CHARACTERIZATION OF TANK 11H AND TANK 51H POST ALUMINUM DISSOLUTION PROCESS SAMPLES

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Waste Processing Technology Section
Savannah River National Laboratory
Aiken, SC 29808

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REVIEWS AND APPROVALS

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List of Acronyms

SRS	Savannah River Site
LWO	Liquid Waste Organization
HM	H-Area Modified PUREX
LTAD	Low Temperature Aluminum Dissolution
DWPF	Defense Waste Processing Facility
SRNL	Savannah River National Laboratory
ARG-1	Analytical Reference Glass 1
AD	Analytical Development
%RSD	Percent Relative Standard Deviation
IE	Inductively Couple Plasma-Emission Spectroscopy
IM	Inductively Couple Plasma-Mass Spectrometry
IC	Ion Chromatography
TH	Titration for Free Hydroxide
TIC	Total Inorganic Carbon
CV	Atomic Absorption Cold Vapor Method
SG	Separation/Gamma Spectroscopy
SA	Separation/Alpha Spectroscopy
SL	Separation/Liquid Scintillation
HM	H-Area Modified PUREX

SUMMARY

A dip sample of the liquid phase from Tank 11H and a 3-L slurry sample from Tank 51H were obtained and sent to Savannah River National Laboratory for characterization. These samples provide data to verify the amount of aluminum dissolved from the sludge as a result of the low temperature aluminum dissolution process conducted in Tank 51H.

The characterization results for the as-received Tank 11H and Tank 51H supernate samples and the total dried solids of the Tank 51H sludge slurry sample appear quite good with respect to the precision of the sample replicates and minimal contamination present in the blank. The two supernate samples show similar concentrations for the major components as expected.

1.0 INTRODUCTION

The Savannah River Site (SRS) Liquid Waste Organization (LWO) added caustic to the H-Area Modified PUREX (HM) sludge in Tank 51H to dissolve aluminum using a low temperature aluminum dissolution (LTAD) process. The LTAD process was conducted to reduce the total mass of sludge solids being fed to the Defense Waste Processing Facility (DWPF). After completion of the LTAD, the sludge was allowed to settle for approximately one month. Once settling was complete the aluminum rich supernate was decanted from Tank 51H to Tank 11H. Additional caustic was added to the small amount of sludge and supernate in Tank 11H prior to the transfer of the aluminum rich supernate from Tank 51H. A dip sample of the liquid phase from Tank 11H and a 3-L slurry sample from Tank 51H were obtained and sent to Savannah River National Laboratory (SRNL) for characterization. A Technical Task Request[1] detailing the required characterization and a Task Technical and Quality Assurance Plan[2] were generated for the task.

2.0 SAMPLE CHARACTERIZATION

2.1 SAMPLE DESCRIPTION

A 3-liter sludge slurry sample from Tank 51H (ID No. = HTF-51-07-121) and a 200 mL dip sample from Tank 11H (ID No. = HTF-11-07-122) were sent to SRNL for characterization. The samples were received at SRNL on February 15, 2008. The sludge slurry sample was mixed and pumped from the sample container. The sludge sample was allowed to settle overnight after which clear supernate was pumped back into the sample container to rinse out any remaining sludge solids. Approximately 3.05 L of a sludge solids/supernate mixture was recovered from the sample container. The Tank 11H dip sample was vigorously shaken to mix the sample and transferred to a poly bottle. The weight of sample recovered from the dip bottle was 165.135 g (~140 mL) and with no visible solids in the sample.

2.2 SUPERNATE SAMPLE PREPARATION FOR ANALYSIS

Portions of the Tank 11H dip sample were prepared for analysis by dilution in de-ionized distilled water or nitric acid to reduce the sample activity and allow removal from the Shielded Cells. The sample was not filtered prior to sample preparation at the request of the customer. All sample preparations of the unfiltered Tank 11H supernate were conducted in triplicate. A blank was prepared along with the sample dilutions.

A portion of the well-mixed Tank 51H sludge slurry was filtered through a 0.45 µ porosity filter. Portions of the filtered supernate were diluted with de-ionized distilled water or nitric acid to reduce the sample activity and allow removal from the Shielded Cells for chemical analysis. All sample preparations of the filtered Tank 51H supernate were conducted in triplicate. A blank was prepared along with the sample dilutions.

2.3 SLUDGE SAMPLE PREPARATION FOR ANALYSIS

Portions of the Tank 51H sludge slurry were dried in an oven at 100 °C. The dried solids were prepared for analysis using two methods; dissolution in aqua regia, and fusion with sodium peroxide followed by uptake in nitric acid. The digested solids were diluted to reduce activity and allow removal from the Shielded Cells. All sample preparations were conducted in triplicate. Duplicate digestions of a glass standard containing many of the elements found in tank waste sludge samples were prepared concurrently with the sample digestions to check for the completeness of the dissolution and contamination levels introduced during sample preparation. Table 2-1 lists the composition of the Analytical Reference Glass-1 (ARG-1) glass standard.[3] A reagent blank was prepared along with the sample digestions.

For the ^{79}Se and ^{129}I analysis, special sample preparation instructions were supplied by Analytical Development section (AD) using aliquots of the undried slurry sample.

Table 2-1. Composition of the Analytical Reference Glass-1 Standard.

Element	wt% in Glass	mg/kg in Glass
Al	2.50	2.50E+04
B	2.69	2.69E+04
Ba	0.079	7.90E+02
Ca	1.02	1.02E+04
Cr	0.064	6.40E+02
Cu	0.003	3.0E+01
Fe	9.79	9.79E+04
K	2.26	2.26E+04
Li	1.49	1.49E+04
Mg	0.52	5.2E+03
Mn	1.46	1.46E+04
Na	8.52	8.52E+04
Ni	0.83	8.3E+03
P	0.11	1.1E+03
Si	22.4	2.24E+05
Sr	0.003	3.0E+01
Ti	0.69	6.9E+03
Zn	0.016	1.6E+02
Zr	0.096	9.6E+02

2.4 WEIGHT PERCENT SOLIDS AND DENSITY MEASUREMENTS

The densities of the filtered supernate and the well-mixed slurry sample were measured in the Shielded Cells using calibrated plastic tubes with a nominal volume of ~8.25 mL. The density measurements were conducted in triplicate on each sample.

The weight percent total solids in the slurry sample and the weight percent dissolved solids in the supernate were measured in the Shielded Cells using a conventional drying oven at 105 °C. The sample was dried until repeated weights indicated no further loss of water. The weight percent dissolved solids in a sample of the filtered supernate were measured in the same manner. All weight percent solids measurements were made in triplicate. The weight percent insoluble solids and weight percent soluble solids in the slurry sample were calculated using the equations shown below.

$Wis = (Wts - Wds)/(1-Wds)$ and $Wss = Wts - Wis$

where:

Wis = weight fraction of insoluble solids in the slurry
Wts = weight fraction of total solids in the slurry
Wds = weight fraction of dissolved solids in the filtered supernate
Wss = weight fraction of soluble solids in the slurry

Thus:

Wt% dissolved solids =	(wt dissolved solids/wt of supernate) x 100
Wt% total solids =	(wt total solids/wt of total slurry) x 100
Wt% insoluble solids =	(wt insoluble solids/wt of total slurry) x 100
Wt% soluble solids =	(wt of dissolved solids/wt of total slurry) x 100

3.0 RESULTS OF THE SAMPLE CHARACTERIZATION

3.1 GENERAL INFORMATION

The data tables at the end of the section provide the composition of the Tank 11H and Tank 51H samples received at SRNL. Portions of these results were reported previously.[4]

The tables include the results of all replicates, blanks, and glass standards. In tables containing data for digested solids samples, the blank was converted to a dried solids basis to allow direct comparison to the sample data as a quality indicator. The data for the blank were converted to a dried solids basis by dividing the concentrations measured in the blank by the target weight of solids used in the sample digestions (~0.250 g in most cases). For waste tank sample characterization, an uncertainty of approximately +/- 15% has been found to be the normal range for the combined sampling and analytical uncertainty.[5] For the Tank 11H and Tank 51H samples, the percent relative standard deviation (%RSD) presented in the tables only includes the uncertainty associated with sub-sampling in the Shielded Cells and the uncertainty of the analytical method. It should be noted that the samples represent a small amount of material from a large tank.

