



*We do the right thing.*

# NRC Salt Waste Monitoring Open Item Status

**April 26, 2011**

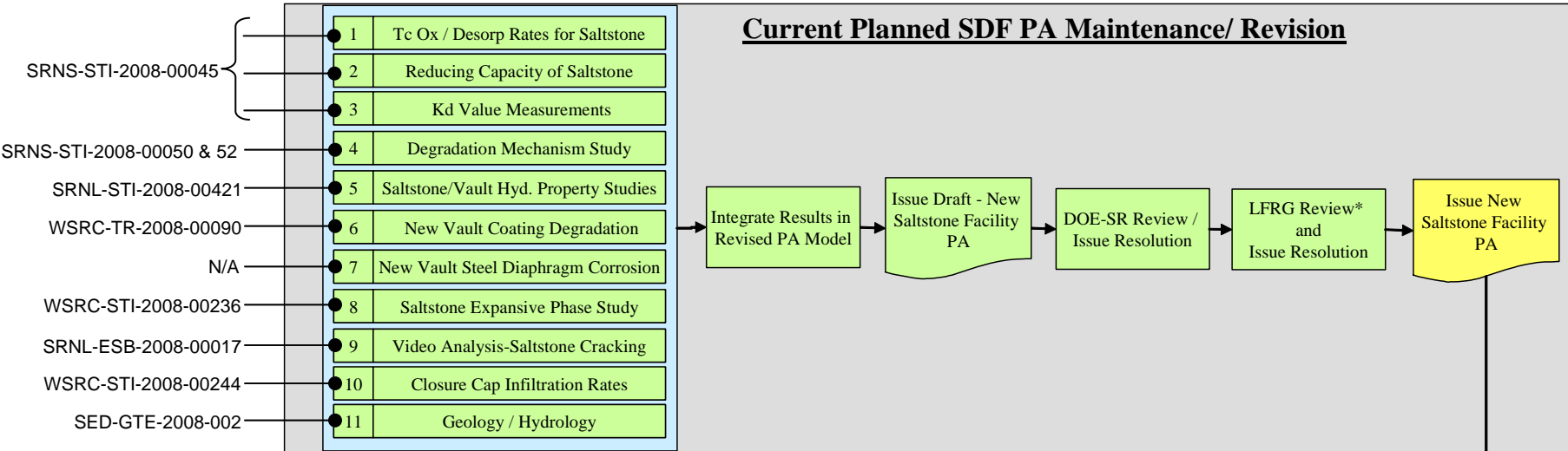
SRR-CWDA-2011-00043

- Objectives
  
- Performance Assessment / Research Activity Status
  
- Open Issues
  - 2007-1
  - 2007-2
  - 2009-1

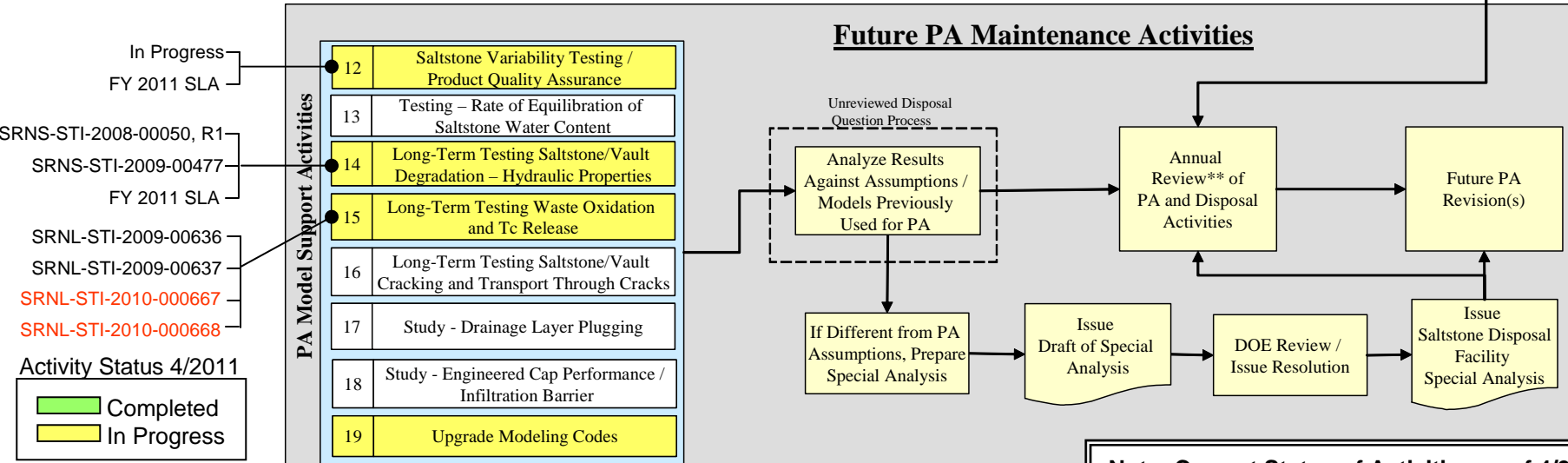
- **Open Follow Up Actions**
  - Disposal Unit 2 Water Tightness Test Quality Assurance Records
  - Radiological composition of inadvertent transfer material
  - Status of ARP / MCU Management Control Plan
  - Assess impact of anchor bolt penetrations in Vault 4
  - Develop data related to impact of scale on formed core sampling methodology

