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Results of Long-Term Analyses of the Salt (Macro) Batch 5 Tank 41H Qualification Sample (Resample)

T. B. Peters

September 2022

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EXECUTIVE SUMMARY

Savannah River National Laboratory (SRNL) analyzed samples from Tank 41H in support of qualification of Salt Waste Processing Facility (SWPF) Salt Batch 5. This document reports the long-term results of the analyses of samples of Tank 41H. Analysis of the Tank 41H Salt Batch 5 sample indicates that the material does not display any unusual characteristics or observations, such as floating solids, the presence of large amounts of solids, or unusual colors. This memo satisfies Deliverable 3 of the Technical Task Request (TTR).

After a data review it was found that the original results reported in the revision 0 of this document were actually from Salt Batch 4 (Tank 21H). A new set of samples was sent for analysis to satisfy Deliverable 3 of the TTR. The results from the original analyses have been replaced with the recent analyses of the actual Salt Batch 5 sample.

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LIST OF ABBREVIATIONS

ACSM	Analytical Characterization and Sample Management
ISDP	Interim Salt Disposition Project
MCU	Modular Caustic-Side Solvent Extraction Unit
%RSD	Percent Relative Standard Deviation
SCO	Shielded Cells Operations
SRNL	Savannah River National Laboratory
SRMC	Savannah River Mission Completion
TTR	Technical Task Request
TTQAP	Task Technical and Quality Assurance Plan
WAC	Waste Acceptance Criteria

List of Revisions

Revision Number	Summary of Changes	Date
0	Initial Issue	2/28/2022
1	Deleted original data and replaced with new analytical data	9/20/2022

1.0 Introduction

This report provides the analytical laboratory results of the long term SWPF Salt Batch 5 samples from Tank 41H. These results will be used by Savannah River Mission Completion (SRMC) to show compliance with downstream facilities. This work was specified by a TTRⁱ and Task Technical and Quality Assurance Plan (TTQAP).ⁱⁱ Details for the work are contained in controlled laboratory notebooks.ⁱⁱⁱ

2.0 Experimental Procedure

A single 3L Tank 41H sample (HTF-41-21-124) was pulled and delivered to SRNL on November 29, 2021. The sample was a variable depth sample obtained approximately 32" from the bottom of the tank (transfer pump suction). Tank 41H was mixed at full speed for approximately 12 hours on 11/23/2021 before the sample was pulled; the sample was pulled approximately 5 days after pump shutdown. The sample was a visually clear solution with no apparent solids.

Due to a sample transfer error, the HTF-41-21-124 material was not sampled during the original evolution in December 2021. The results of that sample are detailed in a previous report.^{iv}

Once the error was discovered in July 2022, a rapid effort to definitively locate and sample the correct material (HTF-41-21-124) was undertaken. Results from this July Shielded Cells Operations sampling are detailed in this report.

Samples were filtered via a 0.45 µm nylon syringe filter, with the exception of the samples for the methyl mercury. The samples were not diluted before delivery to Analytical Characterization and Sample Management (ACSM) for analysis, with the exception of the methyl mercury sub-samples which were diluted with HCl in order to preserve the ratios of the various mercury species. The dilutions are accounted for in the reported values provided.

2.1 Quality Assurance

Requirements for performing reviews of technical reports and the extent of review are established in Manual E7, Procedure 2.60. SRNL documents the extent and type of review using the SRNL Technical Report Design Checklist contained in WSRC-IM-2002-00011, Rev. 2. The customer requested that a Functional Classification of Safety Class apply to this work.ⁱ Thus, a Design Verification technical review was performed via a document review according to the applicable elements detailed in Section 5.3.1 'Design Verification by Document Review' of E7 2.60.18. Data collection and analysis methods used in this work comply with this requirement as detailed in the TTQAP. Results from this report are not RW-0333P as per the TTR.

3.0 Results and Discussion

The results of the previous analyses for the short-term results are in a previous document.^v Results for the long-term analyses are listed in Table 1. Values in parentheses are the percent relative standard deviation (%RSD) values based on replicate sample analysis.

Table 1. Analytical Results

Analyte	Result (pCi/mL)	WAC Requirement (pCi/mL)
^3H	2.23E+03 (4.4%)	5.63E+05
^{14}C	3.18E+03 (33%)	1.13E+05
^{60}Co	<1.55E+01	9.75E+02
^{99}Tc	7.83E+04 (5.7%)	2.11E+05
^{125}Sb	<1.66E+02	7.99E+03
^{126}Sn	1.27E+03 (1.8%)	1.80E+04
^{129}I	3.73E+01 (0.6%)	6.30E+01
^{144}Ce	<3.98E+02	3.12E+04
^{154}Eu	<4.36E+01	1.62E+03
^{155}Eu	<1.44E+03	none
^{232}Th	<1.10E-04	2.88E+03
^{237}Np	5.85E+00 (2.2%)	1.00E+04
^{241}Pu	2.63E+04 (6.4%)	8.38E+05
^{241}Am	<2.60E+01	6.67E+04
^{244}Cm	<1.03E+00	6.67E+04
^{245}Cm	<3.89E+01	2.25E+05
Me-Hg	14.9 (mg/L) (1.4%)	3.50E+02 mg/L

The analytical uncertainties for the radiochemical measurements varied from 5-20%. The analytical uncertainty for the methyl mercury analyses is 20%. The methyl mercury value is typical of previous SWPF salt batches.

Other radiochemical results are typical of previous salt batches. SRNL has also confirmed that this current sample is the correct one, by cross comparisons to a recent corrosion control sample pulled from Tank 41H.^{vi}

4.0 Conclusions

Analysis of the Tank 41H SWPF Salt Batch 5 sample indicates that the material does not display any unusual characteristics or observations, such as floating solids, the presence of large amounts of solids, or unusual colors. The analytical results received thus far are typical of previous salt batches.

This memo satisfies Deliverable 3 of the Technical Task Request (TTR).

5.0 References

- ⁱ A. Samadi-Dezfouli, “Salt Batch Qualification for Feed to Salt Waste Processing Facility”, X-TTR-H-00090, Rev. 3, June 22, 2021.
- ⁱⁱ T. B. Peters and D. H. Jones, “Task Technical and Quality Assurance Plan for SWPF Feed Batch Qualification Testing”, SRNL-RP-2019-00582, Rev. 2, May 2021.
- ⁱⁱⁱ T. B. Peters, “Salt Batch 5 Qualification”, ELN, A4571-00527-02.
- ^{iv} T. B. Peters, “Results of Long-Term Analyses of the Salt (Macro) Batch 5 Tank 41H Qualification Sample”, SRNL-STI-2021-00037, rev.0, February 2022.
- ^v T. B. Peters, “Results of Short-Term Analyses of the Salt (Macro) Batch 5 Tank 41H Qualification Sample (Resample)”, SRNL-STI-2021-00684, rev. 1, August 2022.
- ^{vi} T. B. Peters, “Justification for the Selection of the Salt Batch 5 Resampling”, SRNL-L3100-2022-00043, September 2022.

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Records Administration (EDWS)

Temporary Delegation of Authority

In accordance with SRS 1B Management Requirements and Procedures Manual, Procedure 3.10 Limits of Authority Procedure, temporary delegation of authority is hereby granted as indicated.

Delegating Manager: **MCNEW, RYAN T.**

Department: **WRJ300 - NUCLEAR SAFETY & ENG INTEGRTN**

I hereby grant my authority to **RUSSELL, KIRK J.** for the period of **Sep 30, 2022** to **Oct 7, 2022**. For signature authority, a copy of this delegation will be attached to all documents signed on my behalf.