The data tables also indicate the analytical method used to measure each analyte. Table 3-1 shows the abbreviations used for each analytical method:

Table 3-1. Abbreviations for Analytical Methods used in Data Tables

Analytical Method	Abbreviation in Tables
Inductively Coupled Plasma-Emission Spectroscopy	IE
Inductively Coupled Plasma-Mass Spectrometry	IM
Ion Chromatography	IC
Titration for Free Hydroxide	TH
Total Inorganic Carbon	TIC
Atomic Absorption Cold Vapor Method	CV
Separation/Gamma Spec.	SG
Separation/Alpha Spec.	SA
Separation/Liquid Scintillation	SL

3.2 WEIGHT PERCENT SOLIDS AND DENSITY RESULTS OF THE AS-RECEIVED SLUDGE SLURRY SAMPLE

Tables 3-2 and 3-3 show the results of weight percent solids and density measurements made on the as-received Tank 11H sample, the as-received Tank 51H sludge slurry sample and the filtered supernate obtained from the Tank 51H sludge slurry sample.

3.3 ANALYTICAL RESULTS FOR THE TANK 11H AND TANK 51H SUPERNATE

Table 3-4 shows the results of the analysis of the as-received Tank 11H (unfiltered) supernate. The anion/cation charge balance for the supernate appears good with a difference of only 2%. The sulfate concentration measured by IC shows good agreement with the sulfur concentration measured by IE (6% difference). The generally low percent relative standard deviations for all of the analyses on the supernate sample indicate good precision between the three sample replicates. The blank prepared with the sample replicates shows no measurable contamination.

Table 3-5 shows the results of the analysis of the as-received Tank 51H filtered supernate. Again, the anion/cation charge balance for the supernate appears quite good with a difference of only 8%. The sulfate concentration measured by IC shows good agreement with the sulfur concentration measured by IE (3% difference). The low percent relative standard deviations for all of the analyses on the supernate sample show good precision between the three sample replicates. However, in the IC analysis for nitrate, one of the sample replicates shows a result >50% higher than the average of the other two sample replicates. This value was dropped from the calculations of the average and percent relative standard deviation. The blank prepared with the sample replicates shows slight contamination with ^{137}Cs and ^{99}Tc. The low concentration of the ^{137}Cs contamination in the blank relative to the measured concentration of ^{137}Cs in the samples indicates the cesium contamination should not impact the sample analysis results. However, the ^{99}Tc contamination in the blank shows a concentration only ~3X lower than the ^{99}Tc concentration measured in the samples. The ^{99}Tc contamination could bias the sample results high.

3.4 ANALYTICAL RESULTS FOR THE AS-RECEIVED TANK 51H SLUDGE SOLIDS

Tables 3-6 and 3-7 show the results of the analysis of the aqua regia and sodium peroxide fusion dissolutions of the total dried solids obtained from the as-received Tank 51H sludge slurry sample (HTF-51-07-121). The aqua regia and sodium peroxide fusion data show good agreement between the two dissolution methods for the major components of the sludge solids. The $^{239/240}$Pu results by IM and alpha counting show poor agreement. The IM results indicate lower concentrations of plutonium than the counting results. The $^{239/240}$Pu show good agreement with the values measured in the post aluminum dissolution sludge from the 3-L aluminum dissolution demonstration.[6] Prior experience seems to indicate that the aqua regia dissolution method will not consistently dissolve all of the aluminum in the current Tank 51H sludge batch.[6] However, the aqua regia results for aluminum on the current sample show good agreement with sodium peroxide fusion results.

Table 3-2. Weight Percent Solids and Density of the As-Received Tank 11H Dip Sample

Analyte (Method)	Units	1st Replicate	2nd Replicate	3rd Replicate	Average	%RSD
Weight Percent Dissolved Solids	Wt%	18.5%	18.3%	18.4%	18.4%	0.4%
Density of Supernate	g/mL	1.18	1.17	1.17	1.17	0.5%

Table 3-3. Weight Percent Solids and Density of the As-Received Tank 51H Sludge Slurry Sample

Analyte (Method)	Units	1st Replicate	2nd Replicate	3rd Replicate	Average	%RSD
Weight Percent Total Solids	Wt%	23.4%	23.8%	23.7%	23.6%	0.9%
Weight Percent Dissolved Solids	Wt%	19.4%	19.4%	19.0%	19.3%	1.2%
Weight Percent Soluble Solids	Wt%	-	-	-	18.2%*	-
Weight Percent Insoluble Solids	Wt%	-	-	-	5.41%*	-
Density of Slurry	g/mL	1.21	1.23	1.23	1.22	0.9%
Density of Supernate	g/mL	1.20	1.20	1.21	1.20	0.5%

* Values for the weight percent soluble solids and weight percent insoluble solids were calculated from the measured weight percent total solids and weight percent dissolved solids (see Section 2.4)

Table 3-4. Composition of the As-Received Tank 11H Supernate

Analyte (Method)	Units	1st Replicate	2nd Replicate	3rd Replicate	Average	%RSD	Blank
NO_3^- (IC)	M	1.74E-01	1.76E-01	1.76E-01	1.75E-01	0.5%	-
NO_2^- (IC)	M	3.26E-01	3.33E-01	3.30E-01	3.30E-01	1.0%	-
PO_4^{3-} (IC)	M	<1.3E-02	<1.3E-02	<1.3E-02	-	-	-
SO_4^{2-} (IC)	M	1.76E-02	1.74E-02	1.73E-02	1.74E-02	0.8%	-
$C_2O_4^{2-}$ (IC)	M	<5.7E-03	<5.7E-03	<5.7E-03	-	-	-
Cl^- (IC)	M	3.10E-02	2.91E-02	2.91E-02	2.97E-02	3.8%	-
F^- (IC)	M	<2.6E-02	<2.6E-02	<2.6E-02	-	-	-
CHO_2^- (IC)	M	<1.1E-02	<1.1E-02	<1.1E-02	-	-	-
OH^-_{free} (TH)	M	3.13E+00	3.10E+00	3.06E+00	3.10E+00	1.1%	-
CO_3^{2-} (TIC)	M	9.92E-02	9.83E-02	9.67E-02	9.81E-02	1.3%	-
Ag (IE)	mg/L	<5.7E+00	<5.7E+00	<5.7E+00	-	-	<5.8E+00
Al (IE)	mg/L	1.06E+04	1.07E+04	1.06E+04	1.06E+04	0.2%	<2.6E+01
B (IE)	mg/L	<4.9E+00	<5.0E+00	<4.9E+00	-	-	<5.0E+00
Ba (IE)	mg/L	<1.2E+00	<1.2E+00	<1.2E+00	-	-	<1.2E+00
Be (IE)	mg/L	<2.2E-01	<2.2E-01	<2.2E-01	-	-	<2.2E-01
Ca (IE)	mg/L	<1.6E+01	<1.6E+01	<1.6E+01	-	-	<1.6E+01
Cd (IE)	mg/L	2.76E+00	1.86E+00	1.83E+00	2.15E+00	24%	<1.6E+00
Ce (IE)	mg/L	<6.5E+01	<6.5E+01	<6.5E+01	-	-	<6.5E+01
Cr (IE)	mg/L	2.76E+01	2.78E+01	2.79E+01	2.77E+01	0.6%	<2.0E+00
Cu (IE)	mg/L	<3.2E+00	<3.3E+00	<3.3E+00	-	-	<3.3E+00
Fe (IE)	mg/L	9.81E+00	9.98E+00	9.82E+00	9.87E+00	0.9%	<3.2E+00

The As-Received Tank 11 Supernate was not filtered prior to submitting samples for analysis at the request of the customer.

