SRR-CWDA-2013-00111
Revision 0

Saltstone Disposal Facility
Post-Operations / Pre-Closure
Surveillance and Maintenance Program Plan

August 2013

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Prepared for U.S. Department of Energy Under Contract No. DE-AC09-09SR22505

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1.0 EXECUTIVE SUMMARY

The purpose of the Post-Operations / Pre-Closure Surveillance and Maintenance Program is to define routine surveillance and maintenance activities necessary to ensure that the physical condition of the Saltstone Disposal Facility disposal units / cells are consistent with the conditions assumed in the Saltstone Disposal Facility Performance Assessment (SRR-CWDA-2009-00017) until interim or final closure actions are taken. This program establishes the basis for development of facility procedures needed to implement the elements of this program (i.e., monitoring or inspection), including frequency of actions and process for evaluation of data collected. Evaluation of extent of condition and proposed corrective actions resulting from implementation of this program will be performed by facility engineering staff with assistance from Closure and Waste Disposal Authority (hereinafter referred to as C&WDA) personnel. Interim closure activities may be conducted that mitigate potential degradation mechanisms until final closure is complete, resulting in removal of some or all of the surveillance and maintenance activities described herein. C&WDA will assist the Saltstone Facility personnel in the review of existing measures, or the development of new measures to ensure that they meet the intent of this program.

The objectives of this program are focused on maintaining the integrity of key elements of the disposal units until an interim or final closure configuration establishes long-term or permanent protection of the facility. Performance assessment elements of the disposal units that are essential to long-term performance are integrity of the disposal structures, systems, and components (e.g., roof, walls, and cell penetrations) and the waste form integrity (i.e., minimizing environmental water infiltration and oxidation).

Surveillance activities consist of monitoring and inspections. Monitoring activities are those that gather data from key data collection points such as groundwater monitoring wells, disposal cell liquid collection systems, and heave markers. Inspection activities are pertinent to validate the physical condition of key structures, systems, and components required to maintain the integrity of the disposal unit and waste form until interim or final closure.

Maintenance activities, both preventative and corrective, are performed using existing programs and procedures. Maintenance activities are screened using the Manual S4 Procedure ENG.46 to ensure that the activity is evaluated for impacts to the performance assessment. Maintenance activities can be related to the disposal structures, systems, and components, or with activities needed to ensure the integrity of the waste form itself.

2.0 OBJECTIVES

The operational period of a disposal unit, as used in this plan, refers to the period during which the unit is capable of receiving waste material. Disposal units enter the post-operations period when they have reached their operational fill height, or it has been determined that no further waste material will be disposed of in the unit. The objectives of the plan are focused on maintaining the integrity of disposal unit structural features and waste form after operations are complete and until an interim or final closure configuration establishes long-term protection of the facility. Performance assessment elements of the disposal units that are essential to long-term performance are:

1. Structures, Systems, and Components Integrity
    a. Roof
    b. Walls
    c. Cell Penetrations
2. Waste Form Integrity
    a. Environmental Water Infiltration
    b. Oxidation

3.0 SURVEILLANCE ACTIVITIES

Surveillance activities consist of monitoring and inspections. Monitoring activities are those that gather data from key data collection points such as groundwater monitoring wells, disposal cell liquid collection systems, and heave markers. The scheduling and completion of monitoring and inspection activities will be the responsibility of Saltstone Facility personnel. The Saltstone Facility will also coordinate evaluation of the results with appropriate Savannah River Remediation LLC (SRR) support organizations such as C&WDA and Environmental, Safety, Health, and Quality Assurance, and Compliance Assessment. Manual S4 ENG 46, *LW Unreviewed Waste Management Question*, and SRR-CWDA-2011-00196, *Unreviewed Waste Management Requirements Document for the Saltstone Facility will be used as necessary to document the results of monitoring and inspections activities*. Surveillance activities will be initially baselined on an annual frequency, at a minimum, unless the activity frequency conflicts with existing laws or regulations or as justified by engineering evaluation. Activities may require more or less frequent inspections based on other factors such as the critical nature of the Structure, System, and Component (SSC), or recent behavior of the SSC being monitored.

3.1 Monitoring Activities

Monitoring activities collect data about potential contaminant releases prior to final closure. These activities include:

1. Groundwater monitoring activities are conducted in accordance with the *Groundwater Monitoring Plan for the Z-Area Saltstone Disposal Facility* (WSRC-TR-2005-00257) The Groundwater Monitoring Plan describes both the analytes and frequency of sampling.
2. Some disposal units may be equipped with a liquid collection system within a high-density polyethylene exterior liner. Liquids must be collected in accordance with the requirements of applicable permits and analyzed for, at a minimum, performance

assessment sensitive radionuclides (i.e., Tc-99, I-129, Cs-135). Laboratory results will be evaluated using Manual S4 ENG 46 UWMQ Procedure.

3. Settlement markers are established during the construction of disposal units and are monitored for settlement during the operational life of the disposal cell or unit. After operations, pre-closure monitoring should be conducted in accordance with SRS Engineering Guide 02223-G. [WSRC-IM-95-58] The frequency will be reviewed and revised as appropriate by SRR Engineering until final closure activities preclude such monitoring.

