2006	<u>51 }</u>		10.01		220	
15	A4	J10VN3	1/9/2008	31		001		2780	

16 Statistical Computations

7	Lead		Mercury		Tribum	
Statistical value based o	ni	Small data set 10se conparametric z stat		nuclude dista set kored 95% UCL of calculated		de data set Use ametric 2-sia)
9	N 4		4		4	
0 % < Detection lim	ut 0%		100%		0%	
1 moo			001		967	
2 si dor	v "O 9		Ð		1228	
3 Z-statist	c 1645		1 645		1 845	,
4 90% UCL on mea	n <u>49</u>				1996	
to maa valu	e 61		0.02	U	2780	
6 Staketical valu		ι	002	u	1996	
7 Beckgroun	d NA		NA		NA	
 Statistical value above backgroun 	d 49		0.05	[U]	1996	
Most Stringent Cleanup Lunit for	102	BG/GW/River	033	BG/GW/Pryer	1	
9 nonradionucitide and RAG type	102	Protection	0.34	Protection		
DWAC 173-349 3-PART Test	1				1	
1 95% UCL > Cleanup Linut	2 NA 2 NA		NA	·	1	
2 > 10% above Gleenup Limit	2 NA		NA		1	
3 Any sample > 2X Cleanup Limit	2 NA		NA		1	
WAC 173-340 Compliance? NA	below t	all lead values are ackground (10 Z rformence of the 3-	ara below b	I mercury values ackground (0.33 ormance of the 3-		
4	part les	t is not required	peri test r	s not required	1	

 	-	-	 	

Split-Duplicate.	Analysis										
6 Sampling	Heis	Sample	F	Logd			detcur	¥		T chillion	<u>ו</u>
7 Area	Number	Date	mgAig	TOT	POL	mg/kg	0	POL	pCVg	٦ä	MDA
8 A2	J10VN6	1/9/2006	32		17	0.02	ŢŲĮ	0 D2	800	j	32
Duplicate of 9 J10VNB	J10VN7	1/9/2005	39	. 1	17	062	U	0 02	764	11	31
0 Split of JTOVNE	J10WW7	1/9/2006	25	1	10	0 035	<u>U</u> i	0.035	533	1	0.0320
1	TDL TDL		1		02			400			
2 Duetwala	Bath P	YOLMDA?	Yes (continue)		No-Stop (acceptable)			Yes (continue)			
3 Dupiscate	800h >	SXTDL ²	No-Sto	No-Stop (acceptable)					No-Stop (acceptable)		
4 Anelyed	e e	IPO	1						· · · · · · · · · · · · · · · · · · ·		
5	Both > PQL/MDA*		Yea	(conti	nue)	No-Stop) (acce	ptable)	Yee (continue)		
6 Spirt Analysia	Both ≽	5xTDL2	No-Sto	p (acc	eptakte)		-		No Sto	p (acci	plable)
7	ñ	PD	· ·	_	<u> </u>	r —					

47 48 BG = backgrowne

49 GW - groundwater 50 HEIS = Hanford Environmental Information System

51 J - estimated

52 MDA = minuteum detectable activity

53 MA = not applicable

54 POL - precisal quanidation amit

Q = qualifier

RAG = remedial action goal RPD = relative percent difference TDL = larget detection limit

U = undetected

UCL w upper confidence lime WAC = Westington Administrative Code

CALCULATION SHEET

Washington Closure Hanford

Originator J. M. Capron & Mr. C.	Date03/01/06	Calc. No. 01008-CA-V0274	
Project 100-B/C Area Field Remediation	Job No. 14655	Checked T. M. Blakley 4.	6 Data 3/1/04
Subject 118-B-6 Burial Ground Cleanup Ve	antication 95% UCL Calculation		Sheet No. 6 of 7