Table 3-4. Composition of the As-Received Tank 11H Supernate (Continued)

Analyte (Method)	Units	1st Replicate	2nd Replicate	3rd Replicate	Average	%RSD	Blank
Gd (IE)	mg/L	<6.8E+00	<6.9E+00	<6.9E+00	-	-	<6.9E+00
K (IE)	mg/L	1.23E+02	1.33E+02	1.29E+02	1.29E+02	4.0%	<9.5E+01
La (IE)	mg/L	<8.4E+00	<8.4E+00	<8.4E+00	-	-	<8.4E+00
Li (IE)	mg/L	<5.8E+00	<5.8E+00	<5.8E+00	-	-	<5.8E+00
Mg (IE)	mg/L	<6.8E-01	<6.8E-01	<6.8E-01	-	-	<6.8E-01
Mn (IE)	mg/L	<4.4E-01	<4.4E-01	<4.4E-01	-	-	<4.4E-01
Mo (IE)	mg/L	<6.3E+00	<6.3E+00	<6.3E+00	-	-	<6.3E+00
Na (IE)	mg/L	9.55E+04	9.62E+04	9.56E+04	9.58E+04	0.4%	<5.5E+01
Ni (IE)	mg/L	<4.5E+00	<4.5E+00	<4.5E+00	-	-	<4.6E+00
P (IE)	mg/L	<2.9E+01	<2.9E+01	<2.9E+01	-	-	<2.9E+01
Pb (IE)	mg/L	<1.6E+01	<1.6E+01	<1.6E+01	-	-	<1.6E+01
S (IE)	mg/L	6.00E+02	5.88E+02	5.93E+02	5.94E+02	1.1%	<2.3E+02
Sb (IE)	mg/L	<3.1E+01	<3.1E+01	<3.1E+01	-	-	<3.1E+01
Si (IE)	mg/L	<5.1E+01	<5.1E+01	<5.1E+01	-	-	<5.2E+01
Sn (IE)	mg/L	<9.3E+01	<9.3E+01	<9.3E+01	-	-	<9.3E+01
Sr (IE)	mg/L	<8.2E+00	<8.3E+00	<8.3E+00	-	-	<8.3E+00
Ti (IE)	mg/L	<3.7E+00	<3.7E+00	<3.7E+00	-	-	<3.7E+00
U (IE)	mg/L	<3.8E+02	<3.8E+02	<3.8E+02	-	-	<3.8E+02
V (IE)	mg/L	<3.6E+00	<3.6E+00	<3.6E+00	-	-	<3.6E+00
Zn (IE)	mg/L	<2.8E+00	<2.8E+00	<2.8E+00	-	-	<2.8E+00
Zr (IE)	mg/L	<2.2E+00	<2.2E+00	<2.2E+00	-	-	<2.3E+00

The As-Received Tank 11 Supernate was not filtered prior to submitting samples for analysis at the request of the customer.

Table 3-4. Composition of the As-Received Tank 11H Supernate (Continued)

Analyte (Method)	Units	1st Replicate	2nd Replicate	3rd Replicate	Average	%RSD	Blank
Hg (CV)	mg/L	1.80E+02	1.80E+02	1.80E+02	1.80E+02	0.2%	<1.1E+00
^{232}U (SA)	mg/L	<4.5E-07	<2.7E-07	<3.3E-07	-	-	<2.0E-07
^{233}U (IM)	mg/L	<2.0E-02	<2.0E-02	<2.0E-02	-	-	<2.0E-02
^{234}U (IM)	mg/L	<3.9E-02	<4.0E-02	<3.9E-02	-	-	<4.0E-02
^{235}U (IM)	mg/L	5.80E-02	4.46E-02	4.65E-02	4.97E-02	15%	<2.0E-02
^{236}U (IM)	mg/L	<2.0E-02	<2.0E-02	<2.0E-02	-	-	<2.0E-02
^{238}U (IM)	mg/L	5.07E+00	4.17E+00	4.99E+00	4.74E+00	11%	<4.0E-02
^{137m}Ba (SG)	µCi/mL	1.44E+01	1.41E+01	1.38E+01	1.41E+01	2.3%	<7.2E-04
^{134}Cs (SG)	µCi/mL	<1.7E-03	<1.6E-03	<1.7E-03	-	-	<6.7E-04
^{137}Cs (SG)	µCi/mL	1.53E+01	1.49E+01	1.46E+01	1.49E+01	2.3%	<7.6E-04
^{106}Ru (SG)	µCi/mL	<4.7E-02	<4.6E-02	<4.6E-02	-	-	<4.8E-03
^{154}Eu (SG)	µCi/mL	<3.6E-03	<3.5E-03	<3.0E-03	-	-	<9.2E-04
^{155}Eu (SG)	µCi/mL	<1.7E-02	<1.7E-02	<1.7E-02	-	-	<1.7E-03
^{60}Co (SG)	µCi/mL	<8.2E-04	<8.2E-04	<9.2E-04	-	-	<7.5E-04
^{126}Sn (SG)	µCi/mL	<1.6E-02	<9.0E-03	<1.5E-02	-	-	<1.4E-03
^{126}Sb (SG)	µCi/mL	<2.0E-03	<1.9E-03	<2.0E-03	-	-	<6.5E-04
^{125}Sb (SG)	µCi/mL	<3.8E-02	<3.8E-02	<3.7E-02	-	-	<1.9E-03
^{144}Ce (SG)	µCi/mL	<4.3E-02	<4.2E-02	<4.2E-02	-	-	<3.5E-03
^{241}Am (SG)	µCi/mL	<4.1E-02	<4.1E-02	<4.1E-02	-	-	<3.1E-03

The As-Received Tank 11 Supernate was not filtered prior to submitting samples for analysis at the request of the customer.

Table 3-4. Composition of the As-Received Tank 11H Supernate (Continued)

Analyte (Method)	Units	1st Replicate	2nd Replicate	3rd Replicate	Average	%RSD	Blank
^{99}Tc (IM)	µCi/mL	7.35E-03	5.95E-03	6.06E-03	6.45E-03	12%	<8.4E-04
^{237}Np (IM)	µCi/mL	<1.4E-05	<1.4E-05	<1.4E-05	-	-	<1.4E-05
^{239}Pu (IM)	µCi/mL	<3.6E-03	<3.6E-03	<3.6E-03	-	-	<3.6E-03
^{240}Pu (IM)	µCi/mL	<4.4E-03	<4.5E-03	<4.4E-03	-	-	<4.5E-03
^{238}Pu (SA)	µCi/mL	4.66E-02	5.12E-02	3.94E-02	4.57E-02	13%	<5.9E-05
$^{239/240}$Pu (SA)	µCi/mL	1.84E-03	2.17E-03	1.65E-03	1.88E-03	14%	<8.9E-05
^{241}Pu (SA)	µCi/mL	1.70E-02	1.86E-02	1.47E-02	1.68E-02	12%	<4.2E-04
^{90}Sr (SL)	µCi/mL	6.38E-01	6.54E-01	6.75E-01	6.56E-01	2.8%	<2.1E-04
^{79}Se (SG)	µCi/mL	<6.4E-06	<6.9E-06	<9.3E-06	-	-	-
^{129}I (SG)	µCi/mL	2.44E-05	3.01E-05	3.07E-05	2.84E-05	12%	-
Total Alpha (SL)	µCi/mL	<1.7E-01	<1.2E-01	<1.2E-01	-	-	<1.4E-01
Total Beta (SL)	µCi/mL	1.86E+01	1.89E+01	1.89E+01	1.88E+01	0.8%	<2.4E-01

The As-Received Tank 11 Supernate was not filtered prior to submitting samples for analysis at the request of the customer.

