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SAVANNAH RIVER SITE LIQUID WASTE FACILITIES PERFORMANCE ASSESSMENT MAINTENANCE PROGRAM

FY2012 Implementation Plan

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ACRONYMS/ABREVIATIONS

ARP/MCU	Actinide Removal Process/Modular Caustic Side Solvent Extraction Unit
C&WDA	Closure and Waste Disposal Authority
CA	Composite Analysis
CAB	Citizens Advisory Board
CFR	Code of Federal Regulations
DAS	Disposal Authorization Statement
DOE	Department of Energy
DOE-HQ	Department of Energy - Headquarters
DOE-SR	Department of Energy - Savannah River
DRS	Diffuse Reflectance Spectroscopy
EPA	Environmental Protection Agency
FDC	Future Disposal Cell
FTF	F-Tank Farm
FY	Fiscal Year
HTF	H-Tank Farm
LFRG	Low-Level Waste Disposal Facility Federal Review Group
LLW	Low-Level Waste
MOP	Member of the Public
NDAA	National Defense Authorization Act
NEA-TDB	Nuclear Energy Agency – Thermochemical Database
NRC	Nuclear Regulatory Commission
PA	Performance Assessment
PNNL	Pacific Northwest National Laboratory
RAI	Request for Additional Information
SA	Special Analysis
SCDHEC	South Carolina Department of Health and Environmental Control
SDF	Saltstone Disposal Facility
SEM	Scanning Electron Microscopy
SRNL	Savannah River National Laboratory
SRR	Savannah River Remediation
SRS	Savannah River Site
TER	Technical Evaluation Report
UDQ	Unreviewed Disposal Question
UWMQ	Unreviewed Waste Management Question
UWMQE	Unreviewed Waste Management Question Evaluation
WD	Waste Determination
XAS	X-ray Absorption Spectroscopy
XPS	X-ray Photoelectron Spectroscopy

1.0 EXECUTIVE SUMMARY

The *Radiological Performance Assessment* (PA) *Report for the Z-Area Saltstone Disposal Facility* (SDF) *at the Savannah River Site* (SRS), the *Performance Assessment for F-Tank Farm* (FTF) *at the Savannah River Site* and *the Performance Assessment for the H-Area Tank Farm (HTF) at the Savannah River Site*, managed by Savannah River Remediation, LLC (SRR) for the U.S. Department of Energy (DOE), assess the calculated dose impact on a future, hypothetical member of the public (MOP) and an inadvertent intruder, as well as environmental impacts from the respective facilities to verify compliance with DOE performance standards. In addition, the SDF PA (hereinafter referred to as 1992 PA) and the *Special Analysis* (SA)*: Revision of Saltstone Vault 4 Disposal Limits* (hereinafter referred to as 2005 SA), are used to support demonstration of compliance with pertinent requirements of the *Ronald W. Reagan National Defense Authorization Act (NDAA) for Fiscal Year 2005*, Section 3116 (hereinafter referred to as NDAA Section 3116). The FTF PA and HTF PA will be used to demonstrate compliance with applicable criteria of NDAA Section 3116 in support of closure of the SRS tank farms. The *Savannah River Site DOE 435.1 Composite Analysis* (hereinafter referred to as the CA) is a management tool required to assist DOE in assessing the possible impacts on the public and environment from multiple sources of legacy radioactive material at a DOE site (e.g., SRS) in order to determine where DOE may need to focus attention or take mitigating actions. The CA is maintained by the SRS M&O contractor, Savannah River Nuclear Solutions. [WSRC-RP-92-1360, SRS-REG-2007-00002, WSRC-TR-2005-00074, NDAA_3116, SRR-CWDA-2010-00128, SRR-CWDA-2009-00017, SRNL-STI-2009-00512]

The DOE, through Manual 435.1-1, Change 1, *Radioactive Waste Management Manual* and associated guidance, requires the on-going maintenance of all PAs and the CA. Because PA and CA results are, in part, based on data that is uncertain due to utilization of projected conditions thousands of years into the future, a maintenance program is needed to continue to reduce uncertainty in the inputs and assumptions, providing greater confidence in the results of the analyses and in the long-term plans for public and environmental protection. Additionally, a disciplined process to address potential changes in disposal and/or closure operations (e.g., change in disposal unit design, new residual material characterization) is needed to ensure that proposed changes do not adversely affect conclusions reached using PA results. The purpose of the PA maintenance program is to confirm the continued adequacy of a PA and to increase confidence in the results of the PA. The elements of the PA maintenance program are:

- Unreviewed Waste Management Questions (UWMQs)
- Special Analyses (SAs)
- PA revisions
- Testing and research
- Monitoring

This program implementation plan is prepared and updated annually and submitted to the DOE-SR Operations Office. The preparation and execution of the plan is consistent with the *Maintenance Guide for U.S. Department of Energy Low-Level Waste Disposal Facility Performance Assessments and Composite Analysis* (DOE_11-10-1999) as reflected in DOE Manual 435.1-1. Beginning with the FY2010 implementation plan, the SRS Liquid Waste facilities' PA maintenance activities have been contained in a separate implementation plan from

that for the E-Area Low-Level Waste (LLW) Facility and the CA. The purpose for this change is to better align the documents with the new SRS contract structure. Coordination of the activities across SRS to ensure consistency among the programs and to avoid duplication of effort will be carried out through the SRS DOE Order 435.1 Working Group.

A summary of Liquid Waste maintenance activities is contained in Appendix A of this report. Maintenance activities for the individual PAs are summarized in Appendix A, Tables A.1-1 through A.1-3. Appendix A, Table A.1-4 contains a summary of all PA maintenance activities. This implementation plan reflects the PA-related activities for the current fiscal year and the projected out-year activities for estimation and planning purposes. Actual work performed in the out-years may be adjusted based on new program information and will be dependent on the contract baseline funding and associated actual allocated budget for that year.

Section 2.0 includes a summary of the PA maintenance program activities for the SDF, Section 3.0 contains the activities for FTF, and Section 4.0 covers HTF. Each section includes activities relating to the following areas:

- Annual maintenance program activities
- PA development/revisions (in-progress and future)
- Testing and research activities

In December 2005, the U.S. Nuclear Regulatory Commission (NRC) issued its Technical Evaluation Report (TER) for the review of DOE's draft NDAA Section 3116 Basis Document for Salt Waste disposal at SRS. The NRC concluded that there is reasonable assurance that DOE's proposed salt waste management approach can meet the criteria in NDAA Section 3116, provided certain assumptions made in DOE's analysis of the 2005 SA are verified via monitoring. A crosswalk showing the factors identified by the NRC in their TER and the maintenance program activities relating to these factors is included in Appendix C. [ML053010225, WSRC-TR-2005-00074, DOE-WD-2005-001]

A revision to the 1992 PA has been prepared to support continued disposal authorization and the eventual closure of the SDF. The new SDF PA (SRR-CWDA-2009-00017) will provide the technical basis and results to be used in subsequent documents to demonstrate continued compliance with pertinent requirements of DOE M 435.1-1 and Title 10 Code of Federal Regulations (CFR) Part 61 Subpart C, *Licensing Requirements for Land Disposal of Radioactive Waste*, as identified in NDAA Section 3116. SRR-CWDA-2009-00017 evaluates the existing disposal units, Vaults 1 and 4, Disposal Unit 2 (construction complete), Disposal Units 3 and 5 (currently under construction) as well as all potential Future Disposal Cells (FDCs). Approval of SRR-CWDA-2009-00017 and issuance of a new DOE Disposal Authorization Statement (DAS) will be required prior to disposition of any salt waste in Disposal Unit 2.

Initial development of the FTF PA began in FY2007, and a draft was submitted to the Low-Level Waste Disposal Facility Federal Review Group (LFRG) for review in March 2009. The LFRG issued their final report in August 2009, which recommended the FTF PA was adequate for NRC consultation review without conditions. [LFRG_08-13-2008] In August 2008, Revision 0 of the FTF PA was transmitted to the NRC, the U.S. Environmental Protection Agency (EPA), and South Carolina Department of Health and Environmental Control (SCDHEC) for review and comment. A set of requests for additional information (RAIs) were

received from the NRC in January 2009. Detailed responses to the NRC RAIs and Revision 1 of the FTF PA were provided to the NRC for review in March 2010. The NRC responded with several additional RAIs in December 2010. Responses to these RAIs were provided to NRC in June 2011, and a TER (ML112371715) was issued in November 2011. Signature of DOE's NDAA Section 3116 Basis Document for F-Tank Farm is expected to occur in 3Q FY2012. Tanks 18 and 19 are scheduled to undergo operational closure by the end of calendar year 2012.

Initial planning for the HTF PA was initiated and a limited amount of work was performed in FY2008. Due to funding limitations, only a few activities related to the HTF PA were completed in FY2009. Work on the HTF PA was resumed in full at the beginning of FY2010. The HTF PA was submitted for DOE-Headquarters (DOE-HQ) review via an LFRG review team in November 2010. The only key issue and 18 of the 19 secondary issues identified by the LFRG team were resolved and incorporated in the PA prior to completion of the review team report, and the LFRG approved the PA in March 2011. The only remaining issue will be resolved by the activities described in Section 4.1.8. As required by the *Statement of Resolution of Dispute Concerning Extension of Closure Dates for Savannah River Site High-Level Radioactive Waste Tanks 19 and 18*, DOE submitted the HTF PA to SCDHEC and EPA in March 2011. [Dispute Resolution_11-19-2007] Comments were received from SCDHEC and EPA in 3QFY2011, and responses will returned to SCDHEC and EPA in 2QFY2012. During FY2012 Revision 1 of the HTF PA will be developed as a result of FTF lessons learned and comments on Revision 0.

2.0 Z-AREA SALTSTONE FACILITY

2.1 Z-Area Saltstone Disposal Facility Performance Assessment Annual Maintenance Activities

DOE M 435.1-1 requires the on-going maintenance of all PAs. This maintenance includes a series of activities that must be performed on an annual basis. This section describes the activities required every year in support of the 1992 PA and 2005 SA regardless of the status of the in-progress or future PA revisions.

2.1.1 Maintain Saltstone Disposal Facility Performance Assessment Control Through Unreviewed Waste Management Question Process

Description: A formal system to evaluate disposal practice changes and proposed actions is in place at the SDF, known as the Unreviewed Disposal Question (UDQ) process. This process is being expanded and will be known as the Unreviewed Waste Management Question (UWMQ) process. The UDQ procedure will be revised to reflect the updates within the new SDF PA as well as the expanded scope of the UWMQ process, and these changes will be implemented in FY2012 after issuance of the DAS. The UWMQ process consists of providing UWMQ Evaluations (UWMQEs) of proposed activities or new information to ensure that the assumptions, results, and conclusions of the current PA, any current SAs, the NDAA Section 3116 Waste Determination, and the CA remain valid and the changes are within the bounds of the DAS. [SW24-SSF-ENG-2002, DOE_09-28-1999] If it is identified through the UWMQ process that a proposed activity or new information is outside the bounds of the current analyses, SAs are prepared to update the technical baseline. The UWMQEs and SAs will continue to be required throughout the life of the facility. For planning purposes, the estimated cost assumes that 12 UWMQEs will be prepared in FY2013 (assumptions remaining at 12 for each out-year). The estimated cost does not reflect the cost of any SAs. If an SA is required, it is estimated that approximately $100K would be required for its completion. Therefore, the estimated cost has the potential to vary for any given year.

Deliverables: Provide UWMQEs, UWMQ procedure support, and SAs as needed to support SDF operations.

Expected Completion Date: On-going

Responsibility: SRR Closure and Waste Disposal Authority (C&WDA)

Estimated Cost: FY2012 $100K, FY2013 through FY2018 $85K/yr

2.1.2 Conduct Annual Saltstone Disposal Facility Performance Assessment Validation

Description: The purpose of the PA maintenance program is to confirm the continued adequacy of the current SDF PA and to increase confidence in the results of that PA. A requirement of the maintenance program is to conduct an annual review of the disposal facility activities. The annual PA review is conducted in a systematic manner that incorporates the following considerations:

1. Radionuclide inventories, waste volumes, and waste types disposed throughout the year;
2. Testing and research activities performed during the year and planned for the out-years;
3. Results of PA monitoring conducted in accordance with the PA Monitoring Plan for the SDF.

The above factors are reviewed annually to confirm the adequacy of the current facility PA, and to evaluate the need to conduct SAs or prepare a revision to that PA. The results of the review are documented in an annual review report for the current SDF PA.

Deliverable: Issue a fiscal year PA annual review report.

Expected Completion Date: 2QFY (issued annually)

Responsibility: SRR C&WDA

Estimated Cost: FY2012 through FY2018 $15K/yr

2.1.3 Prepare Annual Performance Assessment Maintenance Program Implementation Plan

Description: The purpose of the PA maintenance program is to confirm the continued adequacy of the PA and to increase confidence in the results. Every year the annual PA maintenance program fiscal year implementation plan is prepared and provided to DOE. The implementation plan outlines planned work for each fiscal year. The cost of preparing the implementation plan will be shared between SDF, FTF, and HTF. See the activities described in Sections 3.1.3 and 4.1.3 for FTF and HTF, respectively.

Deliverable: Issue a fiscal year PA maintenance program implementation plan.

Expected Completion Date: 2QFY (issued annually)

Responsibility: SRR C&WDA

Estimated Cost: FY2012 through FY2018 $15K/yr

2.1.4 Maintain Z-Area Saltstone Disposal Facility Performance Assessment Closure Plan

Description: A closure plan for SDF (WSRC-RP-2000-00426) that complies with DOE M 435.1-1 and associated guidance was issued and approved in FY2000. The *Closure Plan for the Z-Area Saltstone Disposal Facility* must be maintained and modified as needed to reflect changes to the facility. The SDF Closure Plan is reviewed annually to determine if a revision is required. A revision to the SDF Closure Plan will be completed after issuance of a new SDF DAS. This process should begin in FY2012. The revision will incorporate design changes to the SDF reflected in new SDF PA (once approved and issued) after issuance of a new DAS.

Deliverable: Revise current SDF Closure Plan and review annually in out-years.

