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(b) Responsible Manager (Print/Sign): R. B. Calmus	R B Calmus	Date: 10/23/06
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Retrieval Data Report for Single-Shell Tank 241-C-201

M. J. Galgoul
CH2M HILL Hanford Group, Inc.
Richland, WA 99352
U.S. Department of Energy Contract DE-AC27-99RL14047

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Abstract: This report describes the retrieval of waste from SST 241-C-201, which is one of four 200-series SSTs constructed to store waste in Waste Management Area C. The DOE began retrieval of waste on October 25, 2005, and completed retrieval in compliance with Milestone M-45-00 and M-45-00B requirements on March 23, 2006. The limit of technology was reached for the configuration of the vacuum retrieval system as deployed.

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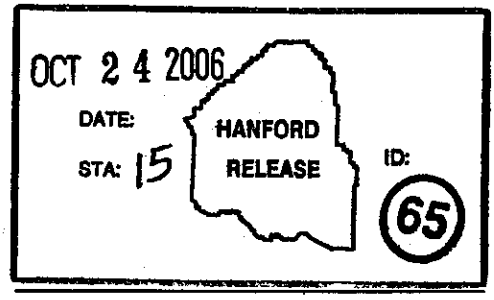

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Page 1

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Change Control Record

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0-B RS	Replace pp 1-1, 8-8, 8-12, and 11-1	M. J. Galgoul 10/23/06	R. B. Calmus

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Revision 0-B

RETRIEVAL DATA REPORT FOR SINGLE-SHELL TANK 241-C-201

Prepared by
M. J. Galgoul

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1.0 INTRODUCTION AND BACKGROUND

Hanford Federal Facility Agreement and Consent Order (HFFACO) (Ecology et al. 1989), Milestone M-45-00 requires the U.S. Department of Energy (DOE) to retrieve waste from all single-shell tanks (SST) at the Hanford Site. This report describes the retrieval of waste from SST 241-C-201 (SST C-201), which is one of four 200-series SSTs constructed to store waste in Waste Management Area C (WMA C). These tanks are collectively referred to as the C-200-series tanks. The DOE began retrieving waste from SST C-201 on October 25, 2005, and completed retrieval operations in compliance with Milestone M-45-00 requirements on March 23, 2006.

Where information regarding treatment, management, and disposal of the radioactive source, byproduct material, and/or special nuclear components of mixed waste (as defined by the *Atomic Energy Act of 1954*, as amended) has been incorporated into this document, it is not incorporated for the purpose of regulating the radiation hazards of such components under the authority of Chapter 70.105, "Hazardous waste management," Revised Code of Washington and its implementing regulations, but is provided for information purposes only.

1.1 PURPOSE

This RDR provides information required by Section 2.1.7 of Appendix I to the HFFACO. The report documents the SST C-201 pre-retrieval sampling and analysis of the waste, the retrieval campaign, waste retrieval system performance, and post-retrieval activities including the residual waste volume determination. This report describes the performance of the retrieval system used to remove waste from SST C-201, presents data confirming that the amount of waste removed meets Milestone M-45-00 retrieval criteria, and summarizes the potential risk to human health posed by the waste remaining in the tank.

1.2 HISTORY

Construction of SST C-201 was completed in 1944. The tank was placed in service in 1947, receiving metal waste from the B Plant bismuth phosphate process through January 1948. Metal waste supernate was removed from SST C-201 in 1953 in preparation for sluicing the metal waste solids in the tank. The metal waste solids were sluiced, a visual inspection was conducted, and in March 1954, the tank was declared empty. (RPP-15408, *Origin of Wastes in C-200 Series Single-Shell Tanks*).

From May 1955 to November 1955, SST C-201 received Hot Semi-Works facility radioactive waste generated from plutonium-uranium extraction (PUREX) pilot plant studies. Most of the Hot Semi-Works waste, in the form of supernate, was removed in 1970. SST C-201 was removed from service in 1976 and interim stabilized in 1982 (RPP-15408).

Unexplained decreases in SST C-201 waste levels that totaled approximately 450 gal were noted in 1988. These decreases were assumed to have been associated with a leak, although no

Table 8-2. Estimated Maximum Incremental Lifetime Cancer Risk/Radiological Dose During the Modeling Period for Primary Radionuclides.

Analyte	Detect	Inventory (Ci)	WMA C Fenceline Conc. (pCi/L)	Peak Year	K_d (mL/g)[a]	Half-Life (yr)	Incremental Lifetime Cancer Risk Scenarios (Groundwater)[b]		Radiological Dose Groundwater (mrem/yr)[b]	Radiological Dose Beta/Photon (mrem/yr)[b]
							Industrial	Residential	All Pathway Farmer	Drinking Water
^{99}Tc	Yes	2.66E-03	1.06E-02	10461	0	2.11E+05	1.46E-10	3.56E-09	1.86E-05	4.72E-05
^{14}C	Yes	7.76E-04	1.20E-03	9781	0	5.73E+03	9.28E-12	6.71E-11	5.79E-06	2.39E-06
^{233}U	Yes	1.41E-05	0	DNA	0.6	1.59E+05	0	0	0	N/A
^{234}U	Yes	4.54E-02	0	DNA	0.6	2.46E+05	0	0	0	N/A
^{235}U	Yes	1.92E-03	0	DNA	0.6	7.04E+08	0	0	0	N/A
^{236}U	Yes	1.09E-03	0	DNA	0.6	2.34E+07	0	0	0	N/A
^{238}U	Yes	4.55E-02	0	DNA	0.6	4.47E+09	0	0	0	N/A
^{129}I	No	1.44E-04	<0.001[c]	12032	0.2	1.57E+07	Dropped[d]	Dropped[d]	Dropped[d]	Dropped[d]
Performance objective[e]							1.0E-6 to 1.0E-4[f]	1.0E-6 to 1.0E-4[f]	25[g]	4[h]

