Characterization of Radionuclides in H-Modified and Purex Waste Sludges from H-Area High Level Waste Tanks

by

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CHARACTERIZATION OF RADIONUCLIDES IN H-MODIFIED AND PUREX WASTE SLUDGES FROM H-AREA HIGH LEVEL WASTE TANKS (U)

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Revision Description

Revision 2 to this document includes the following substantive changes to the Revision 1 document:

- Revalidate H-Area high level waste streams.

- Revise the consolidation of the waste from H-Area high level waste tanks from five waste streams previously documented in three characterization reports [HTK-00002-9, -43, and –30 (WSRC-TR-2000-00249, this document, previous Revision 1); WPT-00002-51 (WSRC-TR-2000-00115, Revision 1); Reference 5); and HTK-00002-2H42 (WSRC-TR-2001-00132; Reference 6) to one waste stream (HTK-00002) in Revision 2 of this document.

- Update the distribution of radionuclides in the consolidated waste stream based on current high level waste tank contents and revised SRS Waste Acceptance Criteria (WAC) 2.02 and 3.17 requirements.

1.0 Background

Characterization of High Level Waste Sludge by the Savannah River Site Closure Business Unit (CBU) is outlined in WSRC-TR-94-0579, *High Level Waste Sludge Characterization in Support of Low Level Waste Certification* (Reference 1). The sludge characterization is based on a series of scaling factors for sludge-containing waste tanks. Scaling Factors were previously compiled and compared with available sample data in WSRC-TR-94-0562, *Characterization of Radionuclides in HLW Sludge Based on Isotopic Distribution in Irradiated Assemblies* (Reference 2). Quantification of sludge-contaminated waste and application of the scaling factors has been performed on a case-by-case basis since approval of the methodology by the Waste Characterization Board in 1994.

The Waste Characterization System (WCS) was established in 1996 to consolidate waste characterization information. Inventories and compositions of major sludge constituents are based on tank fill histories. Minor constituent inventories are based on compositions developed during DWPF design. Fill histories for each tank are also contained in the WCS (Reference 3). Subsequent analytical data is incorporated into this database as deemed appropriate.

Further examination of historical tank use data contained in Reference 3, tank contents (i.e., high heat or low heat fractions of either Purex or H-Modified waste) and waste age (both in Reference 2) allowed consolidation of sludge in waste tanks to be considered.

WSRC 1S SRS Waste Acceptance Criteria Manual, Procedure 2.02, *Low Level, Hazardous, Mixed and PCB Waste Characterization Requirements,* Revision 7 (Reference 4), allows for consolidation of waste streams when the following two criteria are met:

1. Performance Assessment (PA) radionuclide scaling factors do not vary from the proposed data set scaling factor by more than a factor of 10, and

2. The fractional activity of the predominant radionuclides (predominant radionuclides being those that make up 10% or greater of the activity) in each data set does not vary by more than a factor of 2 from the fractional activity of the same radionuclide in the proposed data set.

This document contains the characterization methodology for sludge-contaminated waste generated from the H-Area Tank Farm, based on process knowledge and available analytical data. In addition, this document contains an evaluation for consolidation of sludge-contaminated waste from multiple high level waste (HLW) tanks in the H-Area Tank Farm. The scaling factors developed in this document supercede those presented in References 1 and 2; the previous revision of the current document [WSRC-TR-2000-00249, *Characterization of Radionuclides in H-Modified and Purex Waste Sludges from H-Area High Level Waste Tanks (U), Revision 1, December 2000*] and other previously-developed radionuclide characterizations for H-Area Tank Farm sludge-contaminated waste [WSRC-TR-2000-00115, *Characterization of Radionuclides in Waste Sludges from High Level Waste Tanks 40, 42 and 51 (U), Revision 1, August 2000* (Reference 5) and WSRC-TR-2001-00132, *Characterization of Radionuclides for 2H Evaporator Cleaning Transfers to Tank 42 (U), Revision 0, March 2001* (Reference 6)].

2.0 Introduction

Sludge-contaminated waste consists of waste contaminated with both insoluble species (the sludge fraction) and entrained supernate. The WCS is based on the assumption that, generally, approximately 70-80% of the volume of what is commonly referred to as sludge is interstitial supernate; the remaining approximately 20-30% consists of the insoluble species (Reference 1).

Development of a method for characterization of sludge–contaminated waste must consider both fractions. Separate waste cuts may contain sludge and supernate fractions in varying proportions due to the nature of

the job generating the waste and the variability in waste handling techniques. Development of a distribution representative of all sludge-contaminated waste cuts must allow for varying fractions of sludge and supernate contamination.

This document will develop a radionuclide distribution for the sludge fraction of sludge-contaminated waste stored in all H-Area Tank Farm high level sludge waste tanks in accordance with the methodology outlined in WSRC 1S SRS Waste Acceptance Criteria Manual, Procedure 2.02, Revision 7 (Reference 4). This distribution is based on the assumption that sludge-contaminated waste from all H-Area HLW tanks could be co-mingled, and the actual contamination present on waste in a series of containers from these tanks will be representative of the mean radionuclide distribution. Previously, high level sludge waste from the H-Area Tank Farm has been managed as five separate consolidated waste streams, documented in three separate characterization reports, HTK-00002–9 (Tanks 9, 13, 14), HTK-00002-43 (Tanks 21-23, 43), and HTK-00002–30 (Tanks 11, 12, 15, 30, 32, 35, 36, 39) (this document, previous Revision 1); WPT-00002-51 (Tanks 40, 51; Reference 5); and HTK-00002-2H42 (Tank 42; Reference 6). A single, comprehensive characterization for F- and H-Area Tank Farm supernate has been developed previously (Reference 7).

This document also describes the methodology for application of radionuclide distributions representative of sludge-contaminated waste to individual waste packages.

Most of the waste contaminated with sludge from the H-Area Tank Farm will be categorized as low-level waste (LLW) and disposed of in the E-area Vaults (EAV). The waste does, however, have the potential to be categorized as U.S. Department of Energy-defined transuranic waste (TRU) and/or mixed waste (Reference 4). Quantification of hazardous constituents and determination of whether the waste is classified as mixed is dependent on the amount of sludge present on the waste matrix and the nature of the waste matrix, and will be performed on a case-by-case basis. Quantification of radionuclides present in each waste package will be performed as described in Section 4.0.

The radionuclide distribution developed for LLW contaminated with sludge from the F-Area Tank Farm can also be applied to waste classified as TRU waste. [Neither WSRC 1S SRS Waste Acceptance Criteria Manual, Procedure 3.06, *E-Area TRU Pads Transuranic Waste Acceptance Criteria*, Revision 5, nor Appendix A:34, *TRU Waste Container Characterization Form (OSR 29-90) Instruction* specifies a methodology for determination of the isotopic distribution in TRU Waste, but simply that the methodology be documented.]

3.0 Development of a Radionuclide Distribution for Sludge Fraction of Sludge-Contaminated Waste

The development of the radionuclide distribution in this section is performed per guidance outlined in WSRC 1S SRS Waste Acceptance Criteria Manual, Procedure 2.02, Revision 7 (Reference 4).

3.1 Determining the Initial List of Radionuclides

WSRC 1S SRS Waste Acceptance Criteria Manual, Procedure 2.02, Revision 7 (Reference 4), stipulates that the characterization of each package of waste having a total activity greater than 2 nanocuries/gram must consider the potential presence of any radionuclide that meets any one of three criteria:

1. The radionuclide is identified in WSRC 1S SRS Waste Acceptance Criteria Manual, Procedure 3.17, *Low Level Waste Acceptance Criteria*, Revision 7 (Reference 8), as being a Performance Assessment (PA) or Safety Authorization (SA) Basis radionuclide for a specific treatment, storage or disposal (TSD) facility. For purposes of this distribution, the PA and SA radionuclides for the EAV will be used.

2. The radionuclide could be present in the waste with a relative activity greater than 1.0% of the total waste stream activity at the time of the characterization.

3. The radionuclide is a detectable transuranic or a fissile radionuclide.

The above criteria are hereafter referred to as “inclusion criteria.”

Based on the three inclusion criteria and available process knowledge, the following list of 42 radionuclides (Table 3.1) will be considered when developing the radionuclide distribution of waste packages contaminated with sludge from the H-Area Tank Farm.

Table 3.1. Radionuclides Important to Characterization of the Sludge Fraction of H-Area Tank Farm Sludge-Contaminated Waste

Radionuclide	Inclusion Criteria			
	PA Limiting	SA Limiting	Potentially Present At >1% Total Activity	Detectable Fissile or TRU Radionuclide
H-3		SA		
C-14	PA			
Ni-59			X	
Co-60			X	
Ni-63			X	
Se-79			X	
Sr-90			X	
Y-90			Daughter of Sr-90	
Tc-99	PA			
Ru-106			X	
Rh-106			Daughter of Ru-106	
Sb-125			X	
Sn-126			X	
I-129	PA			
Cs-134			X	
Cs-135			X	
Cs-137			X	
Ba-137m			Daughter of Cs-137	
Ce-144			X	
Pr-144			Daughter of Ce-144	
Pr-144m			Daughter of Ce-144	
Pm-147			X	
Eu-154			X	
U-233				Detectable Fissile
U-234	PA			
U-235				Detectable Fissile
U-236			X	
U-238	PA			
Np-237				Detectable TRU
Np-239			X	
Pu-238				Detectable TRU
Pu-239				Detectable Fissile, TRU
Pu-240				Detectable TRU
Pu-241				Detectable Fissile
Pu-242				Detectable TRU
Am-241				Detectable TRU
Am-242m				Detectable Fissile, TRU
Am-243				Detectable TRU
Cm-244			X	
Cm-245				Detectable Fissile, TRU
Cm-246				Detectable TRU
Cm-247				Detectable Fissile, TRU

3.2 Consolidating Sludge from H-Area Tank Farm

WSRC 1S SRS Waste Acceptance Criteria Manual, Procedure 2.02, Revision 7 (Reference 4), allows for consolidation of waste streams when the following two criteria are met:

1. Performance Assessment radionuclide scaling factors do not vary from the proposed data set scaling factor by more than a factor of 10, and

2. The fractional activity of the predominant radionuclides (predominant radionuclides being those that make up 10% or greater of the activity) in each data set does not vary by more than a factor of 2 from the fractional activity of the same radionuclide in the proposed data set.

Historical data for active tanks under consideration for consolidation are reproduced in Table 3.2.

Table 3.2. H-Area Tank Farm Historical Data

Tank No.	% H-Modified HHW	% H-Modified LHW	% Purex HHW	% Purex LHW	Yr. of Waste Rcpt.	Tank Use/Notes
9			50	50	1955	Waste Removal
10	1	1	49	49	56-59	Waste Removal
11	68	17		15	56-59	Waste Removal
12	84		8	8	56-73	Waste Removal
13	1	88		11	56-74	Waste Removal
14	16	25	59		57-65	Waste Removal
15	92	8			60-81	Waste Removal
21		100			76-81	Evaporator Feed from RBOF/RRF, DWPF
22		100			74-84	Evaporator Feed from DWPF/HDB8
23					84	Evaporator Feed from RBOF/RRF
30	100				86	Concentrate Receipt Tank
32	91	9			71-88	Evaporator Feed from Canyon
35	100				77-90	Evaporator Feed from Canyon
36	100				78	Concentrate Receipt Tank
39	100				82-91	Evaporator Feed from Canyon
40						Extended Sludge Processing
42						Extended Sludge Processing
43		100			82-86	Evaporator Feed from RBOF/RRF/DWPF/HDB8
51						Extended Sludge Processing

The tanks contain H-Modified Waste and/or Purex Waste (both high- and low-heat) in varying proportions. The waste is aged from 12-48 years. The tanks are all utilized for either waste removal, concentrate receipt, evaporator feed, or extended sludge processing.

The WCS contains significant process knowledge supplemented with analytical data relating to what is present in the sludge fraction of these waste tanks. The WCS was accessed for the current distribution of radionuclides in the tanks to determine activities, concentrations, and scaling factors (to Sr-90) for the tank sludge fractions (References 9 and 10; Attachments 1 and 2).

Inventories of radionuclides known to be present in HLW tanks in the H-Area Tank Farm were determined from decay-corrected activity data tables in the WCS (Attachments 1 and 2). Consolidated waste stream averages for radionuclide activity and concentration data and resultant scaling factors are conservatively calculated to include only those tanks in the consolidation that contained the particular radionuclide; i.e., zero activities were not included in the averages.

The WCS is periodically updated to account for waste transfers to and from HLW tanks. In conducting this revalidation, it was determined that the most recent WCS update, which was accessed to obtain current tank contents status (Attachments 1 and 2; References 9 and 10), did not include the transfer of 30,000 gallons of americium/curium (Am/Cm) solution (estimated 6,000 gallons sludge solids; Attachment 3) from F-Canyon Tank 17.1 to H-Area HLW Tank 51, which has occurred (Reference 11). Also, the most recent WCS update did not include the transfer of the combined contents (estimated total of 256,000 gallons of sludge slurry including an estimated total of 76,800 gallons of sludge solids; Attachments 1 and 4) of F-Area HLW Tanks 7 and 18 (Reference 12), which are planned for tank closure, to H-Area HLW Tank 51. In order to include these significant transfers within the consolidated H-Area Tank Farm sludge waste stream, the projected radionuclide inventories for the Am/Cm solution sludge (Reference 11; Attachments 3 and 4) and the combined Tank 7 and 18 sludge (Reference 12, Attachments 1and 4) transfers were obtained and added to the WCS Tank 51 data retrieved on February 20, 2003, to determine projected radionuclide activities (Ci) after the transfer had occurred (Attachments 4 and 5). From the projected final radionuclide inventories for Tank 51 and the other H-Area high level waste tanks, average H-Area Tank Farm radionuclide activities and scaling factors were calculated (Attachment 5).

The set of isotope activities representative of each H-Area tank per the methodology above were next compared to each other to determine whether sludge-contaminated waste from these tanks met the two WAC criteria for consolidation (Attachment 6).

First, the arithmetic mean activity for each isotope under consideration was calculated. The scaling factors (to Sr-90) for PA radionuclides for each waste tank were then compared to determine whether they were within a factor of 10 from the proposed data set, i.e., the arithmetic mean set of scaling factors for the single, consolidated waste stream (Attachment 6).

The second criterion applies to predominant radionuclides only. There are two predominant radionuclides in this distribution, Sr-90 and its daughter Y-90. The fractional activities of Sr-90 and Y-90 were compared to determine whether they were within a factor of 2 from the proposed data set, the arithmetic mean set of fractional activities for the consolidated waste stream. This is also documented in Attachment 6.

Specific issues related to quantification of sludge-contaminated waste generated from these tanks are contained in Section 4. Analysis of combined waste stream HTK-00002 is documented in Attachment 6 and summarized below.

In order to meet the first consolidation criteria, the scaling factors of the PA radionuclides must be present within one order of magnitude from the mean, or within a range of 0.1 to 10 times the mean scaling factor for the waste stream.

Scaling factors for waste stream HTK-00002 were within consolidation criteria set forth in WAC 2.02, Revision 7 (Reference 4) with the following exceptions (Attachment 6):

The PA radionuclides C-14, Tc-99, I-129, U-234, and U-238, are present in some H-Area high level sludge waste tanks, while not in others. In addition, some tanks contain 1-3 orders of magnitude less C-14 or U-238 than the factor of 10 WAC consolidation criterion, compared with the average stream. The WSRC 1S SRS Waste Acceptance Criteria Manual, Procedure 2.02, Revision 7 (Reference 4), indicates that “these [consolidation] factors can be exceeded if it can be shown that the distribution used will be conservative, i.e., the reported activity will be greater than if the factors were within the guidelines.” In the case of those tanks in which the PA radionuclides are not present, the combined waste stream scaling factors are based upon an average of scaling factors for the tanks containing the radionuclides, and applied to waste generated from all the tanks in this grouping. In the case of those tanks containing C-14 and/or U-238 at concentration levels that cause the scaling factors to be less than 0.1 times the mean scaling factors for the waste stream, the mean scaling factor to be applied for H-Area high level sludge waste for that radionuclide would meet the exception clause of WAC 2.02 stated above, “…that the distribution used will be conservative….”

A single H-Area high level sludge waste tank, Tank 51, contains a concentration of the PA radionuclide I-129 that results in the scaling factor for this radionuclide to be more than a factor of 10 greater than the mean scaling factor. In this case, the mean scaling factor for this radionuclide was recalculated and reanalyzed after including only those tanks in which I-129 had higher relative concentrations; this recalculation of a higher mean scaling factor resulted in the scaling factor for I-129 to be within the factor of 10 consolidation criterion.

The second consolidation criterion applies to predominant radionuclides. There are two predominant (>10% of total activity) radionuclides in H-Area high level sludge waste, Sr-90 and its daughter Y-90. The fractional activities of Sr-90 and Y-90 (Attachment 6) vary only slightly within the distribution of sludge; the maximum variation (9.5%) from the proposed data set (the mean distribution) is well within a factor of 2, the second criteria for consolidation.

The recalculated mean set of scaling factors are compared against the individual tank values in Attachment 6. Based on the results of this final comparison, both consolidation criteria are met for the single, combined waste stream HTK-00002 and, therefore, the sludge fraction of sludge-contaminated waste from all the H-Area tanks (listed in Table 3.3) may be consolidated. Accordingly, the recalculated arithmetic mean scaling factor for I-129 will be used in the remainder of the development of the radionuclide distribution.

3.3 Excluding Radionuclides from Consideration

Under WSRC 1S SRS Waste Acceptance Criteria Manual, Procedure 2.02, Revision 7 (Reference 4), radionuclides that meet one of the inclusion criteria outlined in section 3.1 may be excluded from further consideration for a waste stream if one or more of the following conditions exist:

1. There is no reason to expect the radionuclide to be present in the waste stream.

2. For non-SA or non-PA radionuclides, or non-detectable fissile or TRU radionuclides, the individual activity contribution is less than 1.0% of the total radionuclide activity.

The above criteria are hereafter referred to as “exclusion criteria;” exclusion results are presented in Attachment 7 and Table 3.3.

(Note: WSRC 1S SRS Waste Acceptance Criteria Manual, Procedure WAC 2.02, Revision 7, also allows for exclusion from the waste stream distribution of radionuclides whose activities are below specific analytical laboratory Maximum Allowable Lower Limits of Detection [MALLDs]. For conservatism, this exclusion criterion will not be used for this process-knowledge-based characterization of sludge waste stream HTK-00002).

Of the 42 radionuclides listed in Table 3.1, one SA radionuclide (H-3) is excluded because it is not expected to be present in consolidated waste stream HTK-00002 (Table 3.3; Attachment 7). Of the radionuclides included because they were expected to be present at more than 1% of total activity, 18 are determined to be present at less than 1% of the total activity in the waste stream. Four of these radionuclides (Co-60, Pm-147, Eu-154, and Cm-244), however, are retained in the distribution since they are near 1% of total activity.

