222-S LABORATORY

FINAL ANALYTICAL REPORT FOR 242-Z WASTE AND W-4/W-6 TANK HEELS SOLID SAMPLES

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222-S LABORATORY

FINAL ANALYTICAL REPORT FOR 242-Z WASTE AND W-4/W-6 TANK HEELS SOLID SAMPLES

1.0 INTRODUCTION

This final report presents the analytical results for the solid waste samples collected on June 13, 2016. The samples were analyzed in accordance with F15-037, *Sampling Authorization Form (SAF) for 242-Z Solid Waste Samples*; F16-005, *Sampling Authorization Form for Tank Heels-242-Z Tanks W-4 and W-6- Other Solid*; WHL-MP-1011, *Quality Assurance Project Plan for 222-S Laboratory* (QAPP); SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*; DOE/RL-2004-29, *Sampling and Analysis Plan for the Plutonium Finishing Plant, Above-Grade Structures* (SAP); and the additional guidance given by the customer point of contact.

Because the 222-S Laboratory facility was designed to analyze hazardous and complex tank waste samples, most SW-846 test methods performed at the 222-S Laboratory contain deviations that are listed in an appendix in the analytical procedures. All other known deviations or variances from SW-846 are documented in this narrative. The following attachments are included in this report:

Attachment 1	Data Summary Report
Attachment 2	Analysis Date and Holding Time Report
Attachment 3	Correspondence
Attachment 4	Receipt Paperwork
Attachment 5	Sample Breakdown Diagrams

2.0 SAMPLE RECEIPT AND APPEARANCE

The samples were received at the 222-S Laboratory on June 28, 2016. The samples were received in good condition with adequate paperwork and were stored in a secure location upon receipt. Samples were received 15 days after sampling.

3.0 ANALYTICAL RESULTS SUMMARY

The Data Summary Report (Attachment 1) presents the final analytical results for those analytes requested on the SAF. Non- requested analytes are also included in Attachment 1.

The “Det Limit” column in Attachment 1 contains the method detection limit (MDL) or minimum detectable activity (MDA).

In Attachment 1, the column labeled "A#" indicates the aliquot class or the method used for sample preparation before analysis. The aliquot classes are defined as follows:

"A" indicates samples were prepared by SW-846 3050B.

"F" indicates samples were prepared by fusion digest.

"W" indicates samples were prepared by standard water digest.

"HG" indicates acid digest for mercury analysis by SW-846 7471A.

The "Qual Flags" column in Attachment 1 contains data qualifier flags from FEAD CP-15383, *Common Requirements of the Format for Electronic Analytical Data (FEAD)*, which are defined as follows:

"B" for inorganic results is used to indicate that the reported result should be considered an estimate because it was below the quantitation limit. The "B" flag is applied to sample concentrations that are greater than the MDL but less than the quantitation limit.

"C" indicates the blank result was greater than 20% of the sample result.

"N" for all results is used to indicate the matrix spike (MS) recovery is outside the specified range in the QAPP or SAP.

"M" for inorganic results is used to indicate the Relative Percent Difference (RPD) between the sample and sample duplicate results is greater than 30%.

"U" for all results is used to indicate that the reported result was less than the calculated detection limit.

"X" for all results the specific translation of this qualifier is provided in the narrative of this report.

Manual calculations using rounded results from the Data Summary Report (Attachment 1) or from result calculation forms may differ slightly from the actual results derived from the raw data.

3.1 INORGANIC ANALYSES

3.1.1 Anions by Ion Chromatography (IC)

The IC analysis for anions was performed on water-digested aliquots of the samples. The required analytes listed in the SAFs were chloride, fluoride, nitrate, nitrite, and sulfate. Chloride, nitrate, nitrite, and sulfate were detected in the preparation blank at a concentration above the MDL, but below the quantitation limit. The chloride concentration in the preparation blank was greater than 20% of the chloride results in samples S16M000291 (B31FL3) and S16M000305 (B35Y77). The nitrite concentration in the preparation blank was greater than 20% of the nitrite result in sample S16M000291 (B31FL3); and the sulfate concentration in the preparation blank was greater than 20% of the sulfate results in samples S16M000298 (B35Y76) and S16M000305

(B35Y77). These results were flagged with a “C”. Since the preparation blank results were less than the quantitation limit, the usability of the data was not affected and reanalysis was not necessary.

The predigest matrix spike recovery for nitrate and oxalate exceeded the control limits of the 75%-125% requirement listed in the QAPP. The associated sample results were flagged with an “N”. Post digest spikes were prepared for all analytes and were within acceptable limits. This is an indication of possible matrix interferences in the pre-digest MS.

The SW-846 holding time for anions was met. All other quality control (QC) requirements listed in the SAP and the QAPP were also met.

3.1.2 pH

The pH analysis was performed on 1-gram aliquots of the samples. The SAF lists a pH holding time of “as soon as possible”. Therefore, the laboratory completed the pH measurements as soon as practically possible. The analysis time and holding time report is presented in Attachment 2.

The laboratory control standard (LCS) and continuing calibration verification standards were within the required ±0.1 pH unit of their true value, as required in the QAPP. All other QC requirements were met.

3.1.3 Mercury

Analysis for mercury by cold vapor atomic absorption was performed on acid-digested aliquots. All QC requirements were met. The required detection limit (RDL) was met. The 28-day SW-846 holding time for mercury analysis was exceeded because the samples were received at the laboratory 15 days after sampling. In addition, the laboratory used extra time for sample preparation; the samples were loaded into the hot cells for sample preparation and loaded out to the laboratory for sample analysis.

3.1.4 Inductively Coupled Plasma/Atomic Emission Spectroscopy

The inductively coupled plasma/atomic emission spectroscopy (ICP/AES) analysis was performed on acid-digested aliquots of the solid samples. For samples B31FL3 and B35Y76, the percentage of sample digested was reported to be approximately 100%. For sample B35Y77, the percentage of sample digested was reported to be approximately 95%. All analyses met the holding time requirement (see Attachment 2).

The required analytes listed in SAF number F15-037 and SAF number F16-005 were aluminum, arsenic, barium, beryllium, cadmium, chromium, lead, potassium, selenium, silver, and sodium. All other analytes are secondary (i.e., not requested).

The preparation blank results for chromium, cobalt, sulfur, silicon, lanthanum, and boron were above the MDL, but below the quantitation limit. However, only where the blank concentration was greater than 20% of the sample results, the sample results for the analytes listed above were flagged with a “C”.

The RPD between the sample and sample duplicate results for lanthanum, nickel, and vanadium exceeded the 30% requirement listed in the QAPP. Since the sample results for lanthanum and nickel were below the quantitation limit, this criterion does not apply. However, results for vanadium were above the quantitation limit; therefore, the associated sample results have been flagged with an “M”. Since all other positive sample results had passing RPDs, the laboratory believes the RPD failure of lanthanum, nickel, and vanadium were a result of matrix interferences. The predigest MS recovery for aluminum, calcium, iron, potassium, magnesium, sodium, phosphorous, silicon and titanium exceeded the 70%-130% requirement listed in the QAPP. The sample results for potassium, magnesium, sodium, silicon, and titanium have been flagged with “N”. Aluminum, calcium, iron, and phosphorous were spiked at a concentration lower than 25% of the sample results; therefore this criterion does not apply and no flag was applied to these analytes.

Copper and vanadium results were above the estimated quantitation limit in the interference check standard A; therefore an “X” flag has been applied to the sample results for these analytes.

The required detection limits for lead, silver and beryllium listed in the SAP are 11.75µg/g, 2.75µg/g, and 0.65µg/g, respectively. Sample B35Y77 did not meet the detection limit for lead; the detection limits for silver ranged from 3.02µg/g to 3.26µg/g, and the detection limits for beryllium ranged from 1.01µg/g to1.14µg/g. Due to the radiological hazards associated with these samples, extra safety precautions were taken during the sample digestion process to avoid unnecessary exposure to the technicians performing the analyses; therefore a reduced sample size was used. The sample size for acid digestion was approximately 0.2 grams.

All other QC requirements listed in the SAP and the QAPP were met.

3.1.5 Inductively Coupled Plasma/Mass Spectroscopy (ICP/MS)

The ICP/MS analysis for ^{242}Pu was performed on acid-digested aliquots of the solid samples. The pre-digestion MS recovery exceeded the requirement listed in the QAPP; however, the concentration of the MS was less than 25% of the sample result, therefore this criterion does not apply. A post digestion spike for ^{242}Pu was also prepared and analyzed. The recovery for the post digestion spike was within acceptable limits. Plutonium-242 results were above the instrument detection limit in all samples. All other QC requirements listed in the QAPP were met.

3.2 RADIOCHEMISTRY ANALYSES

3.2.1 Total Alpha/Total Beta

The total alpha/total beta analysis was performed on fusion-digested aliquots of the solid samples. The RPDs between the sample and sample duplicate for total alpha and total beta were over 30%, at 32.5 % and 33.9 % respectively. There is no specified FEAD data qualifier for missing a precision limit for radiochemical analyses; therefore an “X” flag has been applied to the sample results. All other QC requirements listed in the SAP and the QAPP were met.

3.2.2 Gamma Energy Analysis

The gamma energy analysis (GEA) was performed on fusion-digested aliquots. The requested isotopes for GEA were ^{137}Cs, ^{60}Co, ^{152}Eu, ^{154}Eu, and ^{155}Eu. The LCS recovery met the QC criteria listed in the QAPP, and no isotopes were detected in the preparation blank or method blank.

The RPD between the sample and sample duplicate for ^{137}Cs was over 30%. Since the counting uncertainty was high, this criterion does not apply. The samples were counted for as long as reasonably achievable. However, the detection limit of 0.0018 µCi/g for ^{60}Co in sample B35Y76 was not met.

3.2.3 Americium-241

The ^{241}Am analysis was performed on fusion-digested aliquots. All sample results for ^{241}Am were above the instrument detection limit. All QC requirements in QAPP were met.

3.2.4 Plutonium-238 and Plutonium-239/240

The ^{238}Pu and $^{239/240}$Pu analysis was performed on fusion-digested aliquots. All sample results for $^{239/240}$Pu and ^{238}Pu were above the instrument detection limit except for the ^{238}Pu results in sample B35Y76. The RPDs between the sample and sample duplicate for ^{238}Pu and $^{239/240}$Pu were slightly over 30%. An “X” flag was applied to the sample results.

Due to dilution constraints, the required detection limit for ^{238}Pu in sample B35Y76 was not met. All QC requirements listed in the QAPP were met.

3.2.5 Plutonium-241

The ^{241}Pu analysis was performed by liquid scintillation counting on fusion-digested aliquots. All QC requirements listed in the QAPP were met. There is no required detection limit in the SAP for ^{241}Pu.

3.2.6 Strontium-89/90

The $^{89/90}$Sr analysis was performed on fusion-digested samples. All sample results were above the instrument detection limit. The QC requirements listed in the QAPP were met.

4.0 PROCEDURES

Table 1 lists the procedures used in preparation and analysis of the samples contained in this report.

