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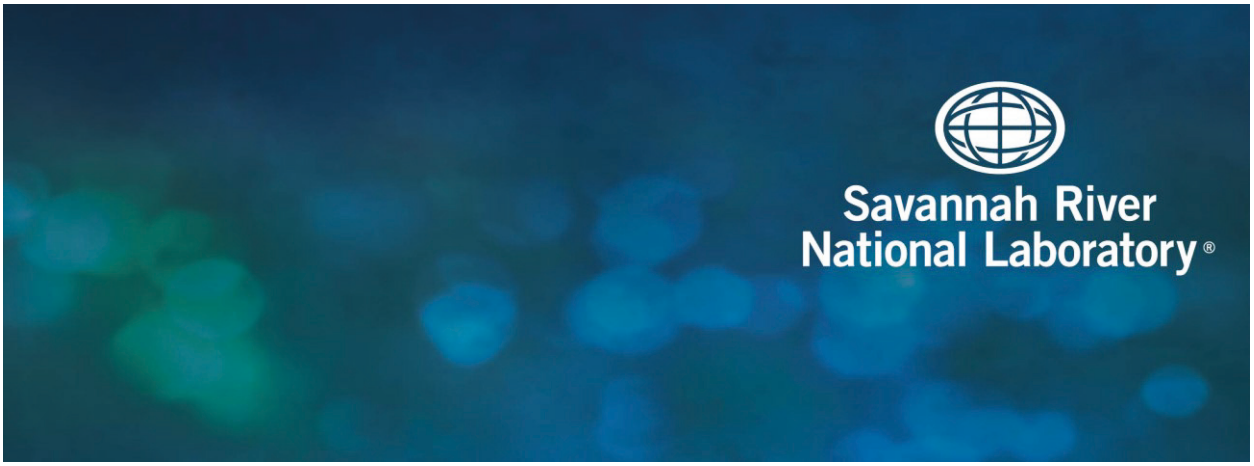

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Characterization of Infrequent Samples from the Concentration, Storage, and Transfer Facility: F-Area Pump Pit 3 (FPP-3) Sump Sample: December 2021 Sample

J. R. Dekarske

W. D. King

December 2021

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REVIEWS AND APPROVALS

AUTHORS:

J. R. Dekarske, Separation Sciences and Engineering

W. D. King, Separation Sciences and Engineering

TECHNICAL REVIEW:

M. S. Hay, Chemical Flowsheet Development, Reviewed per E7 2.60

APPROVAL:

Boyd J. Wiedenman, Manager, Separation Sciences and Engineering

Frank Pennebaker, Director, Chemical Processing

Azikiwe T. Hooker, SRR Tank Farm Facility Engineering

PREFACE OR ACKNOWLEDGEMENTS

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EXECUTIVE SUMMARY

In December 2021, SRR-E sent an ~185 mL sample identified as FPP-3 from a F-Area pump pit sump to SRNL for analysis. The sample was pale yellow in color and contained a small amount of suspended solids visually estimated to be less than 1% by volume. SRNL analysis indicated that the sample contained 4.4 E+05 dpm/mL Cs-137, 6.2 E+05 dpm/mL total beta activity, 9.3 E+02 dpm/mL beta activity following cesium removal, and below detectable levels of alpha activity following cesium removal. In addition, the sample contained 0.015 M free OH^- and 947 µg total organic carbon/mL.

