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Characterization of WM-183 Tank Solids

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This Engineering Design File describes data generated from solid samples collected following the re-washing of Tank WM-183.

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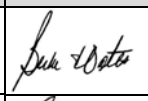
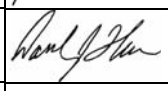
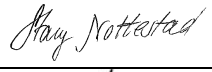
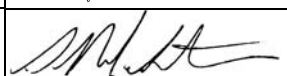
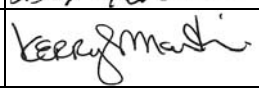
Author	A	Berta E. Oates		3-16-06
Reviewer	R	Dave Thorne, CHP		3-16-06
Reviewer	R	Stacy Nottestad		3-16-06
Independent Review	R	S. Nick Stanisich, CIH		3-16-06
Project Manager	R/A	Kerry L. Martin		3-16-06

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TABLES

ACRONYMS

CFR	Code of Federal Regulations
DOE	Department of Energy
EDF	engineering design file
ICP-MS	inductively coupled plasma-mass spectrometry
INL	Idaho National Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
L&V	limitations and validation report
MDA	minimum detectable activity
NA	not applicable
ND	not detected
PA	performance assessment
R&D	research and development
SAP	sampling and analysis plan
TFF	Tank Farm Facility

1. INTRODUCTION

Tank WM-183 is one of 15 tanks included in the closure activities at the Idaho National Laboratory (INL) Idaho Nuclear Technology and Engineering Center (INTEC) Tank Farm Facility (TFF). The cleaning of Tank WM-183 was performed as part of the Resource Conservation and Recovery Act (RCRA) interim status closure requirements and Department of Energy (DOE) tank requirements. For RCRA clean closure, the assessment of data generated from the liquids remaining in the tank following decontamination (ICP 2006) indicates that the concentrations of RCRA-regulated constituents were reduced to levels below the action levels specified for clean closure in *Idaho Hazardous Waste Management Act/Resource Conservation and Recovery Act Closure Plan for Idaho Nuclear Technology and Engineering Center Tanks WM-182 and WM-183* (DOE-ID 2003a). Likewise, for DOE closure, the data quality assessment report (ICP 2006) demonstrates that radionuclide data generated from liquids remaining in the tank were reduced to levels at or below the radionuclide concentrations presented in the *Performance Assessment for the Tank Farm Facility at the Idaho National Engineering and Environmental Laboratory* (DOE-ID 2003b).

The requirements for sampling and analysis of solids are included in the *Sampling and Analysis Plan for the Post-Decontamination Characterization of the WM-182 and WM-183 Tank Residuals* (INEEL 2002). Because decontamination activities reduced the volume of solids remaining in the tank to less than 15% by volume of the total sample collected, the solids portion of the samples collected were not analyzed and compared with the action levels for RCRA-regulated constituents. However, enough solids were collected from the sampling of WM-183 to allow for the limited determination of radionuclides. Therefore, the purpose of this Engineering Design File (EDF) is to document the characterization of radionuclides present in solids collected following the decontamination of Tank WM-183. This EDF provides information pertaining to the solids collected, results from sample analysis, and limitations of the data generated.

2. SAMPLING

Three solids sampling events occurred for Tank WM-183. The first sampling event was conducted in direct support of the tank closure according to SAP (INEEL 2002) requirements. Sample CP10061901 is a composite solids sample collected 1/15/2003 upon receipt of liquid sample CP10060401. Solids were filtered, dried, re-labeled as CP10061901, logged into the remote analytical laboratory management system as number 030128-2 for tracking, and stored for further analysis.

The second sampling event was performed to collect material for research and development (R&D) tests on filtration of sodium bearing wastes. This sampling event was witnessed by TFF Closure Project personnel but was not conducted in direct support of Tank WM-183 closure and did not follow the Closure SAP requirements. Sample HTD0120101 is a composite R&D sample collected in April 2003. Chain-of-custody protocols were not initiated during the R&D sampling; however, tracking of the R&D sample was initiated when logged in by the remote analytical laboratory on 5/12/2003 under number 030401-5.

The unused R&D sample was provided to the TFF closure project to supply the project with additional data. In October 2003, solids were filtered from the sample, dried, re-labeled as

CP10062801 and stored for further analysis. The solid sample was logged in the analytical laboratory computer system as number 031015-3.

