

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

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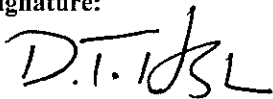
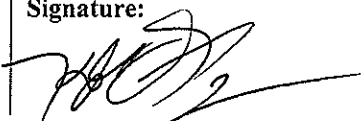
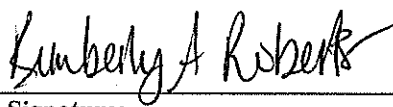
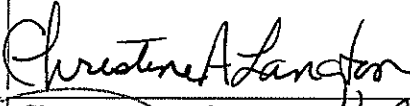
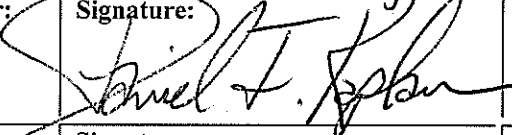
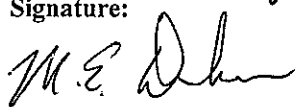
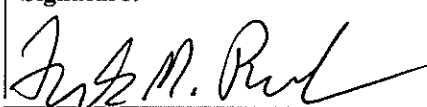
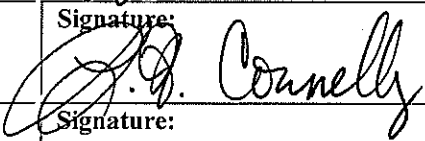


SRNL-RP-2013-00203, rev. 1



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1.0 APPROVALS/TASK TECHNICAL REQUEST IDENTIFICATION

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QA Representative: W. A. Drown	Signature: 	Organization: SRNL-QA	Date: 5/1/2014
Customer: K. H. Rosenberger	Signature: 	Organization: SRR-CWDA-CDA	Date: 5/1/2014

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
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2.0 INTRODUCTION

2.1 Task Definition

Savannah River Remediation (SRR) recently closed Tanks 18 and 19. Performance assessment (PA) modeling of the release of radionuclides from tank waste residues indicates 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 +0.68 V and the pH is 9.2. At this stage, the dominant grout phase is calcite (CaCO_3).¹ Recently, the Nuclear Regulatory Commission released a plan for monitoring disposal actions taken by the U.S. Department of Energy.² This plan recommended that DOE design and perform waste release experiments with actual tank waste residuals. Thus, SRR requested that SRNL design and perform such testing with available tank waste samples.

2.2 Customer/Requester

K. H. Rosenberger, SRR-CWDA-CDA

Technical Task Request: HLE-TTR-2013-002, Rev. 1, "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 and actual 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 and actual 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 and final plan for testing with actual tank waste solids will be issued. A final technical report detailing the release of Pu, Np, Tc, and U from actual tank waste residues will also 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 and actual 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 along with the oxygen concentration of the vapor phase. The vessel will be equipped with the capability for sampling the liquid phase multiple times and to provide a low oxygen content inert gas to assist in maintaining a reducing environment.

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 is 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 ± 1.1
Ca	2.69	2.69 ± 0.27
Fe	8.00	7.90 ± 0.79
Mg	2.00	2.09 ± 0.21
Mn	1.09	1.04 ± 0.10
Na	4.48	5.96 ± 0.60
Si	3.96	0.22 ± 0.038
U	2.37	2.39 ± 0.25 2.50 ± 0.50^b
Pu-239/240	0.0160	0.0160 ± 0.0009^c
Np-237	7.53E-04	bql
Tc-99	2.60E-04	bql

^adetermined by ICP-ES

^bdetermined by ICP-MS

^cdetermined by alpha counting after separating from U and Np

bql = below quantifiable limit

4.3 Characterization of Composited Tank 18 Residue Solids

Archived Tank 18 samples, including previously ground samples, will be composited and mixed to provide a total inventory of about 200 grams for leaching tests. The composited sample will be dried at 60 °C and mixed until a homogeneous composite sample has been obtained. If necessary, researchers will grind the dried solids to a powder. Characterization of the solids will include elemental and radiochemical content.