1 118-8-6 Weste Slaging Area Sample Dala

2	Sampling	HEIS	Sample		Lead			Mercury			า กินัยกา		
3	Area	Number	Date	morkg	Q	POL	markg	Q	POL	pCl/g	a	NÖA	
- 4	A1	J10VP3	1/9/2008	4.0		1,8	0.02	Ų,	0.02	28.6	IJ	3.7	
- 51	A2	J10VP2	1/9/2008	3.2		1.7	0.01	ΰ,	0.01	42.3	J	3.7	
₿	EA .	J10VP4	1/9/2006	6.1		1.7	0.01	u	0.01	23.1	1	3.6	
- 7	A4	J10VPS	\$/9/2008	3.1		1.7	0.02	U	0.02	18.0	Ĵ	2.8	

8 Statistical Computation Input Date

- 9	Sempling	HEIS	Sample	Lead	 Mercury	•	Fritum	
10	Arma	Number	Date	mg/kg	 marka		pCVg	
11	A1	J10VP3	1/9/2008	4.0	0.01 j		28.6	<u> </u>
12	A2	J10VP2	1/9/2006	3.2	0.005		42.8	· · · · · · · · · · · · · · · · · · ·
13	A3	J10VP4	1/8/2006	6.1	 0.005		23.1	
14	A4	J10VP5	1/9/2006	3.1	0.01	:	16.0	

15 Statistical Computations

I6	Load		Mercury		Trilium		
Slatistical value based on		dala sol. Use ametric z-stat.	>50% can	onuclide data set sored, 95% UCL hot calculated.		de date set. U ametric z-stal.	
8 N	4		4		4		
9 % < Detection Winit	0%		100%		0%	T	·
neem	4.1		0.01	· · · · · · · · · · · · · · · · · · ·	27.5		
si. døv.	1.4		0.003		11.1		
Z-słabstic	1.645	I !	1.645		1.645	T	
95% UCL on mean	5.2	1	NA		36.7		
t mex value	6.1		0.02	, U	42.3	—··	
Statistical value	5.2		0.02	<u>; U</u>	36.7		
S Background	NA		NA	1	NA	· · · · · · · · · · · · · · · · · · ·	
7 Statistical value above background	5.2		0.02	U	36.7		
Nost Stringent Cleanup Limit for	10.2	BG/GW/River	0.33	BG/GW/Filver			_
Smonradionuclide and RAG type	10.2	Protection	0.33	Protection	1		
WAC 173-340 3-PART Test			1		1		
95% UCL > Cleanup Limit?	NA		NA	· · · · · · · · · · · · · · · · · · ·			
> 10% above Cleanup Limit?	NA		NA		7		
2 Any sample > 2X Cleanup Limit?	NĄ		NA		-[
					7		
RISK EVALUATION					1		
5 WAC 173-340 Non-Carcinogenic Civanup:	353		24				
 Hazard quotient for each nonradionactide: 	NA		NA				
7 WAC 173-340 Carolnogenic Cleanup:	NA .		NA				
Piek for each carcinogenic nonradionuclida;	NA		NA				
	Because a	it lead values are		di mercury values			
WAC 173-340 Compliance? NA		ckground (10.2		background (0.33			
1		formance of the 3-		formance of the S	⊢		
Nonred noncercinogenic	P	nd calculation of		ind calculation of			
2 Index sum: NA	excess risk	are not required.	excess rist	s are not required.			
3 Nonrad carcinogenic ri <u>sk: NA</u>							
BG = background		POL = practic	quantilation	ling	_		
5 GW = moundwater		Q = qualifier					

46 HEIS - Hanford Environmental Information System

47 J = estimated 48 MDA = minimum detectable activity

49 NA = not applicable

RAG + remedial action goal

U = undetected UCL = upper contidence limit WAC = Washington Administrative Code

CALCULATION SHEET

Washington Closure Hanford

Onginator J M Capron LMC	Date02/01/05	Calo No 01008 CA V0274	Rev No. 0
Project 100-B/C Area Field Remediation	Job No. 14655	Checked T M Blakley	Data 3/ 2/24
Subject 118-B 6 Burlal Ground Cleanup Ve	nheaton 95% UCL Calculations	\$	Sheet No. 7 of 7