The third solid sampling activity was conducted after additional washing was performed in Tank WM-183 in March, 2005. While flushing demineralized water into WM-180 as part of the TFF Closure Project, the level of WM-183 tank contents was noted to have increased. Upon further investigation it was determined that approximately 200 gal of waste and water had leaked into the tank during transfers of WM-180 waste to the evaporator tank system and WM-187 between July and October 2004. The leakage was determined to have been through Valve PUV-09 in Valve Box A5. The valve was repaired and then the second jet in WM-180 was used to flush demineralized water to check the integrity of the valve. Tank WM-183 was re-cleaned between March 1 and 7, 2005, and sampled per the original SAP (INEEL 2002).

Sample CP20040701 is a composite solids sample collected 3/14/2005. Upon receipt of liquid sample CP20040201, solids were filtered, dried, re-labeled as CP20040701, logged into the remote analytical laboratory computer system as number 050517-4 for tracking, and stored for further analysis.

3. SAMPLE ANALYSIS RESULTS

The data generated from the analyses conducted on the solids from the three sampling events are discussed in this section. Insufficient data are available to perform statistics or compute an upper confidence level. Rather, the data are presented in tabular format and discussed.

The small quantity of solid sample limited the number of radionuclides that could be analyzed. The gamma-emitting radionuclides present in the composite solids samples were determined by gamma-spectroscopy. The selection of radionuclide analyses requiring destructive chemical separation techniques (i.e., wet chemistry methods) was prioritized according to sample material available and radionuclides that significantly impact dose (^{90} Sr, ^{99}Tc, and ^{129}I). For sample CP20040701 both total strontium and ^{90}Sr analyses were conducted. Otherwise, total strontium analysis data were used as ^{90}Sr because all other isotopes of strontium are short-lived and would not be present in the tank residues. The reported results for Sr and ^{129}I were determined through beta counting. The reported result for ^{99}Tc was determined by inductively coupled plasma-mass spectrometry (ICP-MS). Insufficient sample material remained for further characterization of composite sample CP100619001; however, additional analyses for select alpha-emitting radionuclides (isotopes of Pu and U) were conducted on the R&D sample CP100628001. Sample CP20040701 had sufficient material to allow for further select analyses, including isotopes of Pu and U, ^{241}Am, ^{237}Np, ^{63}Ni , ^{14}C, and both ^{90}Sr and total Sr. Table 1 presents the results for radionuclides positively detected in sample CP10061901, R&D sample CP100628001, and sample CP20040701.

The data generated were validated according to INL guidelines, and validation flags were assigned based on the corresponding quality control results. No significant data quality issues that negatively impact data usability were noted. The results of all radionuclides analyzed from the three samples and the associated validation flags are presented in Attachment 1.

During validation of the gamma-emitting nuclide data for solids sample CP100619001 (Portage 2003), reported results that were not statistically positive at the 95% confidence limit or were below the respective MDA were assigned a "U" (undetected) validation flag.

During validation of the data generated from the analyses of R&D sample CP100628001, both positive and undetected results for gamma-emitting nuclides, total Sr, and alpha emitting nuclides were flagged "J" (estimated) because the 6 month holding time was exceeded (Portage 2004). Short lived isotopes (those with half-lives less than two years) are known not to be present given the age of the waste in the tank; therefore, the impact of a six month holding time is negligible on long-lived radionuclides. Therefore, data usability is not negatively impacted by holding time.

During validation of the data generated from the analyses of solids sample CP20040701, the reported results for gamma- and alpha-emitting radionuclides that were not statistically positive at the 95% confidence limit or were below the respective MDA were assigned a "U" (undetected) validation flag (Portage 2005b). During the validation of ^{14}C, ^{241}Pu, ^{63}Ni, ^{90}Sr data, the reported results were assigned a "J" (estimated) validation flag to denote that the analyses were conducted beyond the six month holding time (Portage 2005e). The sample was maintained in a controlled environment and properly stored. The half-lives of these radionuclides are long enough to not be significantly impacted by the holding time violation; therefore, the impact to data usability is minimal.