Table 1. Procedures

Analysis	Reference	Preparation Method	Analysis Procedure
Inorganic Analyses			
IC – Anions	SW-846 9056A	Water digest – LA-504-101, Rev. 13-2	LA-533-166, Rev. 2-2

Table 1. Procedures

Analysis	Reference	Preparation Method	Analysis Procedure
ICP/AES – Metals	SW-846 6010C	Acid digest – LA-505-163, Rev. 8-3; SW-846 3050B	LA-505-174, Rev. 1-5
Mercury	SW-846 7471A	Acid Digest- LA-325-110, Rev. 1-2 (SW-846 7471A)	LA-325-110, Rev. 1-2
pH	SW-846 9045A	Direct	LA-212-105, Rev. 8-3
ICP/MS – Actinides	SW-846 6020A	Acid digest – LA-505-163, Rev. 8-3; SW-846 3050B	LA-506-103, Rev. D-0
Radiochemical Analyses			
Total Alpha/Beta	N/A	Separation – LA-508-101, Rev. 15-2 Fusion Digest-LA-549-141, Rev. 13-5	LA-508-124, Rev. 3-1
GEA	N/A	Separation – LA-548-121, Rev. K-1 Fusion Digest – LA-549-141, Rev. 13-5	LA-508-167, Rev. 2-1
^{238}Pu, $^{239/240}$Pu	N/A	Separation – LA-543-102, Rev. 0-2 Fusion digest – LA-549-141, Rev. 13-5	LA-508-168, Rev. 1-2
^{241}Am	N/A	Separation – LA-543-102, Rev. 0-2 Fusion digest – LA-549-141, Rev. 13-5	LA-508-168, Rev. 1-2
^{241}Pu	N/A	Separation- LA-543-102, Rev. 0-2 Fusion digest – LA-549-141, Rev. 13-5	LA-508-122, Rev. 0-2
$^{89/90}$Sr	N/A	Separation- LA-220-101, Rev. K-2 Fusion digest – LA-549-141, Rev. 13-5	LA-508-124, Rev. 3-1

N/A – No reference method for this analysis

5.0 REFERENCES

FEAD CP-15383, 2007, *Common Requirements of the Format for Electronic Analytical Data (FEAD)*, Rev. 8, CH2M HILL Plateau Remediation Company, Richland, Washington.

DOE/RL-2004-29, 2005, *Sampling and Analysis Plan for the Plutonium Finishing Plant, Above-Grade Structures*, Rev. 0, U.S. Department of Energy, Richland, Washington.

F15-037, *Sampling Authorization Form for 242-Z Solid Waste Samples*, CH2M Hill Plateau Remediation Company, Richland, Washington

F16-005, *Sampling Authorization Form for Tank Heels – 242-Z Tanks W-4 and W-6- Other Solid*, CH2M Hill Plateau Remediation Company, Richland, Washington

SW-846, 1986, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*, Third Edition, as amended, U.S. Environmental Protection Agency, Washington, D.C.

WHL-MP-1011, 2014, *Quality Assurance Project Plan for 222-S Laboratory*, Rev. 13-0, Wastren Advantage, Inc. Hanford Laboratory, Richland, Washington.

Attachment 1

DATA SUMMARY REPORT

242-Z-Waste-W4-W6 Tank Heels 2016-06
Data Summary Report

Sample Group: 20161902
SDG Number: 222S20161902
Customer Sample ID: B31FL3
Sample Portion: B31FL3

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Alpha and Beta															
S16M000289		F	ALPHA	Gross alpha	uCi/g	103	<0.0537	590	n/a	n/a	n/a	n/a	0.0422	0.643	
S16M000289		F	12587-47-2	Gross beta	uCi/g	101	<0.134	98.0	n/a	n/a	n/a	n/a	0.107	1.226	
Am241,Cm243															
S16M000289		F	14596-10-2	Americium-241	uCi/g	96.8	<0.261	520	n/a	n/a	n/a	n/a	0.278	0.62	
Anions and Small Organic Acids															
S16M000291		W	16984-48-8	Fluoride	ug/g	103	<1.00E-03	1.27E+03	n/a	n/a	n/a	n/a	203	n/a	
S16M000291		W	666-14-8	Glycolate	ug/g	104	<5.00E-03	<650	n/a	n/a	n/a	n/a	650	n/a	U
S16M000291		W	71-50-1	Acetate	ug/g	105	<0.0100	<1.14E+03	n/a	n/a	n/a	n/a	1.14E+03	n/a	U
S16M000291		W	12311-97-6	Formate	ug/g	105	<7.00E-03	<1.71E+03	n/a	n/a	n/a	n/a	1.71E+03	n/a	U
S16M000291		W	16887-00-6	Chloride	ug/g	97.1	5.00E-03	860	n/a	n/a	n/a	n/a	650	n/a	CB
S16M000291		W	14797-65-0	Nitrite	ug/g	104	0.0440	4.86E+03	n/a	n/a	n/a	n/a	2.85E+03	n/a	CB
S16M000291		W	14808-79-8	Sulfate	ug/g	104	0.0780	<1.87E+03	n/a	n/a	n/a	n/a	1.87E+03	n/a	U
S16M000291		W	338-70-5	Oxalate	ug/g	106	<9.00E-03	<1.06E+03	n/a	n/a	n/a	n/a	1.06E+03	n/a	UN
S16M000291		W	24959-67-9	Bromide	ug/g	104	<6.00E-03	<610	n/a	n/a	n/a	n/a	610	n/a	U
S16M000291		W	14797-55-8	Nitrate	ug/g	107	0.0940	5.82E+05	n/a	n/a	n/a	n/a	2.56E+03	n/a	N
S16M000291		W	14265-44-2	Phosphate	ug/g	104	<0.0140	<813	n/a	n/a	n/a	n/a	813	n/a	U
GEA															
S16M000289		F	10198-40-0	Cobalt-60	uCi/g	96.4	<1.95E-03	<1.55E-03	n/a	n/a	n/a	n/a	1.55E-03	n/a	U
S16M000289		F	10045-97-3	Cesium-137	uCi/g	94.4	<2.71E-03	4.06E-03	n/a	n/a	n/a	n/a	1.92E-03	22.95	
S16M000289		F	14683-23-9	Europium-152	uCi/g	n/a	<4.51E-03	<3.56E-03	n/a	n/a	n/a	n/a	3.56E-03	n/a	U
S16M000289		F	15585-10-1	Europium-154	uCi/g	n/a	<5.42E-03	<4.26E-03	n/a	n/a	n/a	n/a	4.26E-03	n/a	U
S16M000289		F	14391-16-3	Europium-155	uCi/g	n/a	<5.07E-03	<4.28E-03	n/a	n/a	n/a	n/a	4.28E-03	n/a	U
ICP-RCRA Metals															
S16M000292		A	7440-22-4	Silver	ug/g	93.0	<3.00E-03	6.66	n/a	n/a	n/a	n/a	3.26	n/a	B
S16M000292		A	7429-90-5	Aluminum	ug/g	92.9	<0.0140	5.90E+04	n/a	n/a	n/a	n/a	15.2	n/a	
S16M000292		A	7440-38-2	Arsenic	ug/g	90.1	<0.0150	<16.3	n/a	n/a	n/a	n/a	16.3	n/a	U
S16M000292		A	7440-42-8	Boron	ug/g	91.3	2.55E-03	<2.17	n/a	n/a	n/a	n/a	2.17	n/a	U
S16M000292		A	7440-39-3	Barium	ug/g	93.3	<1.00E-03	9.34	n/a	n/a	n/a	n/a	1.09	n/a	B

NA = Not Analyzed, ND = Not Detected

U - < Det Limit
X - Comment
N - Spike Outside Range
X - Rad Chem Comment
M - Inorganic RPD Outside Range
B - Inorganic Estimated
C - Inorganic Blank Contamination

242-Z-Waste-W4-W6 Tank Heels 2016-06
Data Summary Report

Sample Group: 20161902
SDG Number: 222S20161902
Customer Sample ID: B31FL3
Sample Portion: B31FL3

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
ICP-RCRA Metals															
S16M000292		A	7440-41-7	Beryllium	ug/g	93.5	<1.00E-03	<1.09	n/a	n/a	n/a	n/a	1.09	n/a	U
S16M000292		A	7440-69-9	Bismuth	ug/g	91.5	<0.0190	<20.7	n/a	n/a	n/a	n/a	20.7	n/a	U
S16M000292		A	7440-70-2	Calcium	ug/g	93.0	<0.120	3.00E+03	n/a	n/a	n/a	n/a	130	n/a	
S16M000292		A	7440-43-9	Cadmium	ug/g	92.3	<1.00E-03	246	n/a	n/a	n/a	n/a	1.09	n/a	
S16M000292		A	7440-48-4	Cobalt	ug/g	93.8	<1.00E-03	7.59	n/a	n/a	n/a	n/a	1.09	n/a	B
S16M000292		A	7440-47-3	Chromium	ug/g	93.8	4.64E-03	694	n/a	n/a	n/a	n/a	2.17	n/a	
S16M000292		A	7440-50-8	Copper	ug/g	94.7	<2.00E-03	86.8	n/a	n/a	n/a	n/a	2.17	n/a	X
S16M000292		A	7440-53-1	Europium	ug/g	101	<1.00E-03	<1.09	n/a	n/a	n/a	n/a	1.09	n/a	U
S16M000292		A	7439-89-6	Iron	ug/g	91.6	<0.0200	2.53E+04	n/a	n/a	n/a	n/a	21.7	n/a	
S16M000292		A	7440-09-7	Potassium	ug/g	91.9	<0.0220	550	n/a	n/a	n/a	n/a	23.9	n/a	
S16M000292		A	7439-91-0	Lanthanum	ug/g	96.5	1.44E-03	<1.09	n/a	n/a	n/a	n/a	1.09	n/a	U
S16M000292		A	7439-93-2	Lithium	ug/g	98.6	<1.00E-03	6.51	n/a	n/a	n/a	n/a	1.09	n/a	B
S16M000292		A	7439-95-4	Magnesium	ug/g	95.0	<9.00E-03	4.96E+03	n/a	n/a	n/a	n/a	9.78	n/a	
S16M000292		A	7439-96-5	Manganese	ug/g	94.4	<1.00E-03	182	n/a	n/a	n/a	n/a	1.09	n/a	
S16M000292		A	7439-98-7	Molybdenum	ug/g	93.9	<2.00E-03	27.1	n/a	n/a	n/a	n/a	2.17	n/a	
S16M000292		A	7440-23-5	Sodium	ug/g	93.5	<0.0920	1.28E+05	n/a	n/a	n/a	n/a	100	n/a	
S16M000292		A	7440-00-8	Neodymium	ug/g	102	<0.0150	<16.3	n/a	n/a	n/a	n/a	16.3	n/a	U
S16M000292		A	7440-02-0	Nickel	ug/g	91.9	<2.00E-03	539	n/a	n/a	n/a	n/a	2.17	n/a	
S16M000292		A	7723-14-0	Phosphorus	ug/g	89.9	<0.0130	3.96E+03	n/a	n/a	n/a	n/a	14.1	n/a	
S16M000292		A	7439-92-1	Lead	ug/g	94.8	<0.0130	1.30E+04	n/a	n/a	n/a	n/a	14.1	n/a	
S16M000292		A	7704-34-9	Sulfur	ug/g	90.0	0.0438	269	n/a	n/a	n/a	n/a	30.4	n/a	B
S16M000292		A	7440-36-0	Antimony	ug/g	89.8	<0.0180	<19.6	n/a	n/a	n/a	n/a	19.6	n/a	U
S16M000292		A	7782-49-2	Selenium	ug/g	92.2	<0.0300	<32.6	n/a	n/a	n/a	n/a	32.6	n/a	U
S16M000292		A	7440-21-3	Silicon	ug/g	81.0	0.0231	174	n/a	n/a	n/a	n/a	13.0	n/a	
S16M000292		A	7440-24-6	Strontium	ug/g	92.7	<2.00E-03	10.4	n/a	n/a	n/a	n/a	2.17	n/a	B
S16M000292		A	7440-32-6	Titanium	ug/g	91.7	<2.00E-03	11.7	n/a	n/a	n/a	n/a	2.17	n/a	B
S16M000292		A	7440-28-0	Thallium	ug/g	91.7	<0.0150	<16.3	n/a	n/a	n/a	n/a	16.3	n/a	U

NA = Not Analyzed, ND = Not Detected

U - < Det Limit
X - Comment
N - Spike Outside Range
X - Rad Chem Comment
M - Inorganic RPD Outside Range
B - Inorganic Estimated
C - Inorganic Blank Contamination