1 118-B-6 SCL Stockprie Sample Data

2	Sampling	HEIS	Sample		Lead			Mercury			Triburn		
3	Area	Number	Date	mg/kg	0	PQL	mg/kg	0	PQL	pČVg	Ţάï	NUA	
- 4	A1	J10VP1	1/9/2008	47		18	0.03		0.02	292	11	40	
_ 5[A2	JIOVPO	1/9/2008	44	[]	18	0.02	[]	0.01	258	11	32	
Б	A3	J10VN9	1/9/2005	59	l i	18	0.02	Ų	0 02	1 14	100	30	
7	A 4	J10VN8	1/9/2006	70	\Box	17	0.03		0 02	2 02	w	35	

8 Statistical Computation Input Data

ા	Sempling	HEIS	Sample	Lead	Moroury	Thum
10	Area	Number	Date	mgika	mg/kg	pCVg
11	A1	J10VP1	1/9/2006	47	003 ;	232
12	A2	JIOVPO	1/9/2008	44	0.02	258
13	A3	J10VN9	1/9/2006	59	001	114
14	A4	JIOVNS	1/9/2006	70	0.03	2 02

15 Statistical Computations

t6		Lead		Mercury		Trittum	
17	Statistical value based on		dala sel Use amelinc z-stat		iata set Uas ameino z-siat		data set Use reino z-siat
16	N	4		4		4	
19	% < Detection limit	0%		25%		50%	
20	mean	65		0.02		123	
21	si dev	12		0.01		140	
22	Z-slahebc	1 645		1845	-	1645	
23	95% UCL on mean	65		0,03		239	
24	max value	70		0.03		256	
四	Siatistical value	65		0.03	1	238	
28	Background	NA		NA	;	NA !	
27	Statistical value above background	85		0.03	T [238	-¦
1	Most Stringent Cleanup Limit for		BG/GW/River		8G/GW/Rwer		•
	nonradionuclide and RAG type	10.2	Protection	033	Protection	i	
	WAC 173-340 3-PART Test		T TORONIATI			ł	
30	95% UCL > Cleanup Lumit?	NA		NA		1	
31	> 10% above Cleanup Lond?	NA		NA	·	4	
32	Any sample > 2X Cleanup Limit?	NA		NA		ſ	
33				t · · · · · · · · · · · · · · · · · · ·		1	
	RISK EVALUATION					1	
35	WAC 173-340 Non-Carcinogenic Cleanup	353		24		ł	
86	Hazard quotient for each nonredronucide	NA		NA			
	WAC 173-340 Carcinogenic Cleanup:	NA		NA NA		ŧ	
38	Risk for each carcinogenic nonradion/uchde	NA		NA		ſ	
38 [†]						1	
· ·		Весация а	li lead values are	Весацье в	il mexcury values		
40h	WAC 173-340 Gompitance? NA		ckground (10 2		background (0.83		
41			formance of the 3-		ormance of the 3-		
	Nonrad noncarcinogene		nd calculation of		nd calculation of		
	ndex sum: NA		are not required		are not required	1	
	Nonrad parcinogenic risk NA		ant interestations				
	BG = beckground		POL – ometre	al quantiation	hameri	4	
	GW = groundwater		Q = qualities				
	HEIS = Hanford Environmental Information System		RAG = remed	al action cost			
	neigi a Manufig Entradonnental Information oyatoin L – ootwaatad		ll – usdetest				

46 HEIS = Hanford 47 J = estimated

48 MOA = minimum distociable activity

49 NA = not applicable

U = undetected UCL = upper contidence limit WAC = Wastwagton Administrative Code

CALCULATION COVER SHEET

Project Title	118-B-6 Buria) Ground Clean	<u>mJob No</u>	14655	
Area .	100-BC Area			
Discipline	Environmental	*Calc. No.	0100B-CA-V0276	
Subject	118-B-6 Burial Ground RESI	RAD Calculati	on Brief	
Computer Pr	ogram <u>RESRAD</u>	Program	n No. Version	1 <u>6.30</u>