The holding time between sample collections and ICP-MS analysis was exceeded in the ^{99}Tc analyses for samples CP100619001, R&D sample CP100628001, and CP20040701 (Portage 2005 a, 2005d). However, the sample integrity was not compromised because the samples were air dried and maintained in a dried form until analysis. The samples were not exposed to high temperatures during sample preparation, were stored in a stable form, and the half-life ^{99}Tc (211,100 years) is long enough not to be significantly influenced by the holding time. Therefore, data usability was not negatively impacted by the violation of the holding time. The validation flag "J" (estimated) was assigned to all reported results for sample CP100619001 and the R&D sample CP100628001to denote a potential high bias based on ruthenium interference. The element ruthenium causes an interference in ICP-MS analysis because the isotope ^{99}Ru cannot be distinguished from ^{99}Tc by ICP-MS. Therefore, all ^{99}Tc results are reported as maximum concentrations. A potential high bias makes the decisions based on the reported results more conservative and does not negatively impact the data usability. Sample CP20040701 underwent a newly developed separation technique that significantly reduced the Ru concentrations and eliminated the impact of the potential high bias. The validation flag "J" was assigned to the reported result for sample CP20040701 because the precision between laboratory duplicate sample results (48.6% relative percent difference) exceeded the 35% RPD criterion (Portage 2005d). The other laboratory quality control analyses indicated acceptable laboratory precision. The impact to data usability is deemed to be negligible.

In the validation of the ^{129}I data from both sample CP100619001 and R&D sample CP100628001, "J" validation flags were assigned to sample results due to analytical yields (39.6% and 31.1%) slightly below the 40-110% recovery limits (Portage 2005b). The data usability is not negatively impacted because the sample results reported are corrected for the analytical yield. The ^{129}I result for sample CP20040701 was assigned a "J" validation flag (Portage 2005e) because the holding time between sample collection and analysis exceeded six

months. The sample was properly stored and maintained in a controlled environment. The half-life of ^{129}I (15.7 million years) is not influenced by the holding time, and the impact to data usability is minimal.

In addition to the previously discussed methods used to quantify radionuclides, X-ray diffraction (XRD) was also performed to determine the crystalline structure. The technique is nondestructive, meaning that the solids are not altered or consumed to generate the information. However, the information provided by X-ray diffraction is qualitative rather than quantitative; and, the results have limitations in usability. Based on XRD analysis, three major crystalline components were identified in the R&D sample CP10062801: SiO_2 (Quartz), $Cs_3P_3O_9$ (Cesium Phosphate Hydrate), and $Rb_4Th(WO_4)_4$ (beta Rubidium Thorium Tungsten Oxide). In addition, minor components that are *possibly* present in the crystalline structure include: $C_{18}H_{15}N_3Te$ (tellurium azide triphenyl), $Zr(P_2O_7)$ (zirconium phosphate), $ThO_{2.2}Ta_2O_5$ (thorium tantalum oxide), $Nb_3Se_{10}Br_2$ (niobium selenium bromide), Si_5Br_{10} (silicon bromide), and $Sb_2(P_2O_7)_2$ (antimony phosphate) (BBWI 2006). XRD was also performed on CP20040701 solids; however, XRD analysis results were not available prior to the publication of this EDF.

Table 1. Radionuclides detected in composite solid samples CP10061901, CP10062801, and CP20040701.

Radionuclide	CP10061901 (pCi/g)	CP10062801 (pCi/g)	CP20040701 (pCi/g)
^{99}Tc[a]	6.17E+05	4.25E+05	1.10E+05
Total Sr	2.39E+07	1.67E+07	1.34E+07
^{90}Sr	NA[c]	NA[c]	1.50E+07
^{125}Sb	2.77E+06	6.78E+06	ND[b]
^{137}Cs	1.19E+09	1.16E+09	7.45E+08
^{60}Co	1.49E+05	1.87E+05	8.28E+04
^{154}Eu	7.92E+04	ND[b]	9.09E+04
^{241}Am (gamma)	3.40E+05	ND[b]	ND[b]
^{241}Am (alpha)	NA[c]	NA[c]	3.35E+05
^{129}I	6.24E+02	4.96E+02	8.44E+02
^{94}Nb	ND[b]	1.66E+05	NA[c]
^{238}Pu	NA[c]	9.99E+06	9.70E+06
$^{239/240}Pu$	NA[c]	2.75E+06	3.17E+06
^{241}Pu	NA[c]	NA[c]	1.01E+07
^{234}U	NA[c]	2.98E+03	ND[b]
^{14}C	NA[c]	NA[c]	2.15E+04
^{63}Ni	NA[c]	NA[c]	1.96E+05
^{237}Np	NA[c]	NA[c]	1.01E+04

a. Determined by ICP-MS.
b. ND = Not detected. This radionuclide was analyzed for but the reported result was flagged "U" undetected during validation.
c. NA = Not available. This radionuclide was not analyzed for in this sample.

