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Task Technical and Quality Assurance Plan for Determining the Radionuclide Release from Tank Waste Residual Solids

D. T. Hobbs
K. A. Roberts
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February 2015

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1.0 APPROVALS/TASK TECHNICAL REQUEST IDENTIFICATION

Author/Team Lead: D. T. Hobbs	**Signature:**	**Organization:** **SRNL-ERPS-SASP**	**Date:** 2/4/2015
Co-Author: K. A. Roberts	**Signature:**	**Organization:** **SRNL-ERPS-RPA**	**Date:** 2/4/2015
Co-Author: K. M. L. Taylor-Pashow	**Signature:**	**Organization:** **SRNL-ERPS-SASP**	**Date:** 2/4/15
Technical Reviewer: M. E. Denham	**Signature:**	**Organization** **SRNL-ERT-GEO**	**Date:** 2/5/2015
Responsible Manager: F. M. Pennebaker	**Signature:**	**Organization:** **SRNL-ERPS-ACP**	**Date:** 2/5/15
Manager: L. H. Connelly	**Signature:**	**Organization:** **SRNL-AD**	**Date:** 2/4/15
QA Representative: W. A. Drown	**Signature:**	**Organization:** **SRNL-QA**	**Date:** 2/5/2015
Customer: K. H. Rosenberger	**Signature:**	**Organization:** **SRR-CWDA-CDA**	**Date:** 2/4/2015

Task Technical Request Title: Tank Waste Testing to Evaluate Residual Waste Solubility Assumptions used in the Tank Farms PAs	**TTR Number:** **HLE-TTR-2013-002** **Revision: 1**	**TTR Date:** **February 2014**

LIST OF REVISIONS

Revision Number	Summary of Changes	Date
0	Initial Release	June 2013
1	Revised experimental plans based on FY2013 experimental findings and comments received from Nuclear Regulatory Commission staff members.	April 2014
2	Revised experimental plans based on FY2014 experimental findings and guidance from Savannah River Remediation staff.	February 2015

2.0 INTRODUCTION

2.1 Task Definition

Current practice for closing high-level waste (HLW) tanks at the Savannah River Site (SRS) involves removing as much of the HLW as possible, disconnecting all transfer lines and penetrations into the tanks, and filling the internal volume of the tanks with grout. Savannah River Remediation (SRR) closed Tanks 18 and 19 in 2012 and Tanks 5 and 6 in 2013. Performance assessment (PA) modeling of the release of radionuclides from tank waste solids in these tanks indicated that plutonium, neptunium, technetium, and uranium are among the most likely risk drivers.[1] Due to the relatively high concentration of plutonium in Tank 18, the PA indicated that plutonium release was highest upon entering the oxidized region III, when the redox potential, E_h, is +680 mV and the pH is 9.2. At this stage, the dominant grout phase is calcite ($CaCO_3$).[1]

Waste release testing was identified as needed to provide additional information regarding the residual waste solubility assumptions used in the F-Area and H-Area Tank Farm Performance Assessments' waste release models. The proposed testing was described generally in the Savannah River Site Liquid Waste Facilities Performance Assessment Maintenance Program FY2014 Implementation Plan.[2] This plan proposed that waste release experiments be performed with actual tank waste residuals after method development using surrogate materials. Thus, SRR requested that the Savannah River National Laboratory (SRNL) design and perform such testing with available tank waste samples.[3]

2.2 Customer/Requester

K. H. Rosenberger, SRR-CWDA-CDA

Technical Task Request: HLE-TTR-2013-002, Rev. 2, "Tank Waste Testing to Evaluate Residual Waste Solubility Assumptions used in the Tank Farms PAs".[3]

2.3 Task Responsibilities

Personnel in Environmental and Chemical Process Technology (E&CPT) Research Programs of Savannah River National Laboratory (SRNL) will:

- prepare a Task Technical and Quality Assurance Plan (TTQAP – this document) and direct task activities,
- complete experimental testing with surrogates of tank waste residual solids samples,
- record work and results in laboratory notebooks,
- interpret and document results/conclusions,
- provide updates per the request of C&WDA, and
- provide results in a technical report.