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

Committed Calculation 🛛

Preliminary 🗆 Superseded 🗈

Voided 🗆

	Sheet Numbers	Originator	Checker	Reviewer	Approval	Date
0	Cover - 1 pg Secondary - 5 pg Atta. 1 · 74 pg Atta. 2 · 20 pg Atta. 2 · 20 pg Atta. 3 · 22 pg Atta. 4 · 11 pg Atta. 5 · 20 pg Atta. 6 · 22 pg Atta. 6 · 22 pg Atta. 7 · 11 pg Atta. 8 · 20 pg Atta. 9 · 22 pg Atta. 10 · 11 pg Atta. 12 · 20 pg Atta. 12 · 22 pg Atta. 13 · 11 pg Total - 23 pg 5 20	S. W. Clark 3 / <i>P</i> /06	M. W. Perrott PHU, Fundt 3/8/06	T. M. Blakley J. N. Blahly 3/8/00	D. N. Strom	
			SUMMARY OI	FREVISION		

*Obtain Calc. No. from DIS

DE01-437.03 (12/09/2004)

ſ		shington Closure Hanford . nator: S. W. Clark 2023	Date: 7/8/04	Calc. No.:	100B-CA-V0276	Rev.:	0
		oject: 118-B-6 Cleanup Verification	Job No: 14655	Checked:	M. W. Perrott 774	Date:	2/8/06
ĺ		bject: 118-B-6 Burial Ground Clean					No. 1 of 1
-							
1	PU	RPOSE:					
2 3							
		culate the predicted soil and gro					
4		ionuclide contaminants in soils					
5		ow cleanup levels (BCL) stock	pile at the 118-E	-6 Burial C	round remediation site	e over a	a
6	pea	iod of 1,000 years.					
7							
8	GI	VEN/REFERENCES:					
9							
10	1)	Cleanup verification data from				Calcula	tion
11		No. 0100B-CA-V0274, Rev. 0.					
12	- 2)	Remedial Design Report/Reme			•		
13		DOE/RL-96-17, Rev. 5, U.S. I	Department of E	nergy, Rich	land Operations Office	e,	
14		Richland, Washington.					
15	2)	Radioactive and nonradioactive					
16		Grounds Remedial Action Sam					i.
17		Department of Energy, Richlan					
18		purpose of these RESRAD cale					
19		(COC) is tritium (H-3). The no					
20		mercury. Concentrations of the				nedial	
21		action goals per the RDR/RAV	*				
22	- 3)					-	
23		with residual radioactivity guid					
24		Environmental Assessment Div					S .
25	- 4)	· · · · · · · · · · · · · · · · · · ·				п	
26		No. 0100B-CA-V0271, Rev. 0					
27	5)	Analogous site data from the C					
28		Effluent Trench, CVP-98-0000	6, Rev. 0, Bech	tel Hanford	, Inc., Richland, Wash	ington	, and

30 31 32

29

33 SOLUTION:

34

35 1) RESRAD runs were performed for the residual contamination in the shallow zone, deep 36 zone, waste staging area, and BCL stockpile at the 118-B-6 site. Table 1 shows the 37 elevations (NGVD88) and dimensions of the relevant soil horizons. The ground surface 38 elevation for excavation backfill is 144.0 m. The average groundwater elevation beneath 39 the site is 121.6 m. The average elevation of the excavation floor is 135.6 m. The 40 thickness of the deep zone between the bottom of the shallow zone and the excavation floor 41 is 3.8 m (12.5 ft). Test pit and borehole data from analogous sites in the 100-BC Area 42 show that contaminant concentrations that are below direct exposure cleanup levels 43 decrease to background concentrations within 3 m (9.8 ft) below the elevation at which the 44 contamination occurs. Therefore a thickness of 6.8 m (22.3 ft) is used for the contaminated 45 deep zone. Attachment 1 shows the dimensions of each soil horizon and the contaminant

the Limited Field Investigation Report for the 100-BC-1 Operable Unit, DOE/RL-93-06,

Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Washington Closure Hanford	1.	CALCULATION SHEET