- **Provide a status update on activities relevant to NRC Salt Waste Disposal Monitoring**
  - Saltstone Disposal Facility performance assessment test/research activities
- **For Open Issues and Follow up Actions generated as a result of ongoing NRC Salt Waste Disposal Monitoring activities:**
  - Define proposed closure activities
  - Provide current overall status
  - Provide detailed update of activities related to closure of open items

## Current Planned SDF PA Maintenance/ Revision



## Future PA Maintenance Activities



Activity Status 4/2011

Completed (Green box)

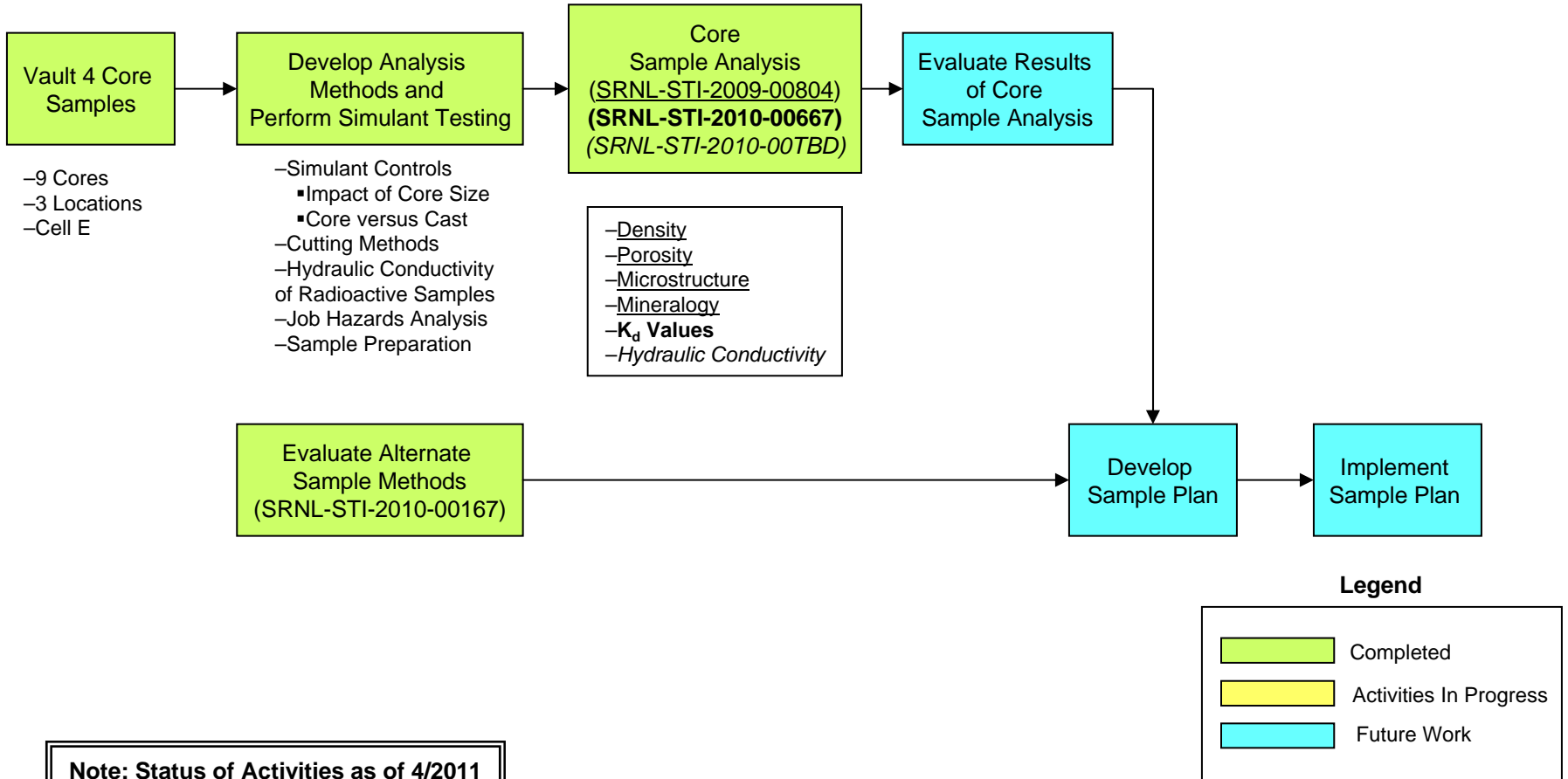
In Progress (Yellow box)