Personnel in the Analytical Development (AD) Section of SRNL will:

- provide analysis of samples representing surrogates of tank waste samples, and
- provide analysis of leachate samples collected from experiments in which radioactive solids are contacted with pore waters for measured periods of time.

Personnel in SRNL Quality Assurance will:

- review and approve the TTQAP and
- provide guidance and oversight for this task as needed.

Personnel in Closure and Waste Disposal Authority (C&WDA) will:

- review and approve this TTQAP,
- provide written requests to SRNL specifying any deviations from this plan, and
- review and approve the final technical report.

2.4 Task Deliverables

SRNL will provide a task schedule and monthly spend plan. A technical report summarizing testing results with surrogate tank waste solids will be issued. The technical reports will include referenced source inputs, assumptions with justifications, tests methods and results, calculations, and conclusions.

3.0 TASK ACCEPTANCE CRITERIA

Approval of this TTQAP by the customer will signify acceptance of the planned testing.

4.0 TASK ACTIVITIES

4.1 Fabrication of Tank Waste Leaching Test Vessel

SRNL researchers will fabricate a test vessel that will be used to contact surrogate tank waste solid samples with pore waters that represent pore waters that will contact tank waste residues under reducing and oxidizing environments after tank closure. The test vessel will be equipped with agitation and probes to measure pH, E_h, and temperature of the solution. The vessel will be equipped with the capability for sampling the liquid phase multiple times.

4.2 Preparation of Tank 18 Residue Surrogate

Initial testing will be conducted using a Tank 18 residue surrogate having the composition provided in Table 1. The composition is based on the average composition of several Tank 18 samples analyzed by SRNL.[4,5] Metal salts, as the respective nitrates, were dissolved in ultrapure water. Aluminum and silicon were added as sodium salts, sodium aluminate and sodium silicate, respectively. Plutonium(IV) and neptunium(V) were added as solutions in nitric acid from available stocks in SRNL. Uranium(VI) was added as uranyl nitrate hexahydrate, $UO_2(NO_3)_2 \cdot 6H_2O$. ^{99}Tc as technetium(VII) was added as a solution of ammonium pertechnetate available from commercial sources.

After addition of all component chemicals and radionuclides, a solution of 19.1 M sodium hydroxide was slowly added to the nitric acid solution while mixing to precipitate the metals as metal hydroxides and hydrous metal oxides. Sodium hydroxide addition continued until the free hydroxide concentration in the supernatant was 0.1 M based on calculated base requirement. The suspension was then heated for 24 hours to reflux to convert a fraction of aluminum and the silicon to sodium aluminosilicate. The suspension was cooled to ambient temperature. At that time, mixing was discontinued and the precipitated solids allowed to gravity settle. Gravity settling did not produce a clear supernatant liquid above the solids. Thus, the suspension was filtered through a disposable Nalgene® filter with 0.45-micron nylon membrane. The filtrate was collected and analyzed to determine the concentrations of Pu, Np, U and Tc that were not incorporated into the precipitated solids.

The concentrated solids mixture was diluted with an alkaline solution containing 0.01 M sodium hydroxide and sodium carbonate at a volume equal to that of the initial filtrate. The filtrate evolution and supernatant dilution was repeated three additional times. The filtered wash solutions were collected and analyzed to determine the concentrations of Pu, Np, U and Tc that were removed by the wash solutions. The collected product was air dried until a dry powder was

achieved. The dried solids were lightly ground, transferred to a preweighed storage container and stored until used in leaching experiments.

Analysis of the filtrates and surrogate Tank 18 residual solids indicated that solids contained Ca, Fe, Mg, Mn, U and Pu at the target concentrations. The concentration of Na was about 33% higher than the target value and likely reflects the incorporation of sodium salts from the wash solution. The concentrations of Al, Si, Np, and Tc were below the target concentrations. The low concentrations of Np and Tc, added as NpO_2^+ and TcO_4^-, respectively, were not unexpected given the solubilities NpO_2^+ and TcO_4^-. With customer concurrence, SRNL researchers proceeded to use the as-prepared surrogate Tank 18 solids.