[Originator.	S. W. Clark	Date: 2/4/06	Calc. No.:	100B-CA-V0276	Rev.: Q
	Project:	118-B-6 Cleanup Verification	Job No: 14655	Checked:	M. W. Perrott	Date: 3/8/66
[Subject:	118-B-6 Burial Ground Clear	Sheet No. 2 of 5			

pathways considered for dose, risk, and groundwater protection. All input factors for the RESRAD runs are shown in the "Summary" section of the RESRAD "Part I: Mixture Sums and Single Radionuclide Guidelines" printouts in the Attachments to this Calculation Summary.

l

2) The years when the peak dose (or concentration) occurs in the groundwater for tritium (H-3) was examined by preliminary RESRAD modeling runs. These years were then added for all horizons in the final RESRAD runs. For the groundwater (well water) the peak years were year 27.6 for the deep zone and year 45 for the shallow zone, waste staging area, and BCL Stockpile. The 27.6- and 45-year time periods were included in all of the RESRAD runs. Year 12 was also added, corresponding to 2018, the date of the 30-year site cleanup schedule of the Hanford Federal Facility Agreement and Consent Order.

Table 1. Wa	aste Site D	imensions fo	r RESRAI	D Modeling	
Parameter	Units	Shallow Zone	Deep Zone	Waste Staging Area	BCL Stockpile
	Contam	inased Zone Din	rensions		
Cover Depth	m	0	4.6	0	0
Area of Contaminated Zone (CZ)	m²	830	56	487	1,492
Length Parallel to Aquifer Flow	m	32.5	8.4	12.5	21.8
	Elevations	of Vadose Zone	e Horizons		
Elevation: Surface	n.	144.0	144.0	144.0	144.0
Elevation: Bottom of Excavation	m	135.6	135.6	135.6	135.6
Elevation: Oroundwater	m	121.6	121.6	121.6	121.6
Thickness: Contaminated Zone	 nı	4.6	6.8	4.6	4.6
Thickness: Unsaturated Zone	n.	17.8	11	17.8	17.8

17 METHODOLOGY:

Runs of RESRAD Version 6.30 were completed for the shallow zone, deep zone, waste
 staging area, and the BCL stockpile using the tritium (H-3) concentrations shown in
 Table 2. RESRAD numerical output reports for dose, risk, and concentration for the
 shallow and deep zones are presented in the Attachments to this Calculation Summary.

Table 2. 118-B-6 Radionuclide Soil Concentrations								
Radionuclide	Shallow Zone Soll Activity, pCl/g	Deep Zone Sofi Activity, pCl/g	Waste Staging Area, pCi/g	BCL Stockpile, pCi/g				
H-3 (mitium)	160	1,996	36.7	238				

Washington Closure Hanford . CALCULATION SHEET

Originator: S. W. Clark	Date: 3/8/06			Rev.: 0
Project: 118-B-6 Cleanup Verification	Job No: 14655	Checked:	M. W. Perrott Mar	Dete: 3/8/66
Subject: 118-B-6 Burial Ground Clear	Sheet No. 3 of 5			

RESULTS:

- $\frac{1}{2}$
- Radionuclide "All Pathways" Dose Rate: The "all pathways" (maximum) dose rates are
 shown in Table 3. The maximum total dose rate of 6.23 mrem/yr from the combined
 - horizons occurs at year zero (2006).
- 5 6

	Table 3. All Pathways Dose Rate (mrem/yr)												
Vadose Zone		"All Pathways" Dose Contributions in mrem/yr at Each Time Slice (yr)											
Horizoa	0	1	3	7	12	27.6	45	100	300	1000			
Run #1 Shallow Zone									0	0			
Run #2 Weste Staning Area	2.84E-01	1.00E-01	1.228-02	1.805-04	9.22E-07	6.94E-08	4.69E-02	5.17E-10	0	Q			
Run #3 BCL Stockpile	3.84E+00	1.36E400	1.65E-01	2.43B-03	1.25E-05	2.51 B-06	6.92B-01	8.06E-09	0	0			
Run #4 Deep Zone	0.00E+00	0.00E+00	0.00B+00	0.00E+00	0.00B+00	3.99E-01	5.20E-03	7.27E-10	Ű	0			
Total	6.23B+00	2.20E+00	2.67E-01	3.93E-03	2.02E-05	3.99E-01	1.38E+00	1.89E-08	0	0			

- 7
- 8 9

2) Radionuclide Excess Cancer Risk: The radionuclide excess cancer risk results are shown

on Table 4. The maximum total risk (2.61 x 10⁻⁵) occurs at year zero (2006).