242-Z-Waste-W4-W6 Tank Heels 2016-06
Data Summary Report

Sample Group: 20161902
SDG Number: 222S20161902
Customer Sample ID: B31FL3
Sample Portion: B31FL3

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
ICP-RCRA Metals															
S16M000292		A	7440-62-2	Vanadium	ug/g	93.4	<1.00E-03	<1.09	n/a	n/a	n/a	n/a	1.09	n/a	UX
S16M000292		A	7440-65-5	Yttrium	ug/g	101	<2.00E-03	8.92	n/a	n/a	n/a	n/a	2.17	n/a	B
S16M000292		A	7440-66-6	Zinc	ug/g	90.6	<0.0320	1.09E+03	n/a	n/a	n/a	n/a	34.8	n/a	
ICP/MS															
S16M000292		A	13982-10-0	Plutonium-242	ug/g	103	<1.30E-05	1.46	n/a	n/a	n/a	n/a	0.0283	n/a	
Mercury by CVAA															
S16M000293		HG	7439-97-6	Mercury	ug/g	106	<1.10E-05	0.145	n/a	n/a	n/a	n/a	2.06E-03	n/a	B
Plutonium-241 by LSC															
S16M000289		F	14119-32-5	Plutonium-241	uCi/g	88.4	<0.0141	95.3	n/a	n/a	n/a	n/a	16.2	22.883	
Pu238,239															
S16M000289		F	PU-239/240	Plutonium-239/240	uCi/g	112	<0.274	81.9	n/a	n/a	n/a	n/a	0.305	1.53	
S16M000289		F	13981-16-3	Plutonium-238	uCi/g	n/a	<0.397	2.94	n/a	n/a	n/a	n/a	0.395	9.32	
Sr-89/90 by GPC															
S16M000289		F	SR-89/90	Strontium-89/90	uCi/g	116	<4.02E-03	0.310	n/a	n/a	n/a	n/a	2.63E-03	5.539	
pH on Solid Samples															
S16M000288			PH	pH	unitless	n/a	n/a	2.94	n/a	n/a	n/a	n/a	0.0100	n/a	

NA = Not Analyzed, ND = Not Detected

U - < Det Limit
X - Comment
N - Spike Outside Range
X - Rad Chem Comment
M - Inorganic RPD Outside Range
B - Inorganic Estimated
C - Inorganic Blank Contamination

242-Z-Waste-W4-W6 Tank Heels 2016-06
Data Summary Report

Sample Group: 20161902
SDG Number: 222S20161902
Customer Sample ID: B35Y76
Sample Portion: B35Y76

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Alpha and Beta															
S16M000296		F	ALPHA	Gross alpha	uCi/g	103	<0.0537	943	n/a	n/a	n/a	n/a	0.0450	0.524	
S16M000296		F	12587-47-2	Gross beta	uCi/g	101	<0.134	176	n/a	n/a	n/a	n/a	0.114	0.936	
Am241,Cm243															
S16M000296		F	14596-10-2	Americium-241	uCi/g	96.8	<0.261	993	n/a	n/a	n/a	n/a	0.232	0.46	
Anions and Small Organic Acids															
S16M000298		W	16984-48-8	Fluoride	ug/g	103	<1.00E-03	5.80E+03	n/a	n/a	n/a	n/a	55.3	n/a	
S16M000298		W	666-14-8	Glycolate	ug/g	104	<5.00E-03	675	n/a	n/a	n/a	n/a	177	n/a	B
S16M000298		W	71-50-1	Acetate	ug/g	105	<0.0100	1.94E+03	n/a	n/a	n/a	n/a	310	n/a	B
S16M000298		W	12311-97-6	Formate	ug/g	105	<7.00E-03	1.28E+03	n/a	n/a	n/a	n/a	465	n/a	B
S16M000298		W	16887-00-6	Chloride	ug/g	97.1	5.00E-03	3.51E+03	n/a	n/a	n/a	n/a	177	n/a	
S16M000298		W	14797-65-0	Nitrite	ug/g	104	0.0440	<774	n/a	n/a	n/a	n/a	774	n/a	U
S16M000298		W	14808-79-8	Sulfate	ug/g	104	0.0780	1.05E+03	n/a	n/a	n/a	n/a	509	n/a	CB
S16M000298		W	338-70-5	Oxalate	ug/g	106	<9.00E-03	1.46E+04	n/a	n/a	n/a	n/a	288	n/a	N
S16M000298		W	24959-67-9	Bromide	ug/g	104	<6.00E-03	<166	n/a	n/a	n/a	n/a	166	n/a	U
S16M000298		W	14797-55-8	Nitrate	ug/g	107	0.0940	2.32E+05	n/a	n/a	n/a	n/a	697	n/a	N
S16M000298		W	14265-44-2	Phosphate	ug/g	104	<0.0140	2.82E+04	n/a	n/a	n/a	n/a	221	n/a	
GEA															
S16M000296		F	10198-40-0	Cobalt-60	uCi/g	96.4	<1.95E-03	<5.79E-03	n/a	n/a	n/a	n/a	5.79E-03	n/a	U
S16M000296		F	10045-97-3	Cesium-137	uCi/g	94.4	<2.71E-03	0.0127	n/a	n/a	n/a	n/a	5.59E-03	24.64	
S16M000296		F	14683-23-9	Europium-152	uCi/g	n/a	<4.51E-03	<0.0187	n/a	n/a	n/a	n/a	0.0187	n/a	U
S16M000296		F	15585-10-1	Europium-154	uCi/g	n/a	<5.42E-03	<0.0150	n/a	n/a	n/a	n/a	0.0150	n/a	U
S16M000296		F	14391-16-3	Europium-155	uCi/g	n/a	<5.07E-03	<0.0311	n/a	n/a	n/a	n/a	0.0311	n/a	U
ICP-RCRA Metals															
S16M000299		A	7440-22-4	Silver	ug/g	93.0	<3.00E-03	<3.42	n/a	n/a	n/a	n/a	3.42	n/a	U
S16M000299		A	7429-90-5	Aluminum	ug/g	92.9	<0.0140	8.75E+04	n/a	n/a	n/a	n/a	16.0	n/a	
S16M000299		A	7440-38-2	Arsenic	ug/g	90.1	<0.0150	<17.1	n/a	n/a	n/a	n/a	17.1	n/a	U
S16M000299		A	7440-42-8	Boron	ug/g	91.3	2.55E-03	3.00	n/a	n/a	n/a	n/a	2.28	n/a	CB
S16M000299		A	7440-39-3	Barium	ug/g	93.3	<1.00E-03	163	n/a	n/a	n/a	n/a	1.14	n/a	

NA = Not Analyzed, ND = Not Detected

U - < Det Limit
X - Comment
N - Spike Outside Range
X - Rad Chem Comment
M - Inorganic RPD Outside Range
B - Inorganic Estimated
C - Inorganic Blank Contamination

242-Z-Waste-W4-W6 Tank Heels 2016-06
Data Summary Report

Sample Group: 20161902
SDG Number: 222S20161902
Customer Sample ID: B35Y76
Sample Portion: B35Y76

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
ICP-RCRA Metals															
S16M000299		A	7440-41-7	Beryllium	ug/g	93.5	<1.00E-03	<1.14	n/a	n/a	n/a	n/a	1.14	n/a	U
S16M000299		A	7440-69-9	Bismuth	ug/g	91.5	<0.0190	<21.7	n/a	n/a	n/a	n/a	21.7	n/a	U
S16M000299		A	7440-70-2	Calcium	ug/g	93.0	<0.120	4.89E+03	n/a	n/a	n/a	n/a	137	n/a	
S16M000299		A	7440-43-9	Cadmium	ug/g	92.3	<1.00E-03	223	n/a	n/a	n/a	n/a	1.14	n/a	
S16M000299		A	7440-48-4	Cobalt	ug/g	93.8	<1.00E-03	15.9	n/a	n/a	n/a	n/a	1.14	n/a	
S16M000299		A	7440-47-3	Chromium	ug/g	93.8	4.64E-03	1.46E+03	n/a	n/a	n/a	n/a	2.28	n/a	
S16M000299		A	7440-50-8	Copper	ug/g	94.7	<2.00E-03	535	n/a	n/a	n/a	n/a	2.28	n/a	X
S16M000299		A	7440-53-1	Europium	ug/g	101	<1.00E-03	<1.14	n/a	n/a	n/a	n/a	1.14	n/a	U
S16M000299		A	7439-89-6	Iron	ug/g	91.6	<0.0200	9.32E+03	n/a	n/a	n/a	n/a	22.8	n/a	
S16M000299		A	7440-09-7	Potassium	ug/g	91.9	<0.0220	84.6	n/a	n/a	n/a	n/a	25.1	n/a	B
S16M000299		A	7439-91-0	Lanthanum	ug/g	96.5	1.44E-03	<1.14	n/a	n/a	n/a	n/a	1.14	n/a	U
S16M000299		A	7439-93-2	Lithium	ug/g	98.6	<1.00E-03	54.8	n/a	n/a	n/a	n/a	1.14	n/a	
S16M000299		A	7439-95-4	Magnesium	ug/g	95.0	<9.00E-03	343	n/a	n/a	n/a	n/a	10.3	n/a	
S16M000299		A	7439-96-5	Manganese	ug/g	94.4	<1.00E-03	551	n/a	n/a	n/a	n/a	1.14	n/a	
S16M000299		A	7439-98-7	Molybdenum	ug/g	93.9	<2.00E-03	16.6	n/a	n/a	n/a	n/a	2.28	n/a	B
S16M000299		A	7440-23-5	Sodium	ug/g	93.5	<0.0920	2.91E+04	n/a	n/a	n/a	n/a	105	n/a	
S16M000299		A	7440-00-8	Neodymium	ug/g	102	<0.0150	<17.1	n/a	n/a	n/a	n/a	17.1	n/a	U
S16M000299		A	7440-02-0	Nickel	ug/g	91.9	<2.00E-03	1.62E+03	n/a	n/a	n/a	n/a	2.28	n/a	
S16M000299		A	7723-14-0	Phosphorus	ug/g	89.9	<0.0130	4.83E+04	n/a	n/a	n/a	n/a	14.8	n/a	
S16M000299		A	7439-92-1	Lead	ug/g	94.8	<0.0130	476	n/a	n/a	n/a	n/a	14.8	n/a	
S16M000299		A	7704-34-9	Sulfur	ug/g	90.0	0.0438	1.18E+03	n/a	n/a	n/a	n/a	32.0	n/a	
S16M000299		A	7440-36-0	Antimony	ug/g	89.8	<0.0180	<20.5	n/a	n/a	n/a	n/a	20.5	n/a	U
S16M000299		A	7782-49-2	Selenium	ug/g	92.2	<0.0300	<34.2	n/a	n/a	n/a	n/a	34.2	n/a	U
S16M000299		A	7440-21-3	Silicon	ug/g	81.0	0.0231	87.3	n/a	n/a	n/a	n/a	13.7	n/a	CB
S16M000299		A	7440-24-6	Strontium	ug/g	92.7	<2.00E-03	19.7	n/a	n/a	n/a	n/a	2.28	n/a	B
S16M000299		A	7440-32-6	Titanium	ug/g	91.7	<2.00E-03	3.73	n/a	n/a	n/a	n/a	2.28	n/a	B
S16M000299		A	7440-28-0	Thallium	ug/g	91.7	<0.0150	<17.1	n/a	n/a	n/a	n/a	17.1	n/a	U

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M - Inorganic RPD Outside Range
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242-Z-Waste-W4-W6 Tank Heels 2016-06
Data Summary Report

Sample Group: 20161902
SDG Number: 222S20161902
Customer Sample ID: B35Y76
Sample Portion: B35Y76