Expected Completion Date: On-going (SDF Closure Plan revision after DAS issued)

Responsibility: SRR C&WDA

Estimated Cost: FY2012 $15K, FY2013 through FY2018 $5K/yr

2.1.5 Maintain Saltstone Disposal Facility Performance Assessment Monitoring Plan

Description: A monitoring plan for SDF PA (WSRC-RP-2000-00325) that complies with DOE M 435.1-1 and associated guidance was issued and approved in FY2000. The PA monitoring plan must be maintained and modified as needed to reflect changes to the facility. The monitoring plan is reviewed annually to determine if a revision is required. A revision to the SDF PA Monitoring Plan will begin in FY2012 after issuance of a new DAS. The current SDF PA Monitoring Plan is based on the 1992 PA and compliance with DOE M 435.1-1 requirements. The revision will incorporate and integrate the on-going activities relative to NDAA Section 3116 monitoring for salt waste disposal at SRS. It is anticipated that an additional revision will be required in FY2015 to ensure the SDF PA Monitoring Plan is kept up to date.

Deliverable: Revise current PA monitoring plan incorporating updates based on the new SDF PA and NDAA Section 3116 monitoring. Review annually in out-years.

Expected Completion Date: On-going (SDF PA Monitoring Plan issued after DAS issued)

Responsibility: SRR C&WDA

Estimated Cost: FY2012 $15K FY2013 through FY2014 $5K/yr, FY2015 $15K, FY2016 through FY2018 $5K/yr

2.1.6 Provide General Technical Support on Saltstone Disposal Facility Performance Assessment Issues

Description: This task is to provide general technical and programmatic support on SDF PA issues, NRC activities, and other regulatory issues that affect SDF operations. Activities include supporting NRC on-site observation visits and technical reviews, general project support, testing and research activity support, and development of resolution path forward for NRC open items. Research activity support includes monitoring of research done by outside agencies (e.g., Cementitious Barriers Partnership, academic research). These activities also include support on interactions with SCDHEC, SRS Citizens Advisory Board (CAB), the LFRG, National Academy of Sciences, and other regulatory and stakeholder bodies.

Deliverable: Provide on-going technical support on regulatory and policy issues/activities affecting SDF operations.

Expected Completion Date: On-going

Responsibility: SRR C&WDA

Estimated Cost: FY2012 through FY2018 $575K/yr

2.2 Saltstone Disposal Facility Performance Assessment Development/Revisions

A revision to the 1992 PA has been prepared to support continued disposal authorization and the eventual closure of the SDF. The revised PA will provide the technical basis and results to be used in subsequent documents to demonstrate continued compliance with pertinent requirements of DOE M 435.1-1 and associated references and 10 CFR 61, Subpart C as required by NDAA Section 3116. The new SDF PA will incorporate the existing disposal units, Vaults 1 and 4, as well as Disposal Unit 2 Cells A and B, and all FDCs. Approval of the new SDF PA and issuance of a DAS will be required prior to disposition of any salt waste in SDF Disposal Unit 2. [WSRC-RP-92-1360, SRR-CWDA-2009-00017]

2.2.1 Performance Assessment Development for In-Progress Saltstone Disposal Facility Performance Assessment Revision

Description: C&WDA will manage individual PA tasks, develop PA program planning documents, set up PA report organization, prepare regulatory review matrices, and develop/maintain PA input packages for technical review and incorporation into the PA. In addition, C&WDA will prepare the PA document, including interpretation and integration of results. Savannah River National Lab (SRNL) or an equivalent technical organization will support C&WDA in development of the Conceptual Models, execution of the models, and interpretation of the results, as needed.

The revised SDF PA, SRR-CWDA-2009-00017, has received LFRG approval and been reviewed by the NRC. Responses were provided to the second round of NRC RAIs in 3QFY2011. The NRC has not yet responded with a TER. Implementation activities include development of a PA facility implementation plan and a Management Readiness Checklist to support facility implementation of the new SDF PA after final approval.

Deliverable: PA revision issued for facility implementation.

Expected Completion Date:
1QFY2010 (LFRG approval of PA revision for stakeholder review) – Complete

3QFY2010 (Initial NRC review) – Complete

4QFY2010 (Initial C&WDA RAI response) - Complete

1QFY2011 (Further NRC review) - Complete

3QFY2011 (RAI response) – Complete

3QFY2012 (DAS issued)

Responsibility: SRR C&WDA

Estimated Cost: FY2012 $50K

2.2.2 Prepare Out-year Saltstone Disposal Facility Performance Assessment Revisions

Description: A future revision of the SDF PA will be scheduled as required and agreed upon by DOE. The SDF PA will be revised when warranted, but for estimating purposes, the next revision is projected to start in FY2015. Unless otherwise noted in the PA, the future PA revision will include the following items at a minimum:

- Analyses and results contained in all SAs that have been completed to date;
- Analyses and results of all UWMQEs completed to date;
- Changes in site future land use plans or closure plans; and
- Changes to PA guidance documents requirements

Deliverable: Issue PA revision.

Expected Completion Date: FY2016

Responsibility: SRR C&WDA

Estimated Cost: FY2015 $1,500K, FY2016 $1,500K

2.3 Z-Area Saltstone Disposal Facility Performance Assessment Testing & Research Activities

This section contains the PA-related testing and research activities that are being performed as part of the on-going maintenance activities aimed at reducing uncertainty in the SDF PA model, or are verification sampling and analysis of materials properties used in the PA (i.e., verification of emplaced saltstone properties and vault concretes). As ongoing research provides new information or reduces uncertainty, this information will be evaluated (via the UWMQE and SA process described in Section 2.1.1) against the information used as a basis for PA modeling.

Disposal operations will proceed according to the current revision of the *Liquid Waste System Plan* (SRR-LWP-2009-00001). After saltstone production operations have ceased, a closure cap will be installed over the SDF to mitigate the infiltration of water through the disposal units and the saltstone waste form. There are key questions related to closure cap design and performance that could affect the results of the PA (e.g., plugging of the drainage layer). However, the most recent revision to the PA suggests that parameters most sensitive to SDF performance are related to the saltstone waste form and the disposal units themselves. [SRR-CWDA-2009-00017]

As such, in the near term, resources are prioritized to support testing and research activities related to key parameters of the saltstone waste form and the disposal units. In addition, since SDF closure cap design and installation are at least 20 years in the future, testing and research work performed to support other closure sites may be used in the future rather than developed independently at SRS. Consequently, activities in this area (Section 2.3.3.10) may be delayed to support near-term testing.

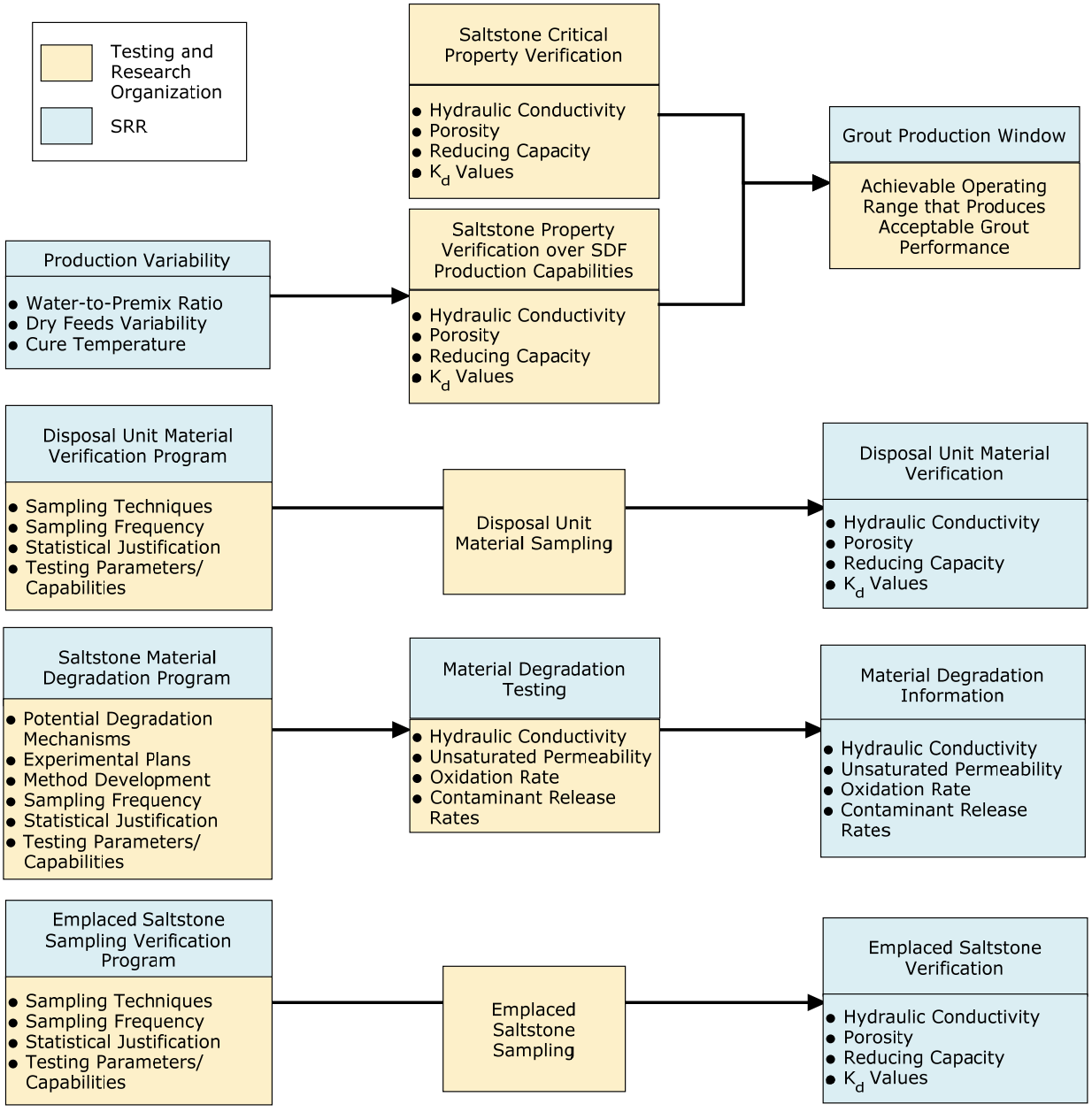
Funding estimations have been made for each activity, as shown in Table 2.3-1. While actual work performed is always dependent on current funding and priorities, this table provides a general idea of work that is expected to be performed over the next six years.

Table 2.3-1: Z-Area Saltstone Disposal Facility Testing and Research Activities

Section	Maintenance Activity	FY12	FY13	FY14	FY15	FY16	FY17	FY18
	Testing and Research Activities							
2.3.1.1	Technetium Kd Sorption Testing	150	0	0	0	0	0	0
2.3.1.2	Kd Distributions in Saltstone	25	0	0	0	0	0	0
2.3.1.3	Kd Distributions in Soil	25	0	0	0	0	0	0
2.3.1.4	PA Property Testing of Saltstone Produced in the SPF Operating Window	260	0	0	0	0	0	0
2.3.1.5	Technetium Kd Column Studies	275	0	0	0	0	0	0
2.3.1.6	Multidimensional Simulation of pH and Eh Evolution in Cementitious Materials	100	0	0	0	0	0	0
2.3.1.7	Effects of Temperature on Cementitious Kd Values	0	100	0	0	0	0	0
2.3.1.8	Saltstone Osmotic Pressure Impacts on Contaminant Movement	0	50	0	0	0	0	0
2.3.2.1	Verify Hydraulic/Physical Properties of Disposal Unit Concrete	60	60	60	60	60	60	60
2.3.2.2	Wall and Floor Panel Hydraulic Properties	75	0	0	0	0	50	0
2.3.3.1	Continue Studies Related to Concrete Degradation Due to Chemical Attack	100	100	50	50	50	50	50
2.3.3.2	Microbial Degradation of Saltstone and Associated Cementitious Materials	100	30	0	0	0	0	0
2.3.3.3	Cracking and Transport Literature Review	40	0	0	0	0	0	0
2.3.3.4	Measurement of Unsaturated Permeability of Fractured Saltstone	100	0	0	0	0	0	0
2.3.3.5	Oxidation Rate Analytical Method Development	300	100	0	0	0	0	0
2.3.3.6	Long-term Radiological Lysimeter Program	150	50	50	50	50	50	50
2.3.3.7	Studies Related to Concrete Degradation Due to Radiation damage	0	100	30	0	0	0	0
2.3.3.8	Dual-Porosity Approach for Unsaturated Flow and Transport and Discrete Fracture Model	0	100	50	0	0	0	0
2.3.3.9	Develop and Implement a Refined Stochastic Fracture Model	0	0	0	150	0	0	0
2.3.3.10	Closure Cap Drainage Layer Long-Term Performance	0	0	0	0	100	50	50
2.3.4.1	Measure Hydraulic/Physical Properties of Saltstone Samples	0	0	0	0	0	0	0
2.3.4.2	Perform Saturated Hydraulic Conductivity Measurement of Formed Core Samples	100	0	0	0	0	0	0
2.3.4.3	In-Situ Characterization of Saltstone	0	100	150	0	0	0	0
	Testing and Research Total	**1,855**	**790**	**390**	**310**	**260**	**260**	**210**

Figure 2.3-2 provides a simple illustration of some of the parallel testing efforts described in detail in this section. From an overall perspective, the illustration below depicts how testing and research activities and on-going testing of the saltstone waste form are being cultivated using an integrated, systematic approach.

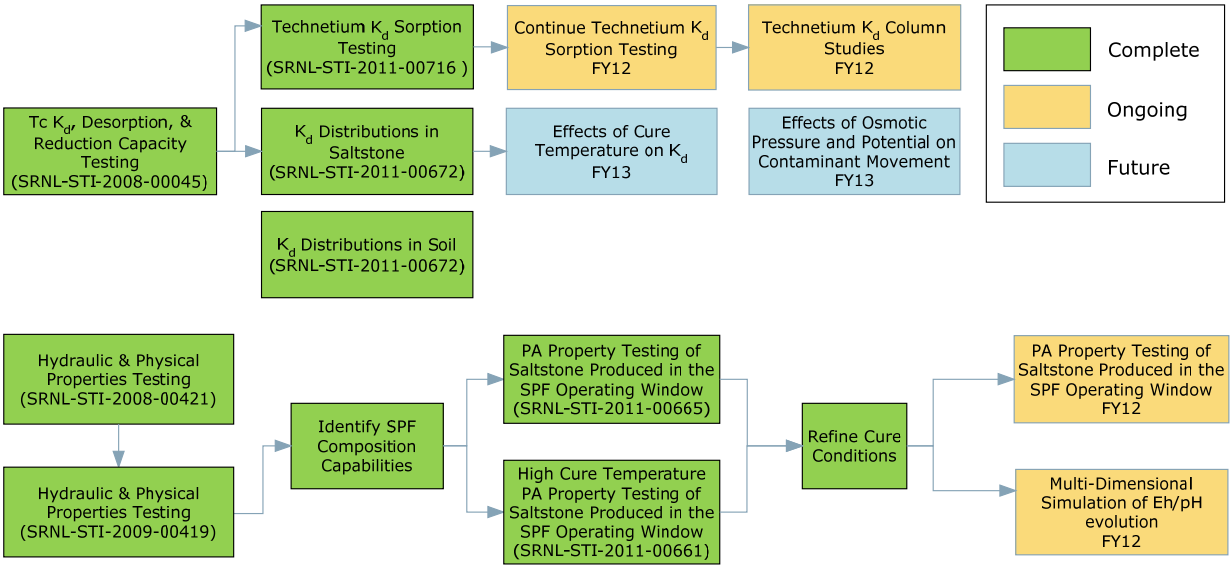
Figure 2.3-2: Saltstone Research, Development, and Testing Program Elements



2.3.1 Critical Property Testing

Several parameters are essential to reducing uncertainty in PA values, specifically in the areas of hydraulic conductivity, reduction capacity, and distribution coefficients for cured saltstone. The current strategy aims at reducing uncertainty in critical property parameters, including current research efforts, is shown in Figure 2.3-3.