Table 3.3. Radionuclides Excluded from Consideration for H-Area Tank Farm Sludge

	Exclusion Criteria	
	Not Expected	Present at <1% (a)
H-3	X	
C-14		
Ni-59		X
Co-60		X(b)
Ni-63		X
Se-79		X
Sr-90		
Y-90		
Tc-99		
Ru-106		X
Rh-106		X
Sb-125		X
Sn-126		X
I-129		
Cs-134		X
Cs-135		X
Cs-137		
Ba-137m		
Ce-144		X
Pr-144		X
Pr-144m		X
Pm-147		X(b)
Eu-154		X(b)
U-233		
U-234		
U-235		
U-236		X
U-238		
Np-237		
Np-239		X
Pu-238		
Pu-239		
Pu-240		
Pu-241		
Pu-242		
Am-241		
Am-242m		
Am-243		
Cm-244		X(b)
Cm-245		
Cm-246		
Cm-247		

(a) For those radionuclides included only because they were expected to be present at >1%
(b) Retained in distribution since they are close to 1% total activity
NOTE: Bold = PA/SA radionuclides

3.4 Development of the Sludge Fraction Distribution

Forty-two radionuclides were determined to be important to characterization of the sludge in H-Area Tank Farm**.** A number of these have been excluded per discussion in Section 3.3, leaving 27 radionuclides to be quantified for consolidated waste stream HTK-00002. Current tank curie contents were used to update the scaling factors to create an isotopic distribution for the single, consolidated waste stream. The radionuclides, corresponding scaling factors (to Sr-90), and mean activity distribution in the waste stream are summarized in Attachments 8 and 9, and Table 3.4.

Table 3.4. Mean Radionuclide Scaling Factors and Distribution for H-Area Tank Farm Sludge

Radionuclide	Mean Scaling Factors (Ci/Ci Sr-90)[a]	Mean Distribution, Normalized[a] (%)
C-14	5.73E-08	2.61E-06
Co-60	3.46E-03	1.58E-01
Sr-90	1.00E+00	4.55E+01
Y-90	1.00E+00	4.55E+01
Tc-99	3.19E-04	1.45E-02
I-129	3.51E-09	1.59E-07
Cs-137	5.87E-02	2.67E+00
Ba-137m	5.55E-02	2.52E+00
Pm-147	1.94E-02	8.81E-01
Eu-154	1.13E-02	5.14E-01
U-233	3.04E-06	1.38E-04
U-234	1.13E-06	5.13E-05
U-235	2.52E-08	1.15E-06
U-238	3.97E-07	1.80E-05
Np-237	1.49E-06	6.79E-05
Pu-238	3.13E-02	1.42E+00
Pu-239	4.68E-04	2.13E-02
Pu-240	2.12E-04	9.65E-03
Pu-241	1.35E-02	6.15E-01
Pu-242	6.49E-07	2.95E-05
Am-241	2.28E-04	1.03E-02
Am-242m	9.08E-06	4.13E-04
Am-243	5.15E-04	2.34E-02
Cm-244	3.60E-03	1.64E-01
Cm-245	3.61E-07	1.64E-05
Cm-246	7.05E-06	3.21E-04
Cm-247	3.44E-11	1.57E-09
Total	**2.20E+00**	**1.00E+02**

[a]Attachments 7 and 8.

3.5 Other WAC Criteria

3.5.1 Comparison to Package Guidelines

Most sludge-contaminated waste will be disposed of in the E-Area Vaults (EAV). Administrative Waste Package Radiological Concentration Guidelines apply to waste disposed of in the EAV. The guidelines applicable to the Low Activity Waste Vault (LAWV), that portion of the EAV reserved for low activity waste, will be used for comparison since they are the most restrictive of the EAV facilities. Low activity waste is defined as waste that will produce less than or equal to 200 mR/hr at 5 cm from an unshielded final disposal container. The average concentration (Ci/gallon of sludge solids; see note below) of each radionuclide in the H-Area Tank Farm Sludge Waste Stream (Attachment 10) and their corresponding LAWV limits (Reference 8) are compared in Table 3.5. Calculations supporting this comparison are in Attachment 11. LAWV limits are expressed in Ci/ft^3 waste and Ci/90 ft^3 B-25 container.

[**Note:** The gallons of sludge solids identified in this section and in Tables 3.5 to 3.9 are the measured gallons of sludge in HLW tanks less the interstitial supernate (generally 70 volume percent) as recorded in the WCS.]

Table 3.5. Comparison of H-Area Tank Farm Sludge-Contaminated Waste to LAWV Limits

Radionuclide	Average Concentration in Sludge solids (Ci/gal)	LAWV Limit (Ci/ft^3)	LAWV limit (Ci/B-25)	Gallons of sludge solids in B-25 to reach LAWV limit
	A	B	C=B*90 ft3/B-25	D=C/A
H-3		1.10E+01	9.90E+02	
C-14	4.40E-06	2.50E-05	2.25E-03	5.11E+02
Tc-99	3.27E-02	5.60E-05	5.04E-03	**1.54E-01**
I-129	1.65E-07	1.10E-08	9.90E-07	6.00E+00
U-234	9.31E-05	1.10E-03	9.90E-02	1.06E+03
U-238	1.31E-05	1.20E-03	1.08E-01	8.24E+03

From the container limits, the maximum volume of sludge solids that could be present in a B-25 container while still meeting the LAWV limits can be calculated. The most limiting isotope in waste stream HTK-00002 is Tc-99, for which more than 0.15 gallon of sludge solids in a B-25 would cause the waste to exceed the LAWV limit. Sludge solids in the H-Area Tank Farms has an average total activity of 280 Ci/gallon and an average total transuranic isotope activity of 6.4 Ci/gallon. Accordingly, 0.15 gallon of sludge solids to meet the LAWV limit for Tc-99 would be equivalent to 43.1 total Ci in a B-25, 1 Ci of which is the transuranic component. Per Table 3.6 for HTK-00002, the limiting amount of sludge solids would be equivalent to an amount (436 nCi/g) that would exceed the TRU limit of 100 nCi/g and, therefore, would not be disposed of in the LAWV. In practice, very few waste boxes fail TRU limits. Any such box will, upon entry into WITS, be flagged as TRU and not be sent to the LAWV.

Table 3.6. Comparison of H-Area Tank Farm Sludge Waste vs. LAWV Limits and TRU Criteria						
Maximum gallons of sludge solids/ B-25 to meet LAWV criteria	**Average total Ci / gallon sludge solids**	**Average total Ci / B-25 at LAWV limit**	**Average total TRU Ci / gallon sludge solids**	**Average total TRU Ci / B-25 at LAWV limit**	**TRU nCi/g at maximum waste weight (5000 lb) in a B-25 at LAWV limit**	**Minimum waste weight in a B-25 at LAWV limit to not be TRU waste (lb)**
A	B	C=A*B	D	E=(D/B)*C	=(E*1E+09nCi/Ci) / (5000 lb*454 g/lb)	=(E*1E+09nCi/Ci) / (454 g/lb*100 nCi/g)
1.54E-01	2.80E+02	4.31E+01	6.43E+00	9.90E-01	4.36E+02	2.18E+04

Note: Average total activity of sludge solids from Attachments 10 and 11 = 2.80E+02 Ci/gal.
Average total TRU activity of sludge solids from Attachments 10 and 11 = 6.43E+00 Ci/gal.

3.5.2 Sum-of-Fractions Calculation

For acceptance of waste packages sent to the LAWV, the radiological content of the waste package must be compared to the administrative guidelines and shown to satisfy the sum-of-fractions criteria where:

activity concentration of isotope A/limit of isotope A
+ activity concentration of isotope B/limit of isotope B
+ activity concentration of isotope N/limit of isotope N
≤ 1

Attachment 11 and Table 3.7 calculate the maximum concentration of sludge solids on sludge-contaminated waste in order for the sum-of-the-fractions criteria to be met.

Table 3.7. Sum-of-Fractions for H-Area Tank Farm Sludge-Contaminated Waste						
Radionuclide	**Ci/gal sludge solids**	**Ci/ft^3 sludge solids**	**ft^3 sludge solids / ft^3 waste**	**Ci/ft^3 waste**	**LAWV limit (Ci/ft^3)**	**Fraction**
	A	B=A*7.48	C	D=B*C	E	=D/E
H-3					1.10E+01	
C-14	4.40E-06	3.29E-05	**2.23E-04**	7.33E-09	2.50E-05	2.93E-04
Tc-99	3.27E-02	2.45E-01	**2.23E-04**	5.45E-05	5.60E-05	**9.74E-01**
I-129	1.65E-07	1.23E-06	**2.23E-04**	2.75E-10	1.10E-08	2.50E-02
U-234	9.31E-05	6.96E-04	**2.23E-04**	1.55E-07	1.10E-03	1.41E-04
U-238	1.31E-05	9.80E-05	**2.23E-04**	2.18E-08	1.20E-03	1.82E-05
				Sum-of-Fractions		**9.99E-01**

Tc-99 dominates the sum-of-the-fractions for sludge waste stream HTK-00002. Primarily based on this dominance, the sum-of-fractions criteria are met for a maximum of 2.23E-04 ft^3 of sludge solids (Table 3.7) for each 1 ft^3 of waste, which equates to 2.00E-02 ft^3 (2.23E-04 ft^3 sludge solids / ft^3 waste x 90 ft^3 maximum waste volume per B-25) or 1.50E-01 gallon of sludge solids per 90 ft^3 volume B-25 container (Attachment 11 and Table 3.8). Since the mean total activity and the mean total transuranic activity for sludge solids are, respectively, 280 Ci/gal and 6.43 Ci/gal, this is equivalent to 42 total Ci of sludge solids in a B-25, or 9.71E-01 Ci of transuranic isotopes in a B-25 for this waste stream. Any B-25 waste container containing 9.65E-01 Ci (or 9.65E+08 nCi) of transuranics must contain 9.65E+06 g (or 2.13E+04 lbs) or more of waste (compared to the 5000 lb maximum waste weight per B-25 container) in order to be within

the TRU limit of 100 nCi/g total transuranics. So, for HTK-00002, the sum-of-fractions limiting amount of sludge solids would be equivalent to an amount that would exceed by more than four times (425 nCi/g) the TRU limit of 100 nCi/g and would not be disposed of in the LAWV. In practice, very few waste boxes fail TRU limits. Any such box will, upon entry into WITS, be flagged as TRU and not be sent to the LAWV.

Table 3.8. Comparison of H-Area Tank Farm Sludge Waste vs. LAWV Sum-of-Fractions Limits and TRU Criteria

Maximum ft^3 sludge solids per ft^3 waste to meet sum-of-fractions criteria	Max gallons sludge solids / B-25 to meet sum of fractions criteria	Average total TRU Ci / gallon sludge solids	Maximum total TRU Ci / B-25 to meet sum-of-fractions criteria	Minimum lb waste weight / B-25 to meet TRU limit of 100 nCi/g	TRU nCi/g in B-25 to meet sum-of-fractions criteria at 5000 lb maximum waste weight
A	B=A*90ft^3/B-25*7.48 gal/ft^3	C	D=B*C	=(D*1E+09 nCi/Ci) / (100 nCi/g *454 g/lb)	=(D*1E+09 nCi/Ci) / (5000lb*454 g/lb)
2.23E-04	1.50E-01	6.43E+00	9.65E-01	2.13E+04	4.25E+02

3.5.3 Nuclear Criticality Safety Criteria

Sludge-contaminated LLW contains an insignificant quantity of fissionable material to impact nuclear criticality criteria. Attachment 11 and Table 3.9 determine the maximum quantity of sludge solids that could be placed in a B-25 prior to exceeding the 50-g Fissile Gram Equivalent (FGE) U-235 limit for the LAWV. This is equivalent to 21 gallons of sludge solids, a significantly greater volume than would meet LAWV and TRU waste limits for a B-25 waste container. Any such box will not be sent to the LAWV for disposal, therefore protecting this requirement.

Table 3.9. Calculation of FGE Equivalent for H-Area Tank Farm Sludge-Contaminated Waste

Radio-nuclide	Activity in blended sludge solids (Ci/gal)	Maximum gallons of sludge solids in a B-25 to meet FGE equivalent	Maximum Curies sludge solids in a B-25	Specific activity (Ci/g)	Maximum mass (grams) in a B-25	Equivalence factor	FGE U-235 (g)
	A	B	C=A*B	D	E=C/D	F	G=E*F
U-233	1.78E-04	**21.2**	3.76E-03	9.648E-03	3.90E-01	1.4	5.46E-01
U-235	1.46E-06	**21.2**	3.10E-05	2.160E-06	1.43E+01	1.0	1.43E+01
Pu-239	5.88E-02	**21.2**	1.25E+00	6.132E-02	2.03E+01	1.6	3.25E+01
Pu-241	3.37E+00	**21.2**	7.14E+01	1.034E+02	6.91E-01	3.5	2.42E+00
Am-242m	2.18E-04	**21.2**	4.62E-03	9.717E+00	4.75E-04	54.0	2.57E-02
Cm-245	4.13E-05	**21.2**	8.75E-04	1.716E-01	5.10E-03	24.0	1.22E-01
Cm-247	8.35E-10	**21.2**	1.77E-08	9.396E-05	1.88E-04	1.6	3.01E-04
						Total FGE U-235	**4.99E+01**

3.6 Documentation of the Sludge Fraction Distribution

The low-level waste characterization form (WCF) for H-Area Tank Farm Waste Stream, HTK-00002, included as Attachment 9, documents the distribution from the waste stream. For those packages determined to contain sufficient sludge to be determined mixed and/or transuranic, appropriate waste stream forms will be provided for each package.

The sludge solids distribution is used to evaluate HLW-contaminated waste in conjunction with the latest version of the distribution of the supernate waste stream, FHW-00001.

4.0 Quantification

4.1 Quantification of Sludge and Supernate Fractions

Quantification of radionuclides in sludge-contaminated waste requires quantification of both the supernate and sludge fractions in each waste cut. Independent quantification of Sr-90, indicative of the sludge fraction, and primarily Cs-137, indicative of the supernate fraction, is key to accurate characterization of sludge-contaminated waste. The sludge fraction distribution and scaling ratios to Sr-90 are provided in Attachments 8 and 9. The supernate fraction distribution and scaling factors to Cs-137 can be found in the documentation for the latest version of the supernate waste stream, FHW-00001 (Reference 7, latest revision).

Scaling factors for the sludge fraction are tied to Sr-90. Although Sr-90 is present in the supernate fraction, it comprises less than 1% of total activity in the supernate fraction. For this reason, all Sr-90 identified in the sludge-contaminated waste will be attributed to the sludge fraction. Scaling ratios developed for the sludge fraction will be applied to the Sr-90 identified in sludge-contaminated waste.

Scaling factors for the supernate fraction are tied to Cs-137. Although Cs-137 is present in the sludge fraction, it typically comprises less than 5% of total activity in the sludge fraction (as is the case for waste stream HTK-00002). For this reason, all Cs-137 identified in sludge-contaminated waste for these waste streams will be attributed to the supernate fraction. Scaling ratios developed for supernate will be applied to the Cs-137 to determine the supernate radionuclides.

The two fractions of sludge-contaminated waste will be manifested separately. The dose of Cs-137 and Sr-90 will be entered into two separate waste streams in WITS, representing the sludge and supernate fractions, respectively, which will calculate curies attributed to each radionuclide identified in the respective distributions. The two waste streams will be combined in WITS to create a single manifest.

4.2 Quantification of Job Control Waste and Other Compactable Sludge-Contaminated Waste

The relative ease with which gamma radiation from Cs-137 is detected makes estimation of the curie content of the supernate fraction of waste straightforward. Dose-to-curie methodologies for quantification of Cs-137 on waste containers have been developed and are currently in use (References 13 and 14).

Sr-90, a low-energy beta emitter, is not easily measured. Although a Beta Screening Tool (BST) has been developed as an improved alternative method for providing a dose associated with Sr-90 (Reference 15), the BST methodology has not yet been implemented for waste quantification purposes. Until such time as the BST is field implemented, the actual quantity of Sr-90 present in the sludge fraction must be estimated by some other means.

The most conservative approach in quantification of a waste cut is to assume that all measured Cs-137 is attributed to both supernate and sludge fractions. For the sludge fraction, the known Sr-90 to Cs-137 ratio is utilized to estimate the maximum Sr-90 that could be present on the waste cut. This approach results in

double-manifesting of the Cs-137, over-manifesting of virtually all of the remaining radionuclides, and significantly over-estimating the sludge fraction.

It is preferable, therefore, to determine an appropriate split of the measured Cs-137 that can be attributed to the supernate and sludge fractions. In determining the appropriate split between these fractions, one must consider the effects of overestimating one fraction or the other. Over-estimating the sludge fraction will result in:

- under-manifesting of radionuclides attributed to supernate only (in this waste stream, the only radionuclide fitting this description is tritium, a PA radionuclide, present at 0.2% of total supernate activity), and

- over-manifesting of transuranics (a higher level of transuranics are present in sludge).

Over-estimating the supernate fraction will result in under-manifesting of radionuclides present in the sludge fraction only.

Determination of the split of Cs-137 contributed from the sludge and supernate fractions will be performed on a case-by-case basis for H-Area high level waste packages.

4.3 Quantification of Non-Compactable Sludge-Contaminated Waste

Estimation of the quantity of Cs-137 present on non-compactable waste, such as equipment or HEPA filters, is performed on a case-by-case basis. This is done by individual dose-to-curie runs, which take into account the specific geometry of the waste (Reference 16).

Application of BST methodology waste to non-compactable waste to determine the amount of Sr-90 present is not appropriate since the waste itself shields beta radiation and would result in unrealistically low measured values. Estimation of Sr-90 present in cuts of non-compactable waste will be performed by estimation of the amount of Cs-137 attributed to the sludge fraction in combination with the known relationship between Sr-90 and Cs-137. This will be performed on a case-by-case basis.

5.0 Periodic Validation

Provisions of WSRC 1S SRS Waste Acceptance Criteria Manual, Procedure 2.02, Revision 7 (Reference 4), require generators of routine wastes, including sludge-contaminated waste, to review and confirm the certification of each waste stream on a periodic basis. HLW sludge has been determined to require reevaluation every two years.

6.0 References

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2. Georgeton, G. K. and J. R. Hester., "Characterization of Radionuclides in HLW Sludge Based on Isotopic Distribution in Irradiated Assemblies (U)," WSRC-TR-94-0562, Rev. 1., January 27, 1995.

3. Hester, J. R., "High Level Waste Characterization System," WSRC-TR-96-0264, December 1996.

4. Procedure 2.02, "Low Level, Hazardous, TRU, Mixed, and PCB Waste Characterization Requirements," WSRC 1S Savannah River Site Waste Acceptance Criteria Manual, Revision 7, Savannah River Site, November 1, 2002.

5. O'Bryant, R. F. and J. K. W. Dunaway, "Characterization of Radionuclides in Waste Sludges from High Level Waste Tanks 40, 42 and 51 (U)", WSRC-TR-2000-00115, Revision 1, August 2000.

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8. Procedure 3.17, "Low Level Radioactive Waste Acceptance Criteria," WSRC 1S Savannah River Site Waste Acceptance Manual, Revision 7, Savannah River Site, September 16, 2002.