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
ICP-RCRA Metals															
S16M000299		A	7440-62-2	Vanadium	ug/g	93.4	<1.00E-03	5.98	n/a	n/a	n/a	n/a	1.14	n/a	BX
S16M000299		A	7440-65-5	Yttrium	ug/g	101	<2.00E-03	2.50	n/a	n/a	n/a	n/a	2.28	n/a	B
S16M000299		A	7440-66-6	Zinc	ug/g	90.6	<0.0320	1.37E+03	n/a	n/a	n/a	n/a	36.5	n/a	
ICP/MS															
S16M000299		A	13982-10-0	Plutonium-242	ug/g	103	<1.30E-05	0.129	n/a	n/a	n/a	n/a	2.97E-03	n/a	
Mercury by CVAA															
S16M000300		HG	7439-97-6	Mercury	ug/g	106	<1.10E-05	0.748	n/a	n/a	n/a	n/a	2.22E-03	n/a	
Plutonium-241 by LSC															
S16M000296		F	14119-32-5	Plutonium-241	uCi/g	88.4	<0.0141	<16.0	n/a	n/a	n/a	n/a	16.0	n/a	U
Pu238,239															
S16M000296		F	PU-239/240	Plutonium-239/240	uCi/g	112	<0.274	2.04	n/a	n/a	n/a	n/a	0.237	10.42	
S16M000296		F	13981-16-3	Plutonium-238	uCi/g	n/a	<0.397	<0.401	n/a	n/a	n/a	n/a	0.401	n/a	U
Sr-89/90 by GPC															
S16M000296		F	SR-89/90	Strontium-89/90	uCi/g	116	<4.02E-03	0.239	n/a	n/a	n/a	n/a	3.05E-03	7.238	
pH on Solid Samples															
S16M000295			PH	pH	unitless	n/a	n/a	2.96	n/a	n/a	n/a	n/a	0.0100	n/a	

NA = Not Analyzed, ND = Not Detected

U - < Det Limit
X - Comment
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X - Rad Chem Comment
M - Inorganic RPD Outside Range
B - Inorganic Estimated
C - Inorganic Blank Contamination

242-Z-Waste-W4-W6 Tank Heels 2016-06
Data Summary Report

Sample Group: 20161902
SDG Number: 222S20161902
Customer Sample ID: B35Y77
Sample Portion: B35Y77

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Alpha and Beta															
S16M000303		F	ALPHA	Gross alpha	uCi/g	103	<0.0537	119	85.9	103	32.5	100	0.0200	0.981	X
S16M000303		F	12587-47-2	Gross beta	uCi/g	101	<0.134	7.81	5.54	6.67	33.9	114	0.0505	3.042	X
Am241,Cm243															
S16M000303		F	14596-10-2	Americium-241	uCi/g	96.8	<0.261	18.2	14.0	16.1	26.0	n/a	0.0381	1.57	
Anions and Small Organic Acids															
S16M000305		W	16984-48-8	Fluoride	ug/g	103	<1.00E-03	84.3	65.0	74.7	25.9	87.3	12.4	n/a	
S16M000305		W	666-14-8	Glycolate	ug/g	104	<5.00E-03	92.5	74.2	83.4	22.0	105	39.8	n/a	B
S16M000305		W	71-50-1	Acetate	ug/g	105	<0.0100	<69.7	<56.0	n/a	n/a	107	69.7	n/a	U
S16M000305		W	12311-97-6	Formate	ug/g	105	<7.00E-03	144	125	134	14.0	105	104	n/a	B
S16M000305		W	16887-00-6	Chloride	ug/g	97.1	5.00E-03	109	89.2	99.3	20.4	99.2	39.8	n/a	C
S16M000305		W	14797-65-0	Nitrite	ug/g	104	0.0440	<174	<140	n/a	n/a	106	174	n/a	U
S16M000305		W	14808-79-8	Sulfate	ug/g	104	0.0780	639	535	587	17.7	105	114	n/a	CB
S16M000305		W	338-70-5	Oxalate	ug/g	106	<9.00E-03	549	425	487	25.6	50.7	64.7	n/a	BN
S16M000305		W	24959-67-9	Bromide	ug/g	104	<6.00E-03	<37.3	<30.0	n/a	n/a	104	37.3	n/a	U
S16M000305		W	14797-55-8	Nitrate	ug/g	107	0.0940	3.03E+04	2.47E+04	2.75E+04	20.3	19.9	157	n/a	N
S16M000305		W	14265-44-2	Phosphate	ug/g	104	<0.0140	136	148	142	8.26	76.5	49.8	n/a	B
GEA															
S16M000303		F	10198-40-0	Cobalt-60	uCi/g	96.4	<1.95E-03	<3.78E-04	<2.78E-04	n/a	n/a	n/a	3.78E-04	n/a	U
S16M000303		F	10045-97-3	Cesium-137	uCi/g	94.4	<2.71E-03	1.46E-03	1.02E-03	1.24E-03	35.2	n/a	7.14E-04	18.93	
S16M000303		F	14683-23-9	Europium-152	uCi/g	n/a	<4.51E-03	<1.03E-03	<8.36E-04	n/a	n/a	n/a	1.03E-03	n/a	U
S16M000303		F	15585-10-1	Europium-154	uCi/g	n/a	<5.42E-03	<1.10E-03	<8.08E-04	n/a	n/a	n/a	1.10E-03	n/a	U
S16M000303		F	14391-16-3	Europium-155	uCi/g	n/a	<5.07E-03	<2.04E-03	<1.21E-03	n/a	n/a	n/a	2.04E-03	n/a	U
ICP-RCRA Metals															
S16M000306		A	7440-22-4	Silver	ug/g	93.0	<3.00E-03	<3.02	<3.32	n/a	n/a	97.3	3.02	n/a	UN
S16M000306		A	7429-90-5	Aluminum	ug/g	92.9	<0.0140	7.75E+03	7.49E+03	7.62E+03	3.42	820	14.1	n/a	
S16M000306		A	7440-38-2	Arsenic	ug/g	90.1	<0.0150	<15.1	<16.6	n/a	n/a	93.5	15.1	n/a	U
S16M000306		A	7440-42-8	Boron	ug/g	91.3	2.55E-03	<2.02	<2.21	n/a	n/a	95.9	2.02	n/a	U
S16M000306		A	7440-39-3	Barium	ug/g	93.3	<1.00E-03	22.8	20.6	21.7	9.80	103	1.01	n/a	

NA = Not Analyzed, ND = Not Detected

U - < Det Limit
X - Comment
N - Spike Outside Range
X - Rad Chem Comment
M - Inorganic RPD Outside Range
B - Inorganic Estimated
C - Inorganic Blank Contamination

242-Z-Waste-W4-W6 Tank Heels 2016-06
Data Summary Report

Sample Group: 20161902
SDG Number: 222S20161902
Customer Sample ID: B35Y77
Sample Portion: B35Y77

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
ICP-RCRA Metals															
S16M000306		A	7440-41-7	Beryllium	ug/g	93.5	<1.00E-03	<1.01	<1.11	n/a	n/a	97.7	1.01	n/a	U
S16M000306		A	7440-69-9	Bismuth	ug/g	91.5	<0.0190	<19.2	<21.0	n/a	n/a	95.4	19.2	n/a	U
S16M000306		A	7440-70-2	Calcium	ug/g	93.0	<0.120	6.06E+03	5.66E+03	5.86E+03	6.73	493	121	n/a	
S16M000306		A	7440-43-9	Cadmium	ug/g	92.3	<1.00E-03	<1.01	<1.11	n/a	n/a	96.7	1.01	n/a	U
S16M000306		A	7440-48-4	Cobalt	ug/g	93.8	<1.00E-03	<1.01	<1.11	n/a	n/a	97.7	1.01	n/a	U
S16M000306		A	7440-47-3	Chromium	ug/g	93.8	4.64E-03	17.6	14.9	16.3	16.3	106	2.02	n/a	CB
S16M000306		A	7440-50-8	Copper	ug/g	94.7	<2.00E-03	<2.02	<2.21	n/a	n/a	99.0	2.02	n/a	UX
S16M000306		A	7440-53-1	Europium	ug/g	101	<1.00E-03	<1.01	<1.11	n/a	n/a	106	1.01	n/a	U
S16M000306		A	7439-89-6	Iron	ug/g	91.6	<0.0200	8.47E+03	9.82E+03	9.14E+03	14.7	744	20.2	n/a	
S16M000306		A	7440-09-7	Potassium	ug/g	91.9	<0.0220	444	507	475	13.1	246	22.2	n/a	N
S16M000306		A	7439-91-0	Lanthanum	ug/g	96.5	1.44E-03	2.21	3.67	2.94	49.4	98.8	1.01	n/a	CB
S16M000306		A	7439-93-2	Lithium	ug/g	98.6	<1.00E-03	<1.01	<1.11	n/a	n/a	102	1.01	n/a	U
S16M000306		A	7439-95-4	Magnesium	ug/g	95.0	<9.00E-03	546	543	545	0.494	271	9.07	n/a	N
S16M000306		A	7439-96-5	Manganese	ug/g	94.4	<1.00E-03	52.2	62.2	57.2	17.6	107	1.01	n/a	
S16M000306		A	7439-98-7	Molybdenum	ug/g	93.9	<2.00E-03	4.01	4.74	4.38	16.8	97.5	2.02	n/a	B
S16M000306		A	7440-23-5	Sodium	ug/g	93.5	<0.0920	1.16E+03	1.07E+03	1.11E+03	7.90	280	92.7	n/a	N
S16M000306		A	7440-00-8	Neodymium	ug/g	102	<0.0150	<15.1	<16.6	n/a	n/a	105	15.1	n/a	U
S16M000306		A	7440-02-0	Nickel	ug/g	91.9	<2.00E-03	4.54	3.09	3.81	38.1	101	2.02	n/a	B
S16M000306		A	7723-14-0	Phosphorus	ug/g	89.9	<0.0130	4.06E+03	3.76E+03	3.91E+03	7.61	151	13.1	n/a	
S16M000306		A	7439-92-1	Lead	ug/g	94.8	<0.0130	<13.1	<14.4	n/a	n/a	99.7	13.1	n/a	U
S16M000306		A	7704-34-9	Sulfur	ug/g	90.0	0.0438	289	227	258	24.1	93.4	28.2	n/a	
S16M000306		A	7440-36-0	Antimony	ug/g	89.8	<0.0180	<18.1	<19.9	n/a	n/a	78.2	18.1	n/a	U
S16M000306		A	7782-49-2	Selenium	ug/g	92.2	<0.0300	<30.2	<33.2	n/a	n/a	94.5	30.2	n/a	U
S16M000306		A	7440-21-3	Silicon	ug/g	81.0	0.0231	359	468	413	26.2	160	12.1	n/a	N
S16M000306		A	7440-24-6	Strontium	ug/g	92.7	<2.00E-03	19.8	17.7	18.8	11.0	98.9	2.02	n/a	B
S16M000306		A	7440-32-6	Titanium	ug/g	91.7	<2.00E-03	1.83E+03	1.88E+03	1.86E+03	3.23	137	2.02	n/a	N
S16M000306		A	7440-28-0	Thallium	ug/g	91.7	<0.0150	<15.1	<16.6	n/a	n/a	92.8	15.1	n/a	U

NA = Not Analyzed, ND = Not Detected

U - < Det Limit
X - Comment
N - Spike Outside Range
X - Rad Chem Comment
M - Inorganic RPD Outside Range
B - Inorganic Estimated
C - Inorganic Blank Contamination

242-Z-Waste-W4-W6 Tank Heels 2016-06
Data Summary Report

Sample Group: 20161902
SDG Number: 222S20161902
Customer Sample ID: B35Y77
Sample Portion: B35Y77