Table 3-5. Composition of the As-Received Tank 51H Filtered Supernate

Analyte (Method)	Units	1st Replicate	2nd Replicate	3rd Replicate	Average	%RSD	Blank
NO_3^- (IC)	M	3.51E-01*	1.98E-01	1.84E-01	1.91E-01	5.0%	<8.1E-03
NO_2^- (IC)	M	3.58E-01	3.79E-01	3.52E-01	3.63E-01	3.9%	<1.1E-02
PO_4^{3-} (IC)	M	<1.3E-02	<1.3E-02	<1.3E-02	-	-	<1.3E-02
SO_4^{2-} (IC)	M	1.81E-02	1.75E-02	1.80E-02	1.79E-02	1.7%	<5.2E-03
$C_2O_4^{2-}$ (IC)	M	<5.8E-03	<5.8E-03	<5.8E-03	-	-	<5.7E-03
Cl^- (IC)	M	2.89E-02	2.91E-02	2.93E-02	2.91E-02	0.8%	<1.4E-02
F^- (IC)	M	<2.7E-02	<2.7E-02	<2.7E-02	-	-	<2.7E-02
CHO_2^- (IC)	M	<1.1E-02	<1.1E-02	<1.1E-02	-	-	<1.1E-02
OH^-_{free} (TH)	M	3.15E+00	3.10E+00	3.07E+00	3.11E+00	1.3%	-
CO_3^{2-} (TIC)	M	1.07E-01	1.60E-01	1.14E-01	1.27E-01	23%	3.27E-03
Ag (IE)	mg/L	<3.0E+00	<3.0E+00	<3.0E+00	-	-	<2.9E+00
Al (IE)	mg/L	1.11E+04	1.12E+04	1.12E+04	1.12E+04	0.4%	<1.3E+01
B (IE)	mg/L	<2.6E+00	<2.5E+00	<2.6E+00	-	-	<2.5E+00
Ba (IE)	mg/L	<6.4E-01	<6.4E-01	<6.4E-01	-	-	<6.3E-01
Be (IE)	mg/L	<1.1E-01	<1.1E-01	<1.1E-01	-	-	<1.1E-01
Ca (IE)	mg/L	<8.1E+00	<8.1E+00	<8.1E+00	-	-	<8.1E+00
Cd (IE)	mg/L	<8.4E-01	<8.3E-01	<8.4E-01	-	-	<8.3E-01
Ce (IE)	mg/L	<3.3E+01	<3.2E+01	<3.3E+01	-	-	<3.2E+01
Cr (IE)	mg/L	2.61E+01	2.60E+01	2.60E+01	2.60E+01	0.1%	<1.0E+00
Cu (IE)	mg/L	<1.7E+00	<1.7E+00	<1.7E+00	-	-	<1.7E+00
Fe (IE)	mg/L	2.52E+00	<1.6E+00	<1.6E+00	2.52E+00**	-	<1.6E+00

* The nitrate value measured for the first replicate was dropped from calculation of the average since the value was more than 50% greater than the average of the other two replicates.
** Only a single value was above the detection limit.

Table 3-5. Composition of the As-Received Tank 51H Filtered Supernate (Continued)

Analyte (Method)	Units	1st Replicate	2nd Replicate	3rd Replicate	Average	%RSD	Blank
Gd (IE)	mg/L	<3.5E+00	<3.5E+00	<3.5E+00	-	-	<3.5E+00
K (IE)	mg/L	1.54E+02	1.66E+02	1.61E+02	1.60E+02	3.7%	<4.8E+01
La (IE)	mg/L	<4.3E+00	<4.3E+00	<4.3E+00	-	-	<4.3E+00
Li (IE)	mg/L	<3.0E+00	<3.0E+00	<3.0E+00	-	-	<3.0E+00
Mg (IE)	mg/L	<3.5E-01	<3.5E-01	<3.5E-01	-	-	<3.5E-01
Mn (IE)	mg/L	<2.3E-01	<2.2E-01	<2.2E-01	-	-	<2.2E-01
Mo (IE)	mg/L	<3.2E+00	<3.2E+00	<3.2E+00	-	-	<3.2E+00
Na (IE)	mg/L	9.27E+04	9.31E+04	9.37E+04	9.32E+04	0.5%	<2.8E+01
Ni (IE)	mg/L	<2.3E+00	<2.3E+00	<2.3E+00	-	-	<2.3E+00
P (IE)	mg/L	2.45E+01	2.52E+01	2.20E+01	2.39E+01	7.1%	<1.5E+01
Pb (IE)	mg/L	<8.4E+00	<8.4E+00	<8.4E+00	-	-	<8.3E+00
S (IE)	mg/L	5.79E+02	5.96E+02	5.99E+02	5.92E+02	1.8%	<1.9E+02
Sb (IE)	mg/L	<1.6E+01	<1.6E+01	<1.6E+01	-	-	<1.6E+01
Si (IE)	mg/L	<2.6E+01	<2.6E+01	<2.6E+01	-	-	<2.6E+01
Sn (IE)	mg/L	<4.8E+01	<4.8E+01	<4.8E+01	-	-	<4.7E+01
Sr (IE)	mg/L	<4.3E+00	<4.3E+00	<4.3E+00	-	-	<4.2E+00
Ti (IE)	mg/L	<1.9E+00	<1.9E+00	<1.9E+00	-	-	<1.9E+00
U (IE)	mg/L	<1.6E+02	<1.6E+02	<1.6E+02	-	-	<1.6E+02
V (IE)	mg/L	<1.9E+00	<1.8E+00	<1.9E+00	-	-	<1.8E+00
Zn (IE)	mg/L	<1.4E+00	<1.4E+00	<1.4E+00	-	-	<1.4E+00
Zr (IE)	mg/L	<1.2E+00	<1.2E+00	<1.2E+00	-	-	<1.1E+00

Table 3-5. Composition of the As-Received Tank 51H Filtered Supernate (Continued)