Figure 2.3-3: Critical Property Testing Strategy



The maintenance activities presented in this section concern critical values such as K_d values, hydraulic conductivities, reduction capacities, water retention characteristics, and kinetic parameters. The SDF PA relies on such values to make informed predictions about system behaviors over long periods. It is therefore desirable to reduce uncertainty in these parameters where possible. The maintenance activities presented here are intended to reduce uncertainty around properties in SDF PA modeling.

There were many K_d values used during the preparation of the revised SDF PA. Values were used for greater than 40 radionuclide species (note that radioisotopes of the same element have the same K_d and solubility values) and eight solid phases. Additionally, ranges for each value and their type of statistical distribution (e.g., normal or log normal) provide additional confidence in the results of the PA. These values were generated in different ways depending on the availability of experimental data. Part of these efforts focus on reducing uncertainty in the K_d values that are most important to the SDF PA.

Several studies from FY2011 have influenced the direction of continued research on properties considered critical to the performance of saltstone. A study on the hydraulic and physical properties of saltstone and their correlation to the mix and curing conditions (SRNL-STI-2011-00665) has prompted further investigation into the effects of cure temperature and curing conditions on saltstone performance properties.

Studies on the technetium distribution coefficient (K_d) under anaerobic conditions began in FY2011 and will continue into FY2012. The sorption experiment (SRNL-STI-2011-00716) currently underway will be continued until equilibrium is reached. A column study will be initiated to independently substantiate these values using an alternate method that may provide additional information.

Additional K_d studies in FY2011 (SRNL-STI-2011-00672) included a literature investigation into plutonium in soils as well as a study of various K_d values in saltstone simulant. The soil study critically reviewed, tabulated, and then statistically analyzed 65 SRS sediment Pu K_d

values to identify their range and distributions. Further refinement of the distributions was made based on the soil texture and soil pH range. The saltstone simulant study was intended to determine the range and distribution of cesium, strontium, iodine and europium K_d values in saltstone. Cesium, strontium, and iodine K_d values were measured from a wide range of formulations of 22 archived saltstone materials, and distributions were provided for each.

2.3.1.1 Technetium K_d Sorption Testing

Description: Testing under this effort focuses on the K_d of technetium in saltstone to support reduction of uncertainty or unnecessary conservatism in the SDF PA with respect to technetium K_d values and distributions. Testing involves the examination of Tc-99 sorption onto cementitious materials with varying slag content. This testing began in FY2011 (SRNL-STI-2011-00716) and will continue into FY2012.

Expected Benefit: K_d values are commonly shown to be among the most important parameters influencing the outcomes of PA predictions. This task is expected to reduce the uncertainty of K_d values of the key radionuclide technetium.

Deliverable: Technical Reports

Expected Completion Date: 2QFY2012 (SRNL-STI-2011-00716 – Status Report)
4QFY2012 Final Report

Responsibility: SRR C&WDA

Estimated Cost: FY2012 $150K

2.3.1.2 K_d Distributions in Saltstone

Description: This saltstone simulant study was intended to determine the range and distribution of cesium, strontium, iodine and europium K_d values in saltstone. Cesium, strontium, and iodine K_d values were measured from a wide range of formulations of 22 archived saltstone materials, and distributions were provided for each. Europium K_d values could not be measured because europium precipitated or sorbed to glassware during the experiment.

Expected Benefit: This activity provided distributions for cesium, strontium, and iodine for saltstone simulants with a wide range of curing and mix parameters. These values will serve as additional input for stochastic modeling used in the PA.

Deliverable: Technical Report (SRNL-STI-2011-00672)

Expected Completion Date: 2QFY2012

Responsibility: SRR C&WDA

Estimated Cost: FY2012 $25K (Complete)

2.3.1.3 K_d Distributions in Soil

Description: This study critically reviewed, tabulated, and then statistically analyzed 65 SRS sediment plutonium K_d values to identify their range and distributions. Further refinement of the distributions was made based on the soil texture and soil pH range. Testing under this effort focused on plutonium K_d values to support reduction of uncertainty or unnecessary conservatism in the SDF PA with respect to K_d distributions in sediment.

Expected Benefit: This activity provided plutonium K_d distributions for varying sediment conditions for use in stochastic modeling and revised the single-value plutonium K_d for sandy sediment based on the observed distributions. These values are more site-specific than those used previously and will improve the accuracy of the PA model. The data provided from this effort will also inform the HTF and FTF PAs.

Deliverable: Technical Report (SRNL-STI-2011-00672)

Expected Completion Date: 2QFY2012

Responsibility: SRR C&WDA

Estimated Cost: FY2012 $25K (Complete)

2.3.1.4 PA Property Testing of Saltstone Produced in the SPF Operating Window

Description: The SDF produces grout by blending salt waste solution and dry feeds materials, and pumping the grout to disposal cells to cure. From FY2009 studies, the three most critical parameters to saltstone performance are water-to-premix ratio, dry feeds variability, and the curing temperature. [SRNL-STI-2009-00810, SRNL-STI-2009-00546] These studies are intended to define the operating conditions required to meet or exceed the materials performance properties used in the SDF PA.

FY2011: A statistically designed set of mixes was developed to determine key process and compositional factors that affect the performance properties of saltstone. A total of 27 mixes were batched and tested containing high and low concentrations of aluminate, varying water to premix ratios (w/p), and varying fly ash content in the premix. Each of the mixes was cured at 20, 40, and 60 °C. Additionally, gel time and bleed water were measured and found to be within the acceptable facility parameters. [SRNL-STI-2011-00665]

An additional study investigated the impact of high temperature curing on the moisture retention properties of ARP/MCU saltstone. Samples cured at 60^{o}C for 28 days were tested for moisture retention characteristics using pressure extraction, measured vapor pressure (chilled mirror hygrometer), and controlled vapor pressure (vapor equilibrium). The porosity and dry bulk density of each mix was measured, and particle density was calculated from the measurements of dry bulk density. Additionally, characteristic curves for high cure temperature samples were compared to those based on saltstone cured at room temperature. [SRNL-STI-2011-00661]

FY2012: The grout in the SDF vaults does not cure at a single temperature, as in SRNL-STI-2011-00661, rather it is exposed to a variable and gradually increasing temperature profile after it is placed. It has been recommended that in addition to curing under vault temperature profiles, samples be cured at high relative humidities in order to maintain saturated grout.

Expected Benefit: These studies are intended to define the operating conditions required to meet or exceed the materials performance properties used in the SDF PA. The FY2011 reports, SRNL-STI-2011-00665 and SRNL-STI-2011-00661, provide hydraulic conductivities, porosities, and moisture retention characteristics for mixes of varying aluminate concentration, water-to-premix ratios, cure temperature and fly ash content. The FY2012 effort is intended to more realistically mimic cure conditions (i.e., temperature and humidity) to understand better the impact of cure temperature on performance properties.

Deliverable: Technical Reports

Expected Completion Date: 4QFY2012

Responsibility: SRR C&WDA

Estimated Cost: FY2012 $260K

2.3.1.5 Technetium K_d Column Studies

Saltstone is approximated as a monolith through which environmental sources of water infiltrate. This water, known as pore water, interacts with the waste form as it traverses the waste to transport contaminants from the waste to the environment. This task, which is being performed by Pacific Northwest National Laboratory (PNNL), involves a column study where the waste form material is placed in a column, a pore water simulant is passed through the waste matrix, and properties of interest are measured in the exiting fluid.

Expected Benefit: This task is intended to be an independent validation of the technetium K_d values used in the PA.

Deliverable: Technical Report

Expected Completion Date: 4QFY2012

Responsibility: SRR C&WDA

Estimated Cost: FY2012 $275K

2.3.1.6 Multidimensional Simulation of pH and Eh Evolution in Cementitious Materials

Description: This task involves development of a multidimensional capability for modeling reactive transport in saltstone cementitious materials, specifically pH and Eh evolution through space and time resulting in gradual evolving of pH and Eh regimes. The output of this model will then be compared with the results from the current one-dimensional model.

Expected Benefit: This activity is expected to remove conservatism in the current PA model by addressing the abrupt changes in pH and Eh that produce artificially high contaminant release. The data provided from this effort will also inform the HTF and FTF PAs.

Deliverable: Technical Report

Expected Completion Date: 4QFY2012

Responsibility: SRR C&WDA

Estimated Cost: FY2012 $100K

2.3.1.7 Effects of Temperature on Cementitious K_d Values

Description: Based on recent analysis of various K_d distributions in saltstone, it appears that higher cure temperatures may affect K_d values for certain radionuclides. [SRNL-STI-2011-00672] Testing under this effort will mimic SDF cure profiles and conditions with saltstone simulants to study the effect of cure temperature on K_d for a suite of radionuclides.

Expected Benefit: This activity is expected to explore the effects of cure temperature on K_d for saltstone in order to refine the range of expected K_d values in saltstone as input for stochastic modeling using samples developed for the activity described in Section 2.3.1.4. The data provided from this effort will also inform the HTF and FTF PAs.

Deliverable: Technical Report

Expected Completion Date: 4QFY2013

Responsibility: SRR C&WDA

Estimated Cost: FY2013 $100K

2.3.1.8 Saltstone Osmotic Pressure Impacts on Contaminant Movement

Description: Recent study into the moisture retention properties of saltstone suggest that osmotic pressure from the high salt concentration in saltstone feed may play a potentially significant role in contaminant transport by altering moisture movement and permitting contaminant migration through semi-permeable membranes. This task would involve analysis of osmotic pressure on the current PA model for flow and transport.

Expected Benefit: This task would reduce uncertainty in water flow and advective contaminant release and a more comprehensive representation of the physical processes dominating contaminant release for the SDF.

Deliverable: Technical Report

Expected Completion Date: FY2013

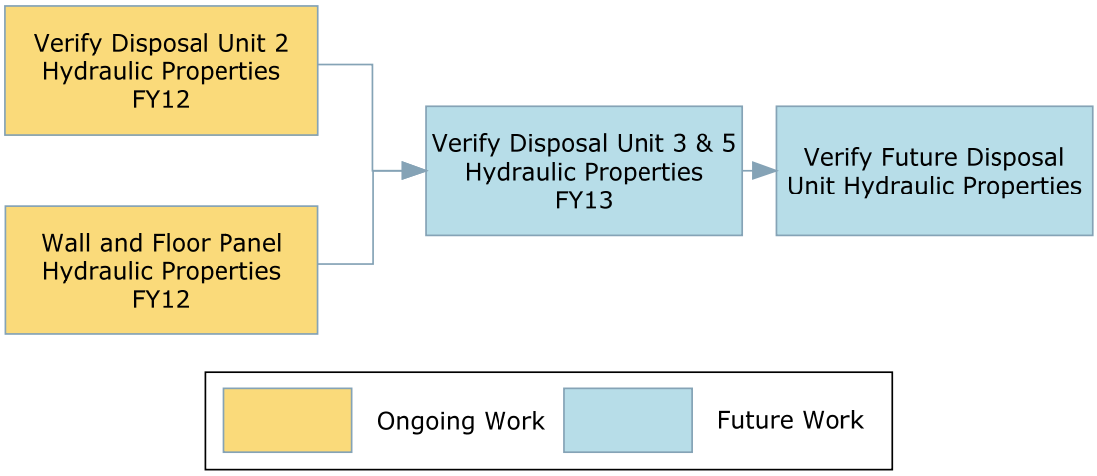
Responsibility: SRR C&WDA

Estimated Cost: FY2013 $50K

2.3.2 Disposal Unit Properties

The maintenance activities presented in this section establish an understanding of the properties of the saltstone disposal units. This understanding reduces uncertainty in the SDF PA by confirming the properties of materials actually used in construction of the saltstone disposal units. The current strategy for disposal unit testing is shown in Figure 2.3-4.

Figure 2.3-4: Disposal Unit Property Testing Strategy



2.3.2.1 Verify Hydraulic/Physical Properties of Disposal Unit Concrete

Description: FDCs benefit from a PA-informed design. The design and materials for construction are to be confirmed using samples gathered from the actual disposal units during construction.

FY2012: Samples of concrete used in the construction of FDCs have been collected from SDU 2 and are being collected from construction of SDUs 3 and 5. Analysis of these will verify that the materials used in the field meet or exceed materials properties identified in the PA, such as hydraulic conductivity, bulk density, particle density, and porosity. Verification of FDC material properties is anticipated as part of an overall performance verification process. This testing will begin in FY2012 and will continue as needed to support additional FDC material testing.

Expected Benefit: This activity is expected to validate the hydraulic and physical properties assumed for the disposal units in the SDF PA and develop correlation between laboratory cured samples and field cured samples.

Deliverable: Technical Reports

Expected Completion Date: FY2018

Responsibility: SRR C&WDA

Estimated Cost: FY2012 $60K, FY2013 through FY2018 $60K/yr

2.3.2.2 Wall and Floor Panel Hydraulic Properties

Description: Information about the long-term performance of disposal unit construction materials is of high interest to the modeling assumptions in the SDF PA.

FY2012: This effort involves the construction of two fundamental construction features of the disposal units: a full-scale wall panel and a section of floor. These representative sections will be constructed with the same materials as those in the actual disposal units and will be exposed to similar environmental conditions. This effort will begin in FY2012 and samples are currently scheduled to be collected every five years. Testing will determine hydraulic

conductivity, porosity, bulk and particle density, moisture characteristic curves, oxidation potential, and permeability.