10 11

Table 4. Radionuclide Excess Cancer Risk											
Vedosc Zonc	Excess Cancer Risk at Each Time Slice (yr)										
Herizon	0	1	3	7	12	27.6	45	100	300	1000	
Run #1 Shallow Zone	9.40E-06	5.21E-06	2.85E-06	2.25E-06	2.44E-06	1.98E-06	2.76E-14	0	0	0	
Run #2 Waste Staging Area	1.17E-06	5.34B-07	2.39E-07	1.71B-07	1.67E-07	1.31E-07	1.45E-15	0	0	Ģ	
Run #3 BCL Stockpile	1.55E-05	7.17B-06	3.00E-06	2.34E-06	2.67E_06	1.88E-06	2.33E-14	0	0	0	
Run #4 Deep Zone	0	0	0	0	5.69E-06	8.37E-06	1.09E-07	1.52E-14	0	0	
Total	2.61E-05	1.29E-05	6.09E-06	4.76E-06	1.10E-05	1.24E-05	1.09E-07	1.52E-14	0	0	

- Redionuclide Groundwater Protection: The tritium (H-3) concentrations in groundwater
 were calculated by the RESRAD model and are summarized in Table 5. Tritium (H-3) was
 calculated to reach groundwater within 1,000 years at concentrations below the drinking
 water remedial action goal (RAG) of 20,000 pCi/L. Because tritium (H-3) is the only
- 18 contaminant of concern there is no need to do a comparison to drinking water standards
- 19 (MCL) calculation brief for the 118-B-6 Burial Ground.
- 20

Originator:	S. W. Clar		Je-		1/			OB-CA-VO		Rev.	
Project:	118-B-6C			Job No				W. Perrott	<u> 141/</u>	Date	
Subject:	118-B-61	Borrial Gr	ound Clea	anup Ver	iflcation I	ESRAD	Calculatie	n		Sheet	No. 4
I	able 5.	RESR/	AD Cal	culated	Ground	lwater	(Well W	ater) Co	ocentra	tions.	
RESRAD	Т	ritlum (F	I-3) Gree	undwate	r Concen	tration in	r pCVL at	Each Tin	e Silce (y	T)	RAG
Run No.	0	1	3	7	12	27.6	45	100	300	1000	рСИ
Run #1	0	o	0	D	0	0	6.83E+03	2.64E-04	1.868-29	0	
Run #2	0	0	l o		0	0	1.40E+03	1.55E-05	1.098-30	0	
Run #3	0	0	0	Ö	0	Û	1.015+04	2.11 E-0 4	1.488-29	0	
Run #4	0	0	Q	٥	0	8.835403	1.158+62	1.61E-05	1.64B-29	0	
Total	0	D	Q	Ó	0	8.83B+03	1.85B+04	5.06E-04	5.68E-29	0	20,000
		_									
CONCL	USIONS	5:									
CONCE											
	• 11 - • • • • •					1				_ 	
							ı in Tabl		compine		mum
all-pa	thways (iose rat	e is 6.23	3 mrenv	vr. occu	ring at '	year zero	(2006).			
						·····	,	/-			
 None 	of the si	ite conta	uminant	s are on	oiccted t	io excee	d remedi	al action	i goals (F	RAGs).	
				P	•]••••••				. Boons (*		
 The r 	adionucl	ide exca	ess lifet	ime can	cer risk	results a	are show	n in Tabl	le 4. The	e maxim	111111
							icer risk				
		now an	n neeb z	tone ex	cess me	une çan				лкан ме	
								(-
zero (2006).							(2101.)()	,		,44 1
zero (2006).								,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		,44 1
								•		-	.41
• Tritiu	m (H-3)						nin 1,000	years at	a maxin	num	
• Tritiu	m (H-3)							years at	a maxin	num	
• Tritiu conce	m (H-3) mtration	of 18,5	00 pCi/.	L, whic	h is belo	w the R	nin 1,000 AG (20,	years at	a maxin L). Bec:	num ause trit	jum
 Tritiu conce (H-3) 	m (H-3) mtration is the or	of 18,5 aly cont	00 pCi/. aminan	L, whic t of con	h is belo cem, the	w the R ere is no	nin 1,000 AG (20, meed to	years at 000 pCi/ do a con	a maxin L). Bec: nparison	num ause trit to drin)	jum sing
 Tritiu conce (H-3) 	m (H-3) mtration is the or	of 18,5 aly cont	00 pCi/. aminan	L, whic t of con	h is belo cem, the	w the R ere is no	nin 1,000 AG (20,	years at 000 pCi/ do a con	a maxin L). Bec: nparison	num ause trit to drin)	jum sing
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- 1	Subject:	118-B-6 Bari	al Ground Clear	nup Verifi	cation RES	RAD Calcul	noue	Sheet No. 5 of 5	57
1 2 3	Intal	ce Quantities	and Health I	kisk Fac	tors (22 p	ages)	Stockpile Radionuclida Stockpile Radionuclida		