**Note: Current Status of Activities as of 4/2011**

\* Independent review performed by the assigned DOE Low Level Waste Federal Review Group (LFRG)  
 \*\* Includes development of Annual PA Review and updates to PA/CA Maintenance Plan

- Documented in NUREG-1911, Revision 2, *NRC Periodic Compliance Monitoring Report for U. S. Department of Energy Non-High Level Waste Disposal Actions - Annual Report for Calendar Year 2009*, dated August 2010.

- Issue
  - *At the SRS Saltstone Facility, as a result of variations in the composition of saltstone grout actually produced at the SRS SPF, DOE should determine the hydraulic and chemical properties of as-emplaced saltstone grout.*
  
- Proposed Closure Activity
  - Complete analysis and evaluation of existing saltstone core samples and prepare and implement sampling plan for on-going verification of hydraulic and chemical properties of as-emplaced saltstone.





- SRS Status
  - In Progress
  
- Update
  - Core sample  $K_d$  testing is complete and available for NRC review.
  - Alternate sampling methods evaluation is complete and formed core sampling has been selected as the preferred alternative. NRC has requested additional evaluation of this technique (see Follow-up Action below).
  - Integrated sampling plan outlining future sampling and correlation of laboratory prepared saltstone to as-emplaced saltstone is the final step in developing a comprehensive sampling program. This activity will be integrated with the new disposal unit schedules.
    - Initiating integration with the Project Team and Design Authority to move from concept to the field.