9. M:\Waste\Hlcats\WCTables\SludgeInv.xls, Reference Date: September 11, 2002, Retrieved from WCS February 20, 2003.

10. M:\Waste\Hlcats\WCTables\TankData.xls, Reference Date: September 11, 2002, Retrieved from WCS, February 20, 2003.

11. Canas, L. R., "F-Canyon Special Waste Compliance Plan for Tank 17.1 Americium/Curium Solution Discharge to HLW ESP Tank 51," X-WCP-F-00003, Revision 1, December 2002.

12. Bui, H., "Waste Compliance Plan for Liquid Waste Transfers from Tank 7 to WPT/ESP Tank 51 – 1st Batch Transfer," WSRC-RP-2002-00364, Revision 1.

13. Jamison, M. E., "Characterization of Non-Routine Low-Level Waste from High Level Waste Activities (U)," WSRC-TR-95-0069, March 13, 1995

14. Hunt, P. D., "Dose-to-Curie Calculations," ESH-HPT-99-0019, Rev. 1, March 2, 1999.

15. Ross, R. H., E. T. Ketusky, and R. Petras, "HLW Characterization in Support of Low Level Waste Certification: HLW Sludge Beta Screening Tool," WSRC-TR-97-0555, Rev. 1, October 8, 1998.

16. SRS-DTC™ 3.1, WMG Inc., 16 Bank Street, Peekskill, NY 10556

Attachment 1

'M:\WASTE8\Hlcats\WCSystem\[WCSystem.xls]TankData
Reference Date: 9/11/02
Date Retrieved from WCS: 2/20/03

Attachment 1

WCS Tank Data
Reference Date: 9/11/02
Latest Data Update: 1/29/03
Date Retrieved: 2/20/03

Tank	Date	Total Waste Volume (gal)	Sludge Volume (gal)	Dry Sludge Density (kg/gal)	Estimated Dry Sludge Weight (kg)	Sludge Interstitial Fraction (vol. frac.)	Salt Volume (gal)	Dry Salt Bulk Sp.G.	Estimated Salt Dry Wt. (kg)	Salt Interstitial Fraction (vol. frac.)	Free Supernate Vol. (gal)	Interstitial Sludge Supernate Vol. (gal)	Interstitial Salt Supernate Vol. (gal)	Total Supernate Vol. (gal)	Supernate Sp.G.	Precipitate Volume (gal)	Dry Precipitate Bulk Sp.G.	Estimated Dry Precipitate Weight (kg)	Precipitate Interstitial (vol. frac.)	Organic Resin Volume (gal)	Organic Resin Sp.G.	Organic Resin Weight (kg)	Zeolite Volume (gal)	Zeolite Sp.G.	Estimated Zeolite Weight (kg)	Sand Weight (kg)	Coal Weight (kg)	Grout Volume (gal)	Level (in)	Sludge Depth (in)	Salt Depth (in)	Free Supernate Depth (in)	Total Supernate Depth (in)	Supernate Concentration (Ci/gal)	Solids Concentration (Ci/gal)	Free Liquid In Tank?	Dry Tank?	Filled To AB Limit For H2 Calculations?	Organic Tank?	Tank Farm Tank?	Total Vapor Space for Empty Tank (gal)
1	03/05/01	505957	7000	0.884	6188	0.7	480000	1.45	2634569	0.22	18957	4900	105600	129457	1.53	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	186.7	2.6	177.1	7.0	47.8	39	221	0	0	0	0	Y	796740
2	03/05/01	540374	4000	0.884	3536	0.7	536000	1.45	2941935	0.22	374	2800	117920	121094	1.52	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	199.4	1.5	197.8	0.1	44.7	14	54	0	0	0	0	Y	796740
3	03/05/01	540645	4000	0.884	3536	0.7	536000	1.45	2941935	0.22	645	2800	117920	121365	1.53	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	199.5	1.5	197.8	0.2	44.8	14	50	0	0	0	0	Y	796740
4	01/05/03	484006	127000	0.884	112268	0.7	34000	1.45	186615	0.22	323006	88900	7480	419386	1.32	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	178.6	46.9	12.5	119.2	154.8	17	83	Y	0	0	0	Y	796740
5	01/05/03	60704	28152	0.884	24886	0.56	0	1.45	0	0.22	32552	15765	0	48317	1.28	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	22.4	10.4	0.0	12.0	17.8	4	219	Y	0	0	0	Y	796740
6	01/05/03	301623	25000	0.884	22100	0.7	0	1.45	0	0.22	276623	17500	0	294123	1.12	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	111.3	9.2	0.0	102.1	108.5	0	283	Y	0	0	0	Y	796740
7	01/05/03	406310	209000	0.884	184756	0.7	0	1.45	0	0.22	197310	146300	0	343610	1.36	0	1.1	0	0.9	0	0.761	0	0	0.761	0	4545	3178	0	149.9	77.1	0.0	72.8	126.8	6	43	Y	0	0	0	Y	796740
8	01/05/03	308398	6448	0.884	5700	0.7	0	1.45	0	0.22	301950	4514	0	306464	1.11	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	113.8	2.4	0.0	111.4	113.1	1	41	Y	0	0	0	Y	796740
9	03/05/01	543626	4000	0.884	3536	0.7	538000	1.45	2952913	0.22	1626	2800	118360	122786	1.41	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	200.6	1.5	198.5	0.6	45.3	14	57	0	0	0	0	Y	796740
10	03/05/01	192410	4000	0.884	3536	0.7	213000	1.45	1169090	0.22	0	2800	46860	49660	1.31	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	71.0	1.5	78.6	0.0	18.3	2	7	0	0	0	0	Y	796740
11	01/05/03	278859	140000	0.884	123760	0.7	0	1.45	0	0.22	138859	98000	0	236859	1.46	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	102.9	51.7	0.0	51.2	87.4	3	86	Y	0	0	0	Y	796740
12	06/08/99	173711	173711	0.884	153561	0.53	92067	1.45	505326	0.22	0	0	0	0	1.53	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	64.1	64.1	34.0	0.0	0.0	0	103	0	Y	0	0	Y	796740
13	01/05/03	858550	223000	0.884	197132	0.7	0	1.45	0	0.22	635550	156100	0	791650	1.41	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	245.3	63.7	0.0	181.6	226.2	25	97	Y	0	0	0	Y	1134000
14	03/05/01	173950	27000	0.884	23868	0.7	156000	1.45	856235	0.22	0	18900	34320	53220	1.40	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	49.7	7.7	44.6	0.0	15.2	33	45	0	0	0	0	Y	1134000
15	02/26/98	213500	213500	0.884	188734	0.48	102480	1.45	562480	0.22	0	0	0	0	1.27	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	61.0	61.0	29.3	0.0	0.0	0	75	0	Y	0	0	Y	1134000
16	08/12/80	0	0	0.884	0	0.7	0	1.45	0	0.22	0	0	0	0	0.00	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0	0	0	Y	0	0	Y	1134000
17	07/01/97	0	0	0.884	0	0.7	0	1.45	0	0.22	0	0	0	0	0.00	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	1300000	0.0	0.0	0.0	0.0	0.0	0	0	0	Y	0	0	Y	1693640
18	01/05/03	318600	47000	0.884	41548	0.7	0	1.45	0	0.22	271600	32900	0	304500	1.18	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	90.0	13.3	0.0	76.7	86.0	0	0	Y	0	Y	0	Y	1693640
19	01/05/03	10620	2542	0.884	2247	0.7	0	1.45	0	0.22	8078	1779	0	9857	1.18	0	1.1	0	0.9	0	0.761	0	12440	0.761	35835	0	0	0	3.0	0.7	0.0	2.3	2.8	0	0	Y	0	0	0	Y	1693640
20	05/08/97	0	0	0.884	0	0.7	0	1.45	0	0.022	0	0	0	0	0.00	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	1300000	0.0	0.0	0.0	0.0	0.0	0	0	0	Y	0	0	Y	1693640
21	01/24/03	882168	14000	0.884	12376	0.7	0	1.45	0	0.22	868168	9800	0	877968	1.04	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	249.2	4.0	0.0	245.2	248.0	0	8	Y	0	Y	0	Y	1693640
22	01/05/03	764498	21000	0.884	18564	0.7	0	1.45	0	0.22	743498	14700	0	758198	1.04	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	216.0	5.9	0.0	210.0	214.2	0	12	Y	0	Y	0	Y	1693640
23	01/05/03	1274754	43000	0.884	38012	0.7	0	1.45	0	0.22	1231754	30100	0	1261854	1.02	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	360.1	12.1	0.0	348.0	356.5	0	0	Y	0	Y	0	Y	1693640
24	01/05/03	1231566	0	0.884	0	0.7	0	1.45	0	0.22	1231566	0	0	1231566	1.04	0	1.1	0	0.9	0	0.761	0	4000	0.761	11522	0	0	0	347.9	0.0	0.0	347.9	347.9	0	0	Y	0	0	0	Y	1693640
25	01/05/03	1284695	0	0.884	0	0.7	1108000	1.45	6081463	0.22	176695	0	243760	420455	1.41	0	1.1	0	0.9	0	0.761	0	1050	0.761	3025	0	0	0	366.0	0.0	315.7	50.3	119.8	7	6	Y	0	0	0	Y	1389960
26	01/29/03	1221480	281000	0.884	248404	0.7	0	1.45	0	0.22	940480	196700	0	1137180	1.36	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	348.0	80.1	0.0	267.9	324.0	8	9	Y	0	Y	Y	Y	1389960
27	01/05/03	1281641	0	0.884	0	0.7	463000	1.45	2541261	0.22	818641	0	101860	920501	1.48	0	1.1	0	0.9	0	0.761	0	4990	0.761	14374	0	0	0	365.1	0.0	131.9	233.2	262.3	8	7	Y	0	0	0	Y	1389960
28	01/05/03	1223586	0	0.884	0	0.7	1032000	1.45	5664323	0.22	191586	0	227040	418626	1.46	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	348.6	0.0	294.0	54.6	119.3	9	8	Y	0	0	0	Y	1389960
29	01/05/03	1086415	0	0.884	0	0.7	1000000	1.45	5488685	0.22	86415	0	220000	306415	1.21	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	309.5	0.0	284.9	24.6	87.3	10	9	Y	0	0	0	Y	1389960
30	01/05/03	1273533	500	0.884	442	0.7	65988	1.45	362187	0.22	1207045	350	14517	1221913	1.47	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	362.8	0.1	18.8	343.9	348.1	20	213	Y	0	Y	0	Y	1389960
31	01/05/03	1259844	0	0.884	0	0.7	1014000	1.45	5565527	0.22	245844	0	223080	468924	1.47	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	358.9	0.0	288.9	70.0	133.6	22	20	Y	0	0	0	Y	1389960
32	01/05/03	718357	182871	0.884	161658	0.7	0	1.45	0	0.22	535486	128010	0	663495	1.51	0	1.1	0	0.9	0	0.761	0	6700	0.761	19300	0	0	0	204.7	52.1	0.0	152.6	189.0	19	141	Y	0	0	0	Y	1389960
33	01/05/03	542120	39000	0.884	34476	0.7	227000	1.45	1245931	0.22	276120	27300	49940	353360	1.17	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	154.5	11.1	64.7	78.7	100.7	1	325	Y	0	0	Y	Y	1389960
34	01/05/03	1256475	25000	0.884	22100	0.7	212000	1.45	1163601	0.22	1019475	17500	46640	1083615	1.17	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	358.0	7.1	60.4	290.4	308.7	8	760	Y	0	0	0	Y	1389960
35	01/05/03	1108704	64584	0.884	57092	0.7	0	1.45	0	0.22	1044120	45209	0	1089329	1.30	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	315.9	18.4	0.0	297.5	310.4	15	336	Y	0	0	0	Y	1389960
36	01/05/03	1255316	150	0.884	133	0.7	1094000	1.45	6004621	0.22	161166	105	240680	401951	1.47	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	357.6	0.0	311.7	45.9	114.5	41	188	Y	0	0	0	Y	1389960
37	01/05/03	661740	0	0.884	0	0.7	973000	1.45	5340491	0.22	0	0	214060	214060	1.43	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	188.5	0.0	277.2	0.0	61.0	27	25	Y	0	Y	0	Y	1389960
38	01/28/03	981747	0	0.884	0	0.7	886275	1.45	4864484	0.22	95472	0	194981	290453	1.49	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	279.7	0.0	252.5	27.2	82.8	2	2	Y	0	Y	0	Y	1389960
39	01/05/03	693401	92664	0.884	81915	0.7	0	1.45	0	0.22	600737	64865	0	665601	1.34	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	197.6	26.4	0.0	171.2	189.6	7	235	Y	0	0	0	Y	1389960
40	01/05/03	508950	508950	0.749	381453	0.7	0	1.45	0	0.22	0	356265	0	356265	1.04	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	145.0	145.0	0.0	0.0	101.5	0	16	Y	0	0	0	Y	1389960
41	01/05/03	1221831	0	0.884	0	0.7	1222533	1.45	6710099	0.22	0	0	268957	268957	1.38	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	348.1	0.0	348.3	0.0	76.6	3	3	Y	0	0	0	Y	1389960
42	01/05/03	1264653	13575	0.884	12000	0.8	0	1.45	0	0.22	1251078	10860	0	1261938	1.31	0	1.1	0	0.9	0	0.761	0	765	0.761	2204	0	0	0	360.3	3.9	0.0	356.4	359.5	2	52	Y	0	0	0	Y	1389960
43	01/28/03	1132010	58756	0.884	51940	0.7	123084	1.45	675569	0.22	950170	41129	27078	1018378	1.12	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	322.5	16.7	35.1	270.7	290.1	1	40	Y	0	0	Y	Y	1389960
44	01/05/03	1277745	0	0.884	0	0.7	989000	1.45	5428309	0.22	288745	0	217580	506325	1.52	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	364.0	0.0	281.8	82.3	144.3	10	9	Y	0	0	0	Y	1389960
45	01/05/03	1278307	0	0.884	0	0.7	1130000	1.45	6202214	0.22	148307	0	248600	396907	1.49	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	364.2	0.0	321.9	42.3	113.1	10	9	Y	0	0	0	Y	1389960
46	01/29/03	928395	0	0.884	0	0.7	667813	1.45	3665413	0.22	260582	0	146919	407501	1.50	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	264.5	0.0	190.3	74.2	116.1	10	9	Y	0	Y	0	Y	1389960
47	01/05/03	1201789	248000	0.884	219232	0.7	868000	1.45	4764179	0.22	85789	173600	190960	450349	1.32	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	342.4	70.7	247.3	24.4	128.3	3	4	Y	0	0	0	Y	1389960
48	01/05/03	235170	0	0.884	0	0.7	0	1.45	0	0.22	235170	0	0	235170	1.15	24570	1.1	102305	0.9	0	0.761	0	0	0.761	0	0	0	0	67.0	0.0	0.0	67.0	67.0	0	32	Y	0	0	0	Y	1389960
49	01/05/03	848016	0	0.884	0	0.7	26676	1.45	146416	0.22	821340	0	5869	827209	1.16	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	241.6	0.0	7.6	234.0	235.7	20	19	Y	0	0	0	Y	1389960
50	01/05/03	58266	0	0.884	0	0.7	0	1.45	0	0.22	58266	0	0	58266	1.06	0	1.1	0	0.9	0	0.761	0	0	0.761	0	0	0	0	16.6	0.0	0.0	16.6	16.6	0	0	Y	0	0	0	Y	1389960
51	01/05/03	435240	435240	0.259	112546	0.8	0	1.45	0	0.22	0	348192	0	348192	1.01	0	1.1	0	0.9	0	0.761	0	4335	0.761	12487	0	0	0	124.0	124.0	0.0	0.0	99.2	0	2	Y	0	0	0	Y	1389960
Total		36304256	3273643		2553235		15789915		86665872		17780846	2061443	3430981	23273370		24570				0		0	34280		98747	4545	3178	2600000												

Attachment 2

'M:\WASTE8\Hlcats\WCSystem\[WCSystem.xls]SludgeInv
Reference Date: 9/11/02
Date Retrieved from WCS: 2/20/03

Attachment 2

WCS Sludge Inventory
Reference Date: 9/11/02
Latest Data Update: 1/29/03
Date Retrieved: 2/20/03