Elemental analyses will be performed after dissolution of the solids and will include inductively coupled plasma emission spectroscopy (ICPES) and inductively coupled plasma mass spectroscopy (ICPMS). Determination of plutonium activity will be performed by chemical separation of the plutonium by thenoyltrifluoroacetone (TTA) extraction followed by alpha spectroscopy. ²³⁷Np activity will be determined by gamma spectroscopy or ICPMS. Uranium concentration will be determined by ICPMS. ⁹⁹Tc activity will be determined by scintillation counting. These techniques will also be used to measure the concentrations of Pu, Np, U and Tc in the pore water samples collected from the leaching tests.

Powder X-ray diffraction (PXRD) spectra and scanning electron microscopy (SEM) will also be obtained. These results will be compared with that of the solids following leaching tests to determine what changes have occurred in the physical and chemical properties of the solids after leaching.

4.4 Pore Water Compositions

Three pore waters will be produced and used for the leaching tests with both surrogate and actual tank waste solids. The pore water will be produced by contacting synthetic infiltration water having the chemical composition shown in Table 2 with grout components. 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 components 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 The grout components are formed into a monolith, then ground to powder and contacted with the infiltration water.

For Reduced Region II (RR2), the infiltration water will be deoxygenated by boiling and bubbling with inert gas followed by contacting with a mixture of cement, flyash and slag (CFS) 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 ground 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 ground CFS solids that have been conditioned with oxygen and carbon dioxide. 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	E _h (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 will investigate the addition of reducing agents such as sulfide (S²⁻) and dithionite (S₂O₄²⁻) to achieve an E_h potential closer to -0.47 V for RR2. For OR2 and OR3, SRNL researchers will investigate the addition of oxidizing agents such as an increased partial pressure 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.

FY2013 also 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. SRNL 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 lower the pH. The decision to adjust the pH for the leaching tests with actual Tank 18 solids will be made based on the measured pH at the start of the test. 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.

4.5 Leach Testing

Leach testing will proceed first with the Tank 18 surrogate solids followed by tests with composited Tank 18 solids. Previous testing established that a zero head-space testing methodology 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.

SRNL researchers plan to test radionuclide release under transition conditions. For this leach test, the leaching will begin initially under reducing conditions and then allowed to transition into an oxidizing condition by the introduction of air and, possibly, a chemical oxidant identified from Activity 4.4. This test will also be subject to funding and schedule constraints.

For the 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 of 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.

Based on the leaching tests with surrogate Tank 18 solids, SRNL researchers will install testing equipment in the Shielded Cells and perform tests with actual Tank 18 solids using the protocols developed with the surrogate tests.