Expected Benefit: This activity is expected to validate the hydraulic and physical properties assumed for the disposal units in the SDF PA.

Deliverable: Technical Reports

Expected Completion Date: After FY2018

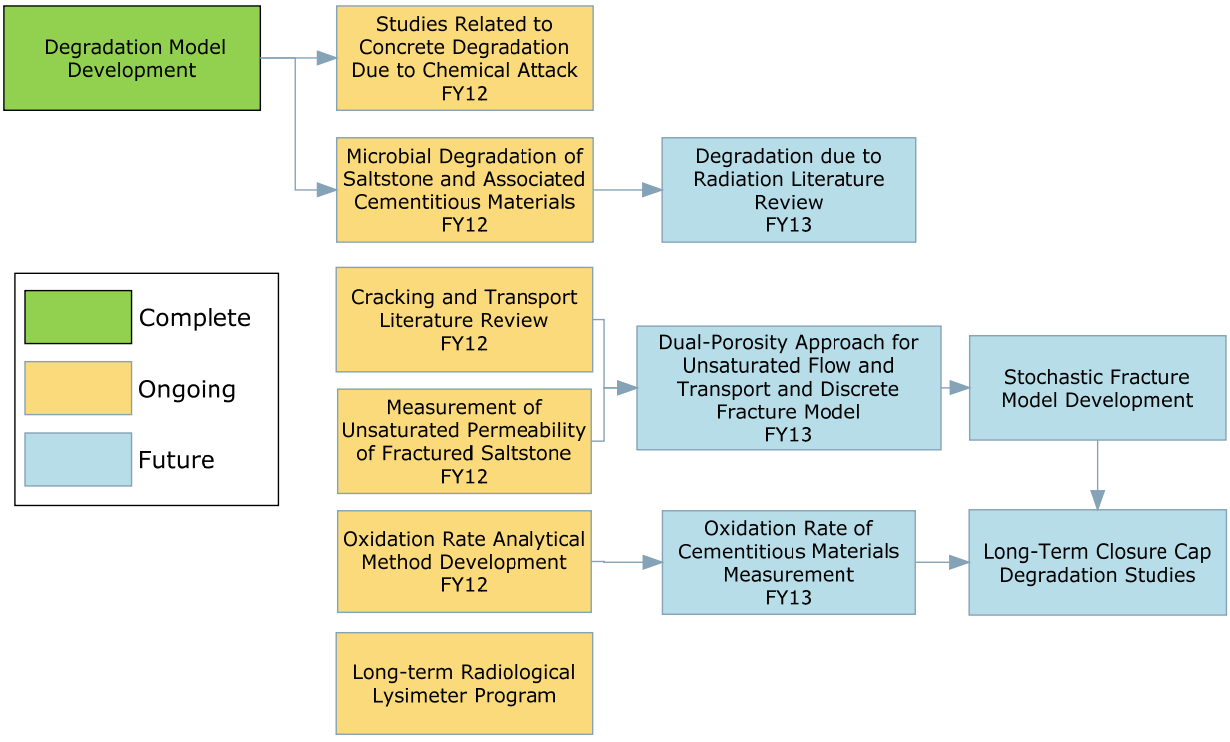
Responsibility: SRR C&WDA

Estimated Cost: FY2012 $75K, FY2017 $50K

2.3.3 Degradation Studies

Maintenance activities presented in this section will focus on meeting information needs relevant to cementitious degradation mechanisms and the frequency and extent of fractures in both saltstone and disposal unit concrete. The overall strategy to gain a better understanding of degradation mechanisms is shown in Figure 2.3-5.

Figure 2.3-5: Degradation Studies



2.3.3.1 Continue Studies Related to Concrete Degradation Due to Chemical Attack

Description: Chemical (sulfate) attack is believed to be a primary degradation mechanism in cementitious materials. This activity continues previous long-term efforts to investigate degradation mechanisms through long-term exposure of cementitious materials to corrosive solutions and analysis of transport properties.

FY2012: This activity continues long-term studies investigating degradation mechanisms. [SRNS-STI-2008-00050, SRNS-STI-2008-00052] The activity includes long-term exposure of cementitious materials to corrosive solutions and analysis of transport properties, development of a carbonation model based on existing SIMCO carbonation test data that can be used for subsequent STADIUM simulations on carbonation of SDU concrete and preparation of cementitious materials for subsequent exposure testing.

Deliverable: Technical Reports

Expected Completion Date: Report Revision 4QFY2012

Responsibility: SRR C&WDA

Estimated Cost: FY2012 $100K, FY2013 $100K, FY2014-FY2018 $50K/yr

2.3.3.2 Microbial Degradation of Saltstone and Associated Cementitious Materials

Description: Microbial organisms present in the environment can promote damage to cementitious materials.

FY2012: This activity will initiate a review of relevant literature currently published to assess the relevant microbial species, key variables, conditions, growth factors, and kinetics on cementitious materials. The literature review will identify key variables, conditions, growth factors, kinetics, and microbial species. If justified, an experimental approach and path forward to address key issues may be developed. The literature review will be initiated in FY2012.

Expected Benefit: This activity is expected to produce a baseline of knowledge concerning on the impact of microbial organisms on the degradation of cementitious materials.

Deliverable: Technical Report

Expected Completion Date: FY2013

Responsibility: SRR C&WDA

Estimated Cost: FY2012 $100K, FY2013 $30K

2.3.3.3 Cracking and Transport Literature Review

Fracturing of the saltstone waste form results in accelerated degradation of saltstone and accelerated release of contaminants. A better understanding of this process would reduce uncertainty associated with values assumed in the PA.

Literature Review: This activity, which began in FY2011, involves a review of existing literature needed to understand the mechanisms of crack formation and propagation in cementitious materials. The literature review is being performed by Purdue University. The report detailing the findings from this literature review is currently in draft and will be issued in 2QFY2012.

Expected Benefit: This activity is expected to provide an understanding of how cementitious material fractures. This understanding will benefit the development of future fracture models (Sections 2.3.3.5, 2.3.3.6) and will verify basic assumptions in the PA. The data provided from this effort will also inform the HTF and FTF PAs.

Deliverable: Technical Report
Expected Completion Date: 2QFY2012

Responsibility: SRR C&WDA

Estimated Cost: FY2012 $40K

2.3.3.4 Measurement of Unsaturated Permeability of Fractured Saltstone

Description: Concerns have been raised that the unsaturated hydraulic conductivity of fractured saltstone has not been measured. This task would involve development and validation of a lab-scale approach for measuring relative permeability of fractured cementitious materials. This would be accomplished by development of a method for generating representative fracture networks, a method for the characterization of said fracture networks, and a method for measurement of permeability under unsaturated conditions.

Expected Benefit: This effort will provide model support for unsaturated hydraulic conductivities of fractured saltstone.

Deliverable: Technical Report

Expected Completion Date: FY2012

Responsibility: SRR C&WDA

Estimated Cost: FY2012 $100K

2.3.3.5 Oxidation Rate Analytical Method Development

Description: This task involves the evaluation and use of a series of analytical approaches to measure oxidation front movement through saltstone and FDC cementitious materials.

FY2012: The task for this fiscal year includes development and validation of the measurement method. The methods under consideration include X-ray photoelectron spectroscopy (XPS), diffuse reflectance spectroscopy (DRS), X-ray absorption spectroscopy (XAS), redox indicators, and leaching. Samples will be laboratory prepared and then cured under uncontrolled environmental conditions to simulate an exposed cementitious surface. Laboratory samples will also be prepared and cured as needed to validate the proposed analytical method. At least one feasible method will be utilized on the first field-cured sample in FY2012.

FY2013: Feasible methods from the FY2012 development will be applied to additional field-cured samples to experimentally measure the oxidation rate of cementitious materials.

Expected Benefit: This activity is expected to validate assumptions in the SDF PA concerning oxidation front movement in cementitious materials. The data provided from this effort will also inform the HTF and FTF PAs.

Deliverable: Technical Report

Expected Completion Date: FY2013

Responsibility: SRR C&WDA

Estimated Cost: FY2012 $300K, FY2013 $100K

2.3.3.6 Long-term Radiological Lysimeter Program

Description: Understanding the long-term behavior of radionuclides in saltstone is essential to models that project this behavior over thousands of years. The objective of this task is to measure the reduction capacity of radioactive samples by placing actual cementitious materials (saltstone or grout) spiked with a suite of radionuclides/analogues including cesium, plutonium, iodine, and technetium in lysimeters to be placed in an outside environment. Measurement will target solubility and K_d values in soil and cementitious materials, and colloidal transport of various radionuclides. The total exposure time is anticipated to be 10 years, with data available in as soon as two years. Soils and cementitious materials will be placed in the lysimeters and the reduction capacity, K_d, and solubility will be determined after environmental exposure.

FY2012: Installation of the lysimeter and initiation of the sample collection program are scheduled to occur in FY2012.

Expected Benefit: This task is expected to provide K_d values in soil and cementitious materials and colloidal transport measurements for various radionuclides. It will provide additional information about long-term geochemical and transport phenomena that will be used to support the waste release and transport models used in the SDF, FTF, and HTF PAs.

Deliverable: Technical Reports

Expected Completion Date: After FY2018

Responsibility: SRR C&WDA

Estimated Cost: FY2012 $150K, FY2013 through FY2018 $50K/yr

2.3.3.7 Studies Related to Concrete Degradation Due to Radiation Damage

Description: Saltstone is a cementitious waste form. As such, damage to cementitious materials from radiolytic mechanisms must be understood. Future testing could include exposure of samples to the equivalent of 10,000 years of cumulative dose using Cobalt-60 gamma radiation. Gases generated due to exposure could result in internal pressurization and cracking. Analysis of gases generated from the exposure, measurement of the physical and mechanical properties of the cementitious samples after exposure, and the leach rates from both irradiated and unirradiated samples are possible areas of future testing.

Expected Benefit: This activity is expected to produce a baseline of knowledge concerning cementitious degradation due to radiolytic mechanisms over long periods to inform PA degradation assumptions. The data provided from this effort will also inform the HTF and FTF PAs.

Deliverable: Technical Report

Expected Completion Date: FY2014

Responsibility: SRR C&WDA

Estimated Cost: FY2013 $100K, FY2014 $30K

2.3.3.8 Dual-Porosity Approach for Unsaturated Flow and Transport and Discrete Fracture Model

Description: This task addresses the overly conservative PA approach of assuming the same contaminant concentration in fractures and the saltstone matrix, resulting in a higher contaminant release. This task would develop an approach to factor in the diffusion of contaminants out of the matrix and into the fracture. This task would involve selection of mass transfer coefficients from literature assuming diffusion-dominated transport in the matrix, simulation of fracture networks using a discrete fracture model, simulation of the same fracture matrix using a dual-domain model, and comparison of results and validation of mass transfer coefficient selection.

Expected Benefit: This task would reduce conservatism in PA contaminant release assumptions. The data provided from this effort will also inform the HTF and FTF PAs.

Deliverable: Technical Report

Expected Completion Date: FY2013

Responsibility: SRR C&WDA

Estimated Cost: FY2013 $100K

2.3.3.9 Develop and Implement a Refined Stochastic Fracture Model

Description: Fracturing of the saltstone waste form results in accelerated degradation of saltstone and accelerated release of contaminants. A better understanding of this process would reduce uncertainty associated with values assumed in the PA.

Literature Review: This activity, which will begin in FY2015, involves material testing needed to understand, develop, and implement a stochastic fracture model that increases confidence in the degradation from fracturing assumed in the sensitivity cases evaluated in the PA. This activity will draw from the literature review conducted to inform the deterministic fracture model.

Expected Benefit: This activity is expected to provide an understanding of how cementitious material fractures. This will help verify assumptions and sensitivities in the PA.

Deliverable: Technical Report

Expected Completion Date: FY2015

Responsibility: SRR C&WDA

Estimated Cost: FY2015 $150K

2.3.3.10 Closure Cap Drainage Layer Long-Term Performance

Description: This task will involve initial research and development regarding the long-term performance of the closure cap sand drainage layer. The effort will involve development of a test plan, acquisition of representative materials, grain size/geochemical analysis, colloid batch tests to characterize colloid potential, and colloid impact screening tests to identify characteristics of reasonable disruptive events. The data provided from this effort will also inform the HTF and FTF PAs.

Expected Benefit: This effort will validate assumptions in the PA concerning the rate of pluggage of the closure cap drainage layer as well as the drainage layer above each disposal unit.

Deliverable: Technical Report

Expected Completion Date: FY2018

Responsibility: SRR C&WDA

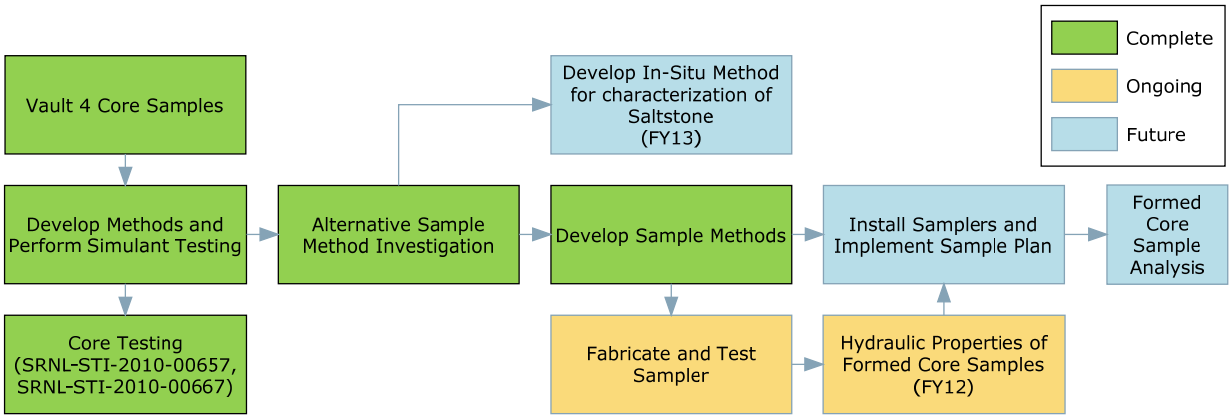
Estimated Cost: FY2016 $100K, FY2017-FY2018 $50K/yr

2.3.4 Emplaced Saltstone Sampling and Characterization

Maintenance activities presented in this section will establish the R&D programs in order to measure properties of emplaced saltstone samples. Saltstone samples collected from Vault 4 have undergone testing as described in Section 2.3.4.1. In the future, alternative sample collection methodologies will be employed that may have less impact on the sample itself, such as the formed-core sampling method. [SRNL-STI-2010-00167]

A sampling device similar to that described in SRNL-STI-2010-00167 has been constructed and tested at full scale. The resulting samples will be tested for PA-significant properties such as hydraulic conductivity (Section 2.3.4.2). This sampling technique is expected to be implemented in SDUs as part of a long-term program to confirm saltstone quality and properties. The current sampling strategy is shown in Figure 2.3-6.