Analyte (Method)	Units	1st Replicate	2nd Replicate	3rd Replicate	Average	%RSD	Blank
Hg (CV)	mg/L	1.25E+02	1.27E+02	1.25E+02	1.26E+02	0.8%	<1.1E+00
^{232}U (SA)	mg/L	<2.2E-07	<1.7E-07	<6.2E-07	-	-	<4.5E-08
^{233}U (IM)	mg/L	<1.0E-01	<1.0E-01	<1.0E-01	-	-	<1.0E-01
^{234}U (IM)	mg/L	<1.0E-01	<1.0E-01	<1.0E-01	-	-	<1.0E-01
^{235}U (IM)	mg/L	<1.0E-01	<1.0E-01	<1.0E-01	-	-	<1.0E-01
^{236}U (IM)	mg/L	<1.0E-01	<1.0E-01	<1.0E-01	-	-	<1.0E-01
^{238}U (IM)	mg/L	1.81E+00	1.75E+00	1.82E+00	1.79E+00	2.3%	<5.0E-01
^{137m}Ba (SG)	µCi/mL	1.42E+01	1.41E+01	1.43E+01	1.42E+01	0.6%	4.38E-04
^{134}Cs (SG)	µCi/mL	<1.2E-03	<1.1E-03	<1.2E-03	-	-	<5.3E-04
^{137}Cs (SG)	µCi/mL	1.50E+01	1.49E+01	1.51E+01	1.50E+01	0.6%	4.63E-04
^{106}Ru (SG)	µCi/mL	<3.3E-02	<3.3E-02	<3.3E-02	-	-	<3.2E-03
^{154}Eu (SG)	µCi/mL	<2.1E-03	<2.2E-03	<2.4E-03	-	-	<6.4E-04
^{155}Eu (SG)	µCi/mL	<9.0E-03	<1.2E-02	<1.2E-02	-	-	<7.5E-04
^{60}Co (SG)	µCi/mL	<5.8E-04	<5.8E-04	<6.3E-04	-	-	<6.1E-04
^{126}Sn (SG)	µCi/mL	<7.9E-03	<7.8E-03	<1.1E-02	-	-	<6.7E-04
^{126}Sb (SG)	µCi/mL	<1.4E-03	<1.4E-03	<1.5E-03	-	-	<4.7E-04
^{125}Sb (SG)	µCi/mL	<2.7E-02	<2.7E-02	<2.7E-02	-	-	<1.4E-03
^{144}Ce (SG)	µCi/mL	<3.0E-02	<3.0E-02	<3.1E-02	-	-	<2.5E-03
^{241}Am (SG)	µCi/mL	<3.0E-02	<3.0E-02	<3.0E-02	-	-	<2.3E-03

Table 3-5. Composition of the As-Received Tank 51H Filtered Supernate (Continued)

Analyte (Method)	Units	1st Replicate	2nd Replicate	3rd Replicate	Average	%RSD	Blank
^{99}Tc (IM)	µCi/mL	8.30E-03	7.12E-03	6.56E-03	7.32E-03	12%	2.62E-03
^{237}Np (IM)	µCi/mL	<7.2E-05	<7.2E-05	<7.2E-05	-	-	<7.1E-05
^{239}Pu (IM)	µCi/mL	<6.2E-03	<6.2E-03	<6.2E-03	-	-	<6.2E-03
^{240}Pu (IM)	µCi/mL	<2.3E-02	<2.3E-02	<2.3E-02	-	-	<2.3E-02
^{238}Pu (SA)	µCi/mL	1.03E-01	1.03E-01	1.19E-01	1.08E-01	8.3%	<9.2E-05
$^{239/240}$Pu (SA)	µCi/mL	5.14E-03	4.76E-03	5.50E-03	5.13E-03	7.2%	<3.7E-05
^{241}Pu (SA)	µCi/mL	<2.6E-02	<2.7E-02	<4.2E-02	-	-	<1.6E-04
^{90}Sr (SL)	µCi/mL	3.78E-01	3.82E-01	3.93E-01	3.84E-01	2.1%	<1.0E-04
^{79}Se (SG)	µCi/mL	<1.2E-05	<7.7E-06	<1.6E-05	-	-	-
^{129}I (SG)	µCi/mL	7.57E-06	9.10E-06	8.33E-06	8.33E-06	9.2%	-
Total Alpha (SL)	µCi/mL	<9.9E-02	<1.0E-01	<1.1E-01			<9.5E-02
Total Beta (SL)	µCi/mL	1.88E+01	1.88E+01	1.85E+01	1.87E+01	1.1%	<2.3E-01

Table 3-6. Composition of the Aqua Regia Dissolution of Total Dried Solids from the As-Received Tank 51H Sludge

Analyte (Method)	Units	1st Replicate	2nd Replicate	3rd Replicate	Average	%RSD	Blank	Average Analyzed Glass Std	Glass Std Composition
Ag (IE)	mg/kg	<9.9E+02	<9.8E+02	<9.7E+02	-	-	<9.6E+02	<1.2E+03	-
Al (IE)	mg/kg	7.92E+04	8.20E+04	7.98E+04	8.03E+04	1.8%	<1.3E+03	2.39E+04	2.50E+04
B (IE)	mg/kg	<7.7E+02	<7.6E+02	<7.5E+02	-	-	<7.5E+02	2.50E+04	2.69E+04
Ba (IE)	mg/kg	3.84E+02	3.91E+02	3.87E+02	3.87E+02	1.0%	<6.3E+01	8.51E+02	7.90E+02
Be (IE)	mg/kg	<1.1E+01	<1.1E+01	<1.1E+01	-	-	<1.1E+01	1.98E+01	-
Ca (IE)	mg/kg	6.65E+03	6.82E+03	6.56E+03	6.68E+03	2.0%	<9.8E+02	1.08E+04	1.02E+04
Cd (IE)	mg/kg	2.23E+02	2.33E+02	2.23E+02	2.26E+02	2.4%	<8.2E+01	<9.9E+01	-
Ce (IE)	mg/kg	<3.3E+03	<3.3E+03	<3.2E+03	-	-	<3.2E+03	<3.8E+03	-
Cr (IE)	mg/kg	3.87E+02	3.80E+02	3.73E+02	3.80E+02	1.8%	<6.5E+01	7.99E+02	6.40E+02
Cu (IE)	mg/kg	1.99E+02	2.03E+02	2.08E+02	2.03E+02	2.2%	<1.7E+02	<2.0E+02	3.00E+01
Fe (IE)	mg/kg	5.83E+04	6.07E+04	5.82E+04	5.91E+04	2.4%	<1.6E+02	1.01E+05	9.79E+04
Gd (IE)	mg/kg	<3.6E+02	<3.6E+02	<3.5E+02	-	-	<3.5E+02	<4.2E+02	-
K (IE)	mg/kg	<4.9E+03	<4.9E+03	<4.8E+03	-	-	<4.8E+03	2.08E+04	2.26E+04
La (IE)	mg/kg	<4.4E+02	<4.4E+02	<4.3E+02	-	-	<4.3E+02	<5.1E+02	-
Li (IE)	mg/kg	<3.0E+02	<3.0E+02	<3.0E+02	-	-	<2.9E+02	1.57E+04	1.49E+04
Mg (IE)	mg/kg	2.43E+03	2.53E+03	2.44E+03	2.47E+03	2.3%	8.98E+01	5.23E+03	5.20E+03
Mn (IE)	mg/kg	1.36E+04	1.40E+04	1.35E+04	1.37E+04	2.1%	<9.6E+01	1.43E+04	1.46E+04
Mo (IE)	mg/kg	<3.3E+02	<3.3E+02	<3.2E+02	-	-	<3.2E+02	<3.8E+02	-
Na (IE)	mg/kg	3.03E+05	3.01E+05	3.03E+05	3.03E+05	0.4%	<2.8E+03	8.48E+04	8.52E+04
Ni (IE)	mg/kg	4.57E+03	4.78E+03	4.63E+03	4.66E+03	2.4%	<5.1E+02	7.85E+03	8.27E+03

Divide mg/kg values by 1E+04 to convert to wt % dried solids basis

Table 3-6. Composition of the Aqua Regia Dissolution of Total Dried Solids from the As-Received Tank 51H Sludge (Continued)