Table 1. Composition of Tank 18 Residue Surrogate

Component	Target Concentration (wt%)	Measured Concentration[a] (wt%)
Al	15.2	11.3 $\pm$ 1.1
Ca	2.69	2.69 $\pm$ 0.27
Fe	8.00	7.90 $\pm$ 0.79
Mg	2.00	2.09 $\pm$ 0.21
Mn	1.09	1.04 $\pm$ 0.10
Na	4.48	5.96 $\pm$ 0.60
Si	3.96	0.22 $\pm$ 0.038
U	2.37	2.39 $\pm$ 0.25 2.50 $\pm$ 0.50[b]
Pu-239/240	0.0160	0.0160 $\pm$ 0.0009[c]
Np-237	7.53E-04	bql
Tc-99	2.60E-04	bql

[a]determined by ICP-ES
[b]determined by ICP-MS
[c]determined by alpha counting after separating from U and Np
bql = below quantifiable limit

4.3 Pore Water Compositions

Three pore waters will be produced and used for the leaching tests with surrogate tank waste solids. The pore water will be produced by contacting synthetic infiltration water having the chemical composition shown in Table 2 with chemicals representing the aged grout components that are controlling the pH and E_h of the pore water. The infiltration water composition is based on the average chemical composition of groundwater from non-impacted wells screened within the water-table aquifer on the SRS.[7]

Table 2. Composition of Synthetic Infiltration Water

Component	Concentration
Na^+	1.39 mg/L
Cl^-	5.51 mg/L
Ca^{2+}	1.00 mg/L
Mg^{2+}	0.66 mg/L
K^+	0.21 mg/L
SO_4^{2-}	0.73 mg/L
pH	4.68

Three pore waters will be generated by contacting the synthetic infiltration water with the grout component chemicals to give the pore waters during the grout aging scenarios modeled in the tank closure performance assessment (see Table 3 for target E_h and pH values for each pore water).[1]

For Reduced Region II (RR2), the infiltration water will be deoxygenated by boiling and bubbling with inert gas followed by contacting with chemical components of the cement, flyash and slag (CFS) that are the equilibrium phases at the three aging stages while maintaining an inert atmosphere.

The weight ratio of the three components will be 125 parts of Cement Type I/II, 210 parts of Slade Grade 100 and 363 parts of Fly Ash Class F, which was the recommended fill material for Tanks 18 and 19.[6] The waste release testing will not investigate the effects of admixtures at this time. The E_h and pH will be monitored during the equilibration phase and adjusted as necessary to ensure that the E_h of the pore water is reducing and that the pH is at or near 11.1. For Oxidized Region II (OR2), oxygenated infiltration water will be contacted with the appropriate chemical components of the aged CFS solids. Since this pore water is oxidizing, the contact operation will be open to air scrubbed of carbon dioxide so that the pore water will be in equilibrium with the $Ca(OH)_2$ of the cement. The E_h and pH will be monitored during the equilibration phase to ensure that the E_h of the pore water is oxidizing and the pH is at or near 11.1.

For Oxidized Region III (OR3), the infiltration water will be contacted with the appropriate chemical components of the aged CFS solids. The E_h and pH will be monitored during the equilibration phase to ensure that the E_h of the pore water is oxidizing and the pH is at or near 9.2.

Table 3. Target E_h and pH for Each Pore Water Composition

Test Condition	Eh (volts)	pH
Reduced Region II	-0.47	11.1
Oxidized Region II	+0.56	11.1
Oxidized Region III	+0.68	9.2