4. CONCLUSIONS

Solids collected following the decontamination of Tank WM-183 were obtained during three different sampling events. Samples CP10061901 and CP20040701 were collected according to SAP requirements and chain of custody protocol were maintained; therefore, the data from both composite samples CP10061901 and CP20040701 should be considered to be legally defensible. No chain of custody documentation was initiated during collection of sample CP10062801, which was initially collected to support R&D activities. However, the reported results when available for all data sets are comparable.

5. REFERENCES

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Portage, 2005d, *Post-Decontamination Characterization of WM 183 Solids*, Report Number CWI-PM0509-11-05, SDG CP20040701EA, Portage, Inc., Idaho Falls, Idaho, November 7, 2005.

Portage, 2005e, *Radioanalytical Data Limitations and Validation Report for the Radiological Analyses of Samples Collected at the INL in Support of the Post-Decontamination Characterization of the WM-183 Solids,* Report Number CWI-PD0366-11-05, SDG CP20040701CW, Portage, Inc., Idaho Falls, Idaho, November 28, 2005.

Attachment 1

Reported Results for WM-183 Solid Samples

Table Att-1-1. Reported results for WM-183 solid samples.

Field Sample ID	Location[a]	Lab Sample ID	Analysis Type	Analyte	Result	Units	Uncertainty	Validator Flag[b]	MDA[c]
CP10061901R4	WM-183 Composite Solids	3AF53	Gamma	^{103}Ru	2.69E+03	pCi/g	1.82E+04	U	6.53E+04
CP10062801R4	WM-183 Composite R&D Solids	3BW46	Gamma	^{103}Ru	-2.71E+06	pCi/g	4.01E+06	UJ	4.93E+06
CP10061901R4	WM-183 Composite Solids	3AF53	Gamma	^{106}Ru	-5.67E+03	pCi/g	1.04E+05	U	4.04E+05
CP10062801R4	WM-183 Composite R&D Solids	3BW46	Gamma	^{106}Ru	8.40E+05	pCi/g	1.50E+06	UJ	2.64E+06
CP20040701	Wm-183 (TR-53 Solids)	5BE96	Gamma	^{106}Ru	5.98+04	pCi/g	2.60E+05	U	8.62E+05
CP10061901R4	WM-183 Composite Solids	3AF53	Gamma	^{108m}Ag	-4.43E+03	pCi/g	2.20E+04	U	7.30E+04
CP10062801R4	WM-183 Composite R&D Solids	3BW46	Gamma	^{108m}Ag	3.60E+01	pCi/g	9.49E+04	UJ	3.72E+05
CP20040701	Wm-183 (TR-53 Solids)	5BE96	Gamma	^{108m}Ag	1.21E+04	pCi/g	4.42E+04	U	1.40E+05
CP10061901R4	WM-183 Composite Solids	3AF53	Gamma	^{110m}Ag	1.07E+03	pCi/g	1.18E+04	U	4.71E+04
CP10062801R4	WM-183 Composite R&D Solids	3BW46	Gamma	^{110m}Ag	-4.78E+03	pCi/g	2.91E+04	UJ	1.09E+05
CP20040701	Wm-183 (TR-53 Solids)	5BE96	Gamma	^{110m}Ag	-2.22E+04	pCi/g	3.06E+04	U	3.12E+04
CP10061901R4	WM-183 Composite Solids	3AF53	Gamma	^{125}Sb	2.77E+06	pCi/g	2.39E+05		2.65E+05
CP10062801R4	WM-183 Composite R&D Solids	3BW46	Gamma	^{125}Sb	6.78E+06	pCi/g	6.62E+05	J	1.19E+06
CP20040701	Wm-183 (TR-53 Solids)	5BE96	Gamma	^{125}Sb	4.52E+05	pCi/g	5.86E+05	U	4.57E+05
CP10061901RI	WM-183 Composite Solids	02KU-01-A	Specific	^{129}I	6.24E+02	pCi/g	6.00E+01	J	1.15E+02
CP10062801RI	WM-183 Composite R&D Solids	02KU-03-A	Specific	^{129}I	4.96E+02	pCi/g	5.20E+01	J	1.08E+02
CP20040701RI	Wm-183 (TR-53 Solids)	02TE-06-A	Specific	^{129}I	8.44E+02	pCi/g	5.40E+01	J	4.90E+01
CP10062801R4	WM-183 Composite R&D Solids	3BW46	Gamma	^{134}Cs	4.87E+01	pCi/g	6.03E+04	UJ	2.36E+05
CP20040701	Wm-183 (TR-53 Solids)	5BE96	Gamma	^{134}Cs[d]	1.38E+05	pCi/g	1.63E+04		7.72E+04
CP10061901R4	WM-183 Composite Solids	3AF53	Gamma	^{134}Cs[d]	3.29E+05	pCi/g	2.33E+04		4.51E+04
CP10061901R4	WM-183 Composite Solids	3AF53	Gamma	^{137}Cs	1.19E+09	pCi/g	3.02E+07		1.20E+05
CP10062801R4	WM-183 Composite R&D Solids	3BW46	Gamma	^{137}Cs	1.16E+09	pCi/g	6.35E+07	J	1.92E+05
CP20040701	Wm-183 (TR-53 Solids)	5BE96	Gamma	^{137}Cs	7.45E+08	pCi/g	4.26E+07		7.52E+04
CP10061901R4	WM-183 Composite Solids	3AF53	Gamma	^{144}Ce	2.01E+04	pCi/g	6.92E+04	U	1.99E+05