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
ICP-RCRA Metals															
S16M000306		A	7440-62-2	Vanadium	ug/g	93.4	<1.00E-03	22.0	31.0	26.5	34.0	96.7	1.01	n/a	XM
S16M000306		A	7440-65-5	Yttrium	ug/g	101	<2.00E-03	<2.02	<2.21	n/a	n/a	108	2.02	n/a	U
S16M000306		A	7440-66-6	Zinc	ug/g	90.6	<0.0320	<32.3	<35.4	n/a	n/a	97.8	32.3	n/a	U
ICP/MS															
S16M000306		A	13982-10-0	Plutonium-242	ug/g	103	<1.30E-05	3.12	2.91	3.02	7.15	-4940	0.0262	n/a	
Mercury by CVAA															
S16M000307		HG	7439-97-6	Mercury	ug/g	106	<1.10E-05	0.0269	0.0338	0.0304	22.9	103	1.90E-03	n/a	B
Plutonium-241 by LSC															
S16M000303		F	14119-32-5	Plutonium-241	uCi/g	88.4	<0.0141	254	213	234	17.6	n/a	3.20	3.276	
Pu238,239															
S16M000303		F	PU-239/240	Plutonium-239/240	uCi/g	112	<0.274	108	79.2	93.4	30.3	n/a	0.0623	0.64	X
S16M000303		F	13981-16-3	Plutonium-238	uCi/g	n/a	<0.397	10.4	7.64	9.01	30.3	n/a	0.0857	2.07	X
Sr-89/90 by GPC															
S16M000303		F	SR-89/90	Strontium-89/90	uCi/g	116	<4.02E-03	1.08E-02	8.91E-03	9.85E-03	19.2	n/a	5.03E-04	22.995	
pH on Solid Samples															
S16M000302			PH	pH	unitless	n/a	n/a	4.43	4.46	4.44	0.675	n/a	0.0100	n/a	

NA = Not Analyzed, ND = Not Detected

U - < Det Limit
X - Comment
N - Spike Outside Range
X - Rad Chem Comment
M - Inorganic RPD Outside Range
B - Inorganic Estimated
C - Inorganic Blank Contamination

Attachment 2

ANALYSIS DATE AND HOLDING TIME REPORT

ANALYSIS DATE AND HOLDING TIME REPORT

Laboratory Sample ID	Customer Sample ID	Method	Prep Method	Sample Date Time	Received Date	Preparation Date	Analysis Date	Missed Holding Time?
S16M000289	B31FL3	GPC-Gross Alpha/Beta	Fusion Digest, Separation	06/13/2016 10:30	06/28/2016 11:08	07/08/2016 10:42	07/12/2016 19:27	No
S16M000296	B35Y76	GPC-Gross Alpha/Beta	Fusion Digest, Separation	06/13/2016 10:15	06/28/2016 11:08	07/08/2016 10:42	07/12/2016 19:27	No
S16M000303	B35Y77	GPC-Gross Alpha/Beta	Fusion Digest, Separation	06/13/2016 10:45	06/28/2016 11:08	07/08/2016 10:42	07/12/2016 19:27	No
S16M000289	B31FL3	AEA-Am-241	Fusion Digest, Separation	06/13/2016 10:30	06/28/2016 11:08	07/08/2016 10:42	07/13/2016 15:55	No
S16M000296	B35Y76	AEA-Am-241	Fusion Digest, Separation	06/13/2016 10:15	06/28/2016 11:08	07/08/2016 10:42	07/13/2016 15:55	No
S16M000303	B35Y77	AEA-Am-241	Fusion Digest, Separation	06/13/2016 10:45	06/28/2016 11:08	07/08/2016 10:42	07/13/2016 15:56	No
S16M000289	B31FL3	GEA	Fusion Digest, Separation	06/13/2016 10:30	06/28/2016 11:08	07/08/2016 10:42	07/21/2016 09:34	No
S16M000296	B35Y76	GEA	Fusion Digest, Separation	06/13/2016 10:15	06/28/2016 11:08	07/08/2016 10:42	07/21/2016 09:20	No
S16M000303	B35Y77	GEA	Fusion Digest, Separation	06/13/2016 10:45	06/28/2016 11:08	07/08/2016 10:42	07/14/2016 13:03	No
S16M000293	B31FL3	CVAA-Mercury, SW-846 7471A	Acid Digest, SW-846 7471A	06/13/2016 10:30	06/28/2016 11:08	07/14/2016 17:00	07/14/2016 19:57	Yes
S16M000300	B35Y76	CVAA-Mercury, SW-846 7471A	Acid Digest, SW-846 7471A	06/13/2016 10:15	06/28/2016 11:08	07/14/2016 17:00	07/14/2016 19:57	Yes
S16M000307	B35Y77	CVAA-Mercury, SW-846 7471A	Acid Digest, SW-846 7471A	06/13/2016 10:45	06/28/2016 11:08	07/14/2016 17:00	07/14/2016 19:57	Yes
S16M000291	B31FL3	IC-Anions, SW-846 9056A	Water Digest	06/13/2016 10:30	06/28/2016 11:08	07/06/2016 09:09	07/08/2016 01:28	No
S16M000298	B35Y76	IC-Anions, SW-846 9056A	Water Digest	06/13/2016 10:15	06/28/2016 11:08	07/06/2016 09:13	07/08/2016 02:01	No
S16M000305	B35Y77	IC-Anions, SW-846 9056A	Water Digest	06/13/2016 10:45	06/28/2016 11:08	07/06/2016 09:17	07/07/2016 22:43	No
S16M000292	B31FL3	ICP/AES-Metals, SW-846 6010C	Acid Digest, SW-846 3050B	06/13/2016 10:30	06/28/2016 11:08	07/08/2016 10:00	07/22/2016 11:57	No
S16M000299	B35Y76	ICP/AES-Metals, SW-846 6010C	Acid Digest, SW-846 3050B	06/13/2016 10:15	06/28/2016 11:08	07/08/2016 10:00	07/22/2016 12:02	No
S16M000306	B35Y77	ICP/AES-Metals, SW-846 6010C	Acid Digest, SW-846 3050B	06/13/2016 10:45	06/28/2016 11:08	07/08/2016 10:00	07/22/2016 11:06	No
S16M000292	B31FL3	ICP/MS-Actinides, SW-846 6020A	Acid Digest, SW-846 3050B	06/13/2016 10:30	06/28/2016 11:08	07/08/2016 10:00	07/14/2016 14:24	No
S16M000299	B35Y76	ICP/MS-Actinides, SW-846 6020A	Acid Digest, SW-846 3050B	06/13/2016 10:15	06/28/2016 11:08	07/08/2016 10:00	07/14/2016 12:59	No
S16M000306	B35Y77	ICP/MS-Actinides, SW-846 6020A	Acid Digest, SW-846 3050B	06/13/2016 10:45	06/28/2016 11:08	07/08/2016 10:00	07/14/2016 13:52	No
S16M000288	B31FL3	PH Solid, SW-846 9045A	N/A	06/13/2016 10:30	06/28/2016 11:08	N/A	07/14/2016 10:00	No
S16M000295	B35Y76	PH Solid, SW-846 9045A	N/A	06/13/2016 10:15	06/28/2016 11:08	N/A	07/14/2016 10:00	No
S16M000302	B35Y77	PH Solid, SW-846 9045A	N/A	06/13/2016 10:45	06/28/2016 11:08	N/A	07/14/2016 10:00	No
S16M000289	B31FL3	AEA- Isotopic Plutonium	Fusion Digest, Separation	06/13/2016 10:30	06/28/2016 11:08	07/08/2016 10:42	07/13/2016 15:36	No
S16M000296	B35Y76	AEA- Isotopic Plutonium	Fusion Digest, Separation	06/13/2016 10:15	06/28/2016 11:08	07/08/2016 10:42	07/13/2016 15:36	No
S16M000303	B35Y77	AEA- Isotopic Plutonium	Fusion Digest, Separation	06/13/2016 10:45	06/28/2016 11:08	07/08/2016 10:42	07/13/2016 15:36	No
S16M000289	B31FL3	Pu-241 by LSC	Fusion Digest, Separation	06/13/2016 10:30	06/28/2016 11:08	07/08/2016 10:42	07/26/2016 19:20	No
S16M000296	B35Y76	Pu-241 by LSC	Fusion Digest, Separation	06/13/2016 10:15	06/28/2016 11:08	07/08/2016 10:42	07/26/2016 19:20	No
S16M000303	B35Y77	Pu-241 by LSC	Fusion Digest, Separation	06/13/2016 10:45	06/28/2016 11:08	07/08/2016 10:42	07/26/2016 19:20	No
S16M000289	B31FL3	GPC-Sr-89/90	Fusion Digest, Separation	06/13/2016 10:30	06/28/2016 11:08	07/08/2016 10:42	07/26/2016 20:25	No
S16M000296	B35Y76	GPC-Sr-89/90	Fusion Digest, Separation	06/13/2016 10:15	06/28/2016 11:08	07/08/2016 10:42	07/26/2016 20:25	No
S16M000303	B35Y77	GPC-Sr-89/90	Fusion Digest, Separation	06/13/2016 10:45	06/28/2016 11:08	07/08/2016 10:42	07/26/2016 20:25	No

Attachment 3

CORRESPONDENCE

ISOCS Item Report

Item ID:	Sample B31FL3
Date Assayed:	6/14/16
Item Mass, kg:	0.060
Isotopic Source:	242Z Default Isotopics

Isotope	Mass Fraction (% of tot-Pu)	Activity (uCi)	Total Uncrtnty (uCi)	Upper Limit (uCi)	Isotope Mass (g)	Total Uncrtnty (g)	Upper Limit (g)	Codes*
Pu-238	0.032%	1.16E+03	3.70E+02	1.90E+03	6.77E-05	2.16E-05	1.11E-04	I
Pu-239	90.452%	1.18E+04	1.28E+03	1.43E+04	1.90E-01	2.06E-02	2.31E-01	M
Pu-240	9.176%	4.37E+03	8.07E+02	5.98E+03	1.92E-02	3.56E-03	2.64E-02	I
Pu-242	0.180%	1.49E+00	7.63E-01	3.02E+00	3.77E-04	1.93E-04	7.62E-04	I
Np-237		9.22E-01	1.00E-01	1.12E+00	1.31E-03	1.42E-04	1.60E-03	M
Am-241	8.133%	5.85E+04	6.42E+03	7.14E+04	1.71E-02	1.87E-03	2.08E-02	M, C
Other TRU								
U-235								
U-238								
Pu-241	0.161%	3.48E+04	5.12E+03	4.50E+04	3.37E-04	4.96E-05	4.36E-04	I
Other								
Other								
Other								

Total Pu, g**	2.097E-01
Total Uncertainty, g***	2.360E-02
Upper Limit, g Pu****	2.569E-01

Total TRU Activity, uCi	7.58E+04
Total Uncertainty, uCi***	8.35E+03
Upper Limit, uCi****	9.25E+04

TRU Specific Activity, nCi/g	1.26E+06
Total Uncertainty, nCi/g***	1.39E+05
Upper Limit, nCi/g****	1.54E+06

Total Activity (TRU + non-TRU), uCi	1.11E+05
Total Uncertainty, uCi***	1.26E+04
Upper Limit, uCi****	1.36E+05

* Codes: M = Activity directly measured by ISOCS.
I = Activity inferred from ISOCS measured Pu-239 and mass fraction using identified isotopic source.
C = Mass fraction calculated from measured ISOCS value and total plutonium.

** Based on Pu-239 and mass fraction of Pu-239.

*** Uncertainties stated at 1 standard deviation.

**** The upper limit is the result plus 2 times the uncertainty. The Upper Limit, g Pu is also the PFP Criticality Value.