Tank	H-3 (Ci)	C-14 (Ci)	Co-60 (Ci)	Ni-59 (Ci)	Ni-63 (Ci)	Se-79 (Ci)	Sr-90 (Ci)	Y-90 (Ci)	Nb-94 (Ci)	Tc-99 (Ci)	Ru-106 (Ci)	Rh-106 (Ci)	Sb-125 (Ci)	Sn-126 (Ci)	I-129 (Ci)	Cs-134 (Ci)	Cs-135 (Ci)	Cs-137 (Ci)	Ba-137m (Ci)	Ce-144 (Ci)	Pr-144 (Ci)	Pm-147 (Ci)
1	0.00E+00	1.28E-02	2.96E+02	2.34E+01	0.00E+00	1.63E+01	6.04E+05	6.04E+05	0.00E+00	2.81E+02	3.03E-05	3.03E-05	2.53E+01	3.02E+01	1.34E-03	2.95E-02	1.88E-01	4.26E+04	4.03E+04	5.46E-08	5.46E-08	3.60E+02
2	0.00E+00	2.86E-03	1.92E+01	3.37E+00	0.00E+00	2.31E+00	7.58E+04	7.58E+04	0.00E+00	3.99E+01	1.85E-08	1.85E-08	6.52E-01	4.29E+00	1.90E-04	3.87E-04	2.67E-02	5.39E+03	5.10E+03	4.51E-12	4.51E-12	8.57E+00
3	0.00E+00	2.48E-03	2.19E+01	2.92E+00	0.00E+00	2.00E+00	6.87E+04	6.87E+04	0.00E+00	3.46E+01	1.24E-07	1.24E-07	1.01E+00	3.72E+00	1.65E-04	7.56E-04	2.31E-02	4.87E+03	4.61E+03	7.49E-11	7.49E-11	1.36E+01
4	0.00E+00	3.34E-03	6.86E+03	1.18E+02	0.00E+00	8.47E+01	3.95E+06	3.95E+06	0.00E+00	1.46E+03	1.46E+00	1.46E+00	3.17E+03	1.58E+02	6.98E-03	1.18E+01	9.81E-01	2.75E+05	2.60E+05	4.57E-02	4.57E-02	5.23E+04
5	0.00E+00	4.45E-02	1.98E+03	1.01E+02	0.00E+00	7.07E+01	2.84E+06	2.84E+06	0.00E+00	1.22E+03	1.32E-03	1.32E-03	2.55E+02	1.31E+02	5.82E-03	3.97E-01	8.18E-01	2.00E+05	1.89E+05	4.48E-06	4.48E-06	3.78E+03
6	0.00E+00	0.00E+00	3.25E+03	1.04E+02	0.00E+00	7.45E+01	3.29E+06	3.29E+06	0.00E+00	1.29E+03	9.45E-03	9.45E-03	5.82E+02	1.39E+02	6.14E-03	1.11E+00	8.63E-01	2.30E+05	2.18E+05	5.95E-05	5.95E-05	8.84E+03
7	0.00E+00	8.62E-01	1.51E+03	1.87E+02	0.00E+00	1.02E+02	3.64E+06	3.64E+06	0.00E+00	1.76E+03	1.26E-04	1.26E-04	1.12E+02	1.90E+02	8.40E-03	1.24E-01	1.18E+00	2.58E+05	2.44E+05	2.45E-07	2.45E-07	1.58E+03
8	0.00E+00	1.15E-02	1.55E+02	4.32E+00	0.00E+00	2.67E+00	1.21E+05	1.21E+05	0.00E+00	4.61E+01	5.46E-03	5.46E-03	4.24E+01	4.96E+00	2.20E-04	1.11E-01	3.09E-02	8.45E+03	7.99E+03	1.60E-04	1.60E-04	6.70E+02
9	0.00E+00	3.09E-03	2.07E+01	3.64E+00	0.00E+00	2.49E+00	8.17E+04	8.17E+04	0.00E+00	4.31E+01	1.96E-08	1.96E-08	6.99E-01	4.63E+00	2.05E-04	4.14E-04	2.88E-02	5.81E+03	5.49E+03	4.74E-12	4.74E-12	9.18E+00
10	0.00E+00	3.24E-04	2.46E+00	3.81E-01	0.00E+00	2.60E-01	8.73E+03	8.73E+03	0.00E+00	4.49E+00	3.81E-09	3.81E-09	8.82E-02	4.78E-01	2.13E-05	7.32E-05	3.01E-03	6.16E+02	5.83E+02	1.36E-12	1.36E-12	1.18E+00
11	0.00E+00	1.59E-01	1.33E+04	1.64E+02	0.00E+00	9.05E+01	5.42E+06	5.42E+06	0.00E+00	1.53E+03	1.41E-01	1.41E-01	7.88E+02	8.29E+01	5.31E-03	4.52E+01	1.03E+00	2.98E+05	2.82E+05	2.19E-02	2.19E-02	2.05E+04
12	0.00E+00	2.53E-01	1.32E+04	2.80E+02	0.00E+00	1.58E+02	8.37E+06	8.37E+06	0.00E+00	2.68E+03	6.31E-03	6.31E-03	4.56E+02	1.62E+02	9.69E-03	1.72E+01	1.79E+00	4.71E+05	4.46E+05	1.95E-04	1.95E-04	1.12E+04
13	0.00E+00	2.92E-01	7.46E+03	2.78E+02	0.00E+00	1.72E+02	7.70E+06	7.70E+06	0.00E+00	2.93E+03	3.17E-03	3.17E-03	2.48E+02	2.25E+02	1.18E-02	8.08E+00	1.96E+00	4.64E+05	4.38E+05	1.10E-04	1.10E-04	5.79E+03
14	0.00E+00	1.51E-03	8.40E+01	7.72E+00	0.00E+00	5.26E+00	1.96E+05	1.96E+05	0.00E+00	9.06E+01	4.33E-07	4.33E-07	2.88E+00	8.82E+00	4.09E-04	1.03E-02	6.06E-02	1.32E+04	1.25E+04	1.39E-09	1.39E-09	4.30E+01
15	0.00E+00	2.34E-01	1.01E+04	2.60E+02	0.00E+00	1.44E+02	7.50E+06	7.50E+06	0.00E+00	2.44E+03	1.01E-02	1.01E-02	3.01E+02	1.32E+02	8.43E-03	1.10E+01	1.63E+00	4.15E+05	3.93E+05	1.34E-03	1.34E-03	7.41E+03
16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
17	0.00E+00	3.42E-03	1.17E+00	2.01E-01	0.00E+00	1.66E-02	7.89E+02	7.89E+02	0.00E+00	2.89E-01	4.07E-05	4.07E-05	3.54E-01	3.09E-02	1.37E-06	9.80E-04	1.93E-04	5.49E+01	5.20E+01	7.20E-07	7.20E-07	5.64E+00
18	0.00E+00	4.01E-02	1.26E+01	2.36E+00	0.00E+00	1.95E-01	9.01E+03	9.01E+03	0.00E+00	3.38E+00	4.59E-04	4.59E-04	3.80E+00	3.62E-01	1.61E-05	1.06E-02	2.26E-03	6.28E+02	5.94E+02	8.20E-06	8.20E-06	6.06E+01
19	0.00E+00	6.96E-04	3.28E-01	4.09E-02	0.00E+00	3.38E-03	1.75E+02	1.75E+02	0.00E+00	5.87E-02	8.55E-06	8.55E-06	1.09E-01	6.29E-03	2.79E-07	2.98E-04	3.92E-05	3.44E+04	3.25E+04	1.02E-07	1.02E-07	1.73E+00
20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
21	0.00E+00	8.96E-05	1.89E+02	1.04E+00	0.00E+00	7.82E-01	5.37E+04	5.37E+04	0.00E+00	1.32E+01	1.23E-02	1.23E-02	2.48E+01	7.15E-01	4.58E-05	1.96E+00	8.84E-03	2.92E+03	2.76E+03	1.97E-03	1.97E-03	6.73E+02
22	0.00E+00	0.00E+00	3.70E+02	2.13E+00	0.00E+00	1.66E+00	1.14E+05	1.14E+05	0.00E+00	2.80E+01	1.48E-02	1.48E-02	4.30E+01	1.51E+00	9.70E-05	3.14E+00	1.87E-02	6.17E+03	5.83E+03	2.07E-03	2.07E-03	1.16E+03
23	0.00E+00	0.00E+00	5.26E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.71E-02	0.00E+00	4.49E+02	4.25E+02	0.00E+00	0.00E+00	0.00E+00
24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
26	0.00E+00	5.88E-01	1.37E+03	3.45E+01	0.00E+00	2.86E+00	1.97E+05	1.97E+05	0.00E+00	4.95E+01	7.83E+01	7.83E+01	2.22E+03	5.31E+00	2.35E-04	1.86E+01	3.31E-02	1.34E+04	1.27E+04	2.39E+01	2.39E+01	4.06E+04
27	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
29	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
30	0.00E+00	7.80E-04	4.52E+02	8.56E-01	0.00E+00	4.71E-01	4.06E+04	4.06E+04	0.00E+00	7.98E+00	1.15E+00	1.15E+00	1.22E+02	4.31E-01	2.76E-05	1.76E+01	5.33E-03	2.19E+03	2.07E+03	6.98E-01	6.98E-01	3.58E+03
31	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
32	0.00E+00	2.45E-01	4.98E+04	2.71E+02	0.00E+00	1.49E+02	1.02E+07	1.02E+07	0.00E+00	2.53E+03	7.30E+01	7.30E+01	8.19E+03	1.37E+02	8.75E-03	1.04E+03	1.69E+00	5.56E+05	5.26E+05	5.16E+01	5.16E+01	2.35E+05
33	0.00E+00	0.00E+00	3.50E+04	1.11E+02	0.00E+00	7.95E+01	5.42E+06	5.42E+06	0.00E+00	1.38E+03	1.07E+03	1.07E+03	5.02E+04	1.48E+02	6.55E-03	3.80E+02	9.21E-01	3.70E+05	3.50E+05	2.87E+02	2.87E+02	9.06E+05
34	0.00E+00	0.00E+00	4.88E+04	1.71E+02	0.00E+00	1.23E+02	8.15E+06	8.15E+06	0.00E+00	2.12E+03	1.62E+03	1.62E+03	6.88E+04	2.28E+02	1.01E-02	5.30E+02	1.42E+00	5.57E+05	5.27E+05	3.92E+02	3.92E+02	1.24E+06
35	0.00E+00	2.07E-01	5.88E+04	2.27E+02	0.00E+00	1.25E+02	9.31E+06	9.31E+06	0.00E+00	2.12E+03	1.14E+02	1.14E+02	1.02E+04	1.14E+02	7.32E-03	1.28E+03	1.41E+00	5.05E+05	4.78E+05	1.11E+02	1.11E+02	2.94E+05
36	0.00E+00	2.34E-04	4.84E+01	2.57E-01	0.00E+00	1.41E-01	1.01E+04	1.01E+04	0.00E+00	2.39E+00	1.69E-03	1.69E-03	5.00E+00	1.29E-01	8.28E-06	3.80E-01	1.60E-03	5.48E+02	5.18E+02	1.99E-04	1.99E-04	1.35E+02
37	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
38	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
39	0.00E+00	1.81E-01	8.46E+04	1.98E+02	0.00E+00	1.09E+02	9.01E+06	9.01E+06	0.00E+00	1.85E+03	2.06E+02	2.06E+02	1.97E+04	9.98E+01	6.39E-03	2.67E+03	1.23E+00	4.86E+05	4.60E+05	2.13E+02	2.13E+02	5.72E+05
40	0.00E+00	6.14E-01	5.05E+03	1.43E+02	0.00E+00	7.90E+01	3.67E+06	3.67E+06	0.00E+00	1.36E+03	1.73E-01	1.73E-01	1.24E+03	1.41E+02	6.36E-03	8.12E+00	9.13E-01	2.51E+05	2.37E+05	7.75E-03	7.75E-03	2.03E+04
41	0.00E+00	0.00E+00	7.19E+01	2.21E-01	0.00E+00	1.71E-01	1.33E+04	1.33E+04	0.00E+00	2.90E+00	1.97E-02	1.97E-02	1.41E+01	1.57E-01	1.00E-05	1.41E+00	1.94E-03	7.17E+02	6.78E+02	4.68E-03	4.68E-03	3.96E+02
42	0.00E+00	2.57E-02	4.83E+02	1.15E+01	0.00E+00	5.97E+00	3.17E+05	3.17E+05	0.00E+00	1.01E+02	6.33E-03	6.33E-03	2.47E+01	5.54E+00	3.52E-04	1.35E+00	6.77E-02	1.76E+04	1.66E+04	9.78E-04	9.78E-04	6.24E+02
43	0.00E+00	0.00E+00	8.01E+03	1.44E+01	0.00E+00	1.12E+01	9.49E+05	9.49E+05	0.00E+00	1.89E+02	8.35E+01	8.35E+01	2.91E+03	1.02E+01	6.56E-04	4.71E+02	1.27E-01	5.09E+04	4.82E+04	1.25E+02	1.25E+02	8.64E+04
44	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
45	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
46	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
47	0.00E+00	4.37E-01	7.73E+02	2.57E+01	0.00E+00	2.12E+00	1.40E+05	1.40E+05	0.00E+00	3.68E+01	7.10E+00	7.10E+00	9.08E+02	3.94E+00	1.75E-04	5.94E+00	2.46E-02	9.55E+03	9.04E+03	8.68E-01	8.68E-01	1.61E+04
48	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
49	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
50	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
51	0.00E+00	5.29E-01	6.86E+01	7.84E+00	3.89E+00	1.02E+01	4.69E+05	4.69E+05	0.00E+00	2.25E+01	9.11E-03	9.11E-03	3.44E+01	4.06E+00	1.31E-01	1.87E+00	8.81E-01	1.55E+03	1.47E+03	1.39E-03	1.39E-03	8.64E+02
Total	0.00E+00	4.75E+00	3.52E+05	2.76E+03	3.89E+00	1.63E+03	9.19E+07	9.19E+07	0.00E+00	2.77E+04	3.26E+03	3.26E+03	1.71E+05	2.18E+03	2.43E-01	6.53E+03	1.94E+01	5.56E+06	5.26E+06	1.20E+03	1.20E+03	3.53E+06

Reference:
M:\Waste\Hlcats\WCTables\SldgInv.xls

Attachment 2

WCS Sludge Inventory
Reference Date: 9/11/02
Latest Data Update: 1/29/03
Date Retrieved: 2/20/03

Tank	Eu-154 (Ci)	Th-232 (Ci)	U-232 (Ci)	U-233 (Ci)	U-234 (Ci)	U-235 (Ci)	U-236 (Ci)	U-238 (Ci)	Np-237 (Ci)	Pu-238 (Ci)	Pu-239 (Ci)	Pu-240 (Ci)	Pu-241 (Ci)	Pu-242 (Ci)	Ingrown Am-241 (Ci)	Am-241 (Ci)	Am-242m (Ci)	Cm-244 (Ci)	Cm-245 (Ci)
1	1.18E+03	0.00E+00	1.27E-02	0.00E+00	0.00E+00	1.76E-02	0.00E+00	4.39E-01	6.41E-01	5.19E+02	1.33E+02	2.97E+01	1.85E+02	6.12E-03	4.06E+01	2.11E+03	2.66E+00	4.25E-01	4.62E-07
2	1.08E+02	0.00E+00	1.73E-03	0.00E+00	0.00E+00	8.12E-04	0.00E+00	2.02E-02	2.12E-01	1.38E+02	1.98E+01	4.42E+00	2.10E+01	9.08E-04	6.02E+00	2.97E+02	3.69E-01	4.94E-02	6.55E-08
3	1.10E+02	0.00E+00	1.52E-03	0.00E+00	0.00E+00	2.03E-03	0.00E+00	5.06E-02	3.78E-01	1.66E+02	2.38E+01	5.31E+00	3.05E+01	1.09E-03	7.30E+00	2.57E+02	3.22E-01	4.61E-02	5.67E-08
4	1.41E+04	0.00E+00	7.16E-02	0.00E+00	0.00E+00	7.77E-02	0.00E+00	3.34E+00	2.98E+00	6.05E+02	5.98E+02	1.34E+02	1.28E+03	2.75E-02	1.75E+02	1.12E+04	1.45E+01	3.21E+00	2.40E-06
5	6.64E+03	0.00E+00	5.69E-02	0.00E+00	0.00E+00	1.05E-01	0.00E+00	2.48E+00	4.19E+00	2.89E+03	4.82E+02	1.15E+02	8.75E+02	3.40E-02	1.72E+02	9.23E+03	1.18E+01	2.09E+00	2.01E-06
6	9.29E+03	0.00E+00	6.18E-02	0.00E+00	0.00E+00	6.65E-02	0.00E+00	2.49E+00	8.63E-01	0.00E+00	2.55E+02	8.84E+01	1.13E+03	1.74E-01	1.73E+02	9.82E+03	1.27E+01	2.55E+00	2.12E-06
7	6.53E+03	0.00E+00	8.59E-02	0.00E+00	0.00E+00	3.79E-01	0.00E+00	9.16E+00	8.40E+00	2.43E+04	3.67E+03	8.76E+02	7.12E+03	2.82E-01	1.29E+03	1.27E+04	1.59E+01	2.50E+00	2.90E-06
8	3.81E+02	0.00E+00	2.35E-03	0.00E+00	0.00E+00	5.43E-03	0.00E+00	2.50E-01	1.13E-01	4.54E+02	7.13E+01	1.68E+01	1.81E+02	2.12E-02	1.72E+01	3.45E+02	4.45E-01	9.59E-02	7.57E-08
9	1.17E+02	0.00E+00	1.87E-03	0.00E+00	0.00E+00	1.18E-03	0.00E+00	2.94E-02	2.01E-01	4.37E+01	6.24E+00	1.39E+00	6.57E+00	2.87E-04	1.88E+00	3.20E+02	3.98E-01	5.33E-02	7.07E-08
10	1.38E+01	0.00E+00	1.92E-04	0.00E+00	0.00E+00	2.28E-04	0.00E+00	5.69E-03	4.35E-02	2.21E+01	3.16E+00	7.06E-01	3.56E+00	1.45E-04	9.72E-01	3.32E+01	4.13E-02	7.22E-03	2.98E-07
11	5.99E+04	1.43E-02	1.66E-04	2.04E+00	1.68E+00	3.16E-02	2.59E-01	5.86E-02	1.11E+00	1.53E+05	1.49E+03	9.34E+02	6.08E+04	1.99E+00	5.96E+03	7.10E+03	8.46E+00	4.87E+01	5.43E-03
12	7.18E+04	1.36E+00	1.41E-02	3.83E+01	3.58E+00	6.74E-02	2.84E-01	6.79E-01	7.94E+00	1.41E+05	2.32E+03	1.28E+03	3.69E+04	1.85E+00	4.46E+03	1.34E+04	1.59E+01	6.68E+01	8.38E-03
13	4.71E+04	1.98E-01	5.54E-02	4.06E+01	5.73E+00	1.57E-01	5.91E-01	1.83E+00	1.47E+01	5.56E+04	1.46E+03	6.03E+02	1.21E+04	4.00E-01	2.23E+03	1.65E+04	2.01E+01	4.55E+01	5.98E-03
14	5.31E+02	1.06E-02	3.22E-03	3.74E-01	5.13E-02	4.15E-03	4.41E-03	7.91E-02	5.48E-01	2.50E+02	6.04E+01	1.95E+01	1.12E+02	3.57E-03	2.43E+01	6.28E+02	7.80E-01	4.63E-01	6.11E-05
15	6.08E+04	1.13E+00	0.00E+00	1.39E+01	3.79E+00	6.12E-02	3.59E-01	1.40E-03	3.55E+00	5.82E+04	1.22E+03	5.90E+02	1.39E+04	4.45E-01	2.55E+03	1.12E+04	1.32E+01	6.23E+01	8.64E-03
16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
17	2.69E+00	0.00E+00	4.88E-05	0.00E+00	0.00E+00	3.29E-04	0.00E+00	2.04E-02	0.00E+00	8.38E+01	1.20E+01	3.17E+00	4.45E+01	4.55E-03	4.80E+00	0.00E+00	0.00E+00	6.33E-04	4.77E-10
18	2.95E+01	0.00E+00	5.66E-04	0.00E+00	0.00E+00	4.30E-03	0.00E+00	2.31E-01	0.00E+00	9.85E+02	1.41E+02	3.60E+01	6.58E+02	4.61E-02	7.12E+01	0.00E+00	0.00E+00	7.14E-03	5.60E-09
19	6.91E-01	0.00E+00	1.03E-05	0.00E+00	0.00E+00	6.80E-05	0.00E+00	6.21E-03	0.00E+00	2.55E+01	3.64E+00	8.13E-01	1.06E+02	1.67E-03	1.02E+01	0.00E+00	0.00E+00	1.47E-04	9.71E-11
20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
21	8.04E+02	5.67E-06	0.00E+00	1.73E-01	1.71E-01	2.36E-03	3.50E-02	1.60E-03	1.05E-01	9.50E+02	1.09E+00	6.34E-01	2.36E+01	5.33E-04	2.72E+00	4.56E+01	5.51E-02	5.22E-01	4.69E-05
22	1.65E+03	0.00E+00	0.00E+00	1.07E+00	3.86E-01	5.91E-03	6.36E-02	8.60E-03	2.35E-01	1.63E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.40E+01	1.14E-01	1.10E+00	9.94E-05
23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
26	1.50E+03	0.00E+00	9.73E-03	0.00E+00	0.00E+00	2.21E-02	0.00E+00	2.02E+00	0.00E+00	1.68E+04	2.39E+03	5.35E+02	1.32E+04	1.10E-01	5.19E+02	0.00E+00	0.00E+00	1.95E-01	8.19E-08
27	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
29	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
30	9.82E+02	0.00E+00	0.00E+00	0.00E+00	1.83E-02	3.25E-04	3.37E-03	1.20E-05	8.25E-03	3.60E+03	3.06E+01	2.20E+01	2.57E+03	5.26E-02	9.96E+01	3.82E+01	4.76E-02	4.48E-01	2.83E-05
31	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
32	1.55E+05	0.00E+00	0.00E+00	0.00E+00	2.77E+00	3.97E-02	6.22E-01	1.86E-02	1.15E+00	4.11E+05	3.53E+03	2.62E+03	2.04E+05	5.53E+00	1.42E+04	1.19E+04	1.44E+01	9.92E+01	8.97E-03
33	4.00E+04	0.00E+00	7.84E-02	3.74E-07	3.12E-03	1.68E-01	7.48E-02	2.47E+01	9.59E+00	2.28E+01	6.91E+03	1.26E+03	3.95E+04	6.45E-02	2.75E+02	1.08E+04	1.47E+01	5.38E+00	2.26E-06
34	5.74E+04	0.00E+00	1.20E-01	0.00E+00	0.00E+00	1.14E-01	0.00E+00	8.05E+00	6.22E+00	0.00E+00	1.30E+03	2.91E+02	6.83E+03	6.03E-02	2.88E+02	1.66E+04	2.25E+01	7.98E+00	3.49E-06
35	1.66E+05	0.00E+00	0.00E+00	0.00E+00	2.72E+00	4.72E-02	8.02E-01	2.79E-02	9.83E-01	4.16E+05	3.29E+03	2.52E+03	2.22E+05	5.66E+00	1.37E+04	1.00E+04	1.23E+01	9.48E+01	7.51E-03
36	1.59E+02	0.00E+00	0.00E+00	0.00E+00	7.26E-03	1.41E-04	2.56E-03	4.60E-05	2.03E-03	6.43E+02	4.90E+00	3.90E+00	2.90E+02	8.42E-03	2.08E+01	1.13E+01	1.38E-02	9.97E-02	8.49E-06
37	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
38	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
39	1.99E+05	0.00E+00	0.00E+00	0.00E+00	9.58E+00	5.64E-02	8.93E-01	4.86E-03	4.01E+00	7.02E+05	5.77E+03	3.95E+03	4.13E+05	1.31E+01	1.80E+04	8.90E+03	1.54E+01	2.21E+05	1.76E+01
40	1.44E+04	2.90E-02	6.72E-02	1.84E+00	6.65E-01	1.89E-01	1.05E-01	8.36E+00	3.47E+00	2.33E+04	2.97E+03	7.27E+02	8.54E+03	8.84E-01	9.12E+02	9.65E+03	1.24E+01	5.84E+00	3.70E-04
41	2.51E+02	0.00E+00	0.00E+00	0.00E+00	1.23E-02	1.43E-04	3.54E-03	9.78E-06	3.69E-02	2.06E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.81E+00	1.20E-02	1.37E-01	1.03E-05
42	2.73E+03	4.36E-02	2.35E-04	6.14E-01	2.26E-01	5.33E-03	3.02E-02	9.35E-02	1.86E-01	3.08E+03	1.05E+02	3.76E+01	7.30E+02	3.44E-02	1.21E+02	4.53E+02	5.31E-01	2.64E+00	3.54E-04
43	2.23E+04	0.00E+00	0.00E+00	0.00E+00	4.40E+00	4.44E-02	6.71E-01	6.23E-03	3.84E+00	1.20E+05	3.73E+02	2.47E+02	1.93E+04	4.63E+00	4.10E+02	6.45E+02	8.00E-01	1.04E+01	6.72E-04
44	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
45	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
46	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
47	9.52E+02	0.00E+00	7.11E-03	0.00E+00	0.00E+00	1.86E-02	0.00E+00	1.48E+00	0.00E+00	1.58E+04	2.26E+03	5.06E+02	1.12E+04	1.04E-01	5.23E+02	0.00E+00	0.00E+00	1.35E-01	6.09E-08
48	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
49	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
50	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
51	1.08E+03	5.48E-02	4.91E-04	5.22E+00	3.47E+00	3.37E-02	8.84E-02	7.74E-01	1.55E+00	1.16E+04	5.17E+03	2.13E+02	2.91E+03	4.46E-01	1.70E+02	7.93E+02	6.72E-01	4.68E+02	4.49E-04
Total	9.43E+05	2.85E+00	6.53E-01	1.04E+02	3.93E+01	1.73E+00	4.89E+00	6.67E+01	7.73E+01	2.16E+06	4.61E+04	1.77E+04	1.08E+06	3.60E+01	6.64E+04	1.65E+05	2.11E+02	2.21E+05	1.76E+01