Table Att-1-1. (continued).

Field Sample ID	Location[a]	Lab Sample ID	Analysis Type	Analyte	Result	Units	Uncertainty	Validator Flag[b]	MDA[c]
CP10062801R4	WM-183 Composite R&D Solids	3BW46	Gamma	^{144}Ce	7.38E+04	pCi/g	5.39E+05	UJ	1.98E+06
CP20040701	Wm-183 (TR-53 Solids)	5BE96	Gamma	^{144}Ce	1.60E+05	pCi/g	3.21E+05	U	6.37E+05
CP20040701CW	Wm-183 (TR-53 Solids)	02TE-01-A	Specific	^{14}C	2.15E+04	pCi/g	9.68E+02	J	9.81E+00
CP10061901R4	WM-183 Composite Solids	3AF53	Gamma	^{152}Eu	-1.23E+04	pCi/g	5.45E+04	U	1.69E+05
CP10062801R4	WM-183 Composite R&D Solids	3BW46	Gamma	^{152}Eu	-1.03E+05	pCi/g	3.29E+05	UJ	9.50E+05
CP20040701	Wm-183 (TR-53 Solids)	5BE96	Gamma	^{152}Eu	-1.71E+05	pCi/g	2.59E+05	U	3.39E+05
CP10061901R4	WM-183 Composite Solids	3AF53	Gamma	^{154}Eu	7.92E+04	pCi/g	1.08E+04		6.90E+04
CP10062801R4	WM-183 Composite R&D Solids	3BW46	Gamma	^{154}Eu	1.16E+05	pCi/g	1.54E+05	UJ	1.24E+05
CP20040701	Wm-183 (TR-53 Solids)	5BE96	Gamma	^{154}Eu	9.09E+04	pCi/g	1.40E+04		3.60E+04
CP10061901R4	WM-183 Composite Solids	3AF53	Gamma	^{155}Eu	-1.81E+04	pCi/g	4.53E+04	U	1.08E+05
CP10062801R4	WM-183 Composite R&D Solids	3BW46	Gamma	^{155}Eu	-1.90E+04	pCi/g	1.90E+05	UJ	7.24E+05
CP20040701	Wm-183 (TR-53 Solids)	5BE96	Gamma	^{155}Eu	3.53E+04	pCi/g	9.62E+04	U	2.47E+05
CP10061901R4	WM-183 Composite Solids	3AF53	Gamma	^{226}Ra	8.69E+05	pCi/g	1.12E+06	U	8.78E+05
CP10062801R4	WM-183 Composite R&D Solids	3BW46	Gamma	^{226}Ra	5.00E+06	pCi/g	1.20E+07	UJ	6.45E+06
CP10062801R9	WM-183 Composite R&D Solids	3BW46	Alpha	^{234}U	2.98E+03	pCi/g	1.21E+03	J	4.75E+02
CP20040701	Wm-183 (TR-53 Solids)	5BE96	Alpha	^{234}U	5.76E+03	pCi/g	8.30E+03	U	1.15E+04
CP10062801R9	WM-183 Composite R&D Solids	3BW46	Alpha	$^{235/236}$U	0.00E+00	pCi/g	0.00E+00	UJ	5.98E+02
CP10061901R4	WM-183 Composite Solids	3AF53	Gamma	^{235}U	-1.68E+03	pCi/g	1.57E+04	U	5.31E+04
CP10062801R4	WM-183 Composite R&D Solids	3BW46	Gamma	^{235}U	1.35E+05	pCi/g	3.78E+05	UJ	3.87E+05
CP20040701	Wm-183 (TR-53 Solids)	5BE96	Alpha	^{235}U	1.04E+03	pCi/g	1.62E+03	U	1.32E+04
CP20040701	Wm-183 (TR-53 Solids)	5BE96	Alpha	^{237}Np	1.01E+04	pCi/g	2.23E+03		3.26E+03
CP10062801R7	WM-183 Composite R&D Solids	3BW46	Alpha	^{238}Pu	9.99E+06	pCi/g	1.63E+06	J	1.79E+03
CP20040701	Wm-183 (TR-53 Solids)	5BE96	Alpha	^{238}Pu	9.70E+06	pCi/g	9.87E+05		1.31E+04
CP10062801R9	WM-183 Composite R&D Solids	3BW46	Alpha	^{238}U	0.00E+00	pCi/g	0.00E+00	UJ	4.75E+02
CP20040701	Wm-183 (TR-53 Solids)	5BE96	Alpha	^{238}U	0.00E+00	pCi/g	0.00E+00	U	2.60E+03
CP10062801R7	WM-183 Composite R&D Solids	3BW46	Alpha	$^{239/240}$Pu	2.75E+06	pCi/g	4.58E+05	J	1.47E+03