6-15-16
Calculated Date

6/16/16
Reviewed Date

PFP ISOCS V2.00

ISOCS Item Report

Item ID:	Sample B35Y76
Date Assayed:	6/13/16
Item Mass, kg:	0.050
Isotopic Source:	242Z Default Isotopics

Isotope	Mass Fraction (% of tot-Pu)	Activity (uCi)	Total Uncrtnty (uCi)	Upper Limit (uCi)	Isotope Mass (g)	Total Uncrtnty (g)	Upper Limit (g)	Codes*
Pu-238	0.032%	6.91E+01	2.20E+01	1.13E+02	4.04E-06	1.29E-06	6.61E-06	I
Pu-239	90.452%	7.01E+02	7.98E+01	8.61E+02	1.13E-02	1.29E-03	1.39E-02	M
Pu-240	9.176%	2.60E+02	4.81E+01	3.56E+02	1.15E-03	2.12E-04	1.57E-03	I
Pu-242	0.180%	8.89E-02	4.55E-02	1.80E-01	2.25E-05	1.15E-05	4.54E-05	I
Np-237		3.16E-01	3.45E-02	3.85E-01	4.49E-04	4.91E-05	5.48E-04	M
Am-241	147.183%	6.31E+04	6.93E+03	7.70E+04	1.84E-02	2.02E-03	2.24E-02	M, C
Other TRU								
U-235								
U-238								
Pu-241	0.161%	2.07E+03	3.05E+02	2.68E+03	2.01E-05	2.95E-06	2.60E-05	I
Other								
Other								
Other								

Total Pu, g**	1.249E-02
Total Uncertainty, g***	1.471E-03
Upper Limit, g Pu****	1.544E-02

Total TRU Activity, uCi	6.41E+04
Total Uncertainty, uCi***	7.04E+03
Upper Limit, uCi****	7.82E+04

TRU Specific Activity, nCi/g	1.27E+06
Total Uncertainty, nCi/g***	1.40E+05
Upper Limit, nCi/g****	1.55E+06

Total Activity (TRU + non-TRU), uCi	6.62E+04
Total Uncertainty, uCi***	7.27E+03
Upper Limit, uCi****	8.08E+04

* Codes: M = Activity directly measured by ISOCS.
I = Activity inferred from ISOCS measured Pu-239 and mass fraction using identified isotopic source.
C = Mass fraction calculated from measured ISOCS value and total plutonium.

** Based on Pu-239 and mass fraction of Pu-239.

*** Uncertainties stated at 1 standard deviation.

**** The upper limit is the result plus 2 times the uncertainty. The Upper Limit, g Pu is also the PFP Criticality Value.

6-14-16 6/16/16

Calculated Date Reviewed Date

PFP ISOCS V2.00

ISOCS Item Report

Item ID:	Sample B35Y77
Date Assayed:	6/13/16
Item Mass, kg:	0.050
Isotopic Source:	242Z Default Isotopics

Isotope	Mass Fraction (% of tot-Pu)	Activity (uCi)	Total Uncrtnty (uCi)	Upper Limit (uCi)	Isotope Mass (g)	Total Uncrtnty (g)	Upper Limit (g)	Codes*
Pu-238	0.032%	3.73E+02	1.19E+02	6.11E+02	2.18E-05	6.95E-06	3.57E-05	I
Pu-239	90.452%	3.78E+03	4.11E+02	4.61E+03	6.10E-02	6.62E-03	7.42E-02	M
Pu-240	9.176%	1.40E+03	2.60E+02	1.92E+03	6.19E-03	1.14E-03	8.48E-03	I
Pu-242	0.180%	4.80E-01	2.46E-01	9.71E-01	1.21E-04	6.20E-05	2.45E-04	I
Np-237		4.86E-02	5.33E-03	5.93E-02	6.91E-05	7.58E-06	8.42E-05	M
Am-241	0.424%	9.81E+02	1.08E+02	1.20E+03	2.86E-04	3.15E-05	3.49E-04	M, C
Other TRU								
U-235		3.07E-03	4.58E-04	3.99E-03	1.42E-03	2.12E-04	1.85E-03	M
U-238								
Pu-241	0.161%	1.12E+04	1.65E+03	1.45E+04	1.08E-04	1.59E-05	1.40E-04	I
Other								
Other								
Other								

Total Pu, g**	6.744E-02
Total Uncertainty, g***	7.592E-03
Upper Limit, g Pu****	8.262E-02

Total TRU Activity, uCi	6.54E+03
Total Uncertainty, uCi***	7.65E+02
Upper Limit, uCi****	8.07E+03

TRU Specific Activity, nCi/g	1.30E+05
Total Uncertainty, nCi/g***	1.52E+04
Upper Limit, nCi/g****	1.60E+05

Total Activity (TRU + non-TRU), uCi	1.77E+04
Total Uncertainty, uCi***	2.26E+03
Upper Limit, uCi****	2.22E+04

* Codes: M = Activity directly measured by ISOCS.
I = Activity inferred from ISOCS measured Pu-239 and mass fraction using identified isotopic source.
C = Mass fraction calculated from measured ISOCS value and total plutonium.

** Based on Pu-239 and mass fraction of Pu-239.

*** Uncertainties stated at 1 standard deviation.

**** The upper limit is the result plus 2 times the uncertainty. The Upper Limit, g Pu is also the PFP Criticality Value.

6-15-16
Calculated Date

6/16/16
Reviewed Date

PFP ISOCS V2.00

From: Menjivar, Carolina E
To: Todak, David
Cc: Widney, Richard J (Jeff); Wyse, Anne-Laure F; Scott, Anthony D
Subject: 242-Z Waste W-4-W6 Tank Heels 2016-06 - Preliminary Analytical Results
Date: Thursday, July 28, 2016 2:42:33 PM
Attachments: 20161902 Preliminary Analytical Results -072816.xls

---

David,
The attached file contains the preliminary analytical results for the Tank Heels-242-Z Tanks W-4 and W-6 solid samples received at the 222-S Laboratory on 06/28/16. These results have been reviewed by the primary chemists, but have not undergone through all the steps of the review process; therefore they are subject to change upon final review. Any changes will be noted on the final report.

This completes our commitment of 30 days turnaround time for preliminary results.

Should you have any questions, please let me know.

Thanks,

Carolina Menjivar
Senior Project Coordinator
Wastren Advantage Inc. Hanford Laboratory
Contractor to the Office of River Protection
U.S. Department of Energy
(509) 372-2525 (Office)
Carolina_E_Menjivar@rl.gov

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From: Menjivar, Carolina E
To: Todak, David
Subject: RE: 242-Z, W6 Tank Heel Solid Samples
Date: Wednesday, June 29, 2016 10:15:41 AM

David,

Yes, I can make the changes on the original COCs and use this email as your permission to do so.

Thanks,

Carolina Menjivar
Senior Project Coordinator
Wastren Advantage Inc. Hanford Laboratory
Contractor to the Office of River Protection
U.S. Department of Energy
(509) 372-2525 (Office)
Carolina_E_Menjivar@rl.gov

From: Todak, David
Sent: Wednesday, June 29, 2016 9:48 AM
To: Menjivar, Carolina E <Carolina_E_Menjivar@rl.gov>
Subject: RE: 242-Z, W6 Tank Heel Solid Samples

Hi Carolina,

I see now why the discrepancy exists. When we created the COCs, we thought the samples were most likely going offsite to Southwest Research Institute, which is also noted on the COCs and who does Pu-242 by AEA. After we performed the NDA, that turned out to not be the case and the samples were sent to 222-S, however the COCs were not revised accordingly. If you could change "Southwest Research Institute" to "222-S" and add Actinides by ICPMS back into the requested analyses, these discrepancies will be resolved. I can submit a SIR to this effect if you'd like, or you can just use this email if that's easier for you.

Thanks,

David Todak
Office: (509) 376-6427
Cell: (509) 947-1305
CHPRC Sample Management Office
Project Coordinator for:
Plutonium Finishing Plant

Soil and Groundwater Remediation Project - Drilling
Decommissioning, Waste, Fuels, and Remediation Services

From: Menjivar, Carolina E
Sent: Wednesday, June 29, 2016 8:33 AM
To: Todak, David <David_Todak@rl.gov>
Subject: 242-Z, W6 Tank Heel Solid Samples

David,

I need to discuss with you a discrepancy on the analyses listed on the chain of custody (COC) forms. The SAFs (F16-005 and F15-037) list a few metals to be analyzed by ICP/MS. However, the COCs do not include any metals to be tested by ICP/MS.
Also, Pu-242 by ICP/MS has been crossed out on the COC (please see attached).

Please

Thanks,

Carolina Menjivar
Senior Project Coordinator
Wastren Advantage Inc. Hanford Laboratory
Contractor to the Office of River Protection
U.S. Department of Energy
(509) 372-2525 (Office)
Carolina_E_Menjivar@rl.gov

WAI
HANFORD
LABORATORY

Attachment 4

RECEIPT PAPERWORK

222-S	SAMPLE RECEIPT AND CHAIN OF CUSTODY VERIFICATION CHECKLIST	ATS-LO-090-101 Rev DG-1

Date Samples Received: 6-28-17 Total Number of Samples: 3 Group #: 20161902

Sample Custodian: Sharon L Holden IH Technician: N/A

Sample Custodian to Complete:

Action	Yes	No	N/A	Comments
RSR provided?			✓	CHPRC SPZ Transfer - Signature page in place of RSR
Verify GKI is complete			✓	☑ In Project File
Received from an alpha facility?	✓			☐ Contact PC for approval to release
Check that outer custody seal is intact, if present	✓			
Record cooler temperature in centigrade, as appropriate			✓	☑ Check if no cooler and/or no ice
Samples are intact and in good condition	✓			If No, provide comments below
RSA/COC provided and complete containing the following information?				
• Client name and client sample number	✓			* See note below - mms 6/29/16
• Date and time of sampling			✓	will verify upon breakdown of Drum
• Sampling location or origin	✓			
• Container type, size, and number	✓			
• Preservatives (if used) noted on the ~~COC/RSA~~ and sample bottles			✓	
• Analysis request is clear	✓			
• Signature of persons relinquishing and receiving samples	✓			
• Date and/or time of sample custody exchange	✓			
Verify that sample numbers on containers match the COC and/or RSA	✓			
Samples stored properly (e.g., refrigeration)	✓			

Notify the PC immediately if any problems are noted. Any "No" checked boxes require PC resolution. For WRPS samples, the initials block below is completed by the responsible WRPS PC.

Samples acceptable for release? Yes PC/SC Initials SLM Date 6-28-16

If No, comment on communication and resolution:

(3) 242-Z solid waste samples

Sample Breakdown on 6-28-16 ~~Att~~ verified all Info on labels match COC's

Number of IH Samples Received:

Aldehyde Screen:	Amines:	Ammonia:	Aromatic HC:	Asbestos:
Beryllium:	Be-Bulk:	Be-Filter:	Be-Wipe	1,3-Butadiene:
Formaldehyde:	Furans:	Mercury:	Methanol:	Nitrosamines:
Nitrous Oxide:	Pyridines:	SVOA:	VOA:	Other-IH:

A-6005-302 (REV 4)

CH2MHill Plateau Remediation Company

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

F15-037-001 | **PAGE 1 OF 1**

COLLECTOR K.C. Patterson/CHPRC	**COMPANY CONTACT** TODAK, D	**TELEPHONE NO.** 376-6427	**PROJECT COORDINATOR** TODAK, D
SAMPLING LOCATION 242-Z Solid Waste #1	**PROJECT DESIGNATION** 242-Z Solid Waste Samples		**SAF NO.** F15-037
ICE CHEST NO.	**FIELD LOGBOOK NO.** HNF-N-507 34	**ACTUAL SAMPLE DEPTH** N/A	**COA** 303531
SHIPPED TO 222-S Laboratory ~~Southwest Research Institute~~ cem 06/29/16	**OFFSITE PROPERTY NO.**		**BILL OF LADING/AIR BILL NO.**

PRICE CODE 9H | **AIR QUALITY** ☐ | **DATA TURNAROUND** 30 Days / 30 Days

METHOD OF SHIPMENT FEDERAL EXPRESS

ORIGINAL

MATRIX*
A=Air
DL=Drum Liquids
DS=Drum Solids
L=Liquid
O=Oil
S=Soil
SE=Sediment
T=Tissue
V=Vegetation
W=Water
WI=Wipe
X=Other

POSSIBLE SAMPLE HAZARDS/ REMARKS
*Contains Radioactive Material at concentrations that are not be regulated for transportation per 49 CFR/IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1.

