

**U.S. NUCLEAR REGULATORY COMMISSION
FEBRUARY 1, 2023, ONSITE OBSERVATION VISIT REPORT
FOR THE SAVANNAH RIVER SITE SALTSTONE DISPOSAL FACILITY**

EXECUTIVE SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) staff conducted its 23rd Onsite Observation Visit (OOV) to the Saltstone Disposal Facility (SDF) at the Savannah River Site (SRS) on February 1, 2023 (SDF Observation 2023-01). This is the first SDF OOV in Calendar Year 2023. On every OOV to SRS the NRC is focused on assessing the U.S. Department of Energy (DOE) compliance with performance objectives (POs) in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 61, Subpart C. The five 10 CFR Part 61 Subpart C POs are: §61.40 (General Requirements); §61.41 (Protection of the General Population from Releases of Radioactivity); §61.42 (Protection of Individuals from Inadvertent Intrusion); §61.43 (Protection of Individuals during Operations); and §61.44 (Stability of the Disposal Site after Closure).

For this OOV, the NRC focused on the monitoring areas and monitoring factors in the NRC SDF Monitoring Plan, Rev. 1 dated September 2013 (available via the NRC Agencywide Documents Access and Management System [ADAMS] at Accession No. [ML13100A113](#)), as supplemented by the six NRC letters from June 5, 2017, to October 18, 2021, ([ML17097A351](#), [ML18033A071](#), [ML18107A161](#), [ML18219B035](#), [ML19150A295](#), and [ML21279A173](#)) to the DOE. This is the ninth SDF OOV under the 2013 SDF Monitoring Plan. The South Carolina Department of Health and Environmental Control (SCDHEC) staff participated in this OOV. The U.S. Environmental Protection Agency (EPA) Region 4 staff participated in this OOV because, in the future, they will be involved in the final closure of the SRS Tank Farms.

Consistent with the NRC Guidance for this OOV dated January 17, 2023, ([ML23017A109](#)), the main activities conducted during this OOV were: (1) discuss operating and disposal structure status; and (2) tour specific aspects of the construction of both Saltstone Disposal Structure (SDS) 8 and SDS 10. As a result of this OOV, the NRC did not close any of the monitoring factors in the 2013 SDF Monitoring Plan (as supplemented) or change the overall conclusions from the April 2012 NRC Technical Evaluation Report (TER) for the SDF ([ML121170309](#)).

1.0 ONSITE OBSERVATION VISIT ACTIVITIES

On January 17, 2023, the NRC issued the OOV Guidance ([ML23017A109](#)) for the February 2023 SDF OOV, SDF Observation 2023-01. An OOV Guidance is a plan for what the NRC expects to cover during an OOV, which may be changed based on what happens during the OOV.

The OOV began with introductions and a short briefing on the agenda that was attended by representatives from the DOE (including the DOE contractors), the NRC, SCDHEC, and the U.S. EPA. The rest of the OOV consisted of a technical discussion and a tour. The technical discussion was focused on the operating and disposal structure status. The tour was focused on specific aspects of the construction of SDS 8 and SDS 10.

1.1 Technical Discussion – Operating and Disposal Structure Status

1.1.1 Observation Scope

The technical discussion supported the NRC monitoring of the DOE disposal actions to assess compliance with the §61.41, §61.42 and §61.43 POs. The technical discussion was most relevant to the following monitoring areas and monitoring factors in the SDF Monitoring Plan, Rev. 1, as supplemented by the NRC letters to the DOE:

- Monitoring Area (MA) 1 (Inventory)
 - Monitoring Factor (MF) 1.01 (Inventory in Disposal Structures)
 - MF 1.02 (Methods Used to Assess Inventory)
- MA 8 (Environmental Monitoring)
 - MF 8.01 (Leak Detection)
- MA 11 (Radiation Protection Program)
 - MF 11.01 (Dose to Individuals During Operations)