Table Att-1-1. (continued).

Field Sample ID	Location[a]	Lab Sample ID	Analysis Type	Analyte	Result	Units	Uncertainty	Validator Flag[b]	MDA[c]
CP20040701	Wm-183 (TR-53 Solids)	5BE96	Alpha	$^{239/240}$Pu	3.17E+06	pCi/g	3.47E+05		1.07E+04
CP10061901R4	WM-183 Composite Solids	3AF53	Gamma	^{241}Am	3.40E+05	pCi/g	2.75E+04		2.23E+05
CP10062801R4	WM-183 Composite R&D Solids	3BW46	Gamma	^{241}Am	6.19E+05	pCi/g	8.75E+05	UJ	9.30E+05
CP20040701	Wm-183 (TR-53 Solids)	5BE96	Gamma	^{241}Am	1.02E+05	pCi/g	4.64E+04	UJ	1.55E+05
CP20040701	Wm-183 (TR-53 Solids)	5BE96	Alpha	^{241}Am	3.35E+05	pCi/g	4.30E+04		1.39E+04
CP20040701X4	Wm-183 (TR-53 Solids)	02TE-02-A	Specific	^{241}Pu	1.01E+07	pCi/g	4.60E+05	J	1.80E+04
CP20040701	Wm-183 (TR-53 Solids)	5BE96	Alpha	^{242}Cm	1.72E+03	pCi/g	2.54E+03	U	5.20E+03
CP20040701	Wm-183 (TR-53 Solids)	5BE96	Alpha	^{244}Cm	0.00E+00	pCi/g	0.00E+00	U	2.71E+03
CP10061901R4	WM-183 Composite Solids	3AF53	Gamma	^{54}Mn	8.47E+03	pCi/g	1.67E+04	U	3.48E+04
CP10062801R4	WM-183 Composite R&D Solids	3BW46	Gamma	^{54}Mn	-3.58E+04	pCi/g	5.52E+04	UJ	7.60E+04
CP20040701	Wm-183 (TR-53 Solids)	5BE96	Gamma	^{54}Mn	-2.52E+03	pCi/g	8.06E+03	U	2.40E+04
CP10061901R4	WM-183 Composite Solids	3AF53	Gamma	^{58}Co	-8.07E+03	pCi/g	1.63E+04	U	3.49E+04
CP10062801R4	WM-183 Composite R&D Solids	3BW46	Gamma	^{58}Co	3.26E+03	pCi/g	6.18E+04	UJ	2.60E+05
CP10061901R4	WM-183 Composite Solids	3AF53	Gamma	^{60}Co	1.49E+05	pCi/g	8.07E+03		1.31E+04
CP10062801R4	WM-183 Composite R&D Solids	3BW46	Gamma	^{60}Co	1.87E+05	pCi/g	2.12E+04	J	2.11E+04
CP20040701	Wm-183 (TR-53 Solids)	5BE96	Gamma	^{60}Co	8.28E+04	pCi/g	8.18E+03		8.67E+03
CP20040701X4	Wm-183 (TR-53 Solids)	02TE-02-A	Specific	^{63}Ni	1.96E+05	pCi/g	1.80E+04	J	4.63E+04
CP10061901R4	WM-183 Composite Solids	3AF53	Gamma	^{65}Zn	8.57E+00	pCi/g	1.54E+04	U	6.05E+04
CP10062801R4	WM-183 Composite R&D Solids	3BW46	Gamma	^{65}Zn	1.35E+05	pCi/g	1.78E+05	UJ	1.37E+05
CP20040701	Wm-183 (TR-53 Solids)	5BE96	Gamma	^{65}Zn	4.82E+01	pCi/g	1.00E+04	U	4.18E+04
CP20040701X4	Wm-183 (TR-53 Solids)	02TE-02-A	Specific	^{90}Sr	1.50E+07	pCi/g	4.34E+05	J	2.74E+03
CP10061901R4	WM-183 Composite Solids	3AF53	Gamma	^{94}Nb	2.55E+04	pCi/g	3.43E+04	U	3.66E+04
CP10062801R4	WM-183 Composite R&D Solids	3BW46	Gamma	^{94}Nb	1.66E+05	pCi/g	1.74E+04	J	6.44E+04
CP10061901R4	WM-183 Composite Solids	3AF53	Gamma	^{95}Nb	2.89E+00	pCi/g	8.62E+03	U	3.45E+04
CP10062801R4	WM-183 Composite R&D Solids	3BW46	Gamma	^{95}Nb	-7.27E+05	pCi/g	1.05E+06	UJ	1.22E+06
CP10061901R4	WM-183 Composite Solids	3AF53	Gamma	^{95}Zr	-2.09E+04	pCi/g	3.62E+04	U	6.23E+04