SPECIAL HANDLING AND/OR STORAGE

PRESERVATION	None
HOLDING TIME	28 Days
TYPE OF CONTAINER	aG/P
NO. OF CONTAINER(S)	1
VOLUME	120mL
SAMPLE ANALYSIS	SEE ITEM (1) IN SPECIAL INSTRUCTIONS

OMNI
20161902
~~S1670~~ QLM 6-28-16
S16M000288
QLM
6-28-16
MARS

SAMPLE NO.	**MATRIX***	**SAMPLE DATE**	**SAMPLE TIME**
B31FL3	OTHER SOLID	JUN 13 2016	1030

CHAIN OF POSSESSION / **SIGN/ PRINT NAMES**

RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME
K.C. Patterson/CHPRC	JUN 13 2016 1130	192A	JUN 13 2016 1130
192A Dirk Sorenson	6/23/16 1420	Michael Espinoza	6-23-16 1426
Michael Espinoza	6/23/16 1615	CR Bloom / 192	6-23-16/1616
Ty Bloom / CR Bloom	6-28-16 0821	DAVID CONNELL	6/28/2016 8:21
DAVID CONNELL	6-28-16 11:08	Holday / Shavar L Holder	6-28-16 11:08

SPECIAL INSTRUCTIONS

TRVL-15-090
(1) 7471_MERCURY_CV: COMMON (SOLIDS); 6010_METALS_ICP: COMMON {Arsenic, Barium, Cadmium, Chromium, Potassium, Silver, Sodium}; 6010_METALS_ICP: COMMON (Add-on) {Aluminum, Beryllium, Lead, Selenium}; 9056_ANIONS_IC: COMMON; 9045_pH (Non-Aqueous): COMMON; ~~Actinides ICPMS: COMMON {Plutonium-242}~~; GAMMA_GS: COMMON; ALPHA_GPC: COMMON {Gross alpha}; BETA_GPC: COMMON {Gross beta}; AMCMISO_IE_PRECIP_AEA: COMMON; PU241_IE_LSC: COMMON {Plutonium-241}; PUISO_IE_PRECIP_AEA: COMMON {Plutonium-238, Plutonium-239/240, ~~Plutonium-242}~~; Actinides ICPMS: COMMON (Plutonium-242)
cem 06/29/2016.

LABORATORY SECTION	**RECEIVED BY**	**TITLE**	**DATE/TIME**
FINAL SAMPLE DISPOSITION	**DISPOSAL METHOD**	**DISPOSED BY**	**DATE/TIME**

PRINTED ON 6/9/2016 | **FSR ID = FSR33084** | **TRVL NUM = TRVL-15-090** | A-6003-618 (REV 2)

CH2MHill Plateau Remediation Company

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

F16-005-002

PAGE 1 OF 1

COLLECTOR K.C. Patterson/CHPRC	**COMPANY CONTACT** TODAK, D	**TELEPHONE NO.** 376-6427	**PROJECT COORDINATOR** TODAK, D
SAMPLING LOCATION 242-Z, W-6 Tank Heel solid	**PROJECT DESIGNATION** Tank Heels - 242-Z Tanks W-4 and W-6 - Other Solid		**SAF NO.** F16-005
ICE CHEST NO.	**FIELD LOGBOOK NO.** HNF-N- 507 34	**ACTUAL SAMPLE DEPTH** N/A	**COA** 303088
SHIPPED TO 222-S Laboratory ~~Southwest Research Institute~~ cem 06/29/16.	**OFFSITE PROPERTY NO.**		**BILL OF LADING/AIR BILL NO.**

PRICE CODE 9H

AIR QUALITY ☐

DATA TURNAROUND 30 Days / 30 Days

METHOD OF SHIPMENT FEDERAL EXPRESS

ORIGINAL

MATRIX*
A=Air
DL=Drum Liquids
DS=Drum Solids
L=Liquid
O=Oil
S=Soil
SE=Sediment
T=Tissue
V=Vegetation
W=Water
WI=Wipe
X=Other

POSSIBLE SAMPLE HAZARDS/ REMARKS
*Contains Radioactive Material at concentrations that are not be regulated for transportation per 49 CFR/IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1.

SPECIAL HANDLING AND/OR STORAGE

PRESERVATION	None
HOLDING TIME	28 Days
TYPE OF CONTAINER	aG/P
NO. OF CONTAINER(S)	1
VOLUME	120mL
SAMPLE ANALYSIS	SEE ITEM (1) IN SPECIAL INSTRUCTIONS

OMNI ✓
QAL 6-28-16
$ 20161902 ✓
S16M000295 ✓
BLH
6-28-16

MARS ✓

SAMPLE NO.	MATRIX*	SAMPLE DATE	SAMPLE TIME	
B35Y76	OTHER SOLID	JUN 13 2016	1015	✓

CHAIN OF POSSESSION / SIGN/ PRINT NAMES

RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME
K.C. Patterson/CHPRC	JUN 13 2016 1130	192A	JUN 13 2016 1130
192A Desorenzo	6/23/16 1415	Michael Esparza	6-23-16 1420
Michael Esparza	6-23-16 1615	Ty Bloom / 192	6-23-16 1616
Ty Bloom	6-28-16 0823	DAVID CONNELL	6-28-16 8:23
DAVID CONNELL	6-28-16 11:08	Sharon L Holden	6-28-16 11:08

SPECIAL INSTRUCTIONS

TRVL-15-090
(1) 7471_MERCURY_CV: COMMON (SOLIDS); 6010_METALS_ICP: COMMON {Barium, Cadmium, Chromium, Silver}; 6010_METALS_ICP: COMMON (Add-on) {Arsenic, Beryllium, Lead, Selenium}; 9056_ANIONS_IC: COMMON; 9045_pH (Non-Aqueous): COMMON; GAMMA_GS: COMMON; ~~Actinides ICPMS: COMMON {Plutonium-242}~~; ALPHA_GPC: COMMON {Gross alpha}; BETA_GPC: COMMON {Gross beta}; AMCMISO_IE_PRECIP_AEA: COMMON; PU241_IE_LSC: COMMON; PUISO_IE_PRECIP_AEA: COMMON {Plutonium-238, Plutonium-239/240}; Actinides ICPMS: COMMON (Plutonium-242) cem - 06/29/2016. Sal 6-9-16

LABORATORY SECTION	**RECEIVED BY**	**TITLE**	**DATE/TIME**
FINAL SAMPLE DISPOSITION	**DISPOSAL METHOD**	**DISPOSED BY**	**DATE/TIME**

PRINTED ON 6/9/2016 **FSR ID = FSR33088** **TRVL NUM = TRVL-15-090** A-6003-618 (REV 2)

CH2MHill Plateau Remediation Company

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

F16-005-003 **PAGE 1 OF 1**

COLLECTOR K.C. Patterson/CHPRC	**COMPANY CONTACT** TODAK, D	**TELEPHONE NO.** 376-6427	**PROJECT COORDINATOR** TODAK, D	**PRICE CODE** 9H
DATA TURNAROUND 30 Days / 30 Days	**SAMPLING LOCATION** 242-Z, floor trench solid	**PROJECT DESIGNATION** Tank Heels - 242-Z Tanks W-4 and W-6 - Other Solid	**SAF NO.** F16-005	**AIR QUALITY** ☐
ICE CHEST NO.	**FIELD LOGBOOK NO.** HNF-N-507 34	**ACTUAL SAMPLE DEPTH** N/A	**COA** 303088	**METHOD OF SHIPMENT** FEDERAL EXPRESS
ORIGINAL	**SHIPPED TO** 222-S Laboratory ~~Southwest Research Institute~~ cem 06/29/16	**OFFSITE PROPERTY NO.**	**BILL OF LADING/AIR BILL NO.**	

MATRIX*
A=Air
DL=Drum Liquids
DS=Drum Solids
L=Liquid
O=Oil
S=Soil
SE=Sediment
T=Tissue
V=Vegetation
W=Water
WI=Wipe
X=Other

POSSIBLE SAMPLE HAZARDS/ REMARKS
*Contains Radioactive Material at concentrations that are not be regulated for transportation per 49 CFR/IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1.

SPECIAL HANDLING AND/OR STORAGE

PRESERVATION	None
HOLDING TIME	28 Days
TYPE OF CONTAINER	aG/P
NO. OF CONTAINER(S)	1
VOLUME	120mL
SAMPLE ANALYSIS	SEE ITEM (1) IN SPECIAL INSTRUCTIONS

OMNI ✓
20161902 ✓
S16M000302 ✓
SLU
6 28 16
MARS ✓

SAMPLE NO.	MATRIX*	SAMPLE DATE	SAMPLE TIME	
B35Y77	OTHER SOLID	JUN 1 3 2016	1045	✓

CHAIN OF POSSESSION / **SIGN/ PRINT NAMES**

RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME
K.C. Patterson/CHPRC	JUN 1 3 2016 1130	192A	JUN 1 3 2016 1130
192A	6/23/16 1420	Michael Esparza	6-23-16 1426
Michael Esparza	6-23-16 1615	TyBloom/192	6-23-16 1616
TyBloom	6-28-16 0823	DAVID CONNELL	6-28-16 8:23
DAVID CONNELL	6-28-16 11:08	Sharon Hobbs	6-28-16 1108

SPECIAL INSTRUCTIONS
TRVL-15-090
(1) 7471_MERCURY_CV: COMMON (SOLIDS); 6010_METALS_ICP: COMMON {Barium, Cadmium, Chromium, Silver}; 6010_METALS_ICP: COMMON (Add-on) {Arsenic, Beryllium, Lead, Selenium}; 9056_ANIONS_IC: COMMON; 9045_pH (Non-Aqueous): COMMON; GAMMA_GS: COMMON; ~~Actinides ICPMS: COMMON {Plutonium-242}~~; ALPHA_GPC: COMMON {Gross alpha}; BETA_GPC: COMMON {Gross beta}; AMCMISO_IE_PRECIP_AEA: COMMON; PU241_IE_LSC: COMMON; PUISO_IE_PRECIP_AEA: COMMON {Plutonium-238, Plutonium-239/240}; Actinides ICPMS: COMMON (Plutonium-242) cem 06/29/16. Sal 6/9/16

LABORATORY SECTION	**RECEIVED BY**	**TITLE**	**DATE/TIME**
FINAL SAMPLE DISPOSITION	**DISPOSAL METHOD**	**DISPOSED BY**	**DATE/TIME**

PRINTED ON 6/9/2016 **FSR ID = FSR33089** **TRVL NUM = TRVL-15-090** A-6003-618 (REV 2)

GENERATOR KNOWLEDGE INFORMATION

1. Chain of Custody Number _____ CACN/COA _____ Customer Identification Number PFP

2. List generator knowledge or description of process that produced sample. Or list description of sample source:
   3 Samples from 242-Z: W-6 tank, ice cream cartons, and floor trench.

   MSDS Available? ◉ No ○ Yes Hanford MSDS No. _____

3. List all waste codes and constituents associated with the waste or media that was sampled, regardless of CERCLA status.
   a) Does the sample contain any of the following listed waste codes?
   By checking "unknown" the customer understands that no knowledge is available following a careful search.

	List Federal Waste Code(s):	List Constituent(s):			
P Codes:			○ Yes	◉ No	
U Codes:			○ Yes	◉ No	
K Codes:			○ Yes	◉ No	○ Unknown
F Codes:			○ Yes	◉ No	○ Unknown

   b) List applicable characteristic waste codes, flash point, pH, constituents, and concentrations as appropriate.