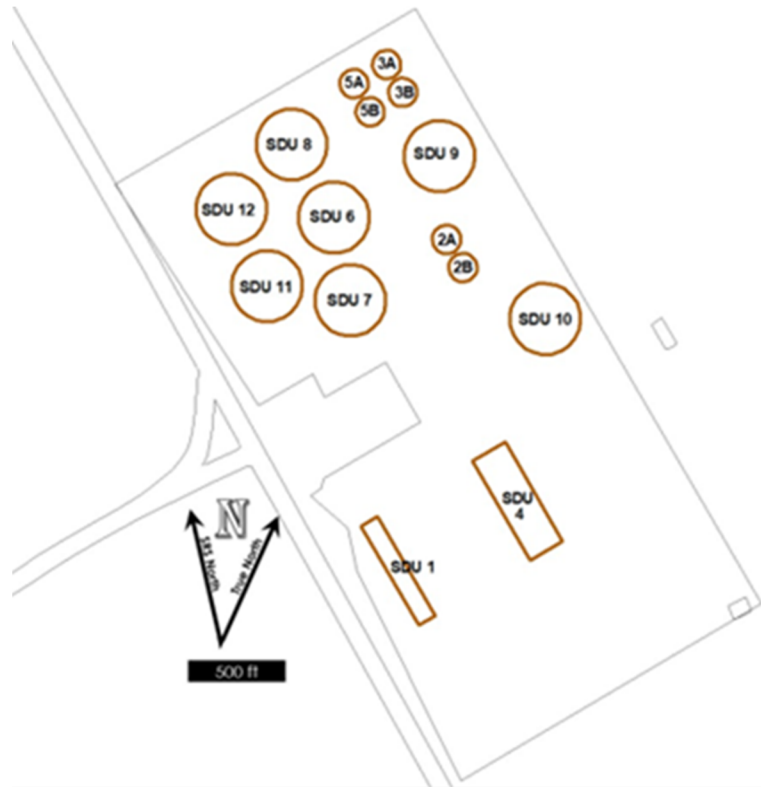
1.1.2 Observation Results

The DOE presented an overview of the recent SDF operating and disposal structure status in the DOE presentation (SRMC-CWDA-2023-00013, Rev. 1) ([ML23055A095](#)). The key points from the technical discussion were:

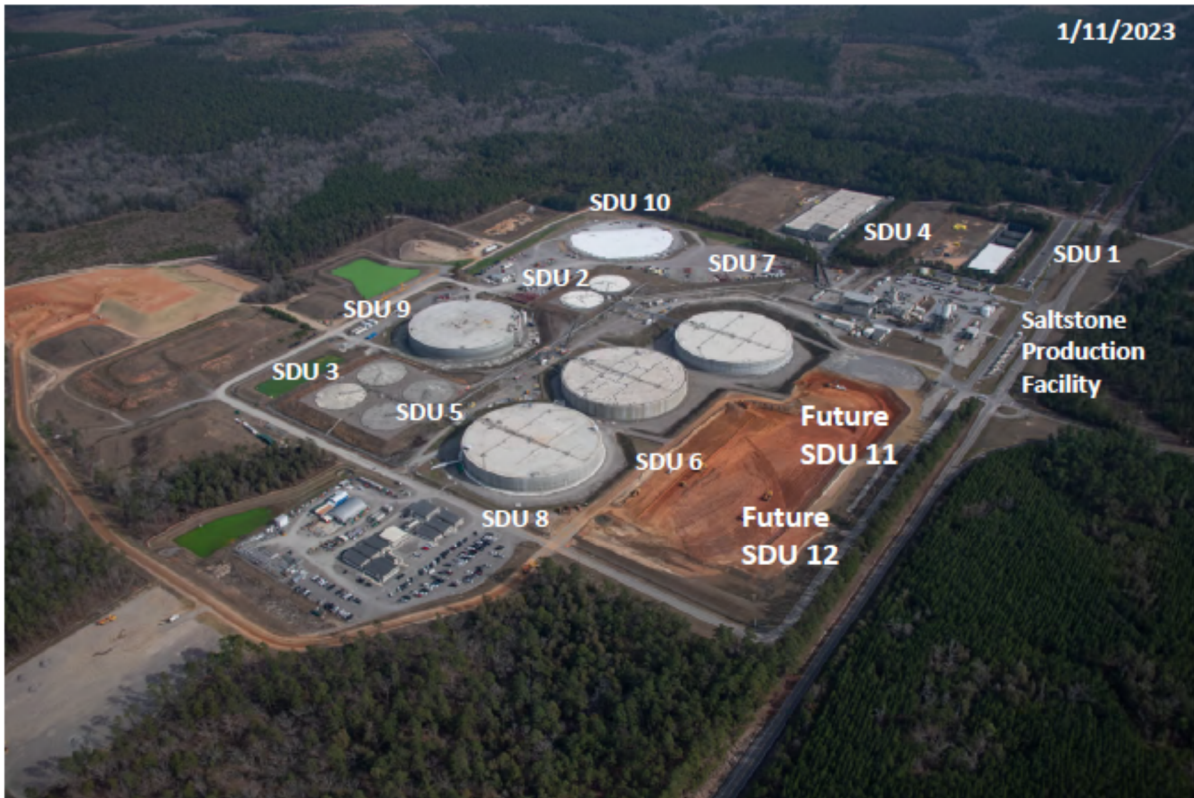
- Regarding the Saltstone Production Facility:
 - in Fiscal Year (FY) 2021, the DOE processed 3,032,607 gallons of salt solution
 - in FY 2022, the DOE processed 2,869,585 gallons of salt solution
- Regarding the Salt Waste Processing Facility (SWPF):
 - initial SWPF transfer to Tank 50 on October 21, 2020
 - cement-free saltstone (60 percent (%) slag, 40% fly ash) trial runs performed July 22 – 26, 2021
 - first time that DOE identified to NRC that the switch to only cement-free saltstone operations started on August 28, 2021 and the change is reasonable
 - no change in curing temperature due to change to cement-free saltstone
- Regarding the SDF:
 - since the last OOV on August 12, 2021
 - SDS 7 became operational
 - saltstone produced and placed in SDS 3A, SDS 3B, SDS 6, and SDS 7
 - as of January 11, 2023, the non-rectangular disposal structures contain
 - SDS 2A has ~2.8 million gallons of saltstone (GoS) (at fill limit)
 - SDS 2B has ~2.8 million GoS (at fill limit)
 - SDS 3A has ~1.7 million GoS (space for ~1.1 million GoS more if approved by the DOE later for full fill height of 21.25 feet)
 - SDS 3B has ~1.6 million GoS (space for ~1.2 million GoS more if approved by the DOE later for full fill height of 21.25 feet)
 - SDS 3B previously used as backup for unforeseen events; but, no