Table Att-1-1. (continued).

Field Sample ID	Location[a]	Lab Sample ID	Analysis Type	Analyte	Result	Units	Uncertainty	Validator Flag[b]	MDA[c]
CP10062801R4	WM-183 Composite R&D Solids	3BW46	Gamma	^{95}Zr	-1.18E+05	pCi/g	2.57E+05	UJ	5.71E+05
CP10061901EA	WM-183 Composite Solids	3BM72	ICP-MS	^{99}Tc	6.17E+05	pCi/g		H[e], J	
CP10062801EA	WM-183 Composite R&D Solids	4CN11	ICP-MS	^{99}Tc	4.25E+05	pCi/g		H[e], J	
CP20040701	Wm-183 (TR-53 Solids)	5BE96	ICP-MS	^{99}Tc	1.10E+05	pCi/g		N*H[e,f], J	
CP10061901F2	WM-183 Composite Solids	2AF53	Specific	Total Sr	2.39E+07	pCi/g	4.03E+05		3.23E+05
CP10062801F2	WM-183 Composite R&D Solids	3BW46	Specific	Total Sr	1.67E+07	pCi/g	3.28E+05	J	3.18E+05
CP20040701	Wm-183 (TR-53 Solids)	5BE96	Specific	Total Sr	1.34E+07	pCi/g	3.10E+05		2.89E+05

a. Sample CP10061901 is a composite sample collected 1/15/2003 upon receipt of liquid sample CP10060401. Solids were filtered, dried, re-labeled and stored for further analysis.

Sample CP10062801 is a composite sample collected in April 2003 (the exact date is unknown) for research and development tests on filtration of sodium bearing wastes. The unaltered sample was provided to the tank farm closure project in October 2003 when the solids were filtered, dried, re-labeled and stored for further analysis.

b. Validator flags:

J = estimated

U = undetected

UJ = undetected estimated value

c. Minimum detectable activity.

d. The positive result reported for this radionuclide is considered to be a false positive given the corresponding half-life and the known age of the waste in the tanks. ^{134}Cs = 2.06 years.

e. The flag "H" was assigned by the laboratory to denote that the analysis was performed outside of method or client specified holding time requirements.

f. The flag * was assigned by the laboratory to denote imprecision between sample and duplicate sample analyses. The flag N was assigned by the laboratory to denote that the matrix spike recovery exceeded the acceptance limits.