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CSTF	Concentration, Storage and Transfer Facility
LSC	Liquid Scintillation Counting
MDA	Minimum Detectable Activity
PMP	Polymethylpentene
SRNL	Savannah River National Laboratory
SRR-E	Savannah River Remediation-Engineering
TOC	Total Organic Carbon
TTQAP	Task Technical and Quality Assurance Plan
TTR	Technical Task Request

1.0 Introduction

On occasion, Savannah River Remediation Engineering (SRR-E) will request Savannah River National Lab (SRNL) to perform analysis on Concentration, Storage, and Transfer Facility (CSTF) samples originating from the sump encasement, catch tank, drain cell, or waste tank annulus per the Technical Task Request (TTR) or email. In December 2021, SRR-E sent SRNL a sample identified as FPP-3 from a pump pit sump. Following the specified (TTR)[i] and Task Technical and Quality Assurance Plan (TTQAP)[ii] and updated request by SRR-E through email, SRNL tested the sample for Total Alpha and Total Beta by liquid scintillation counting (LSC), Cs-137 by Gamma scan, total organic carbon (TOC), and Free-OH.

2.0 Experimental Procedure

The F-Area pump pit Sump FPP-3 sample was received on 06 December 2021 at SRNL. As the "as-received" sample radiation dose rate was non-detectable, the stainless-steel container was moved to a radiological hood for inspection. Upon examination of the sample container and surrounding bags, it was found that a small portion of the sample had leaked from the stain-less steel container into the inner yellow primary containment bag. Nevertheless, approximately 185mL was collected from the stainless steel container into a polymethylpentene (PMP) beaker.

The sample was transferred into clear PMP beakers for visual inspection. The sample appearance was slightly yellow with a minute amount of suspended fine particulates. The sample was not filtered, and aliquots were directly transferred into green shielded bottles and submitted in triplicate preparations each for total gamma/beta/alpha, total organic carbon, and free hydroxide analyses. The remaining sample was retained in a PMP bottle.

2.1 Quality Assurance

Requirements for performing reviews of technical reports and the extent of review are established in manual E7 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. This review meets the acceptance criteria to comply with the TTR[i] requesting this work with a functional classification of Safety Class and per guidance in the TTQAP.[ii] Data are recorded in the electronic laboratory notebook system as Experiment ID A2341-00117-18.[iii]

3.0 Results and Discussion

Photographs of the FPP-3 Sample are provided in
Figure 3-1. The sample was split into three portions for inspection. Separate samples were submitted in triplicate for analysis for each of the following methods: 1) radiochemical analysis (total gamma, beta, and alpha and Cs-removed beta), 2) total organic carbon (TOC), and 3) free hydroxide. Although triplicate subsamples were submitted for the free hydroxide test, only duplicate free hydroxide results were obtained due to the amount of sample volume required by the titration method. Results are provided in
Table 3-1. Total alpha results (Cs-removed) were below detection for all three samples submitted. Significant variability was observed for the total beta and Cs-removed beta results (28-64% RSD, respectively). The average free hydroxide result of 0.015 M indicates a pH of 12.2 (calculated).