Reference:
M:\Waste\Hlcats\WCTables\SldgInv.xls

Attachment 3

Americium/Curium Transfer to Tank 51 Sludge Radionuclide Inventory

Attachment 3

Americium/Curium Transfer to Tank 51
Sludge Radionuclide Inventory

		5/1/2002 grams	W/Ci	Ci/g	5/1/2002 Ci	5/1/2002 grams + 10%	Final Am/Cm Transfer Sludge Ci	Tk 51 Sludge Ci WCS Data Updated 1/29/03	Tk 51 sludge after Hot Run Addition (Ci)
Cs	137	1.70E+01	0.00101	86.98	1.48E+03	1.87E+01	1.63E+03	1.55E+03	3.18E+03
Ba	137m	2.58E-06	3.94E-03	5.38E+08	1.39E+03	2.84E-06	1.53E+03	1.47E+03	3.00E+03
Eu	154	1.96E+01	0.009081	269.9	5.30E+03	2.16E+01	5.83E+03	1.08E+03	6.91E+03
Th	230	5.55E-04	0.02765	2.11E-02	1.17E-05	6.10E-04	1.29E-05		1.29E-05
	231	7.54E-11	0.00121	5.32E+05	4.01E-05	8.30E-11	4.41E-05		4.41E-05
	234	1.35E-07	0.000149	2.32E+04	3.13E-03	1.49E-07	3.44E-03		3.44E-03
U	234	2.83E+01	0.02829	6.25E-03	1.77E-01	3.12E+01	1.95E-01	3.47E+00	3.67E+00
	235	1.86E+01	0.02713	2.16E-06	4.01E-05	2.04E+01	4.41E-05	3.37E-02	3.37E-02
	236	5.70E+00	0.02662	6.47E-05	3.69E-04	6.27E+00	4.06E-04	8.84E-02	8.88E-02
	238	9.31E+03	0.02492	3.36E-07	3.13E-03	2.81E+06	9.45E-01	7.74E-01	1.72E+00
Np	237	3.21E+01	0.02879	7.05E-04	2.26E-02	3.53E+01	2.49E-02	1.55E+00	1.57E+00
	239	8.32E-03	0.00253	2.32E+05	1.93E+03	9.15E-03	2.12E+03		2.12E+03
Pu	238	1.34E+02	0.032593	17.12	2.30E+03	1.48E+02	2.53E+03	1.16E+04	1.42E+04
	239	6.89E+01	3.02E-02	0.06216	4.28E+00	7.57E+01	4.71E+00	5.17E+03	5.18E+03
	240	2.83E+03	3.06E-02	0.2279	6.46E+02	3.12E+03	7.11E+02	2.13E+02	9.24E+02
	241	1.00E+00	3.20E-05	103	1.03E+02	1.10E+00	1.13E+02	2.91E+03	3.03E+03
	242	1.27E+02	2.90E-02	0.003818	4.83E-01	1.39E+02	5.31E-01	4.46E-01	9.77E-01
Am	241	4.52E+02	0.03283	3.432	1.55E+03	4.97E+02	1.71E+03	9.62E+02	2.67E+03
	242m	1.94E+00	4.05E-04	9.718	1.89E+01	2.14E+00	2.08E+01	6.72E-01	2.15E+01
	243	9.68E+03	0.031496	0.1993	1.93E+03	1.07E+04	2.12E+03		2.12E+03
Cm	244	1.85E+03	0.03437	80.9	1.50E+05	2.04E+03	1.65E+05	4.68E+02	1.65E+05
	245	9.90E+01	0.03329	0.1717	1.70E+01	1.09E+02	1.87E+01	4.49E-04	1.87E+01
	246	8.59E+01	0.03192	0.3072	2.64E+01	9.45E+01	2.90E+01		2.90E+01
	247	1.39E+00	0.03119	9.28E-05	1.29E-04	1.53E+00	1.42E-04		1.42E-04
Pa	233	1.09E-06	2.36E-03	2.08E+04	2.26E-02	1.20E-06	2.49E-02		2.49E-02
	234m	4.56E-12	4.95E-03	6.87E+08	3.13E-03	5.01E-12	3.44E-03		3.44E-03
	234	2.04E-12		2.00E+06	4.07E-06	2.24E-12	4.48E-06		4.48E-06
					Sum		Sum		
					1.67E+05		1.83E+05		

1/5/03 WCS Tank 51 Sludge Solids Volume =	435,240	X 0.2 =	87,048	gal
Am/Cm Solution Sludge Solids Volume =	30,000	X 0.2 =	6,000	gal
Total =			93,048	gal

Reference:
X-WCP-F-00003, Revision 1, December 2002

Attachment 4

Projected Am/Cm Transfer and Tanks 7 and 18 Combined Contents Transfer to Tank 51

Attachment 4

Projected Tanks 7 and 18 Combined Contents Transfer to Tank 51 Sludge Concentrations

Radionuclide	WCS Retr. 2-20-03 Tank 51 Prior to Am/Cm Addition Sludge Ci (Sludge Volume = 435,240 gal x 0.2 = 87,048 gal)	**Final Hot Run Ci** (Sludge Volume = 30,000 gal x 0.2 = 6,000 gal)	Projected Total Curies of Radionuclides in Tank 51 Sludge Slurry after Am/Cm Addition (Ci)	Total Curies of Radionuclides in Tank 7 Sludge (Sludge volume = 209,000 gal x 0.3 = 62,700 gal) (Ci)	Total Curies of Radionuclides in Tank 18 Sludge (Sludge volume = 47,000 gal x 0.3 = 14,100 gal) (Ci)	Projected Total Curies of Radionuclides in Combined Tank 7 and 18 Sludge Slurry (Sldg vol. =76,800 gal) (Ci)	Projected Total Curies of Radionuclides in Tank 51 after Combined Tank 7 and 18 Addition (Sldg vol. = 169,848 gal) (Ci)	Projected Total Curies/gal sludge solids of Radionuclides in Tank 51 after Am/Cm and Combined Tank 7 and 18 Addition (Tot. Sldg Solids Vol. = 169,848 gal)
H-3								
C-14	5.29E-01		5.29E-01	8.62E-01	4.01E-02	9.02E-01	1.43E+00	8.43E-06
Ni-59	7.84E+00		7.84E+00	1.87E+02	2.36E+00	1.90E+02	1.97E+02	1.16E-03
Co-60	6.86E+01		6.86E+01	1.51E+03	1.26E+01	1.52E+03	1.59E+03	9.36E-03
Ni-63	3.89E+00		3.89E+00				3.89E+00	2.29E-05
Se-79	1.02E+01		1.02E+01	1.02E+02	1.95E-01	1.02E+02	1.12E+02	6.61E-04
Sr-90	4.69E+05		4.69E+05	3.64E+06	9.01E+03	3.65E+06	4.12E+06	2.43E+01
Y-90	4.69E+05		4.69E+05	3.64E+06	9.01E+03	3.65E+06	4.12E+06	2.43E+01
Nb-94								
Tc-99	2.25E+01		2.25E+01	1.76E+03	3.38E+00	1.77E+03	1.79E+03	1.05E-02
Ru-106	9.11E-03		9.11E-03	1.26E-04	4.59E-04	5.86E-04	9.70E-03	5.71E-08
Rh-106	9.11E-03		9.11E-03	1.26E-04	4.59E-04	5.86E-04	9.70E-03	5.71E-08
Sb-125	3.44E+01		3.44E+01	1.12E+02	3.80E+00	1.16E+02	1.50E+02	8.83E-04
Sn-126	4.06E+00		4.06E+00	1.90E+02	3.62E-01	1.90E+02	1.94E+02	1.14E-03
I-129	1.31E-01		1.31E-01	8.40E-03	1.61E-05	8.42E-03	1.39E-01	8.18E-07
Cs-134	1.87E+00		1.87E+00	1.24E-01	1.06E-02	1.34E-01	2.00E+00	1.18E-05
Cs-135	8.81E-01		8.81E-01	1.18E+00	2.26E-03	1.18E+00	2.06E+00	1.21E-05
Cs-137	1.55E+03	8.14E+01	1.63E+03	2.58E+05	6.28E+02	2.58E+05	2.60E+05	1.53E+00
Ba-137m	1.47E+03	7.65E+01	1.54E+03	2.44E+05	5.94E+02	2.44E+05	2.46E+05	1.45E+00
Ce-144	1.39E-03		1.39E-03	2.45E-07	8.20E-06	8.44E-06	1.40E-03	8.23E-09
Pr-144	1.39E-03		1.39E-03	2.45E-07	8.20E-06	8.44E-06	1.40E-03	8.23E-09
Pm-147	8.64E+02		8.64E+02	1.58E+03	6.06E+01	1.64E+03	2.51E+03	1.48E-02
Eu-154	1.08E+03	5.83E+03	6.91E+03	6.53E+03	2.95E+01	6.56E+03	1.35E+04	7.93E-02
Th-230		1.29E-05	1.29E-05				1.29E-05	7.58E-11
Th-231		4.41E-05	4.41E-05				4.41E-05	2.60E-10
Th-232	5.48E-02		5.48E-02				5.48E-02	3.22E-07
Th-234		3.44E-03	3.44E-03				3.44E-03	2.03E-08
U-232	4.91E-04		4.91E-04	8.59E-02	5.66E-04	8.64E-02	8.69E-02	5.12E-07
U-233	5.22E+00		5.22E+00				5.22E+00	3.08E-05
U-234	3.47E+00	1.95E-01	3.67E+00				3.67E+00	2.16E-05
U-235	3.37E-02	4.41E-05	3.37E-02	3.79E-01	4.30E-03	3.84E-01	4.17E-01	2.46E-06
U-236	8.84E-02	4.06E-04	8.88E-02				8.88E-02	5.23E-07
U-238	7.74E-01	9.45E-01	1.72E+00	9.16E+00	2.31E-01	9.39E+00	1.11E+01	6.54E-05
Pa-233		2.49E-02	2.49E-02				2.49E-02	1.46E-07
Pa-234m		3.44E-03	3.44E-03				3.44E-03	2.03E-08
Pa-234		4.48E-06	4.48E-06				4.48E-06	2.64E-11
Np-237	1.55E+00	2.49E-02	1.57E+00	8.40E+00		8.40E+00	9.97E+00	5.87E-05
Np-239		2.12E+03	2.12E+03				2.12E+03	1.25E-02
Pu-238	1.16E+04	2.53E+03	1.42E+04	2.43E+04	9.85E+02	2.53E+04	3.94E+04	2.32E-01
Pu-239	5.17E+03	4.71E+00	5.18E+03	3.67E+03	1.41E+02	3.81E+03	8.99E+03	5.29E-02
Pu-240	2.13E+02	7.11E+02	9.24E+02	8.76E+02	3.60E+01	9.12E+02	1.84E+03	1.08E-02
Pu-241	2.91E+03	1.13E+02	3.03E+03	7.12E+03	6.58E+02	7.78E+03	1.08E+04	6.36E-02
Pu-242	4.46E-01	5.31E-01	9.77E-01	2.82E-01	4.61E-02	3.28E-01	1.31E+00	7.69E-06
Am-241	9.62E+02	1.71E+03	2.67E+03	1.40E+04	7.12E+01	1.41E+04	1.67E+04	9.85E-02
Am-242m	6.72E-01	2.08E+01	2.15E+01	1.59E+01		1.59E+01	3.74E+01	2.20E-04
Am-243		2.12E+03	2.12E+03				2.12E+03	1.25E-02
Cm-244	4.68E+02	1.65E+05	1.65E+05	2.50E+00	7.14E-03	2.51E+00	1.65E+05	9.74E-01
Cm-245	4.49E-04	1.87E+01	1.87E+01	2.90E-06	5.60E-09	2.90E-06	1.87E+01	1.10E-04
Cm-246		2.90E+01	2.90E+01				2.90E+01	1.71E-04
Cm-247		1.42E-04	1.42E-04				1.42E-04	8.35E-10
Total	9.64E+05	1.80E+05	1.14E+06	7.85E+06	2.12E+04	7.87E+06	9.01E+06	5.31E+01

Attachment 5

Calculation of H-Area Tank Farm Scaling Factors from WCS Radionuclide Inventory Data

Attachment 5

Calculation of H-Area Tank Farm Scaling Factors from WCS Radionuclide Inventory Data