FY2013 testing produced pore waters with lower E_h values than the targeted values in Table 3.[8] Thus, SRNL researchers investigated the addition of reducing agents such as sulfide (S^{2-}) and dithonite ($S_2O_4^{2-}$) to achieve an E_h potential closer to -0.47 V for RR2. For OR2 and OR3, SRNL researchers investigated the addition of oxidizing agents such as an increased partial pressue of oxygen, hydrogen peroxide (H_2O_2) and ozone (O_3) to achieve an E_h potential closer to +0.56 and +0.68 V, respectively. These additions produced temporary increases in the E_h potential, but the values generally remained below the target values, From these findings, the researchers concluded that the CFS monolith does not reach steady-state conditions within several weeks limiting the ability to produce pore waters with the target E_h potentials in a timely manner. FY2013 testing found that the pH of the pore water increased upon contact with the surrogate Tank 18 solids. The increase in pH is not unexpected since the solids are a mixture of metal hydroxides and hydrous oxides and, therefore, have a certain alkalinity capacity. During FY2014, SRNL researchers found that the addition of oxidizing agents reduced the pH of the pore water. Consequently, when the surrogate Tank 18 solids were added to the pore water, the pH of the mixtures was close to the target value.

SRNL researchers will investigate the preparation of pore waters by adding chemical components of the cement, flyash and slag (CFS) that are the equilibrium phases at the three aging stages. The researchers will also control the atmosphere above the solution. For example, for the RR2 pore water, the researchers will pass argon over the pore water solution to limit oxygen and maintain a reducing environment. For the OR2 pore water, researchers will pass air that is free of carbon

dioxide to limit conversion of hydroxide-based phases to the corresponding carbonato phases and, consequently lower pH conditions.

Researchers will investigate the addition of sodium carbonate, sodium bicarbonate, and dilute hydrochloric acid at the beginning of the leaching tests as a means to adjust the pH. For example, the pH of the test suspension will be adjusted if the measured pH is more than 0.2 and 0.3 pH units different than the target pH at 9.2 and 11.1, respectively.

4.4 Leach Testing

Leach testing will proceed first with the surrogateTank 18 solids. Previous testing established that a zero head-space testing methodolgy maintained reducing conditions for up four weeks.[8] In this method, the surrogate waste solids are placed in the glass leach test vial followed by sufficient volume of the desired pore water to fill the remaining volume of the glass vial leaving no available vapor space. The vial is then sealed and placed in a controlled temperature chamber with agitation.

Figure 1 provides photographs of the glass vials and the incubator/shaker used for zero head-space testing in FY2013. After a pre-selected time period, the bottle is opened and the leachate collected and analyzed for radionuclide content, E_h, pH, and other metallic elements as desired. Solids can be recovered and analyzed for radionuclide and elemental content as well as for any changes in particle size and morphology.

For leaching tests under oxidizing conditions, the previous testing indicated that the E_h moved from oxidizing to reducing values in a zero head-space configuration.[8] Thus, researchers will use a test vessel such as that described in Activity 4.1 for these leaching tests. This methodology allows the vessel to be continuously supplied with air to maintain a steady-state concentration of oxygen in solution. The air may be scrubbed of carbon dioxide to maintain higher pH in OR2 leaching experiments.

The surrogate tests will provide experience with the time required for the experimental system to achieve a steady-state condition. Surrogate tests will be carried out with contact times from a minimum of one week and a maximum of eight weeks. The key metric will be the measured radionuclide concentration in the leachates as a function of contact time. If the release of radionuclides does not show evidence of reaching equilibrium after eight weeks of contact, SRNL and SRR staff will meet to decide if tests with longer leaching times will be carried out with the Tank 18 surrogate solids.

The surrogate tests will also allow the researchers to establish the lower limit of detection for the key radionuclides and make changes in the ratio of pore water and solids and aliquot size, if necessary, to achieve the necessary quantification limit for radionuclide releases. Replicate tests will be carried out to determine the experimental variance. SRNL researchers will characterize the Tank 18 surrogate solids using scanning electron microscopy and powder X-ray diffraction techniques to determine possible changes in particle morphology and crystalline phases upon leaching. Selection of the solids samples for analysis will be based on the degree of radionuclides released from the solids.

For the zero head-space surrogate tests, approximately 1.2 grams of the Tank 18 surrogate solids will be contacted with 40 mL of the pore water in zero head-space experiments. A similar phase ratio will be scaled upon use of the agitated glass apparatus fabricated in activity 4.1. This leachate to solids ratio would provide an excess of radionuclide for dissolution in the pore water assuming 100% of the radionuclides are dissolved (see Table 6 and compare with Table 5, which are derived from the estimated pore water solubilities for Pu, Np, U and Tc at the three grout aging scenarios as shown in Table 4).[1] Tables 5 and 6 serve as estimated minimum leachate

concentrations based on solubility concentrations and higher concentrations that vary depending on if 100%, 50% and 10% of the radionuclides dissolve, respectively.