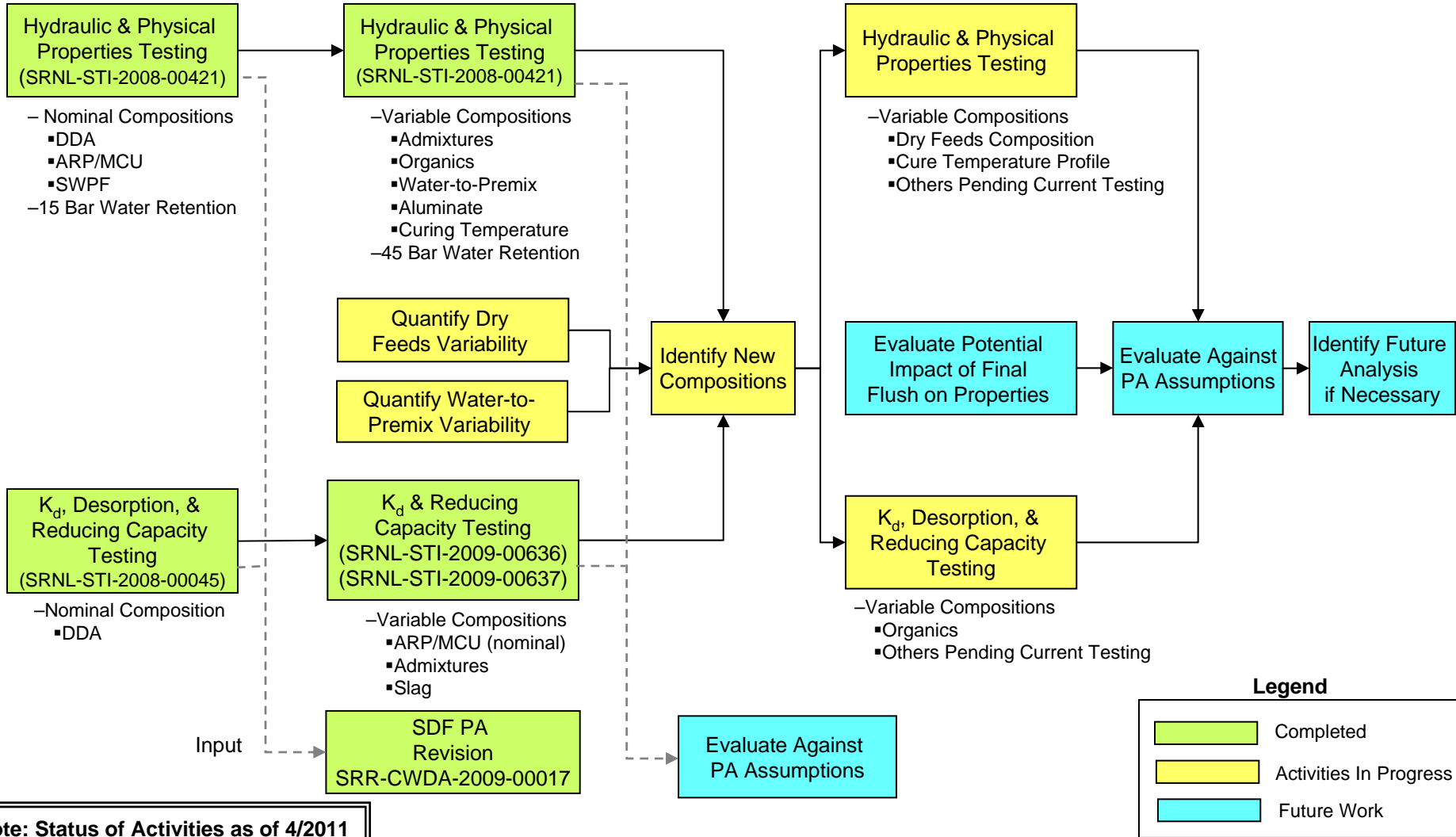
**NOTE: Red text indicates changes from previous update**

- Issue

- *At the SRS Saltstone Facility, DOE should demonstrate that intra-batch variability, flush water additions to freshly poured saltstone grout at the end of each production run, and additives used to ensure processability are not adversely affecting the hydraulic and chemical properties of the final saltstone grout. DOE should show that the hydraulic and chemical properties are consistent with the assumptions in the waste determination or show that any deviations are not significant with respect to demonstrating compliance with performance objectives.*

- Proposed Closure Activity

- Perform testing to determine impacts of variability in dry feeds, water to premix ratio and admixtures, as well as impacts of flush water additions, on the hydraulic and chemical properties of saltstone.
- Evaluate results of testing relative to impacts on inputs and assumptions used in the performance assessment.



- **SRS Status**

- In Progress

- **Update**

- Simulant variations continue to be prepared and tested (see status chart) for properties of hydraulic conductivity, porosity, bleed, set time, young's modulus and moisture characteristic curves.
- New programmable oven purchased by SRNL in preparation for testing which will simulate cure temperature profiles of field emplaced saltstone.