Tank	H-3	C-14	Ni-59	Co-60	Ni-63	Se-79	Sr-90	Y-90	Nb-94	Tc-99	Ru-106	Rh-106	Sb-125	Sn-126	I-129	Cs-134	Cs-135	Cs-137	Ba-137m	Ce-144	Pr-144	Pm-147	Eu-154	Th-232	U-232	U-233
Tank Inventory (Ci)																										
9		3.09E-03	3.64E+00	2.07E+01		2.49E+00	8.17E+04	8.17E+04		4.31E+01	1.96E-08	1.96E-08	6.99E-01	4.63E+00	2.05E-04	4.14E-04	2.88E-02	5.81E+03	5.49E+03	4.74E-12	4.74E-12	9.18E+00	1.17E+02		1.87E-03	
10		3.24E-04	3.81E-01	2.46E+00		2.60E-01	8.73E+03	8.73E+03		4.49E+00	3.81E-09	3.81E-09	8.82E-02	4.78E-01	2.13E-05	7.32E-05	3.01E-03	6.16E+02	5.83E+02	1.36E-12	1.36E-12	1.18E+00	1.38E+01		1.92E-04	
11		1.59E-01	1.64E+02	1.33E+04		9.05E+01	5.42E+06	5.42E+06		1.53E+03	1.41E-01	1.41E-01	7.88E+02	8.29E+01	5.31E-03	4.52E+01	1.03E+00	2.98E+05	2.82E+05	2.19E-02	2.19E-02	2.05E+04	5.99E+04	1.43E-02	1.66E-04	2.04E+00
12		2.53E-01	2.80E+02	1.32E+04		1.58E+02	8.37E+06	8.37E+06		2.68E+03	6.31E-03	6.31E-03	4.56E+02	1.62E+02	9.69E-03	1.72E+01	1.79E+00	4.71E+05	4.46E+05	1.95E-04	1.95E-04	1.12E+04	7.18E+04	1.36E+00	1.41E-02	3.83E+01
13		2.92E-01	2.78E+02	7.46E+03		1.72E+02	7.70E+06	7.70E+06		2.93E+03	3.17E-03	3.17E-03	2.48E+02	2.25E+02	1.18E-02	8.08E+00	1.96E+00	4.64E+05	4.38E+05	1.10E-04	1.10E-04	5.79E+03	4.71E+04	1.98E-01	5.54E-02	4.06E+01
14		1.51E-03	7.72E+00	8.40E+01		5.26E+00	1.96E+05	1.96E+05		9.06E+01	4.33E-07	4.33E-07	2.88E+00	8.82E+00	4.09E-04	1.03E-02	6.06E-02	1.32E+04	1.25E+04	1.39E-09	1.39E-09	4.30E+01	5.31E+02	1.06E-02	3.22E-03	3.74E-01
15		2.34E-01	2.60E+02	1.01E+04		1.44E+02	7.50E+06	7.50E+06		2.44E+03	1.01E-02	1.01E-02	3.01E+02	1.32E+02	8.43E-03	1.10E+01	1.63E+00	4.15E+05	3.93E+05	1.34E-03	1.34E-03	7.41E+03	6.08E+04	1.13E+00		1.39E+01
21		8.96E-05	1.04E+00	1.89E+02		7.82E-01	5.37E+04	5.37E+04		1.32E+01	1.23E-02	1.23E-02	2.48E+01	7.15E-01	4.58E-05	1.96E+00	8.84E-03	2.92E+03	2.76E+03	1.97E-03	1.97E-03	6.73E+02	8.04E+02	5.67E-06		1.73E-01
22			2.13E+00	3.70E+02		1.66E+00	1.14E+05	1.14E+05		2.80E+01	1.48E-02	1.48E-02	4.30E+01	1.51E+00	9.70E-05	3.14E+00	1.87E-02	6.17E+03	5.83E+03	2.07E-03	2.07E-03	1.16E+03	1.65E+03			1.07E+00
23				5.26E-01												2.71E-02		4.49E+02	4.25E+02							
30		7.80E-04	8.56E-01	4.52E+02		4.71E-01	4.06E+04	4.06E+04		7.98E+00	1.15E+00	1.15E+00	1.22E+02	4.31E-01	2.76E-05	1.76E+01	5.33E-03	2.19E+03	2.07E+03	6.98E-01	6.98E-01	3.58E+03	9.82E+02			
32		2.45E-01	2.71E+02	4.98E+04		1.49E+02	1.02E+07	1.02E+07		2.53E+03	7.30E+01	7.30E+01	8.19E+03	1.37E+02	8.75E-03	1.04E+03	1.69E+00	5.56E+05	5.26E+05	5.16E+01	5.16E+01	2.35E+05	1.55E+05			
35		2.07E-01	2.27E+02	5.88E+04		1.25E+02	9.31E+06	9.31E+06		2.12E+03	1.14E+02	1.14E+02	1.02E+04	1.14E+02	7.32E-03	1.28E+03	1.41E+00	5.05E+05	4.78E+05	1.11E+02	1.11E+02	2.94E+05	1.66E+05			
36		2.34E-04	2.57E-01	4.84E+01		1.41E-01	1.01E+04	1.01E+04		2.39E+00	1.69E-03	1.69E-03	5.00E+00	1.29E-01	8.28E-06	3.80E-01	1.60E-03	5.48E+02	5.18E+02	1.99E-04	1.99E-04	1.35E+02	1.59E+02			
39		1.81E-01	1.98E+02	8.46E+04		1.09E+02	9.01E+06	9.01E+06		1.85E+03	2.06E+02	2.06E+02	1.97E+04	9.98E+01	6.39E-03	2.67E+03	1.23E+00	4.86E+05	4.60E+05	2.13E+02	2.13E+02	5.72E+05	1.99E+05			
40		6.14E-01	1.43E+02	5.05E+03		7.90E+01	3.67E+06	3.67E+06		1.36E+03	1.73E-01	1.73E-01	1.24E+03	1.41E+02	6.36E-03	8.12E+00	9.13E-01	2.51E+05	2.37E+05	7.75E-03	7.75E-03	2.03E+04	1.44E+04	2.90E-02	6.72E-02	1.84E+00
42		2.57E-02	1.15E+01	4.83E+02		5.97E+00	3.17E+05	3.17E+05		1.01E+02	6.33E-03	6.33E-03	2.47E+01	5.54E+00	3.52E-04	1.35E+00	6.77E-02	1.76E+04	1.66E+04	9.78E-04	9.78E-04	6.24E+02	2.73E+03	4.36E-02	2.35E-04	6.14E-01
43			1.44E+01	8.01E+03		1.12E+01	9.49E+05	9.49E+05		1.89E+02	8.35E+01	8.35E+01	2.91E+03	1.02E+01	6.56E-04	4.71E+02	1.27E-01	5.09E+04	4.82E+04	1.25E+02	1.25E+02	8.64E+04	2.23E+04			
*51		1.43E+00	1.97E+02	1.59E+03	3.89E+00	1.12E+02	4.12E+06	4.12E+06		1.79E+03	9.70E-03	9.70E-03	1.50E+02	1.94E+02	1.39E-01	2.00E+00	2.06E+00	2.61E+05	2.47E+05	1.40E-03	1.40E-03	2.51E+03	1.35E+04	5.48E-02	8.69E-02	5.22E+00
*With Am/Cm projected addition (from X-WCP-F-00003, Rev. 1) and Tanks 7/18 projected transfer.																										
Average		2.28E-01	1.14E+02	1.33E+04	3.89E+00	6.48E+01	3.73E+06	3.73E+06		1.10E+03	2.66E+01	2.66E+01	2.47E+03	7.33E+01	1.14E-02	2.94E+02	7.80E-01	2.00E+05	1.90E+05	2.78E+01	2.78E+01	7.01E+04	4.54E+04	3.16E-01	2.55E-02	1.04E+01
Mod. Av.															1.32E-02											
(Att. 6)																										
Scaling Factor (Ci/Ci Sr-90)																										
9		3.78E-08	4.45E-05	2.53E-04		3.05E-05	1.00E+00	1.00E+00		5.27E-04	2.40E-13	2.40E-13	8.56E-06	5.67E-05	2.51E-09	5.06E-09	3.53E-07	7.11E-02	6.72E-02	5.80E-17	5.80E-17	1.12E-04	1.43E-03		2.28E-08	
10		3.71E-08	4.37E-05	2.82E-04		2.98E-05	1.00E+00	1.00E+00		5.14E-04	4.36E-13	4.36E-13	1.01E-05	5.48E-05	2.44E-09	8.38E-09	3.44E-07	7.06E-02	6.68E-02	1.56E-16	1.56E-16	1.35E-04	1.58E-03		2.20E-08	
11		2.93E-08	3.02E-05	2.45E-03		1.67E-05	1.00E+00	1.00E+00		2.83E-04	2.60E-08	2.60E-08	1.45E-04	1.53E-05	9.78E-10	8.34E-06	1.89E-07	5.49E-02	5.19E-02	4.03E-09	4.03E-09	3.79E-03	1.11E-02	2.64E-09	3.07E-11	3.77E-07
12		3.03E-08	3.35E-05	1.58E-03		1.89E-05	1.00E+00	1.00E+00		3.20E-04	7.55E-10	7.55E-10	5.45E-05	1.94E-05	1.16E-09	2.06E-06	2.14E-07	5.63E-02	5.33E-02	2.33E-11	2.33E-11	1.34E-03	8.59E-03	1.63E-07	1.68E-09	4.58E-06
13		3.80E-08	3.61E-05	9.70E-04		2.23E-05	1.00E+00	1.00E+00		3.81E-04	4.12E-10	4.12E-10	3.23E-05	2.93E-05	1.53E-09	1.05E-06	2.55E-07	6.02E-02	5.70E-02	1.43E-11	1.43E-11	7.53E-04	6.12E-03	2.57E-08	7.20E-09	5.28E-06
14		7.68E-09	3.93E-05	4.28E-04		2.68E-05	1.00E+00	1.00E+00		4.62E-04	2.21E-12	2.21E-12	1.47E-05	4.50E-05	2.09E-09	5.24E-08	3.09E-07	6.72E-02	6.36E-02	7.08E-15	7.08E-15	2.19E-04	2.71E-03	5.40E-08	1.64E-08	1.90E-06
15		3.12E-08	3.47E-05	1.35E-03		1.92E-05	1.00E+00	1.00E+00		3.25E-04	1.35E-09	1.35E-09	4.01E-05	1.75E-05	1.12E-09	1.47E-06	2.17E-07	5.53E-02	5.23E-02	1.79E-10	1.79E-10	9.87E-04	8.11E-03	1.51E-07		1.85E-06
21		1.67E-09	1.93E-05	3.53E-03		1.45E-05	1.00E+00	1.00E+00		2.46E-04	2.28E-07	2.28E-07	4.61E-04	1.33E-05	8.52E-10	3.64E-05	1.64E-07	5.43E-02	5.14E-02	3.66E-08	3.66E-08	1.25E-02	1.50E-02	1.05E-10		3.22E-06
22			1.88E-05	3.26E-03		1.46E-05	1.00E+00	1.00E+00		2.47E-04	1.30E-07	1.30E-07	3.79E-04	1.33E-05	8.54E-10	2.76E-05	1.65E-07	5.43E-02	5.14E-02	1.82E-08	1.82E-08	1.02E-02	1.45E-02			9.46E-06
23																										
30		1.92E-08	2.11E-05	1.11E-02		1.16E-05	1.00E+00	1.00E+00		1.96E-04	2.84E-05	2.84E-05	2.99E-03	1.06E-05	6.79E-10	4.33E-04	1.31E-07	5.38E-02	5.09E-02	1.72E-05	1.72E-05	8.80E-02	2.42E-02			
32		2.40E-08	2.65E-05	4.88E-03		1.46E-05	1.00E+00	1.00E+00		2.48E-04	7.16E-06	7.16E-06	8.02E-04	1.34E-05	8.57E-10	1.02E-04	1.66E-07	5.45E-02	5.16E-02	5.05E-06	5.05E-06	2.31E-02	1.52E-02			
35		2.22E-08	2.44E-05	6.32E-03		1.34E-05	1.00E+00	1.00E+00		2.27E-04	1.23E-05	1.23E-05	1.10E-03	1.23E-05	7.86E-10	1.38E-04	1.52E-07	5.42E-02	5.13E-02	1.19E-05	1.19E-05	3.15E-02	1.78E-02			
36		2.32E-08	2.55E-05	4.81E-03		1.40E-05	1.00E+00	1.00E+00		2.38E-04	1.68E-07	1.68E-07	4.96E-04	1.28E-05	8.22E-10	3.77E-05	1.59E-07	5.44E-02	5.15E-02	1.97E-08	1.97E-08	1.34E-02	1.58E-02			
39		2.01E-08	2.20E-05	9.39E-03		1.21E-05	1.00E+00	1.00E+00		2.05E-04	2.29E-05	2.29E-05	2.18E-03	1.11E-05	7.09E-10	2.96E-04	1.37E-07	5.39E-02	5.10E-02	2.36E-05	2.36E-05	6.35E-02	2.21E-02			
40		1.67E-07	3.91E-05	1.38E-03		2.15E-05	1.00E+00	1.00E+00		3.72E-04	4.72E-08	4.72E-08	3.37E-04	3.85E-05	1.74E-09	2.21E-06	2.49E-07	6.83E-02	6.46E-02	2.11E-09	2.11E-09	5.53E-03	3.93E-03	7.92E-09	1.83E-08	5.01E-07
42		8.12E-08	3.61E-05	1.52E-03		1.88E-05	1.00E+00	1.00E+00		3.19E-04	1.99E-08	1.99E-08	7.77E-05	1.75E-05	1.11E-09	4.24E-06	2.13E-07	5.54E-02	5.24E-02	3.08E-09	3.08E-09	1.97E-03	8.59E-03	1.37E-07	7.40E-10	1.94E-06
43			1.52E-05	8.45E-03		1.18E-05	1.00E+00	1.00E+00		2.00E-04	8.80E-05	8.80E-05	3.06E-03	1.08E-05	6.91E-10	4.96E-04	1.33E-07	5.37E-02	5.08E-02	1.31E-04	1.31E-04	9.10E-02	2.35E-02			
51		3.47E-07	4.79E-05	3.86E-04	9.44E-07	2.72E-05	1.00E+00	1.00E+00		4.34E-04	2.35E-09	2.35E-09	3.64E-05	4.71E-05	3.37E-08	4.85E-07	5.01E-07	6.35E-02	6.00E-02	3.39E-10	3.39E-10	6.08E-04	3.27E-03	1.33E-08	2.11E-08	1.27E-06
Average		5.73E-08	3.10E-05	3.46E-03	9.44E-07	1.88E-05	1.00E+00	1.00E+00		3.19E-04	8.85E-06	8.85E-06	6.80E-04	2.44E-05	3.04E-09	8.82E-05	2.25E-07	5.87E-02	5.55E-02	1.05E-05	1.05E-05	1.94E-02	1.13E-02	6.17E-08	1.23E-08	3.04E-06
Mod. Av.															3.51E-09											
(Att. 6)																										

Attachment 5

Calculation of H-Area Tank Farm Scaling Factors from WCS Radionuclide Inventory Data

Tank	U-234	U-235	U-236	U-238	Np-237	Np-239	Pu-238	Pu-239	Pu-240	Pu-241	Pu-242	Ingrown Am-241	Am-241	Total Am-241	Am-242m	Am-243	Cm-244	Cm-245	Cm-246	Cm-247	Total	Sludge Volume (gal) (WCS Sludge Vol. x Solids Fract. Vol.)[a]
Tank Inve																						
9		1.18E-03		2.94E-02	2.01E-01		4.37E+01	6.24E+00	1.39E+00	6.57E+00	2.87E-04	1.88E+00	3.20E+02	3.98E-01			5.33E-02	7.07E-08			1.75E+05	1,200
10		2.28E-04		5.69E-03	4.35E-02		2.21E+01	3.16E+00	7.06E-01	3.56E+00	1.45E-04	9.72E-01	3.32E+01	4.13E-02			7.22E-03	2.98E-07			1.87E+04	1,200
11	1.68E+00	3.16E-02	2.59E-01	5.86E-02	1.11E+00		1.53E+05	1.49E+03	9.34E+02	6.08E+04	1.99E+00	5.96E+03	7.10E+03	8.46E+00			4.87E+01	5.43E-03			1.18E+07	42,000
12	3.58E+00	6.74E-02	2.84E-01	6.79E-01	7.94E+00		1.41E+05	2.32E+03	1.28E+03	3.69E+04	1.85E+00	4.46E+03	1.34E+04	1.59E+01			6.68E+01	8.38E-03			1.79E+07	81,644
13	5.73E+00	1.57E-01	5.91E-01	1.83E+00	1.47E+01		5.56E+04	1.46E+03	6.03E+02	1.21E+04	4.00E-01	2.23E+03	1.65E+04	2.01E+01			4.55E+01	5.98E-03			1.64E+07	66,900
14	5.13E-02	4.15E-03	4.41E-03	7.91E-02	5.48E-01		2.50E+02	6.04E+01	1.95E+01	1.12E+02	3.57E-03	2.43E+01	6.28E+02	7.80E-01			4.63E-01	6.11E-05			4.20E+05	8,100
15	3.79E+00	6.12E-02	3.59E-01	1.40E-03	3.55E+00		5.82E+04	1.22E+03	5.90E+02	1.39E+04	4.45E-01	2.55E+03	1.12E+04	1.32E+01			6.23E+01	8.64E-03			1.60E+07	111,020
21	1.71E-01	2.36E-03	3.50E-02	1.60E-03	1.05E-01		9.50E+02	1.09E+00	6.34E-01	2.36E+01	5.33E-04	2.72E+00	4.56E+01	5.51E-02			5.22E-01	4.69E-05			1.16E+05	4,200
22	3.86E-01	5.91E-03	6.36E-02	8.60E-03	2.35E-01		1.63E+03						9.40E+01	1.14E-01			1.10E+00	9.94E-05			2.44E+05	6,300
23																					8.75E+02	12,900
30	1.83E-02	3.25E-04	3.37E-03	1.20E-05	8.25E-03		3.60E+03	3.06E+01	2.20E+01	2.57E+03	5.26E-02	9.96E+01	3.82E+01	4.76E-02			4.48E-01	2.83E-05			9.70E+04	150
32	2.77E+00	3.97E-02	6.22E-01	1.86E-02	1.15E+00		4.11E+05	3.53E+03	2.62E+03	2.04E+05	5.53E+00	1.42E+04	1.19E+04	1.44E+01			9.92E+01	8.97E-03			2.26E+07	54,861
35	2.72E+00	4.72E-02	8.02E-01	2.79E-02	9.83E-01		4.16E+05	3.29E+03	2.52E+03	2.22E+05	5.66E+00	1.37E+04	1.00E+04	1.23E+01			9.48E+01	7.51E-03			2.08E+07	19,375
36	7.26E-03	1.41E-04	2.56E-03	4.60E-05	2.03E-03		6.43E+02	4.90E+00	3.90E+00	2.90E+02	8.42E-03	2.08E+01	1.13E+01	1.38E-02			9.97E-02	8.49E-06			2.25E+04	45
39	9.58E+00	5.64E-02	8.93E-01	4.86E-03	4.01E+00		7.02E+05	5.77E+03	3.95E+03	4.13E+05	1.31E+01	1.80E+04	8.90E+03	1.54E+01			2.21E+05	1.76E+01			2.12E+07	27,799
40	6.65E-01	1.89E-01	1.05E-01	8.36E+00	3.47E+00		2.33E+04	2.97E+03	7.27E+02	8.54E+03	8.84E-01	9.12E+02	9.65E+03	1.24E+01			5.84E+00	3.70E-04			7.91E+06	152,685
42	2.26E-01	5.33E-03	3.02E-02	9.35E-02	1.86E-01		3.08E+03	1.05E+02	3.76E+01	7.30E+02	3.44E-02	1.21E+02	4.53E+02	5.31E-01			2.64E+00	3.54E-04			6.77E+05	2,715
43	4.40E+00	4.44E-02	6.71E-01	6.23E-03	3.84E+00		1.20E+05	3.73E+02	2.47E+02	1.93E+04	4.63E+00	4.10E+02	6.45E+02	8.00E-01			1.04E+01	6.72E-04			2.26E+06	17,627
*51	3.67E+00	4.17E-01	8.88E-02	1.11E+01	9.97E+00	2.12E+03	3.94E+04	8.99E+03	1.84E+03	1.08E+04	1.31E+00			1.67E+04	3.74E+01	2.12E+03	1.65E+05	1.87E+01	2.90E+01	1.42E-04	9.02E+06	169,848
Average	2.47E+00	6.28E-02	3.01E-01	1.24E+00	2.89E+00	2.12E+03	1.18E+05	1.86E+03	9.05E+02	5.91E+04	2.11E+00	3.92E+03	5.35E+03	9.36E+02	3.74E+01	2.12E+03	2.15E+04	2.02E+00	2.90E+01	1.42E-04	8.19E+06	41,083
Mod. Av. (Att. 6)																						
Scaling Fa																						
9		1.44E-08		3.60E-07	2.46E-06		5.34E-04	7.63E-05	1.71E-05	8.04E-05	3.51E-09			4.87E-06			6.52E-07	8.65E-13				
10		2.62E-08		6.52E-07	4.99E-06		2.53E-03	3.62E-04	8.09E-05	4.09E-04	1.66E-08			4.73E-06			8.27E-07	3.41E-11				
11	3.09E-07	5.83E-09	4.78E-08	1.08E-08	2.04E-07		2.82E-02	2.74E-04	1.72E-04	1.12E-02	3.67E-07			1.56E-06			8.99E-06	1.00E-09				
12	4.29E-07	8.06E-09	3.40E-08	8.12E-08	9.49E-07		1.69E-02	2.77E-04	1.53E-04	4.41E-03	2.21E-07			1.90E-06			7.99E-06	1.00E-09				
13	7.44E-07	2.04E-08	7.67E-08	2.38E-07	1.91E-06		7.22E-03	1.89E-04	7.84E-05	1.57E-03	5.20E-08			2.61E-06			5.91E-06	7.77E-10				
14	2.62E-07	2.12E-08	2.25E-08	4.03E-07	2.79E-06		1.28E-03	3.08E-04	9.95E-05	5.72E-04	1.82E-08			3.97E-06			2.36E-06	3.11E-10				
15	5.05E-07	8.15E-09	4.78E-08	1.87E-10	4.73E-07		7.75E-03	1.62E-04	7.86E-05	1.85E-03	5.93E-08			1.75E-06			8.30E-06	1.15E-09				
21	3.18E-06	4.39E-08	6.51E-07	2.97E-08	1.96E-06		1.77E-02	2.04E-05	1.18E-05	4.39E-04	9.92E-09			1.03E-06			9.71E-06	8.73E-10				
22	3.40E-06	5.20E-08	5.60E-07	7.57E-08	2.07E-06		1.43E-02							1.00E-06			9.66E-06	8.75E-10				
23																						
30	4.50E-07	7.99E-09	8.30E-08	2.96E-10	2.03E-07		8.85E-02	7.54E-04	5.41E-04	6.32E-02	1.30E-06			1.17E-06			1.10E-05	6.97E-10				
32	2.72E-07	3.89E-09	6.10E-08	1.83E-09	1.12E-07		4.03E-02	3.46E-04	2.57E-04	2.00E-02	5.42E-07			1.41E-06			9.72E-06	8.79E-10				
35	2.92E-07	5.07E-09	8.61E-08	2.99E-09	1.06E-07		4.46E-02	3.53E-04	2.70E-04	2.38E-02	6.07E-07			1.32E-06			1.02E-05	8.06E-10				
36	7.20E-07	1.40E-08	2.54E-07	4.57E-09	2.01E-07		6.38E-02	4.86E-04	3.87E-04	2.88E-02	8.36E-07			1.37E-06			9.89E-06	8.43E-10				
39	1.06E-06	6.26E-09	9.91E-08	5.39E-10	4.46E-07		7.79E-02	6.40E-04	4.39E-04	4.58E-02	1.45E-06			1.71E-06			2.45E-02	1.95E-06				
40	1.81E-07	5.16E-08	2.86E-08	2.28E-06	9.46E-07		6.36E-03	8.10E-04	1.98E-04	2.33E-03	2.41E-07			3.39E-06			1.59E-06	1.01E-10				
42	7.12E-07	1.68E-08	9.52E-08	2.95E-07	5.86E-07		9.72E-03	3.30E-04	1.18E-04	2.30E-03	1.08E-07			1.67E-06			8.33E-06	1.12E-09				
43	4.64E-06	4.68E-08	7.07E-07	6.57E-09	4.04E-06		1.26E-01	3.93E-04	2.60E-04	2.03E-02	4.88E-06			8.43E-07			1.09E-05	7.08E-10				
51	8.90E-07	1.01E-07	2.16E-08	2.70E-06	2.42E-06	5.15E-04	9.57E-03	2.18E-03	4.45E-04	2.62E-03	3.17E-07			4.06E-03	9.08E-06	5.15E-04	4.02E-02	4.54E-06	7.05E-06	3.44E-11		
Average	1.13E-06	2.52E-08	1.80E-07	3.97E-07	1.49E-06	5.15E-04	3.13E-02	4.68E-04	2.12E-04	1.35E-02	6.49E-07			2.28E-04	9.08E-06	5.15E-04	3.60E-03	3.61E-07	7.05E-06	3.44E-11		
Mod. Av. (Att. 6)																						