If this is observed experimentally, additional leaching tests at a higher phase ratio (lower solids quantity and higher leachate volume) can be carried out to confirm that the radionuclide or elemental concentration is limited by solubility. If the measured radionuclide activity or elemental concentration are well below the estimated solubility limits, coprecipitation could be limiting release to the solution phase. Analysis of the leachates for other metallic elements will be performed to provide insight on the role these phases have on radionuclide release. Note, the quantity of solids and pore water volume may be increased depending on working volume of the leaching test vessel fabricated under activity 4.1.

The zero head-space methodology is attractive for the Shielded Cells facility with actual tank waste residues since assembly of the glass apparatus is much simpler. Also, if a test vial is broken and the contents of the vial are lost, only that data point is lost. For the larger, multiple-sample glass apparatus, the entire experiment may be lost and have to be restarted if the apparatus were broken and the contents lost. The disadvantage of the zero head-space method is that direct measurements of E_h, pH, and oxygen content are performed at the conclusion of the contact time and not over the course of the experiment.

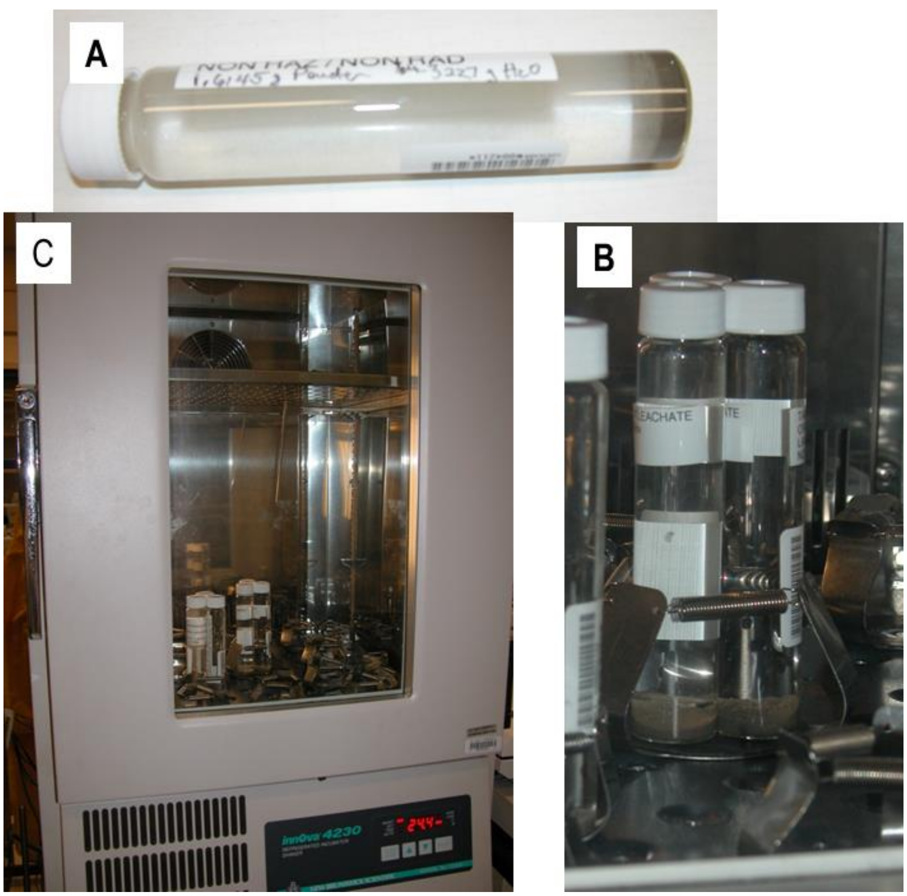

Figure 1. Zero Head-Space Leaching Test Equipment; A. Test vial containing CFS solids and pore water. B. Group of test vials anchored into holder inside of incubator/shaker. C. Innova Model 4230 Incubator Shaker.