Total Scheduled	27
Prepared	24
Tested	17

- NRC Question

- *What cure temperatures have been observed since 2007 and what is the anticipated cure temperature based on the increase in aluminate concentration?*

- SRS Response

- SRS has no specific plans to evaluate the impact of aluminate on cure temperature.
- Cure temperature profiles from saltstone production are being assembled and will be evaluated for use in subsequent testing.
  - Note: Cure temperature as a function of time may be as important to overall saltstone performance as the maximum data point recorded.

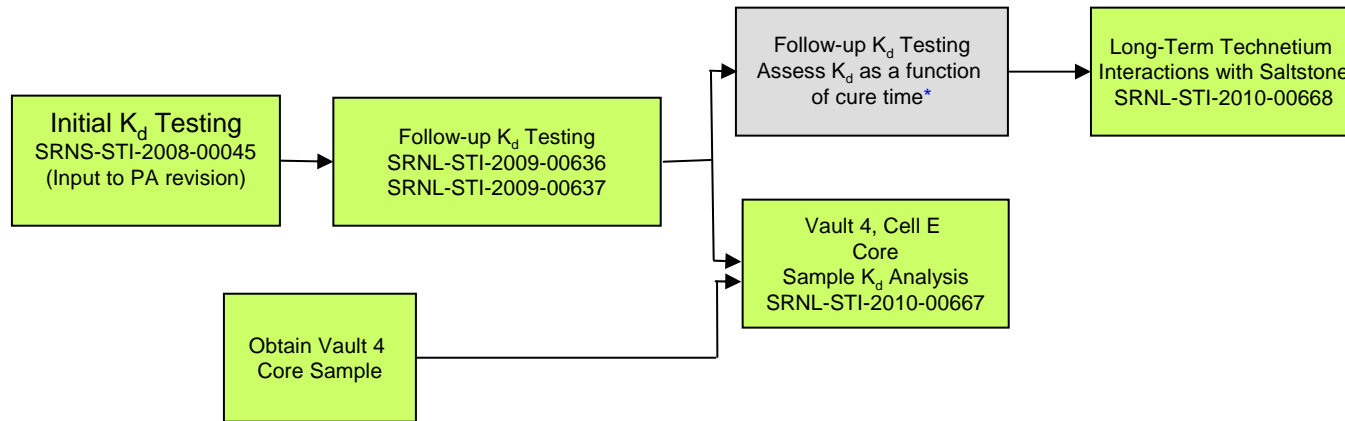
- Documented in *Nuclear Regulatory Commission March 25-26, 2009 Onsite Observation Report For The Savannah River Site Saltstone Facility*, NRC ADAMS accession number ML091320439, dated May 22, 2009

- Issue

- *At the SRS Saltstone Facility, DOE should demonstrate that (1) technetium-99 in salt waste is converted to its reduced chemical form in saltstone grout during the curing of saltstone grout, and is thereby strongly retained in saltstone grout, and (2) the sorption of dissolved technetium-99 onto saltstone grout and vault concrete is consistent with  $K_d$  values for technetium-99 that were assumed in the performance assessment.*

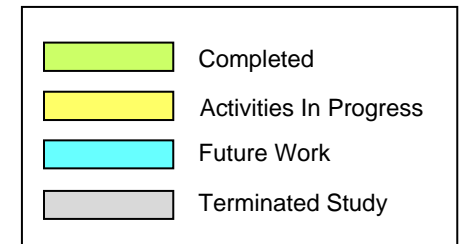
- Proposed Closure Activity

- Perform additional testing on saltstone reducing capacity and  $K_d$  value measurement related to technetium-99.



\*Determined analytical methodology (glovebag) was ineffectual. Desired experimental conditions were achieved and documented in SRNL-STI-2010-00668 (glovebox).

### Legend





- SRS Status
  - Complete; Propose Closure
- Update
  - Testing of  $K_d$  values for emplaced saltstone is complete.
  - Laboratory testing of saltstone simulants in an oxygen free environment is complete.
    - Emplaced Saltstone displays teal color indicative of reducing (and oxygen free) conditions within saltstone.