longer needed for that reason

- SDS 5A has ~2.8 million GoS (at fill limit)
 - SDS 5B has ~2.8 million GoS (at fill limit)
 - SDS 6 has ~11 million GoS (space for ~23 million GoS more)
 - SDS 7 has ~4 million GoS (space for ~30 million GoS more)
 - SDS 7 began receiving saltstone in March 2022
- See below for a DOE drawing of the SDF layout, including future disposal structures (note: the DOE uses the term Saltstone Disposal Unit (SDU)):



- See below for a picture of the SDF, as of January 11, 2023:



- Regarding construction of future disposal structures, as of January 31, 2023:
 - SDS 8
 - completed: floor sections, wall sections, columns, and roof sections
 - completed: pre-stressing and shotcrete
 - completed: leak tightness test
 - in-progress: final high-density polyethylene (HDPE) welding
 - SDS 9
 - completed: floor sections, wall sections, columns, and roof sections
 - in-progress: pre-stressing and shotcrete
 - preparing for: installation of internal liner
 - SDS 10
 - completed: lower mud mat and HDPE/geosynthetic clay liner (GCL) installation
 - poured: 3 of 6 upper mud mat concrete sections
 - preparing for: pouring last 3 upper mud mat concrete sections in February 2023
 - SDS 11
 - in-progress: excavation
 - SDS 12
 - in progress: excavation
- Regarding the SDF worker doses:
 - the SDF worker doses continue to meet the §61.43 PO

1.1.3 Conclusions and Follow-Up Action Items (FUAIs)

The NRC staff will continue to monitor the DOE SDF activities. The following FUAIs resulted from the technical discussion:

- The DOE to provide the NRC with SRNS-TR-2022-00691, *Z-Area Saltstone Disposal Facility Groundwater Monitoring Report for 2022*
- Hold future NRC/DOE MS Teams Call to discuss the DOE modifying the saltstone feed sampling methodology

1.2 Tour – Construction of SDS 8 and SDS 10

1.2.1 Observation Scope

The tour supported the NRC monitoring of the DOE disposal actions to assess compliance with the §61.41 and §61.42 POs. The tour was most relevant to the following monitoring areas and monitoring factors in the SDF Monitoring Plan, Rev. 1, as supplemented by the NRC letters to the DOE:

- MA 6 (Disposal Structure Performance)
 - MF 6.04 (Disposal Structure Concrete Fracturing)
 - MF 6.05 (Integrity of Non-Cementitious Materials)
- MA 8 (Environmental Monitoring)
 - MF 8.01 (Leak Detection)

1.2.2 Observation Results

The tour consisted of observing specific aspects of the construction of SDS 8 (details of leak detection sump construction/assembly) and SDS 10 (installed HDPE/GCL and example of HDPE welding). The key points from the tour were:

- Before the tour, brief instructions related to safety were provided within a construction trailer
- The NRC staff observed specific features of the construction at SDS 8 and SDS 10, and, as requested by the NRC staff, the DOE took pictures of key features of construction of SDS 8 and SDS 10
 - observation of design and construction of a sump
 - observation of stone fill and geotextile fabric above sump and upper mud mat (UMM)
 - observation of HDPE hot wedge welds and extrusion welds
 - discussion of different weld testing (i.e., air pressure, arc)
 - observation of HDPE undulations
 - discussion of UMM pours to push out the undulations without HDPE folding
 - observation of HDPE repairs
- During the tour, a construction manager and others provided information on the phases of construction and construction features, including answering NRC staff questions