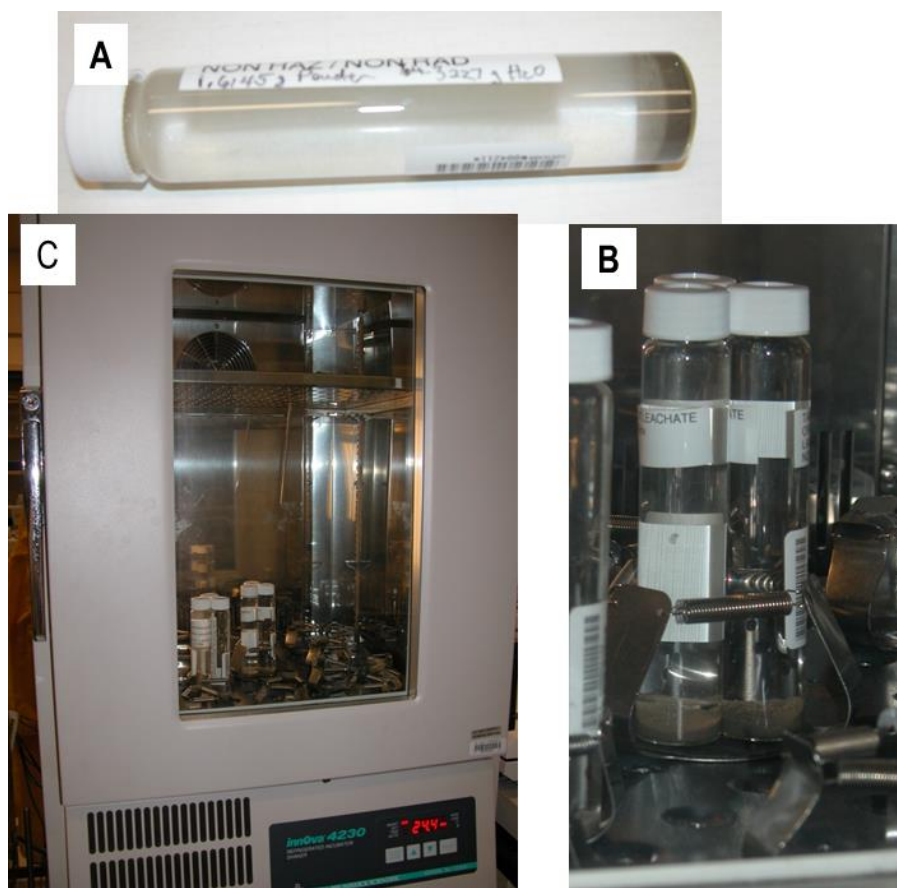


Figure 1. Zero Head-Space Leaching Test Equipment; A. Test vial containing CFS solids and pore water. B. Group of test vials anchored into holder inside of incubator/shaker. C. Innova Model 4230 Incubator Shaker.

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

<u>Element</u>	<u>Reduced Region II</u>	<u>Oxidized Region II</u>	<u>Oxidized Region III</u>
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.

<u>Element</u>	<u>Reduced Region II</u>	<u>Oxidized Region II</u>	<u>Oxidized Region III</u>
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	April 2014
Prepare pore water for leach tests	June 2014
Fabricate glass vessels for OR2 and OR3 leach tests	June 2014
Perform leach tests	August 2014
Issue summary technical report of FY14 experimental findings	September 2014

6.0 RESEARCH FACILITY PLANNING

Preparation of the pore waters is planned for laboratories located in 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

<i>Risk Factor</i>	<i>Event</i>	<i>Mitigation</i>
<i>Equipment</i>		
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
<i>Experimental</i>		
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.
<i>Personnel</i>		
Investigators	Illness, vacation	Back-up researchers identified.
<i>Analytical Support</i>		
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.
<i>Facility</i>		
Facilities	Planned and Unplanned outages	Delays possible due to unplanned outages.
<i>Technical Discovery / Programmatic</i>		
Controlling reducing E _h condition	Unable to maintain reducing E _h condition for sufficient time period to achieve steady-state condition for radionuclide release.	Design of test vessels will be modified to allow control of reducing E _h

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. "U.S. Nuclear Regulatory Commission Plan for Monitoring Disposal Actions Taken by the U.S. Department of Energy at the Savannah River Site F-Area Tank Farm Facility in Accordance with the National Defense Authorization Act for Fiscal Year 2005", U.S. Nuclear Regulatory Commission, Office of Federal and State Materials and Environmental Management Programs, Washington, DC, January 2013.
3. Technical Task Request, "Tank waste testing to evaluate residual waste solubility assumptions used in the Tank Farm PAs", HLE-TTR-2013-002, rev. 1, February 5, 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 Release 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	

Continued on next page....

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		
Inspection	• 1Y, 8.20, Work Control Procedure		X	
	1Q, QAP 10-1, Inspection		X	
Test Control	• L1, 8.10, Inspection		X	
	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		

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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:

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

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