Table 4. Estimated Pore Water Solubilities (mole/L) [from reference 1, Table 11]

Element	Reduced Region II	Oxidized Region II	Oxidized Region III
Pu	3E-11	3E-11	3E-11
Np	1 E-09	3 E-07	2 E-06
U	5 E-09	5 E-05	4 E-06
Tc	1 E-08	no limit	no limit

Table 5. Estimated Pore Water Activities (dpm/mL) Based on Estimated Solubilities in Table 4.

Element	Reduced Region II	Oxidized Region II	Oxidized Region III
Pu	1.2E+00	1.9 E+03	3.0 E+03
Np	3.7E-01	1.1 E+02	7.4 E+02
U*	1.2 E+00	1.2 E+04	9.5 E+02
Tc	3.8 E+01	no limit	no limit

*estimated pore water activity for U reported in ug/L.

Table 6. Estimated Pore Water Activities/Concentrations upon Release from Tank 18 Surrogate Solids

Radionuclide/ Element	Radionuclide Activity/Concentration in Solids (dpm/g)	100% dissolves from 1.2 g per 40 mL leachate (dpm/mL)	50% dissolves from 1.2 g per 40 mL leachate (dpm/mL)	10% dissolves from 1.2 g per 40 mL leachate (dpm/mL)
Pu-239/240	2.5E+07	7.3+05	3.8E+05	7.53+04
Np-237	1.2E+04	3.5+02	1.8+02	3.5+01
Tc-99	9.8E+04	2.9E+03	1.5E+03	2.9E+02
	ug/g	**ug/L**	**ug/L**	**ug/L**
U	2.4E+04	7.1E+05	3.6E+05	7.1E+04

5.0 TASK SCHEDULE

The following table provides a tentative schedule estimate for completion of deliverables. The lead investigator will provide information on schedule logic, task duration, needed resources, and resource constraints to SRNL schedule development personnel as needed.

Tasks	Estimated Completion
Revise and issue TTQAP	February 2015
Prepare pore water for leach tests	April 2015
Perform leach tests with surrogate solids	July 2015
Issue summary technical report of FY15 experimental findings	August 2015

6.0 RESEARCH FACILITY PLANNING

Preparation of the pore waters is planned for laboratories located in 773-A and 999-1W. Leaching tests with radioactive solids is planned for laboratory module B-126/130 in 773-A. Other laboratories are available in 773-A for the leaching tests if laboratory module B-126/130 becomes unavailable.

7.0 PROGRAMMATIC RISK REVIEW

Risk Factor	***Event***	***Mitigation***
Equipment		
Test vessel	Failure	Backup test vessels will be fabricated and readily available; however switch over to a new vessel may require initiating a new experiment or re-equilibrating for several days.
pH and E_h Measuring Instruments	Failure	Backup pH and E_h probes and instruments will be available for immediate replacement
Experimental		
Inadvertent spill of leachate solutions	During or after preparation	Conditioned pore waters will be stored and available immediately for use.
Inadvertent spill of experimental sample	During sampling	If sample spilled shortly after being taken a new sample can be drawn.
Inadvertent spill of experimental sample	During analysis	Duplicate samples will be prepared for different analyses; sample remaining from one analysis can be used for the other if one sample is spilled.
Personnel		
Investigators	Illness, vacation	Back-up researchers identified.
Analytical Support		
Equipment	Failure	Delays could be possible due to repairs of instruments.
Instruments	Availability	Delays could be possible due to instrument availability, will be dependent on task priorities.
Facility		
Facilities	Planned and Unplanned outages	Delays possible due to unplanned outages.

8.0 R&D HAZARDS SCREENING

A Hazard Analysis Package (HAP) covering the planned experiments with surrogate tank waste solids has been developed and issued for this work.[9] It is anticipated that the testing of the actual tank waste solids is considered waste characterization and, therefore, will not require the controls associated with a waste treatability study. A separate Hazard Analysis Package (HAP) covering the planned experiments with actual tank waste solids will be developed for that phase of the work.