- Update

- Follow-up laboratory testing in oxygen free environment, as well as a more extensive literature review, support  $K_d$  values of 1000 used in the modeling of saltstone.
- Testing of  $K_d$  values as a function of curing time for saltstone simulants was discontinued due to limited ability to reproduce a low oxygen environment capability and the clear need for this environment to represent field conditions.

- Documented in *Nuclear Regulatory Commission March 25-26, 2009 Onsite Observation Report For The Savannah River Site Saltstone Facility*, NRC ADAMS accession number ML091320439, dated May 22, 2009

- **Follow up Action**
  - *Provide QA records of hydrostatic testing.*
- **SRS Status**
  - In Progress
    - Records will be available following the Operational Readiness Review (ORR)

- Cell Design Changes Implemented to 2A/B

Postulated Condition	Corrective Action
<p>Installation of drainwater system anchor bolts penetrated to rebar or caused cracking of base concrete</p>	<p>Cut anchor bolts flush with floor and coat over floor anchor bolts</p>
<p>Installation of drainwater system anchor bolts penetrated to rebar or caused cracking of base concrete</p>	<p>Install "lower cold cap" of type V concrete without anchor bolt penetrations to reinstall 12" of type V concrete in conformance with PA assumptions</p>
<p>Coating around sheet drain wall anchor bolts does not seal around threads</p>	<p>Install washer and nut mechanical seal on wall anchor bolts</p>
<p>Flexure of wall panels near the floor/curb damaged coating near the curb/floor</p>	<p>Install secondary, more flexible coating on interior</p>
<p>Flexure of wall panels near the floor/curb created a pathway around the curb</p>	<p>Install exterior type V concrete curb to prevent flexure and add secondary type V concrete barrier external to the cell.</p>

## Final Testing Summary

- Dye: Blue
- Duration: 132 hours
- Fill Height: 12 feet
  
- Results: No evidence of dye detected at all.
  - Key surfaces inspected:
    - wall / curb interface
    - below external concrete curb



- **Follow up Action**
  - *Provide Engineering Estimate of radiological composition of inadvertent transfer material.*
  
- **SRS Status**
  - Complete
    - Supplied information 10/2010
    - SRR is awaiting closure from NRC.

- **Follow up Action**

- *Inform NRC when DOE is ready to exit its ARP/MCU Management Control Plan.*

- **SRS Status**

- In Progress
  - SRR is still operating under the ARP/MCU Management Control Plan.



- Follow up Action
  - *Assess impacts of anchor bolt penetrations on Vault 4.*
- SRS Status
  - In Progress
    - Recently entered cells B and H to document physical conditions of anchor bolt penetrations.
    - Historical semi-annual monitoring well data has not indicated evidence of nitrate release from Vault 4.



- **Follow up Action**
  - *Develop data related to impact of scale on formed core sampling methodology .*
  
- **SRS Status**
  - In progress:
    - SRS intends to move forward with formed core sampling technology while additional evaluations are performed.
    - Operational considerations such as worker exposure and sampling logistics are being considered in development of the sampling plan.

- NRC Comment

- *NRC staff noted that the saltstone fractures do not appear to be extensive, but that conclusion was hindered by lack of scale and a limited survey area and that DOE planned to do additional surveys in the future.*

- SRS Status

- In Progress
  - A video surveillance program for saltstone cells has been developed.
  - Video is being gathered from cells
  - Analysis of data will be performed and evaluated with respect to the PA.

ADAMS	Agencywide Documents Access and Management System
ARP	Actinide Removal Process
DDA	Deliquification, Dissolution, and Adjustment
DOE	United States Department of Energy
DOE-SR	Department of Energy – Savannah River Operations Office
HDPE	High Density Polyethylene
LFRG	Low Level Waste Federal Review Group
MCU	Modular Caustic Side Solvent Extraction Unit
NRC	United States Nuclear Regulatory Commission
PA	Performance Assessment
PODD	Performance Objective Demonstration Document
SDF	Saltstone Disposal Facility
SPF	Saltstone Production Facility
SRR	Savannah River Remediation
SRS	Savannah River Site
SWPF	Salt Waste Processing Facility
UDQE	Unreviewed Disposal Question Evaluation
WSRC	Washington Savannah River Company