Figure 2.3-6: Emplaced Saltstone Testing Strategy



2.3.4.1 Measure Hydraulic/Physical Properties of Vault 4 Drill-Cored Saltstone Samples

Description: In order to validate the hydraulic and physical properties of saltstone, samples of the existing saltstone would give the highest pedigree results. Vault 4 samples were collected in FY2009 using both wet and dry drill coring methods and aliquots of these samples were sent to SRNL to measure hydraulic conductivity. These measurements were performed on Vault 4 saltstone samples but it is recognized that the sample collection methodology currently employed may affect the viability of the samples. [LWO-RIP-2008-00006]

FY2010-FY2011: Saltstone samples collected from Vault 4 Cell E using both dry and wet coring methods were also submitted for permeability analysis. The cores from Vault 4 Cell E were in multiple pieces when they were recovered. Permeability testing was only performed on the portions of the core sample that were intact and had no visible fractures or cracks. [SRNL-STI-2010-00657]

An additional effort measured K_d values for these Vault 4 Cell E samples. The study was designed to provide insight into how readily species immobilized in saltstone will leach from the saltstone under oxidizing conditions simulating the edge of a saltstone monolith and under reducing conditions (30 to 60 ppm O_2), targeting conditions within the saltstone monolith. Solubility and K_d values were obtained from measurement of the species present in the solid and the aqueous leachate. [SRNL-STI-2010-00667]

In the future, alternative sample collection methodologies will be employed that may have less impact on the sample itself, such as the formed-core sampling method. [SRNL-STI-2010-00167] Future testing and verification of saltstone properties is anticipated as part of an overall performance verification process.

Expected Benefit: This activity was expected to provide data for field-cured disposed saltstone, but the techniques required to retrieve the cored samples from Vault 4 likely invalidated the hydraulic property data reported in SRNL-STI-2010-00657. Consequently, alternative sampling methods are being pursued.

Deliverable: Technical Reports (SRNL-STI-2010-00657, SRNL-STI-2010-00667)

Expected Completion Date: Complete

Responsibility: SRR C&WDA

Estimated Cost: Complete

2.3.4.2 Perform Saturated Hydraulic Conductivity Measurement of Formed Core Samples

Description: Due to issues identified with previous sample collection methods, a sample collection device similar to that described in SRNL-STI-2010-00167 has been fabricated and tested, and the samples in the samples saved for further analysis. The effect of sample collection method on the properties of the sample is of great interest, so the hydraulic properties of the simulant cores from this effort will be tested and compared to previous simulant results.

Expected Benefit: This effort is expected to determine the effects of the formed core sampling methodology on the hydraulic properties of samples. It should also verify that sample size does not influence hydraulic conductivity.

Deliverable: Technical Report

Expected Completion Date: FY2012

Responsibility: SRR C&WDA

Estimated Cost: FY2012 $100K

2.3.4.3 In-Situ Characterization of Saltstone

Description: This effort involves the development and validation of a suite of methods for in-situ characterization of saltstone fracture state and field-scale hydraulic properties. This is a multi-year effort involving evaluation and down-select of methods and a test plan for implementation.

Expected Benefit: This effort is expected to provide a robust method of validating emplaced saltstone fracture state and field-scale hydraulic properties.

Deliverable: Technical Report

Expected Completion Date: FY2014

Responsibility: SRR Waste Solidification Engineering

Estimated Cost: FY2013 $100K, FY2014 $150K

3.0 F-AREA TANK FARM

3.1 FTF PA Annual Maintenance Activities

DOE M 435.1-1 requires the on-going maintenance of all PAs. This maintenance involves a series of activities that must be performed on an on-going or annual basis. The activities in Section 3.1 represent those activities that will be required every year in support of the FTF PA regardless of the status of any on-going or future PA revisions. These activities will be initiated for the FTF PA once the PA is implemented, or sooner, if necessary, to support PA implementation and tank closure. It is anticipated that the FTF PA would be implemented in FY2012.

3.1.1 Maintain F-Area Tank Farm Performance Assessment Control Through Unreviewed Waste Management Question Process

Description: Similar to the process set up for evaluating disposal related questions in SDF, a UWMQ process will be established for FTF closure activities. The UWMQ process will consist of providing UWMQ Evaluations (UWMQEs) of proposed activities or new information to ensure that the assumptions, results, and conclusions of the approved PA and CA remain valid.

If identified through the UWMQ process that a proposed activity or new information is outside the bounds of the approved NDAA Section 3116 Basis Document, PA, or CA, SAs are prepared to update the technical baseline. UWMQEs and SAs will continue to be required throughout the life of the facility. For planning purposes, the estimated cost assumes that six UWMQs will be prepared each year in the out-years (beginning FY2012). The estimated cost does not reflect the cost of any general FTF SAs.

If a general FTF SA is required, it is estimated that approximately $100K would be required to complete an SA. The estimated cost will vary, up or down, depending on the actual number of UWMQEs performed and the need to perform SAs in any given year. In addition, in support of the closure process, tank-specific SAs will be prepared to document the final residual material contents of the tanks in comparison to the PA assumptions. Costs associated with the tank-specific SAs will be captured as part of the associated FTF Tier 2 closure plan as discussed in the Section 3.1.5 maintenance activity.

Deliverable: Provide UWMQEs, UWMQ procedure support, and SAs as needed to support closure of FTF.

Expected Completion Date: On-going

Responsibility: SRR C&WDA

Estimated Cost: FY2012 through FY2018 $150K/yr

3.1.2 Conduct Annual F-Area Tank Farm Performance Assessment Validation

Description: The purpose of the PA maintenance program is to confirm the continued adequacy of the PA and to increase confidence in the results of the PA. One part of the maintenance program is to conduct an annual review of the facility closure activities. The

annual PA review is conducted in a systematic manner that incorporates the following considerations:

- Final residual radionuclide and chemical inventories;
- Testing and research activities performed during the year and planned for the out-years;
- Results of PA monitoring conducted in accordance with the facility monitoring plan

The above factors will be reviewed annually to confirm the adequacy of the current FTF PA and to evaluate the need to conduct SAs or prepare a revision to the PA. The results of the review will be documented in an annual review report for the FTF PA. Annual validation of the FTF PA will begin once the FTF PA has been implemented.

Deliverable: Issue fiscal year PA annual review report

Expected Completion Date: 2QFY (issued annually)

Responsibility: SRR C&WDA

Estimated Cost: FY2012 through FY2018 $20K/yr

3.1.3 Prepare Annual Performance Assessment Maintenance Program Implementation Plan

Description: The purpose of the PA maintenance program is to confirm the continued adequacy of the current PA and to increase confidence in the results. Every year the annual PA maintenance program fiscal year implementation plan will be prepared and provided to DOE. The implementation plan will outline planned work for each fiscal year covering a 6-year period. The cost of preparing the implementation plan will be shared between SDF, FTF, and HTF. See the maintenance activities in Sections 2.1.3 and 4.1.3 for SDF and HTF, respectively.

Deliverable: Issue fiscal year PA maintenance program implementation plan

Expected Completion Date: 2QFY (issued annually)

Responsibility: SRR C&WDA

Estimated Cost: FY2012 through FY2018 $15K/yr

3.1.4 Develop/Maintain F-Area Tank Farm Performance Assessment Tier 1 Closure Plan

Description: SRS closure management is regulated under DOE M 435.1-1. Implementation of the FTF PA will require development and maintenance of an FTF Tier 1 closure plan complying with the DOE M 435.1-1 prior to grouting of any FTF waste tanks. Once developed, the closure plan will be reviewed periodically to determine if a revision is required. The FTF Tier 1 closure plan is currently under development and is to be issued in FY2012. Final approval of the FTF Tier 1 closure plan is dependent on issuance of the NDAA Section 3116 Waste Determination. In addition, review/revision of the plan will occur annually in the out-years.

Deliverable: Develop Tier 1 closure plan and review annually.

Expected Completion Date: FY2012 (Initial issuance)

Responsibility: SRR C&WDA

Estimated Cost: FY2012 through FY2018 $5K/yr

3.1.5 Prepare F-Area Tank Farm Tank-Specific Performance Assessment Tier 2 Closure Plans

Description: SRS closure management is regulated under the Federal Facility Agreement and SCDHEC industrial wastewater treatment permit. [WSRC-OS-94-42, DHEC_03-03-1993] Implementation of the FTF PA will require development and maintenance of a DOE M 435.1-1 compliant Tier 1 closure plan as discussed in the maintenance activity in Section 3.1.4. In addition, a Tier 2 closure plan will be required for each individual waste tank or group of waste tanks prior to grouting. The Tier 2 closure plans will contain the waste tank-specific information required as part of the closure process. As a part of the development of the Tier 2 closure plans, waste tank-specific SAs documenting the final tank residual characterization in comparison to the FTF PA assumptions will be required. An SA reflecting the final characterization information for Tanks 18 and 19 was issued in FY2012. [SRR-CWDA-2010-00124] A Tier 2 closure plan for Tanks 18 and 19 is to be completed in FY2012. As schedules for remaining waste tank closures are finalized, estimated completion dates and waste tank groupings for the Tier 2 closure plans and the associated waste tank-specific SAs will be incorporated into the annual PA maintenance program fiscal year implementation plan. Estimations and tank groupings here are based on the closure timing in the current *Liquid Waste System Plan* and the relative locations of tanks. [SRR-LWP-2009-00001] It is anticipated that a new DOE M 435.1-1 compliant Tier 2 closure plan will be needed at least once per fiscal year as FTF waste tanks are readied for operational closure (grouting).

Deliverable: Issue waste tank-specific Tier 2 closure plan and associated SA.

Expected Completion Date: FY2012 (Tier 2 for Tanks 18/19)
FY2014 (Tier 2 for Tanks 5/6)

Responsibility: SRR C&WDA

Estimated Cost: FY2012 $100K, FY2014 $100K

3.1.6 Develop/Maintain F-Area Tank Farm Performance Assessment Monitoring Plan

Description: SRS closure management is regulated under the Federal Facility Agreement and SCDHEC industrial wastewater treatment permit. [WSRC-OS-94-42, DHEC_03-03-1993] It is anticipated that FTF PA implementation will require development and maintenance of a monitoring plan complying with the DOE M 435.1-1 and associated documents within one year of FTF PA implementation. Once developed, the monitoring plan will be reviewed annually to determine if a revision is required. For planning purposes, it is assumed that initial development of the FTF monitoring plan will occur in FY2013 and review/revision of the plan will occur annually in the out-years.

Deliverable: Develop PA monitoring plan and review annually.

Expected Completion Date: FY2013 (Initial issuance of FTF monitoring plan)

Responsibility: SRR C&WDA

Estimated Cost: FY2013 $50K, FY2014 through FY2018 $10K/year

3.1.7 Provide General Technical Support on F-Area Tank Farm Performance Assessment Issues

Description: This task is to provide general technical and programmatic support on FTF PA issues, NRC activities, and other regulatory issues that affect FTF waste tank closure. Activities include supporting NRC on-site observation visits and technical reviews, general project support, testing and research activity support, and development of resolution path forward for NRC open items. This also includes support on interactions with SCDHEC, CAB, LFRG, National Academy of Sciences, and other regulatory and stakeholder bodies.

Deliverable: Provide on-going technical support on regulatory and policy issues/forums affecting FTF closure activities.

Expected Completion Date: On-going

Responsibility: SRR C&WDA

Estimated Cost: FY2012 through FY2018 $150K/yr

3.2 F-Area Tank Farm Performance Assessment Development/Revisions

The FTF PA provides the technical basis and results to be used in subsequent documents to demonstrate compliance with performance objectives of *Licensing Requirements for Land Disposal of Radioactive Waste*, *Radioactive Waste Management*, *Federal Facility Agreement for the Savannah River Site*, *Standards for Wastewater Facility Construction*, and *Proper Closeout of Wastewater Treatment Facilities*. [10 CFR 61, DOE O 435.1, WSRC-OS-94-42, SCDHEC R.61-67, SCDHEC R.61-82]

3.2.1 Performance Assessment Development for In-Progress F-Area Tank Farm Performance Assessment

Description: In August 2008, the LFRG review team issued their final report (LFRG_08-13-2008) and Revision 0 of the FTF PA (SRS-REG-2007-00002) was submitted to the NRC, the EPA, the CAB, and the SCDHEC for review and comment. In FY2009, activities included initiation of comment resolution and preparation of PA comment response packages (SRR-CWDA-2009-00054, SRR-CWDA-2009-00055, and SRR-CWDA-2009-00056). Changes were incorporated into Revision 0 of SRS-REG-2007-00002 and Revision 1 was issued March 31, 2010. In FY2011, the SRS-REG-2007-00002 Revision 1 was reviewed by the NRC and other stakeholders as part of NDAA Section 3116 process in support of waste tank closure. The NRC issued a series of RAIs, which were responded to in a comment response matrix SRR-CWDA-2009-00054. In FY2012 NRC issued a TER (ML112371715) with recommendations on tank closure actions. DOE will consider these recommendations while working to implement the FTF PA in FY2012 and operationally close Tanks 18 and 19 by the end of FY2012, as well as in future PA revisions.