9.0 QUALITY ASSURANCE

9.1 Documents Requiring Requester Approval

Document	Management		Customer		QA	
	Yes	No	Yes	No	Yes	No
Task Technical and QA Plan	X		X		X	
Final Report	X		X			X

9.2 Records Generated During Task Performance

Description	YES	NO	AR*
Task Technical and QA Plan	X		
Controlled Laboratory Notebooks	X		
Task Technical Reports			X
Data Qualification Reports		X	
Supporting Documentation			X

*** AR = As Required**

9.3 Task QA Plan Procedure Matrix

See Attachment 1.

10.0 REFERENCES

1. M. E. Denham and M. R. Millings, “Evolution of Chemical Conditions and Estimated Solubility Controls on Radionuclides in the Residual Waste Layer During Post-Closure Aging of High-Level Waste Tanks”, SRNL-STI-2012-00404, August 2012.
2. K. H. Rosenberger, “Savannah River Site Liquid Waste Facilities Performance Assessment Maintenance Program FY2014 Implementation Plan”, SRR-CWDA-2013-00133, January 2014.
3. Technical Task Request, “Tank waste testing to evaluate residual waste solubility assumptions used in the Tank Farm PAs”, HLE-TTR-2013-002, rev. 2, December 2014.
4. L. N. Oji, D. Diprete, and D. R. Click, “Characterization of the Tank 18F Samples”, SRNL-STI-2009-00625, Rev. 0, December 2009.
5. L. N. Oji, D. Diprete, and C. J. Coleman, “Characterization of Additional Tank 18F Samples”, SRNL-STI-2010-00386, Rev. 0, September 2010.
6. D. B. Stefanko and C. A. Langton, “Tanks 18 and 19-F Structural Flowable Grout Fill Material Evaluation and Recommendations”, SRNL-STI-2011-00551, Rev. 1, April 2011.
7. R. N. Strom, and D.S. Kaback, “SRP Baseline Hydrogeologic Investigation: Aquifer Characterization Groundwater Geochemistry of the Savannah River Site and Vicinity (U)”, WSRC-RP-92-450, 1992.
8. D. T. Hobbs, “Radionuclide Rlease for Tank Waste Residual Solids”, SRNL-STI-2014-00117, March 27, 2014.
9. “Leach studies of cementitious and solid waste forms”, SRNL-L3100-2010-00051, Rev. 2, HAP Lead: K. Roberts.

Attachment 1. Task QA Plan Procedure Matrix

Listed below are the sections of the site QA Manual (1Q) and associated implementing procedures for SRNL. Sections applicable to this task are indicated by Yes, No, or As Required. The selected procedures identify the controls for task activities performed by E&CPT Research Programs Section only.

QA Manual Sections	Implementing Procedures	YES	NO	AR
Organization	1Q, QAP 1-1, Organization	X		
	• L1, 1.02, SRNL Organization	X		
	1Q, QAP 1-2, Stop Work			X
Quality Assurance Program	1Q, QAP 2-1, Quality Assurance Program	X		
	• L1, 8.02, SRNL QA Program Implementation and Clarification	X		
	1Q, QAP 2-2, Personnel Training & Qualification	X		
	• L1, 1.32, Read and Sign/Briefing Program	X		
	1Q, QAP 2-3, Control of Research and Development Activities	X		
	• L1, 7.10 Identification of Technical Work Requirements	X		
	1Q, QAP 2-7, QA Program Requirements for Analytical Measurement Systems	X		
Design Control	1Q, QAP 3-1, Design Control	X		
	• E7, 2.60, Technical Reviews	X		
	• E7, 3.60, Technical Reports	X		
Procurement Document Control	1Q, QAP 4-1, Procurement Document Control			X
	• 7B, Procurement Management Manual			X
	• 3E, Procurement Specification Procedure Manual			X
	• E7, 3.10, Determination of Quality Requirements for Procured Items			X
Instructions, Procedures and Drawings	1Q, QAP 5-1, Instructions, Procedures and Drawings	X		
	• L1, 1.01, Administration of SRNL Procedures and Work Instructions	X		
	• L1, 7.26 R&D Work Control Documents	X		
	• E7, 2.30 Drawings		X	
Document Control	1Q, QAP 6-1, Document Control	X		
	• 1B, MRP 3.32, Document Control	X		
Control of Purchased Items and Services	1Q, QAP 7-2, Control of Purchased Items and Services	X		
	• 7B, Procurement Management Manual	X		
	• 3E, Procurement Specification Procedure Manual	X		
	1Q, QAP 7-3, Commercial Grade Item Dedication		X	
	• E7, 3.46 Replacement Item Evaluation/ Commercial Grade Dedication		X	