- After the OOV, the NRC technical staff issued a memorandum with detailed technical information about the tour ([ML23059A428](#))

1.2.3 Conclusions and FUAIs

The NRC staff will continue to monitor the DOE SDF activities. The NRC staff is interested in the HDPE/GCL composite barrier installations at future disposal structures. The following FUAIs resulted from the tour:

- The DOE to provide the NRC with an electronic copy of the photographs from the SDS 8 and SDS 10 tour
- The DOE to provide the NRC with quality control procedures regarding inspection, detection, and repair of HDPE defects and damage due to construction-related defects (not seam-related defects) (i.e., procedure to detect unintended damage to the HDPE during and after installation due to such things as machinery, equipment, construction boots, heavy or sharp items dropping on the geomembrane)
- If possible, the DOE to provide to the NRC with a video of the entire pour of the remaining upper mud mat for SDS 10 showing the interaction of the flowing cementitious material, including smoothing and straightening out the uneven HDPE sheets below
- The DOE to provide the NRC with the conceptual model of water source and path for SDS 6 leak detection sump contents and to provide discussion on the comparison and relevance to future disposal structure designs after SDS 6

2.0 OVERALL CONCLUSIONS

2.1 Overall Conclusions

The information gathered during SDF Observation 2023-01 will be used for multiple NRC Technical Review Reports and future OOVs, based on the topics discussed. There is no change to the overall conclusions from the NRC 2012 SDF TER regarding compliance of DOE disposal actions with the 10 CFR Part 61 POs. Background information can be found in the most recent NRC-issued Waste Incidental to Reprocessing (WIR) Periodic Monitoring Report ([ML19058A272](#)) dated October 21, 2019. Please go to the NRC Public Website DOE WIR Location webpage for the SDF (<https://www.nrc.gov/waste/incidental-waste/wir-process/wir-locations/saltstone.html>) to see the current status of the NRC Monitoring of the SDF. The NRC expects that the DOE will take into consideration the NRC staff information that was provided during the OOV.

2.1 Status of OPEN FUAIs from either Previous DSF OOVs or Calls

All FUAIs from previous calls were closed prior to SDF Observation 2023-01. All but two of the FUAIs from previous SDF OOVs were closed prior to SDF Observation 2023-01:

- *SDF-CY21-01-001* – The DOE did provide the documents to the NRC; but the DOE needs to provide follow-up pictures and videos that were requested by the NRC.
- *SDF-CY21-01-007* – The DOE will continue to provide the NRC with schedule

updates on timing of HDPE/GCL installation and UMM placement for future disposal structures. This FUIAI will remain open until the DOE completes those activities.

2.2 Summary of FUIAIs Opened During this Onsite Observation Visit

After the OOV, the NRC received the updated DOE OOV presentation (SRMC-CWDA-2023-00013, Rev. 1) ([ML23055A095](#)) pertaining to the activities during this OOV. The table below contains the FUIAIs that were opened during SDF Observation 2023-01, including a unique NRC identifier for each FUIAI:

Unique Identifier	FUIAI
SDF-CY23-01-001	The DOE to provide the NRC with SRNS-TR-2022-00691, <i>Z-Area Saltstone Disposal Facility Groundwater Monitoring Report for 2022</i>
SDF-CY23-01-002	Hold future NRC/DOE MS Teams Call to discuss the DOE modifying the saltstone feed sampling methodology
SDF-CY23-01-003	The DOE to provide the NRC with an electronic copy of the photographs from the SDS 8 and SDS 10 tour
SDF-CY23-01-004	The DOE to provide the NRC with quality control procedures regarding inspection, detection, and repair of HDPE defects and damage due to construction-related defects (not seam-related defects) (i.e., procedure to detect unintended damage to the HDPE during and after installation due to such things as machinery, equipment, construction boots, heavy or sharp items dropping on the geomembrane)
SDF-CY23-01-005	If possible, the DOE to provide to the NRC with a video of the entire pour of the remaining upper mud mat for SDS 10 showing the interaction of the flowing cementitious material, including smoothing and straightening out the uneven HDPE sheets below
SDF-CY23-01-006	The DOE to provide the NRC with the conceptual model of water source and path for SDS 6 leak detection sump contents and to provide discussion on the comparison and relevance to future disposal structure designs after SDS 6

3.0 PARTICIPANTS

U.S. NRC	U.S. DOE	SCDHEC
George Alexander	Joel Maul	Leigh Beatty
Hans Arlt		
Harry Felsher	U.S. DOE Contractors	U.S. EPA
Adam Lee	Steve Hommel	Jana Dawson
Gianni Nelson	Scott Kirk	
Kelli Trotter	Larry Romanowski	
	Kent Rosenberger	
	Malcom Smith	

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