- 4 Part IV: Concentration of Radionuclides (11 pages)
- 5 11. RESRAD Output: Run #4 118-B-6 Burial Ground Deep Zone Radionuclides; Part I:
 6 Mixture Sums and Single Radionuclide Guidelines (20 pages)
- 7 12. RESRAD Output: Run #4 118-B-6 Burial Ground Deep Zone Radionuclides; Part III:
 8 Intake Quantities and Health Risk Factors (22 pages)
- 9 13. RESRAD Output: Run #4 118-B-6 Burial Ground Deep Zone Radionuclides; Part IV:
- 10 Concentration of Radionuclides (11 pages)

ATTACHMENT 1

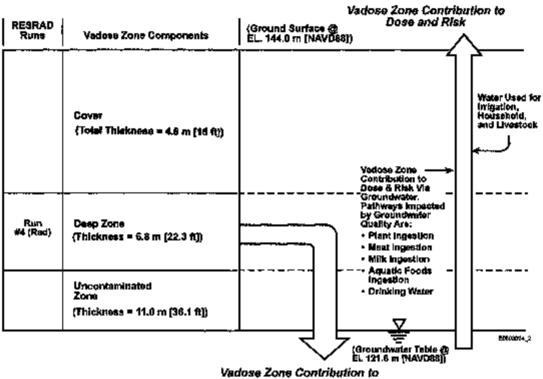
Vadose Zone Contribution to Dose and Risk RESRAD (Ground Surface @ EL. 144.0 m (NAVD86)) Vadose Zone Components Runa External Gamma Inhalation Plant Ingestion Meat Ingestion Aquatic Foods ingestion Soil Ingestion Milk Ingestion : Water Used for Infigation, Household, and Livestock Shallow Zone, Waste Staging Area, and BCL Stockpile Run #1 (Rad) #2 (Rad) #3 (Rad) (Total Thickness = 4.6 m (15 ft)) - - Plant Ingestion Meatingeotion Deep Zone - Milk Ingestion (Thickness = 17.6 m [58.4 ft]) Aquatic Foods Ingestion Drinking Water Ĭ Σ E00402024_1 (Groundwater Table @ EL 121.6 m [NAVD88])

118-B-6 Burial Ground Cleanup Verification Model

Vedose Zone Contribution to Groundwater Contamination

Attachmer	nt1	Sheet No. 1 of 2
Originators:	S. W. Clark 🕰 🕰	Sheet No. 1 of 2
Chk'd By 🔄	M. W. Perrott 2%	Date 28/0
Calc. No	01008-CA-V0276	Rev. No. 10

ATTACHMENT 1



118-B-6 Burial Ground Cleanup Verification Model

Groundwater Contamination

Attachmer	nt1	Sheet No, 2 of 2	
Originators: 3		Sheet No, 2 of 2	
Chk'd By	M. W. Perrott 🛪	the Date 3/ 6/5	
Calc. No	0100B-CA-V027	6 Rev. No. 0	

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