Analyte (Method)	Units	1st Replicate	2nd Replicate	3rd Replicate	Average	%RSD	Blank	Average Analyzed Glass Std	Glass Std Composition
P (IE)	mg/kg	8.82E+02	8.39E+02	8.78E+02	8.66E+02	2.7%	<7.5E+02	9.31E+02	1.10E+03
Pb (IE)	mg/kg	<8.5E+02	<8.5E+02	<8.3E+02	-	-	<8.3E+02	<9.9E+02	-
S (IE)	mg/kg	<1.2E+04	<1.2E+04	<1.2E+04	-	-	<1.2E+04	<1.4E+04	-
Sb (IE)	mg/kg	<1.6E+03	<1.6E+03	<1.6E+03	-	-	<1.6E+03	<1.9E+03	-
Sn (IE)	mg/kg	<4.8E+03	<4.8E+03	<4.7E+03	-	-	<4.7E+03	<5.6E+03	-
Sr (IE)	mg/kg	<4.3E+02	<4.3E+02	<4.2E+02	-	-	<4.2E+02	<5.0E+02	3.00E+01
Ti (IE)	mg/kg	<1.9E+02	<1.9E+02	<1.9E+02	-	-	<1.9E+02	5.84E+03	6.90E+03
U (IE)	mg/kg	<2.0E+04	<2.0E+04	<1.9E+04	-	-	<1.9E+04	<2.3E+04	-
V (IE)	mg/kg	<1.9E+02	<1.9E+02	<1.8E+02	-	-	<1.8E+02	<2.2E+02	-
Zn (IE)	mg/kg	2.60E+02	2.63E+02	2.82E+02	2.69E+02	4.4%	<1.4E+02	2.06E+02	1.60E+02
Zr (IE)	mg/kg	8.12E+02	8.34E+02	8.18E+02	8.21E+02	1.4%	<2.0E+02	6.04E+02	9.60E+02
Hg (CV)	mg/kg	1.42E+04	1.42E+04	1.34E+04	1.39E+04	3.4%	<1.1E+02	<1.3E+02	-
^{233}U (IM)	mg/kg	<5.1E+00	<5.1E+00	<5.0E+00	-	-	<5.0E+00	<6.0E+00	-
^{234}U (IM)	mg/kg	<5.1E+00	<5.1E+00	<5.0E+00	-	-	<5.0E+00	<6.0E+00	-
^{235}U (IM)	mg/kg	9.93E+01	1.08E+02	9.38E+01	1.00E+02	6.9%	<5.0E+00	<6.0E+00	-
^{236}U (IM)	mg/kg	<5.1E+00	<5.1E+00	<5.0E+00	-	-	<5.0E+00	<6.0E+00	-
^{238}U (IM)	mg/kg	1.27E+04	1.31E+04	1.23E+04	1.27E+04	3.2%	<2.8E+01	<3.3E+01	-

Divide mg/kg values by 1E+04 to convert to wt % dried solids basis

Table 3-6. Composition of the Aqua Regia Dissolution of Total Dried Solids from the As-Received Tank 51H Sludge (Continued)

Analyte (Method)	Units	1st Replicate	2nd Replicate	3rd Replicate	Average	%RSD	Blank	Average Analyzed Glass Std	Glass Std Composition
^{137}Cs (SG)	mCi/kg	1.17E+02	1.10E+02	1.10E+02	1.12E+02	3.4%	<8.2E-02	<9.5E-02	-
^{134}Cs (SG)	mCi/kg	<2.5E-01	<2.5E-01	<2.5E-01	-	-	<7.2E-02	<9.5E-02	-
^{60}Co (SG)	mCi/kg	3.00E-01	2.86E-01	2.92E-01	2.93E-01	2.3%	<3.0E-03	<3.7E-03	-
^{106}Ru (SG)	mCi/kg	<3.3E-01	<3.3E-01	<2.8E-01	-	-	<1.7E-02	<2.0E-02	-
^{125}Sb (SG)	mCi/kg	<1.4E-01	<1.4E-01	<1.3E-01	-	-	<7.8E-03	<9.7E-03	-
^{126}Sn (SG)	mCi/kg	<2.3E-01	<2.3E-01	<2.3E-01	-	-	<5.5E-03	<6.4E-03	-
^{126}Sb (SG)	mCi/kg	<4.5E-02	<4.5E-02	<4.5E-02	-	-	<2.8E-03	<3.1E-03	-
^{144}Ce (SG)	mCi/kg	<5.2E-01	<5.2E-01	<5.2E-01	-	-	<1.6E-02	<1.9E-02	-
^{154}Eu (SG)	mCi/kg	1.69E+01	1.70E+01	1.69E+01	1.69E+01	0.5%	<3.8E-03	<4.6E-03	-
^{155}Eu (SG)	mCi/kg	1.63E+00	<1.5E+00	1.41E+00	1.52E+00*	10%	<6.4E-03	<7.4E-03	-
^{241}Am (SG)	mCi/kg	1.23E+01	1.22E+01	1.23E+01	1.23E+01	0.2%	<1.3E-02	<1.6E-02	-
^{99}Tc (IM)	mCi/kg	<4.8E-01	<4.8E-01	<4.7E-01	-	-	<4.7E-01	<5.6E-01	-
^{237}Np (IM)	mCi/kg	<3.6E-03	<3.6E-03	<3.6E-03	-	-	<3.5E-03	<4.2E-03	-
^{239}Pu (IM)	mCi/kg	1.19E+00	1.28E+00	1.22E+00	1.23E+00	3.7%	<3.1E-01	<3.7E-01	-
^{240}Pu (IM)	mCi/kg	<1.2E+00	<1.2E+00	<1.1E+00	-	-	<1.1E+00	<1.4E+00	-
^{242}Pu (IM)	mCi/kg	<2.0E-02	<2.0E-02	<2.0E-02	-	-	<2.0E-02	<2.4E-02	-
^{238}Pu (SA)	mCi/kg	2.77E+02	2.45E+02	2.34E+02	2.52E+02	8.8%	<4.1E-01	<6.8E-01	-
$^{239/240}$Pu (SA)	mCi/kg	8.16E+00	8.45E+00	7.17E+00	7.93E+00	8.4%	<9.6E-01	7.16E-01	-
^{241}Pu (SA)	mCi/kg	7.18E+01	7.25E+01	6.04E+01	6.82E+01	10%	<5.4E+00	<5.2E+00	-

* Only two values averaged.

Table 3-6. Composition of the Aqua Regia Dissolution of Total Dried Solids from the As-Received Tank 51H Sludge (Continued)

Analyte (Method)	Units	1st Replicate	2nd Replicate	3rd Replicate	Average	%RSD	Blank	Average Analyzed Glass Std	Glass Std Composition
^{90}Sr (SL)	mCi/kg	5.24E+03	5.63E+03	6.40E+03	5.76E+03	10%	<1.9E-02	<8.2E-02	-
Total Alpha (SL)	mCi/kg	3.02E+02	3.17E+02	2.94E+02	3.04E+02	3.8%	<8.2E+00	<1.1E+01	-
Total Beta (SL)	mCi/kg	1.57E+04	1.63E+04	1.50E+04	1.57E+04	4.2%	<2.3E+01	<2.9E+01	-

Table 3-7. Composition of the Sodium Peroxide Fusion Dissolution of Total Dried Solids from the As-Received Tank 51H Sludge