[a]Sludge volume times (1 minus sludge interstitial fraction volume) from Attachment 1.

	Tanks 7/18 Sludge Volume (gal) (WCS Sludge Vol. x Solids Fract. Vol.)[a]
Tank 7	62,700 gal
Tank 18	14,100 gal

Attachment 6

Comparison of H-Area Tank Farm Sludge Scaling Factors and Activity Fractions for Consolidation

Attachment 6

Comparison of H-Area Tank Farm Sludge Scaling Factors and Activity Fractions for Consolidation

Sludge scaling factors (Ci/Ci Sr-90)

Isotope	Tank 9	Tank 10	Tank 11	Tank 12	Tank 13	Tank14	Tank 15	Tank 21	Tank 22	Tank 23	Tank 30	Tank 32	Tank 35	Tank 36	Tank 39	Tank 40	Tank 42	Tank 43	Tank 51	Mean Ci/ Ci Sr-90*
C-14	3.78E-08	3.71E-08	2.93E-08	3.03E-08	3.80E-08	7.68E-09	3.12E-08	1.67E-09			1.92E-08	2.40E-08	2.22E-08	2.32E-08	2.01E-08	1.67E-07	8.12E-08		3.47E-07	5.73E-08
Tc-99	5.27E-04	5.14E-04	2.83E-04	3.20E-04	3.81E-04	4.62E-04	3.25E-04	2.46E-04	2.47E-04		1.96E-04	2.48E-04	2.27E-04	2.38E-04	2.05E-04	3.72E-04	3.19E-04	2.00E-04	4.34E-04	3.19E-04
I-129	2.51E-09	2.44E-09	9.78E-10	1.16E-09	1.53E-09	2.09E-09	1.12E-09	8.52E-10	8.54E-10		6.79E-10	8.57E-10	7.86E-10	8.22E-10	7.09E-10	1.74E-09	1.11E-09	6.91E-10	3.37E-08	3.04E-09
	2.51E-09	2.44E-09	9.78E-10	1.16E-09	1.53E-09	2.09E-09	1.12E-09	8.52E-10	8.54E-10			8.57E-10	7.86E-10	8.22E-10		1.74E-09	1.11E-09		3.37E-08	3.51E-09
U-234			3.09E-07	4.29E-07	7.44E-07	2.62E-07	5.05E-07	3.18E-06	3.40E-06		4.50E-07	2.72E-07	2.92E-07	7.20E-07	1.06E-06	1.81E-07	7.12E-07	4.64E-06	8.90E-07	1.13E-06
U-238	3.60E-07	6.52E-07	1.08E-08	8.12E-08	2.38E-07	4.03E-07	1.87E-10	2.97E-08	7.57E-08		2.96E-10	1.83E-09	2.99E-09	4.57E-09	5.39E-10	2.28E-06	2.95E-07	6.57E-09	2.70E-06	3.97E-07

PA radionuclides, fraction of mean scaling factor (allowable fraction = 0.1-10.0)

Isotope	Tank 9	Tank 10	Tank 11	Tank 12	Tank 13	Tank14	Tank 15	Tank 21	Tank 22	Tank 23	Tank 30	Tank 32	Tank 35	Tank 36	Tank 39	Tank 40	Tank 42	Tank 43	Tank 51
C-14	0.66	0.65	0.51	0.53	0.66	**0.13**	0.54	**0.03**			0.33	0.42	0.39	0.40	0.35	2.92	1.42		6.06
Tc-99	1.65	1.61	0.89	1.00	1.19	1.45	1.02	0.77	0.77		0.62	0.78	0.71	0.74	0.64	1.17	1.00	0.63	1.36
I-129	0.83	0.80	0.32	0.38	0.50	0.69	0.37	0.28	0.28		0.22	0.28	0.26	0.27	0.23	0.57	0.37	0.23	**11.11**
	0.72	0.70	0.28	0.33	0.44	0.60	0.32	0.24	0.24			0.24	0.22	0.23		0.50	0.32		9.62
U-234			0.27	0.38	0.66	0.23	0.45	2.82	3.02		0.40	0.24	0.26	0.64	0.94	0.16	0.63	4.11	0.79
U-238	0.91	1.65	**0.03**	0.20	0.60	1.02	**0.0005**	**0.07**	0.19		**0.001**	**0.005**	**0.008**	**0.01**	**0.001**	5.75	0.74	**0.02**	6.80

Predominant Radionuclide Fractional activity ([predominant radionuclide Ci] / [total radionuclide Ci])

Isotope	Tank 9	Tank 10	Tank 11	Tank 12	Tank 13	Tank14	Tank 15	Tank 21	Tank 22	Tank 23	Tank 30	Tank 32	Tank 35	Tank 36	Tank 39	Tank 40	Tank 42	Tank 43	Tank 51	Mean
Sr-90	4.66E-01	4.66E-01	4.61E-01	4.66E-01	4.68E-01	4.67E-01	4.69E-01	4.64E-01	4.65E-01		4.19E-01	4.52E-01	4.48E-01	4.47E-01	4.25E-01	4.64E-01	4.68E-01	4.20E-01	4.57E-01	4.55E-01
Y-90	4.66E-01	4.66E-01	4.61E-01	4.66E-01	4.68E-01	4.67E-01	4.69E-01	4.64E-01	4.65E-01		4.19E-01	4.52E-01	4.48E-01	4.47E-01	4.25E-01	4.64E-01	4.68E-01	4.20E-01	4.57E-01	4.55E-01

Predominant radionuclides, variation from mean fractional activity (allowable variation = 100%)

Isotope	Tank 9	Tank 10	Tank 11	Tank 12	Tank 13	Tank14	Tank 15	Tank 21	Tank 22	Tank 23	Tank 30	Tank 32	Tank 35	Tank 36	Tank 39	Tank 40	Tank 42	Tank 43	Tank 51
Sr-90	2.42%	2.33%	1.41%	2.42%	2.82%	2.67%	3.15%	1.89%	2.23%		-7.99%	-0.75%	-1.66%	-1.78%	-6.70%	1.86%	2.94%	-7.67%	0.41%
Y-90	2.42%	2.33%	1.41%	2.42%	2.82%	2.67%	3.15%	1.89%	2.23%		-7.99%	-0.75%	-1.66%	-1.78%	-6.70%	1.86%	2.94%	-7.67%	0.41%

Attachment 7

H-Area Tank Farm Sludge Waste Stream Exclusion Criteria

Attachment 7

H-Area Tank Farm Sludge Waste Stream
Exclusion Criteria

Isotope	Mean Ci/Ci Sr-90	Mean Distribution	<1% of Dist?(a)	Not Expected	Distribution: RADs Remaining after Exclusion	Distribution: Fractional Distribution (percent)	Distribution: Re-normalized Distribution (percent)
Waste Stream HTK-00002-all w/42H							
H-3				x			
C-14	5.73E-08	2.61E-06			**C-14**	2.61E-06	2.61E-06
Ni-59	3.10E-05	1.41E-03	yes				
Co-60	3.46E-03	1.57E-01	yes(b)		Co-60	1.57E-01	1.58E-01
Ni-63	9.44E-07	4.29E-05	yes				
Se-79	1.88E-05	8.54E-04	yes				
Sr-90	1.00E+00	4.55E+01	no		Sr-90	4.55E+01	4.55E+01
Y-90	1.00E+00	4.55E+01	no		Y-90	4.55E+01	4.55E+01
Tc-99	3.19E-04	1.45E-02			**Tc-99**	1.45E-02	1.45E-02
Ru-106	8.85E-06	4.02E-04	yes				
Rh-106	8.85E-06	4.02E-04	yes				
Sb-125	6.80E-04	3.09E-02	yes				
Sn-126	2.44E-05	1.11E-03	yes				
I-129	3.51E-09	1.59E-07			**I-129**	1.59E-07	1.59E-07
Cs-134	8.82E-05	4.01E-03	yes				
Cs-135	2.25E-07	1.02E-05	yes				
Cs-137	5.87E-02	2.67E+00	no		Cs-137	2.67E+00	2.67E+00
Ba-137m	5.55E-02	2.52E+00	no		Ba-137m	2.52E+00	2.52E+00
Ce-144	1.05E-05	4.78E-04	yes				
Pr-144	1.05E-05	4.78E-04	yes				
Pr-144m	1.05E-05	4.78E-04	yes				
Pm-147	1.94E-02	8.81E-01	yes(b)		Pm-147	8.81E-01	8.81E-01
Eu-154	1.13E-02	5.14E-01	yes(b)		Eu-154	5.14E-01	5.14E-01
U-233	3.04E-06	1.38E-04			U-233	1.38E-04	1.38E-04
U-234	1.13E-06	5.13E-05			**U-234**	5.13E-05	5.13E-05
U-235	2.52E-08	1.15E-06			U-235	1.15E-06	1.15E-06
U-236	1.80E-07	8.17E-06	yes				
U-238	3.97E-07	1.80E-05			**U-238**	1.80E-05	1.80E-05
Np-237	1.49E-06	6.79E-05			Np-237	6.79E-05	6.79E-05
Np-239	5.15E-04	2.34E-02	yes				
Pu-238	3.13E-02	1.42E+00			Pu-238	1.42E+00	1.42E+00
Pu-239	4.68E-04	2.13E-02			Pu-239	2.13E-02	2.13E-02
Pu-240	2.12E-04	9.65E-03			Pu-240	9.65E-03	9.65E-03
Pu-241	1.35E-02	6.14E-01			Pu-241	6.14E-01	6.15E-01
Pu-242	6.49E-07	2.95E-05			Pu-242	2.95E-05	2.95E-05
Am-241	2.28E-04	1.03E-02			Am-241	1.03E-02	1.03E-02
Am-242m	9.08E-06	4.13E-04			Am-242m	4.13E-04	4.13E-04
Am-243	5.15E-04	2.34E-02			Am-243	2.34E-02	2.34E-02
Cm-244	3.60E-03	1.64E-01	yes(b)		Cm-244	1.64E-01	1.64E-01
Cm-245	3.61E-07	1.64E-05			Cm-245	1.64E-05	1.64E-05
Cm-246	7.05E-06	3.20E-04			Cm-246	3.20E-04	3.21E-04
Cm-247	3.44E-11	1.57E-09			Cm-247	1.57E-09	1.57E-09
Total	2.20E+00	1.00E+02			Total	9.99E+01	1.00E+02

Bold = PA radionuclides

(a) for those radionuclides included because they were expected to be present at greater than 1% of total activity

(b) retained in distribution since they are close to 1% of total activity

all fissile and transuranic isotopes retained in distribution

Attachment 8

H-Area Tank Farm Sludge Waste Stream Activity Distribution

Attachment 8

H-Area Tank Farm Sludge Waste Stream
Activity Distribution

Radionuclide	SLUDGE FRACTION		
	activity fraction (%)	normalized distribution (%)	scaling factors Ci/Ci Sr-90
	Waste Stream HTK-00002		
H-3			
C-14	2.61E-06	2.61E-06	5.73E-08
Co-60	1.58E-01	1.58E-01	3.46E-03
Sr-90	4.55E+01	4.55E+01	1.00E+00
Y-90	4.55E+01	4.55E+01	1.00E+00
Tc-99	1.45E-02	1.45E-02	3.19E-04
I-129	1.59E-07	1.59E-07	3.51E-09
Cs-137	2.67E+00	2.67E+00	5.87E-02
Ba-137m	2.52E+00	2.52E+00	5.55E-02
Pm-147	8.81E-01	8.81E-01	1.94E-02
Eu-154	5.14E-01	5.14E-01	1.13E-02
U-233	1.38E-04	1.38E-04	3.04E-06
U-234	5.13E-05	5.13E-05	1.13E-06
U-235	1.15E-06	1.15E-06	2.52E-08
U-238	1.80E-05	1.80E-05	3.97E-07
Np-237	6.79E-05	6.79E-05	1.49E-06
Pu-238	1.42E+00	1.42E+00	3.13E-02
Pu-239	2.13E-02	2.13E-02	4.68E-04
Pu-240	9.65E-03	9.65E-03	2.12E-04
Pu-241	6.15E-01	6.15E-01	1.35E-02
Pu-242	2.95E-05	2.95E-05	6.49E-07
Am-241	1.03E-02	1.03E-02	2.28E-04
Am-242m	4.13E-04	4.13E-04	9.08E-06
Am-243	2.34E-02	2.34E-02	5.15E-04
Cm-244	1.64E-01	1.64E-01	3.60E-03
Cm-245	1.64E-05	1.64E-05	3.61E-07
Cm-246	3.21E-04	3.21E-04	7.05E-06
Cm-247	1.57E-09	1.57E-09	3.44E-11
Total	1.00E+02	1.00E+02	2.20E+00

Attachment 9

Waste Characterization Form for Sludge Fraction, HTK-00002

OSR 29-82# (Rev 1-14-2003)

Ref. 1S Manual, Appendix A-17 Instructions

EAV Low Level Waste Stream Characterization

1. Waste Stream ID	2. Generating Facility	3. Waste Organization	4. Building Name	5. Effective Date
HTK-00002	HTF	H-Area Tank Farm	241-H	3/8/2003

6. WITS Stream Description	7. Reason for Submittal	8. WSCF No.	9. Rev
Sludge contam'd waste from Tks 9-15, 21-23, 30, 32, 35, 36, 40, 42, 43, and 51	New Waste Stream		

10. Activity Generating Waste	11. Physical Form	12. TSD Facility/Location
H Tank Farm Operations	Combustible	EAV - Law Vault - 1

13. Valid Calculation Method for Waste	14. STC Constant	15. STC Min Value	16. DTC Waste Form
☐ Char by Pack ☐ Dose-to-Curie ☐ Smear to Curie ☒ Curies or RAD Weight	N/A	N/A	N/A

17. Assigned Container Types	18. DTC Containers	19. Waste Description	Vol %
B-12 (14)	N/A	Contaminated Equipment	50
B-25 (Yellow)-Light (6)		Job Control Waste	50
B-25 (Yellow) 625# (733)			
55-gal Drum (A,7A) (15)			
Riser Plug Box (945)			

20. WITS ID	21. Tech Baseline	22. Container Document No.	23. Deviation Document No.	24. CERCLA	25. Waste < 2 nCi/g
HTK00002LLW	WSRC-2000-00249, Rev 2	N/A	N/A	☐ Yes ☒ No	☐ Yes ☒ No

26. Source(s)	27. PCB Category				
☐ Yes ☒ No	☐ PCB Leachable	☐ PCB Bulk	☒ N/A	☐ PCB Article	
		☐ PCB Remediation	☐ PCB Laboratory	☐ PCB Decontamination	

28. Comments

29. Meas Tech	30. Waste Incidental to Reprocessing (WIR) — Evaluation Document No.
☐ Sample and Analysis ☒ Process Knowledge	_____ ☒ NA

31. Currently Assigned Isotopes

Isotope	Ci %	Basis for Exclusion (PA isotopes only)	Isotope	Ci %	Basis for Exclusion*
C-14	2.16E-06		Am-243	2.34E-02	
Co-60	1.58E-01		Cm-244	1.64E-01	
Sr-90	4.55E+01		Cm-245	1.64E-05	
Y-90	4.55E+01		Cm-246	3.21E-04	
Tc-99	1.45E-02		Cm-247	1.57E-09	
I-129	1.59E-07				
Cs-137	2.67E+00		H-3		Not present
Ba-137m	2.52E+00				
Pm-147	8.81E-01				
Eu-154	5.14E-01				
U-233	1.38E-04				
U-234	5.13E-05				
U-235	1.15E-06				
U-238	1.80E-05				
Np-237	6.79E-05				
Pu-238	1.42E+00				
Pu-239	2.13E-02				
Pu-240	9.65E-03				
Pu-241	6.15E-01				
Pu-242	2.95E-05				
Am-241	1.03E-02				
Am-242m	4.13E-04				

Total 100% ~~80.1389~~ %

32. GCO Name	33. GCO Address	34. GCO Phone
W. R. Stewart	704-56H	8-0604

35. GCO Signature**	Date	Environmental Compliance Authority Signature	Date
	3/6/03		3-6-03
Solid Waste Generator Service Approval	Date	WITS Data Input Signature	Date

**Generator Certification Statement: "I certify that to the best of my knowledge, the data submitted provides a true and accurate description of the waste."