3.2 Inspection Activities

Routine inspections of key structures, systems, and components are initially baselined at an annual frequency to ensure the integrity of the disposal unit and waste form until interim or final closure. If recent inspections or other occurrences indicate a reasonable probability of failure of a particular SSC, the frequency of inspections may be increased to ensure adequate monitoring of conditions. These inspections should include:

3.2.1 Structures, Systems and Components Integrity

a. Roof – Inspection of roof concrete for cracking, spalling, or other signs of concrete degradation
b. Walls – Inspection of the exterior surface of the wall for cracking, spalling, or other signs of concrete degradation (if wall surfaces are accessible)
c. Cell Penetrations – Cell penetrations may be active or inactive depending on operational, safety, or other considerations
    i. Operational cell penetrations represent opportunities for infiltration of water from environmental sources. Maintenance of materials (e.g., gaskets) and equipment attached or affixed to penetrations that are in active use will be included in the routine surveillance and monitoring activities required for operation of the installed equipment.
    ii. Inactive cell penetrations exist in both the operational mode as well as the pre-closure mode. Inactive cell penetrations are typically equipped with a threaded cap to ensure that water from environmental sources do not infiltrate the cell prior to final closure. Inspections will be conducted to determine the condition of each penetration. If degradation is observed that could lead to water infiltration, a task-specific maintenance activity will be developed to ensure that appropriate maintenance is performed.

3.2.2 Waste Form Integrity

a. Environmental Water Infiltration – Infiltration of environmental sources of water after operations is evaluated through combination of camera inspections and monitoring of drainwater levels within each cell. The frequency of inspections should be annually at a minimum.

b. Oxidation – The rate of oxidation of the waste form is not readily measurable; rather, it is derived from laboratory experiments. However, after the cell is filled with the final waste form, a "clean cap" is poured over the waste form. The cap will be inspected concurrent with the environmental water infiltration inspection for cracking or spalling that could expose the waste form to contact with oxygen, either from the air or from infiltrating water.

4.0 CONTROL OF MAINTENANCE ACTIVITIES

Maintenance activities may be required to correct conditions identified as a result of monitoring or inspection activities or, for manufactured items (i.e., engineered equipment or commercial materials and equipment), as routine maintenance specified in vendor documentation. Routine maintenance will be performed in accordance with manufactures recommendations until interim of final closure activities are performed that remove the SSC from service. Maintenance activities can be performed using existing programs and procedures. Maintenance activities are screened using Manual S4 ENG 46, *LW Unreviewed Waste Management Question*, and SRR-CWDA-2011-00196, *Unreviewed Waste Management Requirements Document for the Saltstone Facility* to ensure that the activity is evaluated for impacts to the performance assessment.

1. Structures, Systems, and Components – Maintenance activities related to structures, systems, and components that have the potential to impact the disposal cell are controlled for performance assessment impacts through Manual S4 ENG 46.
2. Waste Form - After saltstone is introduced into the cell, physical maintenance of the waste form is not anticipated. However, until final closure, some systems (such as the drainwater removal system) may remain in place to ensure that the waste form conditions can be maintained until final closure. Excess water in the cell is typically shed to the drainwater system and pumped back to the Saltstone Production Facility as part of routine production process. The systems should remain until interim or final closure activities fill the cell and drainwater piping with grout.

5.0 REMOVAL FROM SERVICE

Activities described in this document are required until the system, structure, or component is modified such that the degradation mechanisms are mitigated. Modifications that remove structures, systems, and components from service until final closure, or modify them in a way that minimizes or eliminates the need for surveillance and maintenance activities, are referred to as interim closure activities, while modifications that mitigate degradation in the long term and are compliant with performance assessment modeling assumptions are referred to as final closure activities.

Interim closure activities reduce or eliminate surveillance and maintenance activities and are consistent with long-term closure activities (or are easily reversible). Final closure activities stabilize conditions for the long term in compliance with the closure configuration modeled in the performance assessment. Examples of Interim and Final Closure activities are:

Interim Closure Measure

- Installation of temporary roof materials to mitigate rainwater infiltration
- Installation of clean cap material (clean cap material properties as defined in the performance assessment) over the top of the saltstone monolith, but below the bottom of the structure roof
- Installing steel caps on structure penetrations
- Removal of operating equipment from the structure

Final Closure Measure

- Installation of HDPE/GCL and sand drainage layer
- Completely filling the cell with clean grout (grout properties as defined in the performance assessment)
- Filling structure penetrations with clean grout (grout properties as defined in the performance assessment)
- Removal of operating equipment anchorages and repairing voids with cementitious material as consistent with the performance assessment assumptions

6.0 REFERENCES

Manual S4 ENG 46, *LW Unreviewed Waste Management Question (UWMQ)*, Savannah River Site, Aiken, SC, Rev. 2, March 23, 2012.

SRR-CWDA-2009-00017, *Performance Assessment for the Saltstone Disposal Facility at the Savannah River Site*, Savannah River Site, Aiken, SC, Rev. 0, October 2009.

WSRC-TR-2005-00257, *Groundwater Monitoring Plan for the Z-Area Saltstone Disposal Facility*, Savannah River Site, Aiken, SC, Rev. 5, July 2010.

WSRC-IM-95-58, *SRS Engineering Practices Manual, Engineering Guide, No. 02223-G, Settlement Monitoring*, Savannah River Site, Aiken, SC, Rev. 2, April 22, 2008.