Analyte (Method)	Units	1st Replicate	2nd Replicate	3rd Replicate	Average	%RSD	Blank	Average Analyzed Glass Std	Glass Std Composition
Ag (IE)	mg/kg	<9.9E+02	<9.4E+02	<9.4E+02	-	-	<9.6E+02	<1.1E+03	-
Al (IE)	mg/kg	7.99E+04	8.18E+04	7.89E+04	8.02E+04	1.8%	<1.3E+03	2.54E+04	2.50E+04
B (IE)	mg/kg	<7.7E+02	<7.3E+02	<7.3E+02	-	-	<7.5E+02	2.52E+04	2.69E+04
Ba (IE)	mg/kg	3.56E+02	4.03E+02	3.34E+02	3.64E+02	10%	<6.3E+01	8.15E+02	7.90E+02
Be (IE)	mg/kg	<1.1E+01	<1.1E+01	<1.1E+01	-	-	<1.1E+01	<1.3E+01	-
Ca (IE)	mg/kg	6.85E+03	8.00E+03	6.36E+03	7.07E+03	12%	1.45E+03	1.15E+04	1.02E+04
Cd (IE)	mg/kg	2.08E+02	2.24E+02	1.91E+02	2.07E+02	7.9%	<8.2E+01	<9.6E+01	-
Ce (IE)	mg/kg	<3.3E+03	<3.1E+03	<3.1E+03	-	-	<3.2E+03	<3.7E+03	-
Cr (IE)	mg/kg	3.45E+02	3.71E+02	3.44E+02	3.53E+02	4.4%	<1.0E+02	8.19E+02	6.40E+02
Cu (IE)	mg/kg	1.95E+02	2.17E+02	1.97E+02	2.03E+02	5.9%	<1.7E+02	<1.9E+02	3.00E+01
Fe (IE)	mg/kg	5.67E+04	6.52E+04	5.17E+04	5.79E+04	12%	2.61E+02	9.94E+04	9.79E+04
Gd (IE)	mg/kg	<3.6E+02	<3.4E+02	<3.4E+02	-	-	<3.5E+02	<4.0E+02	-
K (IE)	mg/kg	<4.9E+03	<4.7E+03	<4.7E+03	-	-	<4.8E+03	2.28E+04	2.26E+04
La (IE)	mg/kg	<4.4E+02	<4.2E+02	<4.2E+02	-	-	<4.3E+02	<4.9E+02	-
Li (IE)	mg/kg	<3.0E+02	<2.9E+02	<2.9E+02	-	-	<2.9E+02	1.48E+04	1.49E+04
Mg (IE)	mg/kg	2.24E+03	2.57E+03	1.99E+03	2.27E+03	13%	5.02E+01	5.14E+03	5.20E+03
Mn (IE)	mg/kg	1.31E+04	1.49E+04	1.18E+04	1.33E+04	12%	<9.6E+01	1.39E+04	1.46E+04
Mo (IE)	mg/kg	<3.3E+02	<3.1E+02	<3.1E+02	-	-	<3.2E+02	<3.7E+02	-
Ni (IE)	mg/kg	4.40E+03	4.96E+03	3.95E+03	4.44E+03	11%	<5.1E+02	7.57E+03	8.27E+03

Divide mg/kg values by 1E+04 to convert to wt % dried solids basis

Table 3-7. Composition of the Sodium Peroxide Fusion Dissolution of Total Dried Solids from the As-Received Tank 51H Sludge (Continued)

Analyte (Method)	Units	1st Replicate	2nd Replicate	3rd Replicate	Average	%RSD	Blank	Average Analyzed Glass Std	Glass Std Composition
P (IE)	mg/kg	1.13E+03	1.20E+03	8.70E+02	1.07E+03	16%	<7.5E+02	9.41E+02	1.10E+03
Pb (IE)	mg/kg	<8.5E+02	<8.1E+02	<8.1E+02	-	-	<8.3E+02	<9.6E+02	-
S (IE)	mg/kg	<1.2E+04	<1.2E+04	<1.2E+04	-	-	<1.2E+04	<1.4E+04	-
Sb (IE)	mg/kg	<1.6E+03	<1.5E+03	<1.6E+03	-	-	<1.6E+03	<1.8E+03	-
Si (IE)	mg/kg	3.06E+03	3.28E+03	3.28E+03	3.20E+03	4.0%	<2.9E+03	2.24E+05	2.24E+05
Sn (IE)	mg/kg	<4.8E+03	<4.6E+03	<4.6E+03	-	-	<4.7E+03	<5.5E+03	-
Sr (IE)	mg/kg	<4.3E+02	<4.1E+02	<4.1E+02	-	-	<4.2E+02	<4.9E+02	3.00E+01
Ti (IE)	mg/kg	<9.9E+01	<9.4E+01	<9.4E+01	-	-	<9.6E+01	6.44E+03	6.90E+03
U (IE)	mg/kg	<2.0E+04	<1.9E+04	<1.9E+04	-	-	<1.9E+04	<2.2E+04	-
V (IE)	mg/kg	<1.9E+02	<1.8E+02	<1.8E+02	-	-	<1.8E+02	<2.1E+02	-
Zn (IE)	mg/kg	2.52E+02	3.47E+02	2.91E+02	2.97E+02	16%	1.41E+02	2.27E+02	1.60E+02
^{232}U (SA)	mg/kg	<1.6E-04	<1.0E-04	<8.8E-05	-	-	<1.1E-05	<3.5E-05	-
^{233}U (IM)	mg/kg	<5.1E+00	<4.9E+00	<4.9E+00	-	-	<5.0E+00	<5.8E+00	-
^{234}U (IM)	mg/kg	<5.1E+00	<4.9E+00	<4.9E+00	-	-	<5.0E+00	<5.8E+00	-
^{235}U (IM)	mg/kg	9.42E+01	1.12E+02	8.39E+01	9.68E+01	15%	<5.0E+00	<5.8E+00	-
^{236}U (IM)	mg/kg	<5.1E+00	<4.9E+00	<4.9E+00	-	-	<5.0E+00	<5.8E+00	-
^{238}U (IM)	mg/kg	1.23E+04	1.41E+04	1.10E+04	1.25E+04	12%	<1.3E+01	<1.5E+01	-

Divide mg/kg values by 1E+04 to convert to wt % dried solids basis

Table 3-7. Composition of the Sodium Peroxide Fusion Dissolution of Total Dried Solids from the As-Received Tank 51H Sludge (Continued)