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Attachment 1. Task QA Plan Procedure Matrix continued

QA Manual Sections	Implementing Procedures	YES	NO	AR
Identification and Control of Items	1Q, QAP 8-1, Identification and Control of Items	X		
	• L1, 8.02 SRNL QA Program Implementation and Clarification	X		
Control of Processes	1Q, QAP 9-1, Control of Processes		X	
	1Q, QAP 9-2, Control of Nondestructive Examination		X	
	1Q, QAP 9-3, Control of Welding and Other Joining Processes		X	
	1Q, QAP 9-4, Work Planning and Control	X		
	• 1Y, 8.20, Work Control Procedure		X	
Inspection	1Q, QAP 10-1, Inspection		X	
	• L1, 8.10, Inspection		X	
Test Control	1Q, QAP 11-1, Test Control		X	
Control of Measuring and Test Equipment	1Q, QAP 12-1, Control of Measuring and Test Equipment	X		
	1Q, QAP 12-2, Control of Installed Process Instrumentation		X	
	1Q, QAP 12-3, Control and Calibration of Radiation Monitoring Equipment (not applicable to ERPS)		X	
Packaging, Handling, Shipping and Storage	1Q, QAP 13-1, Packaging, Handling, Shipping and Storage			X
	• L1, 8.02 SRNL QA Program Implementation and Clarification			X
Inspection, Test, and Operating Status	1Q, QAP 14-1, Inspection, Test, and Operating Status		X	
	• L1, 8.02 SRNL QA Program Implementation and Clarification		X	
Control of Nonconforming Items	1Q, QAP 15-1, Control of Nonconforming Items			X
	• L1, 8.02 SRNL QA Program Implementation and Clarification			X
Corrective Action System	1B, MRP 4.23, Corrective Action Program			X
Quality Assurance Records	1Q, QAP 17-1, Quality Assurance Records Management	X		
	• L1, 8.02 SRNL QA Program Implementation and Clarification	X		
	• L1, 7.16, Laboratory Notebooks and Logbooks	X		
	• L1, 7.30, Electronic Laboratory Notebook and Logbook Experiments	X		

Continued on next page….

Attachment 1. Task QA Plan Procedure Matrix continued

QA Manual Sections	Implementing Procedures	YES	NO	AR
Audits	1Q, QAP 18-2, Surveillance			X
	1Q, QAP 18-3, Quality Assurance External Audits		X	
	1Q, QAP 18-4, Management Assessment Program			X
	• 12Q, SA-1, Self-Assessment			X
	1Q, QAP 18-6, Quality Assurance Internal Audits			X
	1Q, QAP 18-7, Quality Assurance Supplier Surveillance		X	
Quality Improvement	L1, 8.02 SRNL QA Program Implementation and Clarification			X
Software Quality Assurance	1Q, QAP 20-1, Software Quality Assurance			X
	• E7, 5.0, Software Engineering and Control			X
Environmental Quality Assurance	1Q, QAP 21-1, Quality Assurance Requirements for the Collection and Evaluation of Environmental Data (ERPS works to QAP 2-3 and is exempt from this QAP.)		X	
Special Requirements (applicable if RW-0333P QA program specified by customer)	L1, 8.21, Supplemental Quality Assurance Requirements for DOE/RW-0333P		X	

Identify the following information for your task:

Is the work Technical Baseline or Non-Baseline?	Baseline	Non-Baseline	
	X		
Is the work R&D, Routine Service, or Engineering Design?	R&D	Routine Service	Engineering Design
	X		
Is the work for an onsite or offsite customer?	Onsite	Offsite	
	X		

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