Deliverable: Implementation of FTF PA

Expected Completion Date: 2Q FY2012 (Implementation of FTF PA)

Responsibility: SRR C&WDA

Estimated Cost: FY2012 $30K

3.2.2 Prepare Out-year F-Area Tank Farm Performance Assessment Revisions

Description: A future revision of the FTF PA will be scheduled as required and agreed upon by DOE. The current FTF PA will be revised when warranted, but for estimating purposes, the next revision will be scheduled starting in FY2017. Unless otherwise noted in the FTF PA, the future FTF PA revision will include the following items at a minimum:

- Analyses and results contained in all SAs that have been completed to date
- Analyses and results of all UWMQEs completed to date
- Changes in site future land use plans or closure plans
- Changes to PA guidance documents requirements

Future FTF PA revisions will also consider the following:

- LFRG open items for the following four criteria: 3.1.6.5, 3.1.8.1, 3.1.8.2, and 3.1.8.3. (LFRG_08-13-2008)
- Comment Responses to SCDHEC and EPA on Revision 1 of the FTF PA (SRR-CWDA-2011-00164, SRR-CWDA-2011-00175)
- Responses to RAIs posed by the NRC (SRR-SWDA-2011-00054)
- NRC recommendations in the FTF TER (ML112371715), specifically:
    - *DOE should consider how it might improve far-field model calibration and transparency in future PA updates*
    - *DOE should evaluate the need for additional vertical or horizontal mesh refinement to ensure that contaminant plumes are not artificially dispersed over the volume of the cells in the far-field model and that time discretization is adequate. Comparisons of plume spread in the FTF model to actual observations of contaminant plumes for more mobile and less mobile plumes would be instructive with respect to the adequacy of the FTF models in predicting contaminant concentrations at a down-gradient well.*
    - *The limited information that is available on the condition of the concrete vaults may not be consistent with the base case assumptions in the steel liner corrosion modeling or the assignment of probabilities to the various configurations within the PA with respect to steel liner failure.*

Deliverable: Issue PA revision

Expected Completion Date: FY2018

Responsibility: SRR C&WDA

Estimated Cost: FY2017 $1,500K, FY2018 $1,500K

3.3 F-Area Tank Farm Performance Assessment Testing & Research Activities

Issuances of the FTF PA and the *Basis for Section 3116 Determination for Closure of F-Tank Farm at the Savannah River Site* (DOE/SRS-WD-2010-001) are anticipated to occur in

2QFY2012. After approval and issuance of the FTF PA, additional PA-related testing and research activities identified as part of the on-going maintenance will be prioritized and performed per this Plan.

In their FTF TER (ML112371715), the NRC recommended several issues for DOE to consider during maintenance and monitoring of the FTF PA. These recommendations will require further evaluation to determine how and when they should be addressed. In their TER, the NRC recommends:

- *DOE should consider additional data collection related to calcareous zone outcrop locations and tracer tests to provide further support for the adequacy of its modeling treatment of the Upper Three Runs-Lower Zone aquifer.*
- *DOE should continue to evaluate the appropriateness of selected transport parameters (e.g., dispersivities and K_ds, particularly for calcareous zones) and selection of sorption models (see section 4.2.9.2 on Pu transport) during the monitoring period*
- *Additional model support should be provided for:*
    1. *The long-term hydraulic conductivity of the upper foundation layer and lateral drainage layer, and*
    2. *The long-term erosion of the topsoil layer.*
- *Prior to completing the final closure cap design, a preliminary evaluation of erosion protection designs (e.g., assessment of an acceptable rock source, the ability of an integrated drainage system to accommodate design features, etc.) should be conducted.*
- *NRC Staff recommends DOE conduct waste release experiments:*
    1. *To increase experimental support for key modeling assumptions about behavior of grout over time including evolution of pH and Eh.*
    2. *To identify key radionuclide association with solid phases comprising the residue in representative tanks to support key modeling assumptions.*
    3. *Leach tests on multiple samples from each tank.*
        a. *Static tests to determine constant concentrations of elements of concern under conditions of exposure to local ground water and to grout leachate.*
        b. *Semi-dynamic leach tests to try to distinguish releases from high solubility compounds from those of low solubility compounds.*
- *NRC staff recommends DOE continue to evaluate the following areas during the monitoring period:*
    1. *Closure cap settlement and stability analyses (Medium Risk-Significance, Intermediate Term) including the following:*
        a. *Site-specific settlement analysis for FTF, that includes the increased overburden from tank grout and the closure cap.*

b. Evaluation of vault and grout integrity that is consistent with observations and reasonable expectations of future degradation of cementitious materials.

c. Assessment of the potential subsidence due to ongoing dissolution of calcareous sediment in the Santee formation.

3.3.1 Tank Residual Characterization

These tasks involve measurements and methods that will improve upon current knowledge of materials remaining in the tanks at operational closure. Although these efforts are FTF activities, much of the information will also be used to inform the HTF PA described in Section 4.2. Additional maintenance items will be developed and performed as the FTF PA is implemented. Some maintenance activities established under the Z-Area SDF maintenance program (Section 2.0) also inform the FTF PA and HTF PA such as those concerning cementitious degradation, soil parameters, and fracture formation.

3.3.1.1 Improved Tank Residual Volume Measurements

Description: This task would focus on improvement of existing mapping and residual volume estimation techniques as well as investigation of alternative techniques.

FY2012: This task would involve improvement efforts to existing video/photograph residual volume estimation via training development as well as investigation of alternative techniques for residual volume estimation to determine if an alternative method would add value to the current residual volume measurement techniques.

Expected Benefit: This task is expected to improve residual volume mapping techniques that are used to inform plans for operational closure of the tank.

Deliverable: Technical Report

Expected Completion Date: FY2012

Responsibility: SRR Tank Closure Engineering

Estimated Cost: FY2012 $100K

3.3.1.2 Plutonium Speciation Studies

Description: Through the NDAA Section 3116(a) consultation process, the NRC observed that uncertainties associated with the FTF PA doses might prevent DOE from meeting the 10 CFR Part 61, Subpart C performance objectives, particularly with regard to plutonium-related modeling assumptions. The NRC staff's primary concern was that the timing of the FTF PA peak dose could be shifted into the period of performance. This peak dose is associated with the residual Pu-239 inventory in Tank 18. The NRC's TER recommends that DOE provide additional model support to further reduce the uncertainty surrounding PA assumptions that, if found to be significantly non-conservative, could result in this peak dose shifting into the 10,000-year performance period.

FY2012: As a first step in addressing the NRC recommendations, DOE-SR sought to determine if additional model support (focusing on plutonium solubility) existed outside of the DOE-EM community, specifically within the DOE weapons laboratories. An expert

panel was convened to provide technical advice relating to further documenting plutonium waste release and transport. The expert panel issued a Plutonium Solubility Peer Review Report (LA-UR-12-00079), containing several suggestions and opportunities for improvement regarding the plutonium modeling assumptions and Tank 18 residual waste experiments that would further strengthen the technical arguments. To implement the suggestions provided in the Peer Review Report and address the NRC recommendations, a series of new activities were completed that provides enhanced model support. These activities included:

1. Analyzing additional potential plutonium waste forms, including calculation of new plutonium solubility values utilizing the Nuclear Energy Agency – Thermochemical Database (NEA-TDB) for use in the waste release model;
2. Issuing studies regarding potential areas of significant conservatism within the FTF PA conceptual model noted by the expert panel;
3. Performing a series of new parametric barrier analyses for plutonium waste release (i.e., variability around plutonium solubility values) and plutonium transport (i.e., variability around plutonium sandy soil K_d values);
4. Utilizing updated plutonium K_d values that better reflect expected FTF soil conditions;
5. Performing deterministic Base Case sensitivity runs showing the dose impact of uncertainty regarding both plutonium solubility and transport;
6. Performing new probabilistic analysis incorporating the revised plutonium solubility values and updated plutonium K_d values; and
7. Testing of a Tank 18 waste sample using X-ray Diffraction and Scanning Electron Microscopy techniques.

The results of these analyses have been incorporated into the Tank 18/Tank 19 Special Analysis (described in Section 3.3.1.3).

Further tasks in FY2012 will involve development and implementation of an experimental plan to provide additional information and model support for the closure of Tank 18.

Deliverable: Technical Reports

Expected Completion Date: FY2012

Responsibility: SRR C&WDA

Estimated Cost: FY2012 $300K

3.3.1.3 Special Analysis for Tanks 18 and 19

Description: Special Analyses are performed to evaluate the significance of new information or new analytical methods to the results and associated conclusions of a PA. For the FTF, as waste tanks and ancillary equipment are cleaned, final residual inventories will be used to update the FTF fate and transport modeling performed as part of the FTF PA, allowing for

evaluation of the difference between the projected and final waste tank inventories to determine if the results and conclusions of the FTF PA remain valid.

FY2012: The *Tank 18/Tank 19 Special Analysis for the Performance Assessment for the F-Tank Farm at the Savannah River Site* uses the FTF PA Base Case model to evaluate the final residuals that are planned to be grouted in-place in Tanks 18 and 19 (utilizing final residual characterization data). [SRR-CWDA-2010-00124] It also takes advantage of new information gathered/generated since Revision 1 of the FTF PA was developed, including information used to address Tank 18 observations and recommendations in the TER.

Deliverable: Special Analysis for Tanks 18 and 19

Expected Completion Date: 2QFY2012

Responsibility: SRR C&WDA

Estimated Cost: FY2012 $100K

4.0 H-TANK FARM

4.1 H-Area Tank Farm Performance Assessment Annual Maintenance Activities

DOE M 435.1-1 requires the on-going maintenance of all PAs. This maintenance involves a series of activities that must be performed on an on-going or annual basis. The activities in this section represent those activities that will be required annually in support of the HTF PA regardless of the status of any on-going or future PA revisions. These activities will be initiated for the HTF PA once the PA is implemented, or sooner, if necessary to support PA implementation and waste tank closure. It is anticipated that the HTF PA would be implemented in FY2013.

4.1.1 Maintain H-Area Tank Farm Performance Assessment Control Through Unreviewed Waste Management Question Process

Description: The UWMQ process established for FTF will be applicable to HTF closure activities as well once the HTF PA is approved. In addition, in support of the closure process, waste tank-specific SAs will be prepared to document the final residual material contents of the tanks in comparison to the PA assumptions. Costs associated with the waste tank-specific SAs will be captured as part of the HTF Tier 2 closure plan, as discussed in the maintenance activity in Section 4.1.5.3

Deliverable: Provide UWMQEs, UWMQ procedure support and SAs as needed to support HTF closure.

Expected Completion Date: On-going

Responsibility: SRR C&WDA

Estimated Cost: FY2013 through FY2018 $150K/yr

4.1.2 Conduct Annual H-Area Tank Farm Performance Assessment Validation

Description: The purpose of the PA maintenance program is to confirm the continued adequacy of a facility PA and to increase confidence in the results of that PA. One requirement of the maintenance program is to conduct an annual review of the facility closure activities. The annual PA review will be conducted in a systematic manner that incorporates the following considerations:

- Final residual radionuclide and chemical inventories;
- Testing and research activities performed during the year and planned for the out-years;
- Results of PA monitoring conducted in accordance with the facility monitoring plan

The above factors will be reviewed annually to confirm the adequacy of the HTF PA and to evaluate the need to conduct SAs or prepare a revision to the PA. The results of the review will be documented in an annual review report for the HTF PA. Annual validation of the HTF PA will begin once the PA has been implemented.

Deliverable: Issue fiscal year PA annual review report

Expected Completion Date: 2QFY (Issued annually)

Responsibility: SRR C&WDA

Estimated Cost: FY2013 $30K, FY2014 through FY2018 $20K/yr

4.1.3 Prepare Annual Performance Assessment Maintenance Program Implementation Plan

Description: The purpose of the PA maintenance program is to confirm the continued adequacy of a facility PA and to increase confidence in the results. Every year the annual PA maintenance program fiscal year implementation plan will be prepared and provided to DOE. The implementation plan will outline planned work for each fiscal year covering a 6-year period. The cost of preparing the implementation plan will be shared between SDF, FTF, and HTF. See the maintenance activities in Sections 2.1.3 and 3.1.3 for SDF and FTF respectively.

Deliverable: Issue fiscal year PA maintenance program implementation plan.

Expected Completion Date: 2QFY (issued annually)

Responsibility: SRR C&WDA

Estimated Cost: FY2012 through FY2018 $15K/yr

4.1.4 Develop/Maintain H-Area Tank Farm Performance Assessment Tier 1 Closure Plan

Description: SRS closure management is regulated under the Federal Facility Agreement and SCDHEC industrial wastewater treatment permit. [WSRC-OS-94-42, DHEC_03-03-1993] Implementation of the HTF PA will require development and maintenance of a DOE M 435.1-1 compliant HTF Tier 1 closure plan prior to grouting of any HTF waste tanks. Once developed, the closure plan will be reviewed annually to determine if a revision is required. For planning purposes, it is assumed that development and issuance of the HTF Tier 1 closure plan will occur in FY2014. In addition, review/revision of the plan will occur annually in the out-years.

Deliverable: Develop Tier 1 closure plan and review annually.

Expected Completion Date: FY2014 (Initial issuance)

Responsibility: SRR C&WDA

Estimated Cost: FY2013 $50K, FY2014 through FY2018 $5K/yr

4.1.5 Prepare H-Area Tank Farm Waste Tank-Specific Performance Assessment Tier 2 Closure Plans

Description: SRS closure management is regulated under the Federal Facility Agreement and SCDHEC industrial wastewater treatment permit. [WSRC-OS-94-42, DHEC_03-03-1993] Implementation of the HTF PA will require development and maintenance of an HTF Tier 2 closure plan as discussed in the maintenance activity in Section 4.1.4. In addition, Tier 2 closure plans will be required for each individual waste tank or group of waste tanks prior to grouting. The Tier 2 closure plans will contain the waste tank-specific information required as part of the closure process. As a part of the development of the Tier 2 closure plans, waste tank-specific SAs documenting the final waste tank residual characterization in

comparison to the current HTF PA assumptions will be required. As schedules for these waste tank closures are finalized, estimated completion dates and waste tank groupings for the Tier 2 closure plans and the associated waste tank-specific SAs will be incorporated into the annual PA maintenance program fiscal year implementation plan. Estimations and groupings here are based on the current *Liquid Waste System Plan* and the relative timing of operational tank closure. [SRR-LWP-2009-00001]

Deliverable: Issue waste tank-specific Tier 2 closure plans and associated SAs.

Expected Completion Date: FY2015 (Tier 2 for Tanks 12/16)

FY2016 (Tier 2 for Tank 10/11)

Responsibility: SRR C&WDA

Estimated Cost: FY2015 $100K, FY2016 $100K

4.1.6 Develop/Maintain H-Area Tank Farm Performance Assessment Monitoring Plan

Description: SRS closure management is regulated under the Federal Facility Agreement and SCDHEC industrial wastewater treatment permit. [WSRC-OS-94-42, DHEC_03-03-1993] It is anticipated that HTF PA implementation will require development and maintenance of a DOE M 435.1-1 compliant monitoring plan within one year of PA implementation. Once developed, the monitoring plan will be reviewed annually to determine if a revision is required. For planning purposes, is assumed that initial development of the HTF monitoring plan will occur in FY2013 and review/revision of the plan will occur annually in the out-years.