Analyte (Method)	Units	1st Replicate	2nd Replicate	3rd Replicate	Average	%RSD	Blank	Average Analyzed Glass Std	Glass Std Composition
^{137}Cs (SG)	mCi/kg	1.15E+02	1.17E+02	1.13E+02	1.15E+02	1.5%	1.16E-01	1.66E-01	-
^{134}Cs (SG)	mCi/kg	<2.5E-01	<2.7E-01	<2.4E-01	-	-	<6.6E-02	<9.5E-02	-
^{60}Co (SG)	mCi/kg	3.04E-01	3.42E-01	2.76E-01	3.08E-01	11%	<2.4E-03	<2.6E-03	-
^{106}Ru (SG)	mCi/kg	<2.3E-01	<2.5E-01	<2.3E-01	-	-	<1.3E-02	<1.8E-02	-
^{125}Sb (SG)	mCi/kg	7.28E-02	<7.0E-02	<9.5E-02	-	-	<5.4E-03	<6.2E-03	-
^{126}Sn (SG)	mCi/kg	<2.0E-01	<2.0E-01	<1.8E-01	-	-	<4.1E-03	<4.6E-03	-
^{126}Sb (SG)	mCi/kg	<3.5E-02	<3.7E-02	<3.2E-02	-	-	<1.9E-03	<2.2E-03	-
^{144}Ce (SG)	mCi/kg	<4.1E-01	<4.3E-01	<3.8E-01	-	-	<1.0E-02	<1.3E-02	-
^{154}Eu (SG)	mCi/kg	1.72E+01	2.00E+01	1.54E+01	1.75E+01	13%	<2.8E-03	<3.6E-03	-
^{155}Eu (SG)	mCi/kg	1.64E+00	<2.1E+00	1.23E+00	1.44E+00*	20%	<4.9E-03	<5.5E-03	-
^{241}Am (SG)	mCi/kg	1.15E+01	1.38E+01	1.03E+01	1.19E+01	15%	1.91E-02	1.67E-01	-
^{99}Tc (IM)	mCi/kg	<3.1E-01	<2.9E-01	<2.9E-01	-	-	<3.0E-01	<3.5E-01	-
^{237}Np (IM)	mCi/kg	<3.6E-03	3.61E-03	<3.5E-03	-	-	<3.5E-03	<4.1E-03	-
^{239}Pu (IM)	mCi/kg	1.64E+00	2.10E+00	1.54E+00	1.76E+00	17%	<3.1E-01	<3.6E-01	-
^{240}Pu (IM)	mCi/kg	<1.2E+00	<1.1E+00	<1.1E+00	-	-	<1.1E+00	<1.3E+00	-
^{242}Pu (IM)	mCi/kg	<2.0E-02	<1.9E-02	<1.9E-02	-	-	<2.0E-02	<2.3E-02	-
^{238}Pu (SA)	mCi/kg	1.94E+02	2.07E+02	1.80E+02	1.93E+02	7.0%	<6.1E-03	<3.1E-02	-
$^{239/240}$Pu (SA)	mCi/kg	5.47E+00	5.63E+00	4.61E+00	5.24E+00	10%	2.27E-02	<8.6E-03	-
^{241}Pu (SA)	mCi/kg	6.16E+01	6.29E+01	4.70E+01	5.72E+01	15%	5.41E-02	<3.5E-02	-

* Only two values averaged.

Table 3-7. Composition of the Sodium Peroxide Fusion Dissolution of Total Dried Solids from the As-Received Tank 51H Sludge (Continued)

Analyte (Method)	Units	1st Replicate	2nd Replicate	3rd Replicate	Average	%RSD	Blank	Average Analyzed Glass Std	Glass Std Composition
^{90}Sr (SL)	mCi/kg	5.01E+03	5.67E+03	4.70E+03	5.13E+03	9.7%	9.55E-01	1.25E+00	-
^{79}Se (SL)*	mCi/kg	2.22E-02	2.89E-02	3.80E-02	2.97E-02	27%	-	-	-
^{129}I (SL)*	mCi/kg	8.60E-04	8.43E-04	7.06E-04	8.03E-04	11%	-	-	-
Total Alpha (SL)	mCi/kg	2.86E+02	3.18E+02	2.77E+02	2.94E+02	7.4%	<9.7E+00	<1.3E+01	-
Total Beta (SL)	mCi/kg	1.39E+04	1.61E+04	1.17E+04	1.39E+04	16%	<2.2E+01	<2.6E+01	-

* The Se-79 and I-129 required special sample preparations and are reported with the sodium peroxide fusion results only for convenience.

4.0 DISCUSSION OF RESULTS

4.1 AS-RECEIVED TANK 11H AND TANK 51H SUPERNATE CHARACTERIZATION

The characterization results for the as-received Tank 11H and Tank 51H supernate appear quite good with respect to the precision of the sample replicates and minimal contamination present in the blank. Table 4-1 summarizes the composition of the key components of both samples using the data from Tables 3-4 and 3-5. As expected both supernate samples show similar compositions for the major components.

Table 4-1. Comparison of the Tank 11H and Tank 51H Supernate

Analyte (Method)	Units	Tank 11H Supernate (Average)	Tank 11H Supernate (%RSD)	Tank 51H Supernate (Average)	Tank 51H Supernate (%RSD)
NO_3^- (IC)	M	1.75E-01	0.5%	1.91E-01	5.0%
NO_2^- (IC)	M	3.30E-01	1.0%	3.63E-01	3.9%
SO_4^{2-} (IC)	M	1.74E-02	0.8%	1.79E-02	1.7%
Cl^- (IC)	M	2.97E-02	3.8%	2.91E-02	0.8%
OH^-_{free} (TH)	M	3.10E+00	1.1%	3.11E+00	1.3%
CO_3^{2-} (TIC)	M	9.81E-02	1.3%	1.27E-01	23%
Al (IE)	mg/L	1.06E+04	0.2%	1.12E+04	0.4%
Cr (IE)	mg/L	2.77E+01	0.6%	2.60E+01	0.1%
Fe (IE)	mg/L	9.87E+00	0.9%	2.52E+00*	-
K (IE)	mg/L	1.29E+02	4.0%	1.60E+02	3.7%
Na (IE)	mg/L	9.58E+04	0.4%	9.32E+04	0.5%
S (IE)	mg/L	5.94E+02	1.1%	5.92E+02	1.8%
Hg (CV)	mg/L	1.80E+02	0.2%	1.26E+02	0.8%
^{238}U (IM)	mg/L	4.74E+00	11%	1.79E+00	2.3%
^{137}Cs (SG)	µCi/mL	1.49E+01	2.3%	1.50E+01	0.6%
^{90}Sr (SL)	µCi/mL	6.56E-01	2.8%	3.84E-01	2.1%
^{238}Pu (SA)	µCi/mL	4.57E-02	13%	1.08E-01	8.3%
$^{239/240}Pu$ (SA)	µCi/mL	1.88E-03	14%	5.13E-03	7.2%
^{99}Tc (IM)	µCi/mL	6.45E-03	12%	7.32E-03	12%

The As-Received Tank 11 Supernate was not filtered prior to submitting samples for analysis at the request of the customer. The Tank 51H supernate was filtered before analysis.
* Only a single replicate was above the detection limit.

4.2 AS-RECEIVED TANK 51H SLUDGE SAMPLE CHARACTERIZATION

Table 4-2 summarizes the composition of the key components of the post aluminum dissolution sludge using the data from aqua regia and peroxide fusion dissolution of the total dried solids in Tables 3-6 and 3-7. The characterization results for the total dried solids of the Tank 51H sludge slurry sample appear good also. The sample replicates show good precision with minimal contamination present in the blanks and glass standards.

Table 4-2. Summary of the Post Aluminum Dissolution Tank 51H Sludge Composition

Analyte	Average	%RSD
Na mg/kg	3.03E+05	0.4%
Al mg/kg	8.03E+04	1.6%
Fe mg/kg	5.85E+04	7.7%
Hg mg/kg	1.39E+04	3.4%
Mn mg/kg	1.35E+04	7.7%
U mg/kg	1.27E+04	8.0%
Ca mg/kg	6.87E+03	8.4%
Ni mg/kg	4.55E+03	7.7%
Si mg/kg	3.20E+03	4.0%
Mg mg/kg	2.37E+03	9.2%
^{235}U mg/kg	9.85E+01	10%
^{238}U mg/kg	1.26E+04	8.0%
^{90}Sr mCi/kg	5.44E+03	11%
^{99}Tc mCi/kg	<4.8E-01	-
^{137}Cs mCi/kg	1.14E+02	2.7%
^{237}Np mCi/kg	<3.6E-03	-
^{238}Pu mCi/kg	2.23E+02	16%
$^{239/240}$Pu mCi/kg	6.58E+00	24%
^{241}Pu mCi/kg	6.27E+01	15%

Divide mg/kg values by 1E+04 to convert to wt % dried solids basis
All results are the average of six replicates except Na, Hg (only aqua regia data) and Si (only sodium peroxide fusion data).
The %RSD was calculated based on the same number of replicates as the average.

5.0 REFERENCES

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