D001:	☐ FP <100°F	☐ FP ≥100 <140°F	☐ DOT Oxidizer	○ Yes	○ No	◉ Unknown
D002:	☐ pH ≤2	☐ pH ≥12.5	☐ Solid Corrosive (WSC2)	○ Yes	○ No	◉ Unknown
D003:	☐ Cyanide	☐ Sulfide	☐ Water Reactive	☐ Other _____ (i.e., peroxide former, explosive, air reactive)	○ Yes	○ No	◉ Unknown
D004-D043 (Identify applicable waste codes and concentrations):					○ Yes	○ No	◉ Unknown

   c) If characteristic, list any known underlying hazardous constituents (UHCs) reasonably expected to be present, and their concentrations that may be present above the LDR treatment standard (40 CFR 268.48):
   Unknown

   d) List any known Land Disposal Restrictions (LDR) subcategories, if applicable (40 CFR 268.40):
   Unknown

   e) List any applicable Washington State dangerous waste codes: (not required if federally regulated)

WT01:	○ Yes	○ No	◉ Unknown
WT02:	○ Yes	○ No	◉ Unknown
W001:	○ Yes	○ No	◉ Unknown

   List constituents and concentrations:

   (*State mixture rule for ignitability)

WP01:	○ Yes	○ No	◉ Unknown
WP02:	○ Yes	○ No	◉ Unknown
WP03:	○ Yes	○ No	◉ Unknown
F003:*	○ Yes	○ No	◉ Unknown

4. Is this material TSCA regulated for PCBs? ○ Yes ◉ No ○ Unknown ○ Analysis Requested

   List concentration if applicable: _____

   If yes, what is the source of the PCBs? (see TSCA PCB Hanford Site User Guide, DOE/RL-2001-50)

   ☐ PCB Liquid Waste ☐ PCB Bulk Product Waste ☐ PCB Transformer ≥500 ppm ☐ Unknown
   ☐ PCB Remediation Waste ☐ PCB R&D Waste ☐ PCB contaminated electrical equipment (capacitor/ballast) <500 ppm
   ☐ PCB Spill Material ☐ PCB Item ☐ Other PCB Waste (list) _____

5. Is this material TRU? ◉ Yes ○ No ○ Unknown

6. ACCURACY OF INFORMATION
   Based on my inquiry of those individuals immediately responsible for obtaining this information, that to the best of my knowledge, the information entered in this document is true, accurate, and complete.

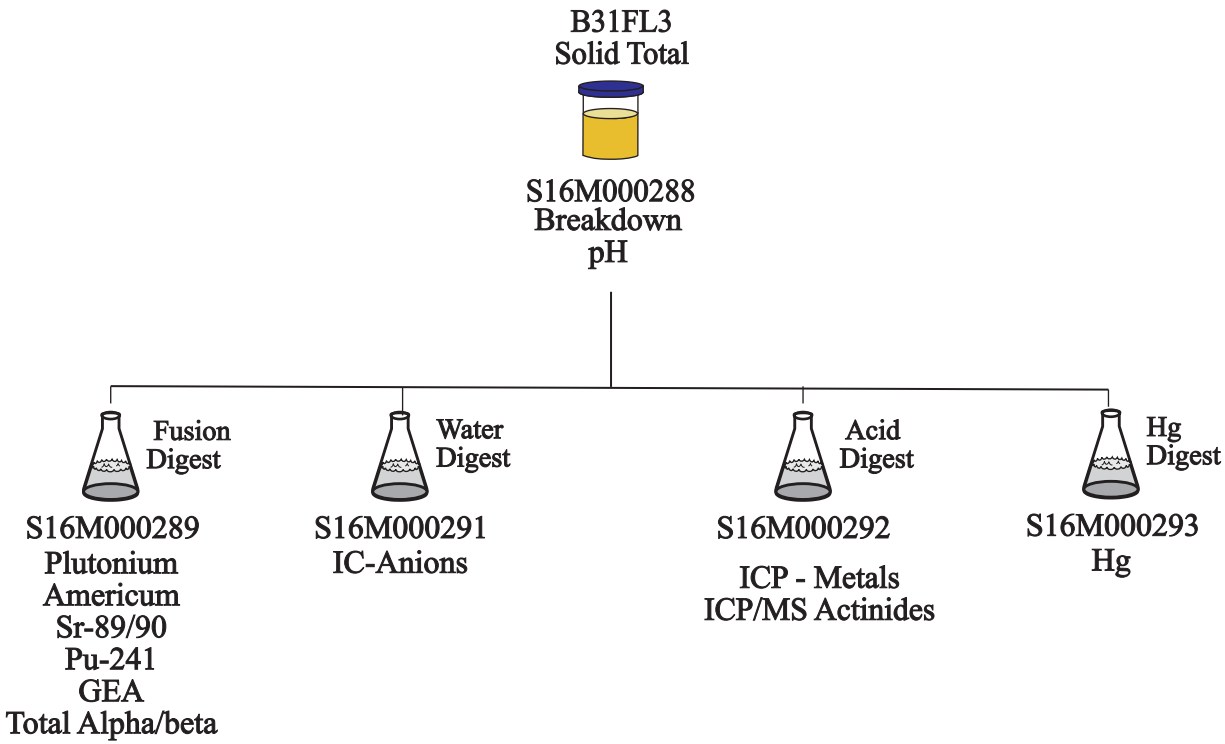
   Print & Sign RJ Wordney _____ Date 6/23/16

 A-6002-990 (REV 1)

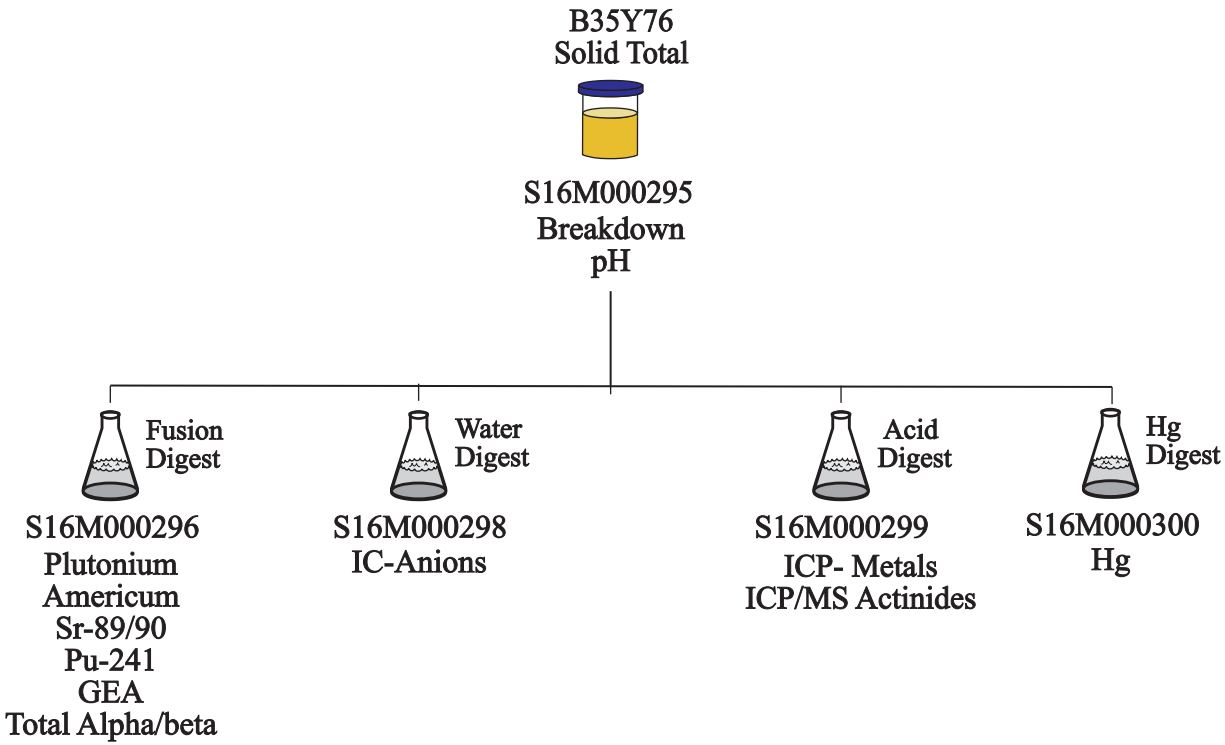
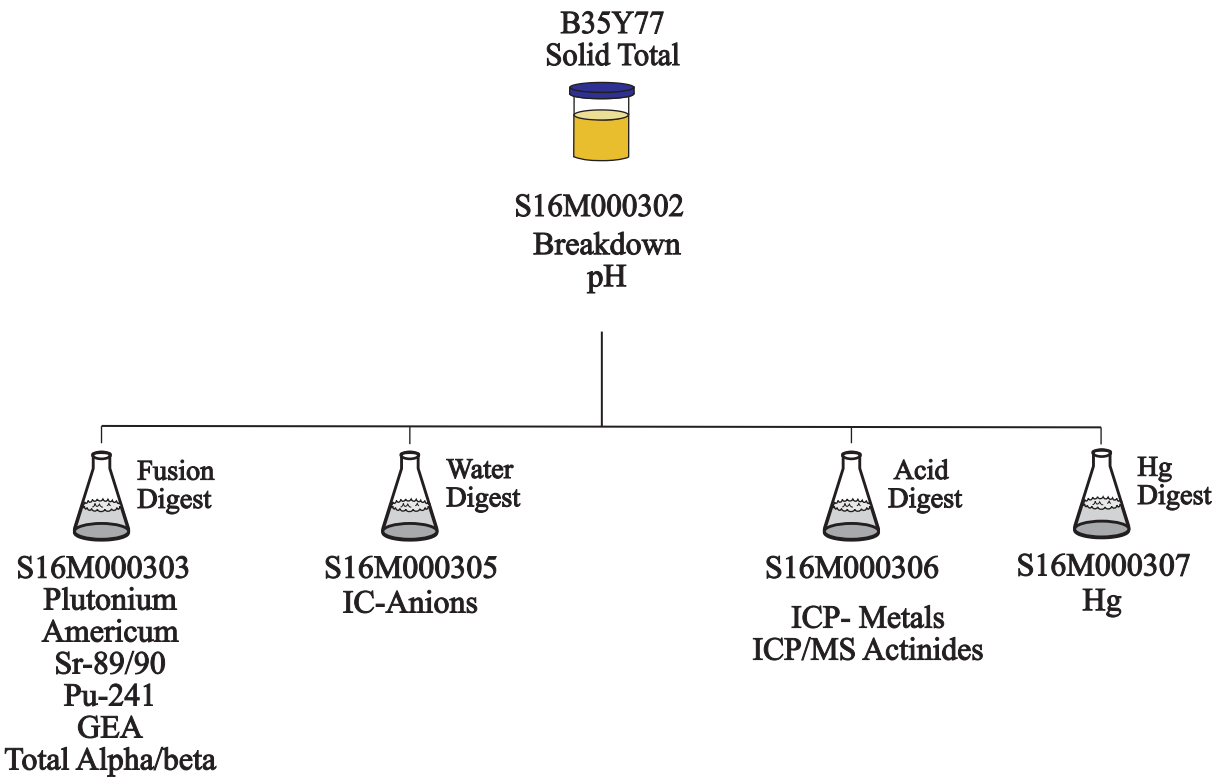
Attachment 5

SAMPLE BREAKDOWN DIAGRAMS

242-Z Waste/W-4/W6 Tank Heels
Sample Group: 20161902
SAF No. F15-037



242-Z Waste/W-4/W6 Tank Heels
Sample Group: 20161902
SAF No. F16-005



242-Z Waste/W-4/W6 Tank Heels
Sample Grpup: 20161902
SAF No. F16-005