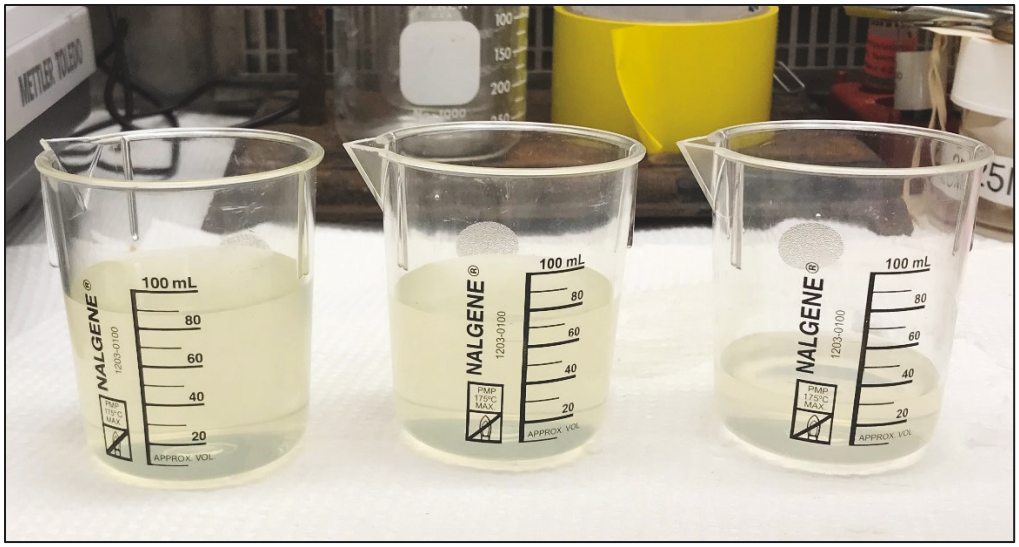

Figure 3-1. Photographs of the FPP-3 Sample Split Between Three PMP Beakers

Table 3-1. Results for December 2021 FPP-3 sample: Total Alpha, Total Beta, Total Gamma scan, TOC, and Free Hydroxide.

Test	Replicate 1	Replicate 2	Replicate 3	Average	%RSD
Cs-Removed Alpha (dpm/mL) (one sigma % uncertainty)	<2.36 E+01(MDA)	<2.03 E+02 (MDA)	<2.36 E+01(MDA)	NA	
Total Beta (dpm/mL) (one sigma % uncertainty)	5.20 E+05 (13%)	8.19 E+05 (12%)	5.12 E+05 (13%)	6.17 E+05	28
Cs-Removed Beta (dpm/mL) (one sigma % uncertainty)	1.62 E+03 (25%)	6.20 E+02 (18%)	5.55 E+02 (19%)	9.32 E+02	64
Total Gamma (dpm/mL) (one sigma % uncertainty)	4.50 E+05 (5.00%)	4.16 E+05 (5.00%)	4.48E+05 (5.00%)	4.38 E+05	4.4
TOC (µg C/mL) (one sigma % uncertainty)	937 (10%)	975 (10%)	929 (10%)	947	2.6
Free Hydroxide (M) (one sigma % uncertainty)	---	0.015 (10%)	0.015 (10%)	0.015	0.0

4.0 Conclusions

The FPP-3 sample characterization indicated low to moderate gamma and beta activity in the sample and no measurable alpha activity. Approximately 950 µg/mL of total organic carbon was observed, and the pH was 12.2 (based on free hydroxide measurement).

5.0 References

[i] Technical Task Request, “Infrequent CSTF Samples”, X-TTR-H-0101, Rev. 1, June 2021.
[ii] L. N. Oji, S. C. Lucatero, “Task Technical and Quality Assurance Plan for the Analysis of Infrequent Samples from the Concentration, Storage, and Transfer Facility”, SRNL-RP-2020-00565, Rev.1, July 2021.
[iii] W. D. King: ELN: A2341-00117-18 (Electronic Notebook (Production)); SRNL, Aiken, SC 29808 (2021).

Distribution:

Cj.bannochie@srnl.doe.gov
William.bates@srnl.doe.gov
marion.cofer@srnl.doe.gov
alex.cozzi@srnl.doe.gov
connie.herman@srnl.doe.gov
brady.lee@srnl.doe.gov
Joseph.Manna@srnl.doe.gov
Gregg.Morgan@srnl.doe.gov
frank.pennebaker@srnl.doe.gov
William.Ramsey@srnl.doe.gov
Marissa.Reigel@srnl.doe.gov
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Curtis.Gardner@srs.gov
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tony.polk@srs.gov
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mark-a.smith@srs.gov
patricia.suggs@srs.gov
thomas.temple@srs.gov
celia.aponte@srs.gov
timothy.baughman@srs.gov
Richard.Edwards@srs.gov
Azikiwe.hooker@srs.gov
Ryan.McNew@srs.gov
phillip.norris@srs.gov
Christine.Ridgeway@srs.gov
Azadeh.Samadi-Dezfouli@srs.gov
Vijay.Jain@srs.gov
Bruce.wiersma@srnl.doe.gov
arthur.wiggins@srs.gov

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