[a] See PNNL-13895, *Hanford Contaminant Distribution Coefficient Database and Users Guide*, Rev. 1, for the basis for the K_d values listed for the radionuclides.
[b] All exposure scenarios are described in HNF-SD-WM-TI-707.
[c] Simulation predicted contaminant arrives at the fenceline, but at a concentration (0.001 pCi/L) that is much below the minimum detection limit for standard analytical methods.
[d] Dropped from the analysis because the simulation predicted concentration (0.001 pCi/L) is much below the minimum detection limit for standard analytical methods.
[e] Performance objectives apply to the cumulative (i.e., all contaminants) for the entire WMA.
[f] EPA/540/R-99/006, *Radiation Risk Assessment at CERCLA Sites: Q & A, Directive* 9200.4-31P.
[g] DOE O 435.1, *Radioactive Waste Management*.
[h] 65 FR 76708, "National Primary Drinking Water Regulations; Radionuclides; Final Rule."
Notes:
DNA = did not arrive at fenceline within the modeling period
N/A = radionuclide is not a beta/photon emitter
Shaded cells are nondetects and the inventory used in the risk assessment is calculated at one-half the minimum detection limit.

Table 8-4. Cumulative Incremental Lifetime Cancer Risk, Hazard Index, and Radiological Drinking Water Dose from Peak Groundwater Concentration Related to Residual Waste Volume in Single-Shell Tank C-201.

Metric[a]	Industrial Receptor		Residential Receptor		Performance Objective[b]
	Nominal	Bounding	Nominal	Bounding	
Radioactive chemicals ILCR (unitless)	1.55E-10[c] (1.55E-10)[c,d]	2.79E-10[c] (2.79E-10)[c,d]	3.63E-09[c] (3.63E-09)[c,d]	6.53E-09[c] (6.53E-09)[c,d]	1.0E-06 to 1.0E-4[e]
Nonradioactive chemicals ILCR (unitless)			Dropped[f]	Dropped[f]	1.0E-5[g]
Hazard Index (unitless)			1.32E-04[c] (1.32E-3)[c,d]	2.70E-03[c] (2.96E-03)[c,d]	1.0[g]

Dose	Nominal	Bounding	Dose
APF (mrem/yr)	2.42E-5[c] (2.42E-5)[c,d]	4.36E-05[c] (4.36E-05)[c,d]	25 mrem/yr[h]
EPA maximum contaminant level (MCL) beta/photon emitters (mrem/yr target organ dose)	4.95E-5[c] (4.95E-5)[c,d]	8.91E-05[c] (8.91E-05)[c,d]	4 mrem/yr[i]
Groundwater Concentration	**Nominal**	**Bounding**	**MCL**
^{99}Tc (pCi/L)	1.06E-2	1.91E-02	900 pCi/L
^{14}C (pCi/L)	1.20E-3	2.14E-03	2000 pCi/L
^{129}I (pCi/L) (not detected)	<0.001	<0.001	1 pCi/L
Chromium (µg/L)	5.05E-02	1.04E-01	100 µg/L
Fluoride (µg/L)	1.12E-02	2.05E-02	4,000 µg/L
Nitrate (µg/L)[k]	2.19E-03	8.61E-03	45,000 µg/L
Nitrite (µg/L)[k]	5.62E-03	3.65E-03	3,000 µg/L
Uranium (µg/L)	0.0	0.00E+00	30 µg/L

[a] Metric ILCR-rad were evaluated using industrial and residential land use scenarios described in HNF-SD-WM-TI-707. ILCR-nonrad and Hazard Index were evaluated using WAC 173-340-705 (4) Method B (residential).
[b] Performance objectives apply to entire WMA, not just a single component of the WMA.
[c] Analytes with a fenceline concentration of less than either 0.001 pCi/L (radioactive) or 0.001 µg/L (nonradioactive), which is a value that is well below the minimum detection limit for standard analytical methods, are not included in the total.
[d] Total in parenthesis includes nondetects with inventory calculated at one-half the detection limit.
[e] EPA/540/R-99/006, *Radiation Risk Assessment at CERCLA Sites: Q & A, Directive 9200.4-31P.*
[f] Dropped from the analyses because no analyte with a cancer slope factor was predicted to have a concentration >0.001 µg/L, which is a value that is well below the minimum detection limit for standard analytical methods.
[g] WAC 173-340-705 (4).
[h] DOE O 435.1, *Radioactive Waste Management.*
[i] 65 FR 76708, "National Primary Drinking Water Regulations; Radionuclides; Final Rule."
[j] Model estimated concentration >0.001 pCi/L, which is a value that is well below the minimum detection limit for standard analytical methods.
[k] MCL is for nitrate and nitrite, not nitrogen in nitrate or nitrogen in nitrite which are 10,000 and 1,000, respectively.

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