Deliverable: Develop PA monitoring plan and review annually.

Expected Completion Date: FY2014 (Initial issuance)

Responsibility: SRR C&WDA

Estimated Cost: FY2013 $50K, FY2014 through FY2018 $5K/yr

4.1.7 Provide General Technical Support on H-Area Tank Farm Performance Assessment Issues

Description: This task is to provide general technical and programmatic support on HTF PA issues, NRC activities, and other regulatory issues affecting HTF waste tank closure activities. Activities include supporting NRC on-site observation visits and technical reviews, general project support, testing and research activity support, and development of resolution path forward for NRC open items. This also includes support on interactions with SCDHEC, CAB, LFRG, National Academy of Sciences, and other regulatory and stakeholder bodies.

Deliverable: Provide on-going technical support on regulatory and policy issues/forums affecting HTF closure activities.

Expected Completion Date: On-going

Responsibility: SRR C&WDA

Estimated Cost: FY2013 through FY2018 $150K/yr

4.1.8 Develop Performance Assessment Model Archive and Revision Control

Description: This task will establish software and hardware resources for archiving development and final PA modeling files to a read-only storage medium. It will also implement software revision control software (e.g., subversion) to track changes to PA modeling input and information processing files through the project life cycle. This is the only remaining secondary issue to be closed from the HTF PA LFRG review. In FY2011, a QA audit of SRNL software QA was performed. This issue remains open pending further discussion with LFRG.

Deliverable: Closure of LFRG secondary issue

Expected Completion Date: FY2012

Responsibility: SRR C&WDA

Estimated Cost: FY2012 $30K

4.2 H-Area Tank Farm Performance Assessment Development/Revisions

Initial planning for the HTF PA was initiated and a limited amount of work was performed in FY2008. Due to funding limitations, only a few activities related to the HTF PA were completed in FY2009. Work on the HTF PA was resumed in full at the beginning of FY2010. As required by the *Statement of Resolution of Dispute Concerning Extension of Closure Dates for Savannah River Site High-Level Radioactive Waste Tanks 19 and 18*, DOE submitted the HTF PA to SCDHEC and EPA by March 31, 2011. [Dispute Resolution_11-19-2007] The HTF PA will provide the technical basis and results to be used in subsequent documents to demonstrate compliance with 10 CFR 61, DOE M 435.1-1, the Federal Facility Agreement, and SCDHEC R.61-82 and R.61-67. Responses to SCDHEC and EPA comments have been issued to DOE-SR, and HTF PA Revision 1 is expected to be issued to DOE-SR in 4QFY2012.

4.2.1 Performance Assessment Development for In-Progress H-Area Tank Farm Performance Assessment

Description: In FY2012, C&WDA will manage individual PA tasks, develop PA program planning documents, set up PA report organization, prepare regulatory review matrices, and develop/maintain PA input packages for technical review and incorporation into the PA. In addition, C&WDA will prepare the PA document, including interpretation and integration of results. SRNL will support C&WDA in development of the conceptual models, execution of the models, and interpretation of the results, as needed. The DOE review process is planned for FY2013 followed by stakeholder reviews. Implementation is anticipated in FY2013.

Deliverable: Issue PA to DOE-SR for review.

Expected Completion Date:
2QFY2009 (Document modeling) – Complete
FY2010 (Draft PA to DOE-SR) – Complete
2QFY2011 (LFRG approval of PA) – Complete
2QFY2011 (Issue PA to EPA and SCDHEC) – Complete

1QFY2012 (Comment responses to DOE-SR) - Complete

4QFY2012 (Issue HTF PA Revision 1 to DOE-SR)

Responsibility: SRR C&WDA

Estimated Cost: FY2012 $400K, FY2013 $100K

4.2.2 Prepare Out-year H-Area Tank Farm Performance Assessment Revisions

Description: A future revision of the HTF PA will be scheduled as required and agreed upon by DOE. The HTF PA will be revised when warranted, but for estimation purposes, the next revision will be scheduled starting after FY2018. Unless otherwise noted in the PA, future PA revision will include the following items at a minimum:

- Analyses and results contained in all SAs that have been completed to date.
- Analyses and results of all UWMQEs completed to date.
- Changes in site future land use plans or closure plans.
- Changes to PA guidance documents requirements.

Deliverable: Issue PA revision

Expected Completion Date: After FY2018

Responsibility: SRR C&WDA

Estimated Cost: After FY2018

4.3 H-Area Tank Farm Performance Assessment Testing & Research Activities

This section of the PA maintenance program implementation plan contains PA related testing and research activities identified as part of the on-going maintenance of the HTF PA. The first revision of the HTF PA was completed in FY2011 and Revision 1 is scheduled to be provided to DOE-SR by the end of FY2012. Following issuance of Revision 1, testing and research activities will be identified for the HTF PA.

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APPENDIX A

Summary Tables for the Liquid Waste Facilities PA Maintenance Program

A.1 Summary Tables for the Liquid Waste Facilities PA Maintenance Program

Tables A.1-1 through A.1-3 summarize the estimated expenditures by activity and fiscal year. Table A.1-4 contains a summary of the combined estimated expenditures for all the Liquid Waste facility PA maintenance activities. This implementation plan reflects the PA related activities in the annual operating plan for the current fiscal year and the projected out-year activities for estimation purposes.

Table A.1-1: Summary for the Z-Area Saltstone Disposal Facility PA Maintenance Program ($K)

Section	Maintenance Activity	FY12	FY13	FY14	FY15	FY16	FY17	FY18
	Task Performed Annually							
2.1.1	Maintain SDF PA Control Through UWMQ Process	100	85	85	85	85	85	85
2.1.2	Conduct Annual SDF PA Validation	15	15	15	15	15	15	15
2.1.3	Prepare Annual PA Maintenance Program Implementation Plan	15	15	15	15	15	15	15
2.1.4	Maintain SDF Closure Plan	15	5	5	5	5	5	5
2.1.5	Maintain SDF PA Monitoring Plan	15	5	5	15	5	5	5
2.1.6	Provide General Technical Support on SDF PA Issues	575	575	575	575	575	575	575
	Annual Tasks Total	735	700	700	710	700	700	700
	Performance Assessment Development/Revisions							
2.2.1	PA Development for In-Progress SDF PA Revision	50	0	0	0	0	0	0
2.2.2	Prepare Out-year SDF PA Revisions	0	0	0	1,500	1,500	0	0
	PA Development/Revisions Total	50	0	0	1,500	1,500	0	0

Table A.1-1: Summary for the Z-Area Saltstone Disposal Facility PA Maintenance Program ($K) (Continued)

Section	Maintenance Activity	FY12	FY13	FY14	FY15	FY16	FY17	FY18
	Testing and Research Activities							
2.3.1.1	Technetium Kd Sorption Testing	150	0	0	0	0	0	0
2.3.1.2	Kd Distributions in Saltstone	25	0	0	0	0	0	0
2.3.1.3	Kd Distributions in Soil	25	0	0	0	0	0	0
2.3.1.4	PA Property Testing of Saltstone Produced in the SPF Operating Window	260	0	0	0	0	0	0
2.3.1.5	Technetium Kd Column Studies	275	0	0	0	0	0	0
2.3.1.6	Multidimensional Simulation of pH and Eh Evolution in Cementitious Materials	100	0	0	0	0	0	0
2.3.1.7	Effects of Temperature on Cementitious Kd Values	0	100	0	0	0	0	0
2.3.1.8	Saltstone Osmotic Pressure Impacts on Contaminant Movement	0	50	0	0	0	0	0
2.3.2.1	Verify Hydraulic/Physical Properties of Disposal Unit Concrete	60	60	60	60	60	60	60
2.3.2.2	Wall and Floor Panel Hydraulic Properties	75	0	0	0	0	50	0
2.3.3.1	Continue Studies Related to Concrete Degradation Due to Chemical Attack	100	100	50	50	50	50	50
2.3.3.2	Microbial Degradation of Saltstone and Associated Cementitious Materials	100	30	0	0	0	0	0
2.3.3.3	Cracking and Transport Literature Review	40	0	0	0	0	0	0
2.3.3.4	Measurement of Unsaturated Permeability of Fractured Saltstone	100	0	0	0	0	0	0
2.3.3.5	Oxidation Rate Analytical Method Development	300	100	0	0	0	0	0
2.3.3.6	Long-term Radiological Lysimeter Program	150	50	50	50	50	50	50
2.3.3.7	Studies Related to Concrete Degradation Due to Radiation damage	0	100	30	0	0	0	0
2.3.3.8	Dual-Porosity Approach for Unsaturated Flow and Transport and Discrete Fracture Model	0	100	50	0	0	0	0
2.3.3.9	Develop and Implement a Refined Stochastic Fracture Model	0	0	0	150	0	0	0
2.3.3.10	Closure Cap Drainage Layer Long-Term Performance	0	0	0	0	100	50	50
2.3.4.1	Measure Hydraulic/Physical Properties of Saltstone Samples	0	0	0	0	0	0	0
2.3.4.2	Perform Saturated Hydraulic Conductivity Measurement of Formed Core Samples	100	0	0	0	0	0	0
2.3.4.3	In-Situ Characterization of Saltstone	0	100	150	0	0	0	0
	Testing and Research Total	1,855	790	390	310	260	260	210
	Z-AREA SDF PA COMPILED TOTAL	**2,645**	**1,490**	**1,090**	**2,520**	**2,460**	**960**	**910**

Table A.1-2: Summary for the F-Tank Farm PA Maintenance Program ($K)

Section	Maintenance Activity	FY12	FY13	FY14	FY15	FY16	FY17	FY18
	Tasks Performed Annually							
3.1.1	Maintain FTF PA Control Through UWMQ Process	150	150	150	150	150	150	150
3.1.2	Conduct Annual FTF PA Validation	20	20	20	20	20	20	20
3.1.3	Prepare Annual PA Maintenance Program Implementation Plan	15	15	15	15	15	15	15
3.1.4	Develop/Maintain FTF PA DOE O 435.1, Chg 1 Tier 1 Closure Plan	5	5	5	5	5	5	5
3.1.5	Prepare FTF Waste Tank-Specific PA DOE O 435.1, Chg 1 Tier 2 Closure Plans	100	0	100	0	0	0	0
3.1.6	Develop/Maintain FTF PA Monitoring Plan	0	50	10	10	10	10	10
3.1.7	Provide General Technical Support on FTF PA Issues	150	150	150	150	150	150	150
	Annual Tasks Total	440	390	450	350	350	350	350
	Performance Assessment Development/Revisions							
3.2.1	PA Development for In-Progress FTF PA	30	0	0	0	0	0	0
3.2.2	Prepare Out-year FTF PA Revisions	0	0	0	0	0	1,500	1,500
	PA Development/Revisions Total	30	0	0	0	0	1,500	1,500
	Testing and Research Activities							
3.3.1.1	Improved Tank Residual Volume Measurements	100	0	0	0	0	0	0
3.3.1.2	Plutonium Speciation Studies	300	0	0	0	0	0	0
3.3.1.3	Special Analysis for Tanks 18 and 19	100	0	0	0	0	0	0
	Testing and Research Total	500	0	0	0	0	0	0
	FTF PA COMPILED TOTAL	**970**	**390**	**450**	**350**	**350**	**1,850**	**1,850**

Table A.1-3: Summary for the H-Tank Farm PA Maintenance Program ($K)

Section	Maintenance Activity	FY12	FY13	FY14	FY15	FY16	FY17	FY18
	Tasks Performed Annually							
4.1.1	Maintain HTF PA Control Through UWMQ Process	0	150	150	150	150	150	150
4.1.2	Conduct Annual HTF PA Validation	0	30	20	20	20	20	20
4.1.3	Prepare Annual PA Maintenance Program Implementation Plan	15	15	15	15	15	15	15
4.1.4	Develop/Maintain HTF PA DOE 435.1, Chg 1 Tier 1Closure Plan.	0	50	5	5	5	5	5
4.1.5	Prepare HTF Waste Tank-Specific PA DOE 435.1, Chg 1 Tier 2 Closure Plans.	0	0	0	100	100	0	0
4.1.6	Develop/Maintain HTF PA Monitoring Plan	0	50	5	5	5	5	5
4.1.7	Provide General Technical Support on HTF PA Issues	0	150	150	150	150	150	150
4.1.8	Develop PA Model Archive and Revision Control System	30	0	0	0	0	0	0
	Annual Tasks Total	45	400	445	345	445	345	345
	Performance Assessment Development/Revisions							
4.2.1	PA Development for In-Progress HTF PA	400	100	0	0	0	0	0
4.2.2	Prepare Out-year HTF PA Revisions	0	0	0	0	0	0	0
	PA Development/Revisions Total	400	100	0	0	0	0	0
	Testing and Research Activities							
4.3	Future HTF PA Test and Research Activities To be Determined After Final PA Approval	-	-	-	-	-	-	-
	Testing and Research Total	-	-	-	-	-	-	-
	HTF PA COMPILED TOTAL	**445**	**545**	**345**	**445**	**445**	**345**	**345**

Table A.1-4: Summary for the Liquid Waste Facilities PA Maintenance Program ($K)

Liquid Waste Facility PA Maintenance Program	FY12	FY13	FY14	FY15	FY16	FY17	FY18
Z-Area SDF PA Maintenance Program Totals	**2,645**	**1,490**	**1,090**	**2,520**	**2,460**	**960**	**910**
FTF PA Maintenance Program Totals	**970**	**390**	**450**	**350**	**350**	**1,850**	**1,850**
HTF PA Maintenance Program Totals	**445**	**545**	**345**	**445**	**445**	**345**	**345**
COMPILED TOTAL	**4,060**	**2,425**	**1,885**	**3,315**	**3,255**	**3,155**	**3,105**

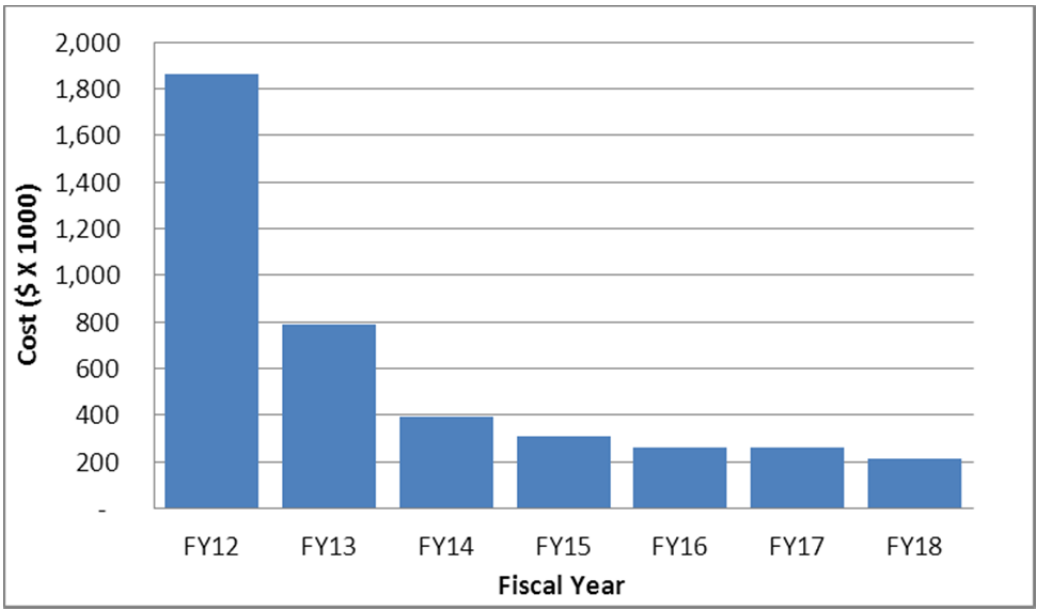
APPENDIX B

Summary – SDF Testing & Research Funding Requirements for FY2012 through FY2018

B.1 Graphic Summary of Testing & Research Funding Requirements for FY2012 through FY2018

Figure B.1-1 portrays the trend of the funding requirements for this year and the next 6 years as it relates to testing and research for the SDF. As indicated, the bulk of the spending is on the front end to allow for verification of assumptions in the PA. Progress into the out-years indicates research and testing is more focused on reducing uncertainties, thereby reducing funding requirements. As testing strategies and long-term plans are developed for FTF and HTF testing and research, similar information will be provided.