Attachment 10

H-Area Tank Farm Sludge Solids Radionuclide Concentrations

Attachment 10

H-Area Tank Farm Sludge Solids Radionuclide Concentrations

Tank	H-3	C-14	Ni-59	Co-60	Ni-63	Se-79	Sr-90	Y-90	Nb-94	Tc-99	Ru-106	Rh-106	Sb-125	Sn-126	I-129	Cs-134	Cs-135	Cs-137	Ba-137m	Ce-144	Pr-144	Pm-147	Eu-154	Th-232	U-232	U-233
Tank Concentration (Ci/gal sludge solids)																										
9		2.57E-06	3.03E-03	1.72E-02		2.07E-03	6.81E+01	6.81E+01		3.59E-02	1.63E-11	1.63E-11	5.83E-04	3.86E-03	1.71E-07	3.45E-07	2.40E-05	4.84E+00	4.58E+00	3.95E-15	3.95E-15	7.65E-03	9.73E-02		1.55E-06	
10		2.70E-07	3.18E-04	2.05E-03		2.16E-04	7.27E+00	7.27E+00		3.74E-03	3.17E-12	3.17E-12	7.35E-05	3.99E-04	1.77E-08	6.10E-08	2.50E-06	5.14E-01	4.86E-01	1.14E-15	1.14E-15	9.82E-04	1.15E-02		1.60E-07	
11		3.78E-06	3.90E-03	3.16E-01		2.15E-03	1.29E+02	1.29E+02		3.65E-02	3.35E-06	3.35E-06	1.88E-02	1.97E-03	1.26E-07	1.08E-03	2.44E-05	7.09E+00	6.71E+00	5.20E-07	5.20E-07	4.89E-01	1.43E+00	3.41E-07	3.96E-09	4.86E-05
12		3.10E-06	3.43E-03	1.62E-01		1.93E-03	1.02E+02	1.02E+02		3.28E-02	7.73E-08	7.73E-08	5.59E-03	1.98E-03	1.19E-07	2.11E-04	2.20E-05	5.77E+00	5.46E+00	2.39E-09	2.39E-09	1.38E-01	8.80E-01	1.67E-05	1.72E-07	4.69E-04
13		4.37E-06	4.15E-03	1.12E-01		2.57E-03	1.15E+02	1.15E+02		4.39E-02	4.74E-08	4.74E-08	3.71E-03	3.37E-03	1.76E-07	1.21E-04	2.93E-05	6.93E+00	6.55E+00	1.65E-09	1.65E-09	8.66E-02	7.04E-01	2.96E-06	8.29E-07	6.07E-04
14		1.86E-07	9.53E-04	1.04E-02		6.49E-04	2.42E+01	2.42E+01		1.12E-02	5.35E-11	5.35E-11	3.56E-04	1.09E-03	5.05E-08	1.27E-06	7.49E-06	1.63E+00	1.54E+00	1.71E-13	1.71E-13	5.31E-03	6.56E-02	1.31E-06	3.98E-07	4.61E-05
15		2.11E-06	2.34E-03	9.12E-02		1.30E-03	6.76E+01	6.76E+01		2.20E-02	9.11E-08	9.11E-08	2.71E-03	1.19E-03	7.59E-08	9.95E-05	1.47E-05	3.74E+00	3.54E+00	1.21E-08	1.21E-08	6.67E-02	5.48E-01	1.02E-05		1.25E-04
21		2.13E-08	2.47E-04	4.51E-02		1.86E-04	1.28E+01	1.28E+01		3.15E-03	2.92E-06	2.92E-06	5.90E-03	1.70E-04	1.09E-08	4.66E-04	2.10E-06	6.95E-01	6.57E-01	4.69E-07	4.69E-07	1.60E-01	1.91E-01	1.35E-09		4.12E-05
22			3.39E-04	5.87E-02		2.63E-04	1.80E+01	1.80E+01		4.45E-03	2.34E-06	2.34E-06	6.83E-03	2.40E-04	1.54E-08	4.98E-04	2.97E-06	9.79E-01	9.26E-01	3.29E-07	3.29E-07	1.84E-01	2.62E-01			1.71E-04
23				4.08E-05												2.10E-06		3.48E-02	3.30E-02							
30		5.20E-06	5.71E-03	3.01E+00		3.14E-03	2.71E+02	2.71E+02		5.32E-02	7.69E-03	7.69E-03	8.11E-01	2.87E-03	1.84E-07	1.17E-01	3.56E-05	1.46E+01	1.38E+01	4.65E-03	4.65E-03	2.39E+01	6.55E+00			
32		4.47E-06	4.93E-03	9.07E-01		2.72E-03	1.86E+02	1.86E+02		4.61E-02	1.33E-03	1.33E-03	1.49E-01	2.49E-03	1.59E-07	1.90E-02	3.08E-05	1.01E+01	9.59E+00	9.40E-04	9.40E-04	4.29E+00	2.83E+00			
35		1.07E-05	1.17E-02	3.04E+00		6.45E-03	4.81E+02	4.81E+02		1.09E-01	5.90E-03	5.90E-03	5.28E-01	5.90E-03	3.78E-07	6.62E-02	7.30E-05	2.61E+01	2.47E+01	5.74E-03	5.74E-03	1.52E+01	8.56E+00			
36		5.20E-06	5.71E-03	1.08E+00		3.14E-03	2.24E+02	2.24E+02		5.32E-02	3.75E-05	3.75E-05	1.11E-01	2.87E-03	1.84E-07	8.43E-03	3.56E-05	1.22E+01	1.15E+01	4.41E-06	4.41E-06	3.01E+00	3.53E+00			
39		6.50E-06	7.13E-03	3.04E+00		3.92E-03	3.24E+02	3.24E+02		6.65E-02	7.41E-03	7.41E-03	7.07E-01	3.59E-03	2.30E-07	9.60E-02	4.44E-05	1.75E+01	1.65E+01	7.65E-03	7.65E-03	2.06E+01	7.15E+00			
40		4.02E-06	9.38E-04	3.31E-02		5.17E-04	2.40E+01	2.40E+01		8.94E-03	1.13E-06	1.13E-06	8.09E-03	9.24E-04	4.17E-08	5.32E-05	5.98E-06	1.64E+00	1.55E+00	5.08E-08	5.08E-08	1.33E-01	9.45E-02	1.90E-07	4.40E-07	1.20E-05
42		9.48E-06	4.22E-03	1.78E-01		2.20E-03	1.17E+02	1.17E+02		3.73E-02	2.33E-06	2.33E-06	9.08E-03	2.04E-03	1.30E-07	4.96E-04	2.49E-05	6.47E+00	6.12E+00	3.60E-07	3.60E-07	2.30E-01	1.00E+00	1.61E-05	8.65E-08	2.26E-04
43			8.18E-04	4.55E-01		6.35E-04	5.38E+01	5.38E+01		1.07E-02	4.74E-03	4.74E-03	1.65E-01	5.81E-04	3.72E-08	2.67E-02	7.18E-06	2.89E+00	2.73E+00	7.08E-03	7.08E-03	4.90E+00	1.26E+00			
*51		8.43E-06	1.16E-03	9.36E-03	2.29E-05	6.61E-04	2.43E+01	2.43E+01		1.05E-02	5.71E-08	5.71E-08	8.83E-04	1.14E-03	8.18E-07	1.18E-05	1.21E-05	1.53E+00	1.45E+00	8.23E-09	8.23E-09	1.48E-02	7.93E-02	3.22E-07	5.12E-07	3.08E-05
*With Am/Cm projected addition (from X-WCP-F-00003, Rev. 1) and Tanks 7/18 projected transfer.																										
Average		4.40E-06	3.39E-03	6.61E-01	2.29E-05	1.93E-03	1.25E+02	1.25E+02		3.27E-02	1.51E-03	1.51E-03	1.41E-01	2.04E-03	1.62E-07	1.77E-02	2.22E-05	6.59E+00	6.23E+00	1.45E-03	1.45E-03	4.07E+00	1.96E+00	5.34E-06	4.62E-07	1.78E-04
Mod. Av. (Att. 6)															1.65E-07											

Attachment 10

H-Area Tank Farm Sludge Solids Radionuclide Concentrations

Tank	U-234	U-235	U-236	U-238	Np-237	Np-239	Pu-238	Pu-239	Pu-240	Pu-241	Pu-242	Ingrown Am-241	Am-241	Total Am-241	Am-242m	Am-243	Cm-244	Cm-245	Cm-246	Cm-247	Total	Sludge Volume (gal)
Tank Conc	**Tank Concentration (Ci/gal sludge solids)**																					(WCS Sludge Vol. x Solids Fract. Vol.)[a]
9		9.83E-07		2.45E-05	1.68E-04		3.64E-02	5.20E-03	1.16E-03	5.48E-03	2.39E-07	1.57E-03	2.67E-01	2.68E-01	3.31E-04		4.44E-05	5.89E-11			1.46E+02	1,200
10		1.90E-07		4.74E-06	3.63E-05		1.84E-02	2.63E-03	5.88E-04	2.97E-03	1.21E-07	8.10E-04	2.76E-02	2.84E-02	3.44E-05		6.02E-06	2.48E-10			1.56E+01	1,200
11	3.99E-05	7.53E-07	6.17E-06	1.40E-06	2.63E-05		3.64E+00	3.54E-02	2.22E-02	1.45E+00	4.74E-05	1.42E-01	1.69E-01	3.11E-01	2.01E-04		1.16E-03	1.29E-07			2.80E+02	42,000
12	4.39E-05	8.26E-07	3.48E-06	8.32E-06	9.72E-05		1.73E+00	2.84E-02	1.57E-02	4.52E-01	2.27E-05	5.46E-02	1.64E-01	2.18E-01	1.95E-04		8.19E-04	1.03E-07			2.20E+02	81,644
13	8.56E-05	2.34E-06	8.83E-06	2.74E-05	2.20E-04		8.31E-01	2.18E-02	9.01E-03	1.80E-01	5.98E-06	3.33E-02	2.47E-01	2.80E-01	3.00E-04		6.80E-04	8.94E-08			2.46E+02	66,900
14	6.33E-06	5.12E-07	5.45E-07	9.77E-06	6.76E-05		3.09E-02	7.46E-03	2.41E-03	1.38E-02	4.41E-07	3.00E-03	7.75E-02	8.05E-02	9.62E-05		5.72E-05	7.54E-09			5.18E+01	8,100
15	3.42E-05	5.51E-07	3.23E-06	1.26E-08	3.20E-05		5.24E-01	1.10E-02	5.31E-03	1.25E-01	4.01E-06	2.30E-02	1.01E-01	1.24E-01	1.19E-04		5.61E-04	7.79E-08			1.44E+02	111,020
21	4.07E-05	5.61E-07	8.33E-06	3.80E-07	2.50E-05		2.26E-01	2.61E-04	1.51E-04	5.62E-03	1.27E-07	6.48E-04	1.09E-02	1.15E-02	1.31E-05		1.24E-04	1.12E-08			2.76E+01	4,200
22	6.13E-05	9.38E-07	1.01E-05	1.36E-06	3.73E-05		2.58E-01						1.49E-02	1.49E-02	1.80E-05		1.74E-04	1.58E-08			3.87E+01	6,300
23														0.00E+00							6.78E-02	12,900
30	1.22E-04	2.16E-06	2.25E-05	8.02E-08	5.50E-05		2.40E+01	2.04E-01	1.47E-01	1.71E+01	3.51E-04	6.64E-01	2.55E-01	9.19E-01	3.17E-04		2.99E-03	1.89E-07			6.47E+02	150
32	5.06E-05	7.23E-07	1.13E-05	3.40E-07	2.09E-05		7.49E+00	6.44E-02	4.78E-02	3.72E+00	1.01E-04	2.59E-01	2.17E-01	4.76E-01	2.62E-04		1.81E-03	1.63E-07			4.12E+02	54,861
35	1.40E-04	2.44E-06	4.14E-05	1.44E-06	5.07E-05		2.14E+01	1.70E-01	1.30E-01	1.15E+01	2.92E-04	7.07E-01	5.18E-01	1.22E+00	6.34E-04		4.89E-03	3.87E-07			1.07E+03	19,375
36	1.61E-04	3.12E-06	5.69E-05	1.02E-06	4.51E-05		1.43E+01	1.09E-01	8.66E-02	6.44E+00	1.87E-04	4.62E-01	2.52E-01	7.13E-01	3.06E-04		2.21E-03	1.89E-07			5.01E+02	45
39	3.45E-04	2.03E-06	3.21E-05	1.75E-07	1.44E-04		2.53E+01	2.08E-01	1.42E-01	1.48E+01	4.71E-04	6.47E-01	3.20E-01	9.67E-01	5.54E-04		7.93E+00	6.31E-04			7.63E+02	27,799
40	4.35E-06	1.24E-06	6.86E-07	5.48E-05	2.27E-05		1.53E-01	1.95E-02	4.76E-03	5.60E-02	5.79E-06	5.97E-03	6.32E-02	6.92E-02	8.14E-05		3.82E-05	2.42E-09			5.18E+01	152,685
42	8.32E-05	1.96E-06	1.11E-05	3.44E-05	6.84E-05		1.14E+00	3.86E-02	1.38E-02	2.69E-01	1.27E-05	4.45E-02	1.67E-01	2.11E-01	1.96E-04		9.73E-04	1.30E-07			2.49E+02	2,715
43	2.50E-04	2.52E-06	3.81E-05	3.54E-07	2.18E-04		6.80E+00	2.12E-02	1.40E-02	1.09E+00	2.63E-04	2.33E-02	3.66E-02	5.98E-02	4.54E-05		5.88E-04	3.81E-08			1.28E+02	17,627
*51	2.16E-05	2.46E-06	5.23E-07	6.54E-05	5.87E-05	1.25E-02	2.32E-01	5.29E-02	1.08E-02	6.36E-02	7.69E-06			9.85E-02	2.20E-04	1.25E-02	9.74E-01	1.10E-04	1.71E-04	8.35E-10	5.31E+01	169,848
Average Mod. Av. (Att. 6)	9.31E-05	1.46E-06	1.60E-05	1.31E-05	7.74E-05	1.25E-02	6.00E+00	5.88E-02	3.84E-02	3.37E+00	1.04E-04			3.20E-01	2.18E-04	1.25E-02	4.96E-01	4.13E-05	1.71E-04	8.35E-10	2.80E+02	41,083

[a]Sludge volume x (1 - sludge interstitial fraction volume) from Attachment 1.

Attachment 11

Comparison of H-Area Tank Farm Sludge Solids Waste Against WAC 3.17, Rev. 7, Requirements

Attachment 11

Comparison of H-Area Tank Farm Sludge Solids Waste Against WAC 3.17, Rev. 7, Requirements

Comparison Against WAC 3.17, Rev. 7, Requirements - Waste Stream HTK-00002

Comparison to Package Guidelines (Section 3.5.1)

Isotope	Isotope Average Ci / Average Sludge Volume (Ci/gal)[a]	LAWV limit ci/ft3	LAWV limit Ci for B-25	Amt isotope in B-25 to reach LAWV Limit (gal) = LAWV limit in B-25/sludge activity	Total Curies in B-25	TRU Curies	for 5000 lb nCi/g	min waste wt to not be TRU
H-3	0.00E+00	1.10E+01	9.90E+02					
C-14	4.40E-06	2.50E-05	2.25E-03	5.11E+02				
Tc-99	3.27E-02	5.60E-05	5.04E-03	**1.54E-01**	4.31E+01	9.90E-01	436.3328	21816.64
I-129	1.65E-07	1.10E-08	9.90E-07	6.00E+00				
U-234	9.31E-05	1.10E-03	9.90E-02	1.06E+03				
U-238	1.31E-05	1.20E-03	1.08E-01	8.24E+03				

Sum of Fractions Calculation (Section 3.5.2)

Activity, blended waste **2.80E+02** Ci/gal

TRU Curies/Total Curies = 2.30E-02

Total TRU = 6.43E+00 Ci/gal

Isotope	Isotope Average Ci/gal[a]	Ci/ft3 sludge	Ci/ft3 waste	LAWV limit ci/ft3	Fraction
H-3	0.00E+00	0.00E+00	0.00E+00	1.10E+01	0.00E+00
C-14	4.40E-06	3.29E-05	7.33E-09	2.50E-05	2.93E-04
Tc-99	3.27E-02	2.45E-01	5.45E-05	5.60E-05	9.74E-01
I-129	1.65E-07	1.23E-06	2.75E-10	1.10E-08	2.50E-02
U-234	9.31E-05	6.96E-04	1.55E-07	1.10E-03	1.41E-04
U-238	1.31E-05	9.80E-05	2.18E-08	1.20E-03	1.82E-05

Np-237	7.74E-05			
Pu-238	6.00E+00			
Pu-239	5.88E-02			
Pu-240	3.84E-02			
Pu-242	1.04E-04			
Am-241	3.20E-01			
Am-242m	2.18E-04			
Am-243	1.25E-02			
Cm-245	4.13E-05			
Cm-246	1.71E-04			
Cm-247	8.35E-10			

ft3 sludge/ft3 waste 2.23E-04 — Total **9.99E-01**

ft3 sludge/B-25 2.00E-02

Gal sludge/B-25 1.50E-01 — max amount of sludge in a B-25 to meet Sum of Fractions Limit

Equivalent Curies 4.20E+01 — TRU curies 9.65E-01 — min lb wt not to be TRU

nCi/g at max wt 4.25E+02 — 21250.07857

Nuclear Criticality Safety Criteria (Section 3.5.3)

	Isotope Average Ci / Average Sludge Volume (Ci/gal)[a]	Specific Activity Ci/g	Ci	Mass (g)	Equiv Factor	FGE
U-233	1.78E-04	9.648E-03	3.76E-03	3.90E-01	1.4	5.46E-01
U-235	1.46E-06	2.160E-06	3.10E-05	1.43E+01	1.0	1.43E+01
Pu-239	5.88E-02	6.132E-02	1.25E+00	2.03E+01	1.6	3.25E+01
Pu-241	3.37E+00	1.034E+02	7.14E+01	6.91E-01	3.5	2.42E+00
Am-242m	2.18E-04	9.717E+00	4.62E-03	4.75E-04	54.0	2.57E-02
Cm-245	4.13E-05	1.716E-01	8.75E-04	5.10E-03	24.0	1.22E-01
Cm-247	8.35E-10	9.396E-05	1.77E-08	1.88E-04	1.6	3.01E-04

Gal Sludge 21.191

Equiv Curies 5.93E+03

Total **4.99E+01**

[a]Sludge solids isotope Ci/gal data from Attachment 10.