Figure B.1-1: SDF Testing & Research Funding Requirements FY2012 - FY2018



APPENDIX C

Crosswalk for SDF PA Maintenance Activities and Factors Identified in the NRC Technical Evaluation Report Covering SRS Salt Waste Disposal

C.1 Crosswalk for SDF PA Maintenance Activities and Factors Identified in the NRC Technical Evaluation Report Covering SRS Salt Waste Disposal

On December 28, 2005, the NRC issued the TER for review of the *Basis for Section 3116 Determination for Salt Waste Disposal at the Savannah River Site*. The NRC concluded that there is reasonable assurance that DOE's proposed salt waste management approach can meet the criteria in NDAA Section 3116 provided certain assumptions made in DOE's analysis of the Vault 4, 2005 SA are verified via monitoring. A crosswalk showing the factors identified by the NRC in their 2005 TER and the maintenance program activities relating to these factors is included in Table C.1-1. [ML0353010225, DOE-WD-2005-001]

Table C.1-1: NRC TER Factors for 10 CFR 61 Subpart C Compliance

Factor	Factor	Related PA Maintenance Activities as Described in this Document
1	The rate of waste oxidation and release of technetium from an oxidized layer of saltstone will be a key determinant of the future performance of the SDF, and therefore, whether 10 CFR 61.41 can be met. More realistic modeling will be important to achieving the performance objectives, and adequate model support is essential to providing the technical basis for the model results. It will be important to ensure that gas phase transport of oxygen through fractures will not significantly increase oxidation of technetium in the saltstone.	o The SDF PA revision currently in-progress (**2.2.1**) incorporates a revised conceptual model for saltstone oxidation. Later studies will be incorporated via the UWMQ process **(2.1.1)** or a future PA revision **(2.2.2)**: ▪ Rate of waste oxidation and release of technetium (**2.3.1.5, 2.3.1.1, 2.3.3.5, 2.3.3.6**) ▪ Measurement of key radionuclide K_d values in cementitious materials (**2.3.1.2, 2.3.1.7**) o The SDF PA revision includes sensitivity and uncertainty analysis, which will provide a better understanding of the impact of waste oxidation and technetium release on performance objectives. o PA maintenance activities to provide additional model support are described under Factor 3.
2	The extent of degradation that may influence the hydraulic isolation capabilities of the saltstone and vaults will be a key factor in assessing whether the SDF can meet 10 CFR 61.41. Degradation mechanisms that may result in the hydraulic conductivity of degraded saltstone and vault concrete being larger than 1E-07 cm/s (1E-01 ft/yr) need to be evaluated with multiple sources of information (e.g., modeling, analogs, experiments [especially field scale and long-term], expert elicitation) to ensure that they are unlikely to occur. It will be important to ensure that field-scale physical properties (e.g., hydraulic conductivity, effective diffusivity) of as-emplaced saltstone are not significantly different from the results of laboratory tests of smaller-scale samples performed to date. It will be important to perform additional laboratory measurements of hydraulic conductivity because the data being relied upon represent limited samples that had a small range of curing times. In addition, because there was a fairly significant amount of variability in the TCLP test results, if DOE deviates significantly from the nominal saltstone composition, DOE should perform additional tests for hydraulic conductivity and effective diffusivity that justify the parameter values used over the range of compositions.	o The SDF PA revision currently in-progress (**2.2.1**) incorporates updated assumptions for saltstone and vault concrete initial and degraded properties. Studies performed since the draft date of the 2009 PA will be incorporated via the UWQ process **(2.1.1)** or a future PA revision **(2.2.2)**: ▪ Initial vault and saltstone properties (**2.3.2.1, 2.3.2.2, 2.3.4.1, 2.3.4.2, 2.3.4.3**) ▪ Vault coating degradation (FY2008) ▪ Chemical (Sulfate and Carbonate) Attack (**2.3.3.1**) ▪ Degradation mechanisms (**2.3.3.1, 2.3.3.2, 2.3.3.7**) ▪ Saltstone expansive phase study (FY2008) ▪ Saltstone fracturing and/or cracking (**2.3.3.3, 2.3.3.9**) ▪ Fractured saltstone properties (**2.3.3.4, 2.3.3.8**) o The SDF PA revision includes sensitivity and uncertainty analysis, which will provide a better understanding of the impact of the various cementitious properties on performance objectives.

Table C.1-1: NRC TER Factors for 10 CFR 61 Subpart C Compliance (Continued)

Factor	Factor	Related PA Maintenance Activities as Described in this Document
3(1)	Adequate model support is essential to assessing whether the SDF can meet 10 CFR 61.41. The model support for, (1) moisture flow through fractures in the concrete and saltstone located in the vadose zone, (2) realistic modeling of waste oxidation and release of technetium, (3) the extent and frequency of fractures in saltstone and vaults that will form over time, (4) the plugging rate of the lower drainage layer of the engineered cap, and (5) the long-term performance of the engineering cap as an infiltration barrier is key to confirming performance assessment results.	(1) Moisture Flow through Fractures o New studies are being performed to establish new moisture characteristic curves for saltstone and vault concrete (**2.3.2.1, 2.3.2.2, 2.3.4.2**). o A long-range program plan for on-going testing of degradation mechanisms associated with cementitious hydraulic properties is being developed (**2.3.3**) to identify additional field/lab testing and identify test methods and equipment. o Additional studies are being performed to analyze flow through fractured cementitious material (**2.3.3.4, 2.3.3.8**)
3(2)	Adequate model support is essential to assessing whether the SDF can meet 10 CFR 61.41. The model support for, (1) moisture flow through fractures in the concrete and saltstone located in the vadose zone, (2) realistic modeling of waste oxidation and release of technetium, (3) the extent and frequency of fractures in saltstone and vaults that will form over time, (4) the plugging rate of the lower drainage layer of the engineered cap, and (5) the long-term performance of the engineering cap as an infiltration barrier is key to confirming PA results.	(2) Waste Oxidation and Technetium Release o The SDF PA revision currently in-progress (**2.2.1**) incorporates a revised conceptual model for saltstone oxidation. The revised PA model will include information from studies that were completed by the initial draft date of the new PA revision. Later studies will be incorporated via the UWMQ process **(2.1.1)** or a future PA revision **(2.2.2)**: ▪ Rate of waste oxidation and release of technetium (**2.3.1.1, 2.3.1.5, 2.3.3.5**) ▪ Measurement of key radionuclide K_d values (**2.3.1.2, 2.3.1.3, 2.3.1.7**) o The SDF PA revision (**2.2.1**) will include sensitivity and uncertainty analysis, which will provide a better understanding of the impact of waste oxidation and technetium release on performance objectives. o A long-range program plan for on-going testing of waste oxidation and release of technetium is being developed (**2.3.1, 2.3.3.5**) to identify additional field/lab testing and identify test methods and equipment.

Table C.1-1: NRC TER Factors for 10 CFR 61 Subpart C Compliance (Continued)

Factor	Factor	Related PA Maintenance Activities as Described in this Document
3(3)	Adequate model support is essential to assessing whether the SDF can meet 10 CFR 61.41. The model support for, (1) moisture flow through fractures in the concrete and saltstone located in the vadose zone, (2) realistic modeling of waste oxidation and release of technetium, (3) the extent and frequency of fractures in saltstone and vaults that will form over time, (4) the plugging rate of the lower drainage layer of the engineered cap, and (5) the long-term performance of the engineering cap as an infiltration barrier is key to confirming performance assessment results.	(3) Extent and Frequency of Fractures o The SDF PA revision currently in-progress (**2.2.1**) will incorporate updated assumptions for saltstone and vault concrete initial and degraded properties. The revised PA model will include information from new studies for saltstone cracking (FY2008) o A long-range program plan for on-going testing of the extent and frequency of fractures is being developed (**2.3.3.3, 2.3.3.9**) to identify additional field/lab testing and identify test methods and equipment.
3(4)	Adequate model support is essential to assessing whether the SDF can meet 10 CFR 61.41. The model support for, (1) moisture flow through fractures in the concrete and saltstone located in the vadose zone, (2) realistic modeling of waste oxidation and release of technetium, (3) the extent and frequency of fractures in saltstone and vaults that will form over time, (4) the plugging rate of the lower drainage layer of the engineered cap, and (5) the long-term performance of the engineering cap as an infiltration barrier is key to confirming performance assessment results.	(4) Plugging Rate of lower Drainage Layer o The SDF PA revision currently in-progress (**2.2.1**) will incorporate an updated closure cap design and model. o A long-range program plan for evaluating the plugging rate of the lower drainage layer is being developed (**2.3.3.10**). o Evaluation of a replacement for the HELP code is currently planned.
3(5)	Adequate model support is essential to assessing whether the SDF can meet 10 CFR 61.41. The model support for, (1) moisture flow through fractures in the concrete and saltstone located in the vadose zone, (2) realistic modeling of waste oxidation and release of technetium, (3) the extent and frequency of fractures in saltstone and vaults that will form over time, (4) the plugging rate of the lower drainage layer of the engineered cap, and (5) the long-term performance of the engineering cap as an infiltration barrier is key to confirming performance assessment results.	5) Long-Term Performance of Engineered Cap o The SDF PA revision currently in-progress (**2.2.1**) will incorporate an updated closure cap design and model. o A long-range program plan for evaluating the long-term performance of the engineered cap will be developed to identify additional field/lab testing and identify test methods and equipment.

Table C.1-1: NRC TER Factors for 10 CFR 61 Subpart C Compliance (Continued)

Factor	Factor	Related PA Maintenance Activities as Described in this Document
4	The erosion control design is important to ensuring that 10 CFR 61.42 can be met because it eliminates pathways and scenarios for intruder dose assessments. Implementation of an adequate design that does not deviate significantly from information submitted to the NRC in CBU-PIT-2005-00203 and the associated references is important, or if it does deviate significantly that it is reviewed by NRC staff to ensure the revisions are consistent with long-term erosion control design principles.	o The SDF PA revision currently in-progress (**2.2.1**) will incorporate an updated closure cap design and model. o Future changes to the erosion control design, if not part of a PA revision, will need to be evaluated by the UWMQ process (**2.1.1**) and will be reviewed as part of the annual PA validation (**2.1.2**) and closure plan review (**2.1.4**).
5	The infiltration control design is important to ensuring that 10 CFR 61.41 can be met because the release of contaminants to the groundwater is predicted to be sensitive to the large reduction in infiltration provided by the infiltration control. It is important to ensure that the design can be implemented and will perform as designed.	o Additional model support will be developed to substantiate assumptions about lower drainage layer plugging and long-term performance of the engineered cap. A long-range program plan for evaluating the plugging rate of the lower drainage layer is being developed (**2.3.3.10**).
6	Implementation of an adequate sampling plan is important to ensuring that 10 CFR 61.41 and 10 CFR 61.42 can be met. It is important to assess results of future sampling and confirm that current projections of the concentrations of highly radioactive radionuclides in treated salt waste (or grout) are greater than or equal to actual concentrations of highly radioactive radionuclides in treated salt waste (or grout).	o A review of the inventory of waste disposed of in the SDF is evaluated as part of the annual PA validation (**2.1.2**). In addition, feed tank sampling is reviewed with the NRC as part of the on-going support of the NRC monitoring role (**2.1.6**).
7	To ensure that Tank 48 waste can be safely managed, future tests of the physical properties of samples that contain organic materials similar to Tank 48 waste will need to confirm that the properties of the wasteform made from this waste will provide for suitable wasteform performance such that the disposal system will be able to meet the performance objectives. The technical basis should, at a minimum, include tests for hydraulic conductivity and effective diffusivity.	o Current plans are to treat the existing Tank 48 waste by organic destruction. The resulting material will then be treated by the Salt Waste Processing Facility prior to disposal of any material in SDF. Any additional testing or research activities required will be reviewed once the treatment method is finalized.
8	Predicted removal efficiencies of highly radioactive radionuclides by each of the planned salt waste treatment processes are a key factor in determining the radiological inventory disposed of in saltstone. The inventory, in turn, is an important factor in the determination that 10 CFR 61.41 and 10 CFR 61.42 can be met.	o A review of the inventory of waste disposed of in the SDF is evaluated as part of the annual PA validation (**2.1.2**). If inventories exceed the projections assumed in the SDF PA the inventory will need to be evaluated by the UWMQ process (**2.1.1**). In addition, inventory is one of the areas reviewed with the NRC as part of the on-going support of the NRC monitoring role (**2.1.6**).

[Factors are from ML053010225, Section 4.3.1]