ARF-023114

SRR-ESH-2021-00012
Revision 0

Status of F/H Area Radioactive Liquid Waste Tanks Being Removed from Service

CY2020 Annual Report

March 2021

Savannah River Remediation
AMENTUM | BECHTEL | JACOBS | BWXT

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

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Executive Summary

Per Section IX.B.2 of the Federal Facility Agreement (FFA) for the Savannah River Site (SRS), the United States Department of Energy (DOE) is required to submit a report to the United States Environmental Protection Agency (EPA) – Region 4 and the South Carolina Department of Health and Environmental Control (SCDHEC) containing new or replacement waste tank system component assessments annually on or before March 9th of each year. Further, Section IX.E.3 of the SRS FFA requires that DOE submit to EPA and SCDHEC the status of the radioactive liquid waste tanks being removed from service. To fulfill these requirements, Calendar Year (CY) 2020 individual tank status reports and a list of FFA assessment reports are included in this report in Appendix A and Appendix B, respectively. Appendix L of the SRS FFA stipulates that, with respect to the F-Area and H-Area waste tanks, in connection with the annual report, DOE shall report on the status of bulk waste and heel removal activities, Performance Assessments (PA), General Closure Plans, operational closure of tanks, and implementation of Section 3116(a) of the *Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005* (NDAA). The information required by Appendix L is provided in Section 2 of this report.

In 2020, DOE continued to make progress regarding waste removal and closure. DOE operated Tank Closure Cesium Removal (TCCR) Unit 1 in the H-Tank Farm (HTF) to process dissolved salt solution fed from Tank 10H with the resultant decontaminated salt solution (DSS) being transferred to Tank 11H, prior to subsequent transfer of this DSS to Tank 50H for eventual disposal in the Saltstone Disposal Facility (SDF). Processing of the third batch of Tank 10H salt solution through TCCR Unit 1 was completed in August 2020. Subsequently, field activities to prepare Tank 10H and the TCCR Unit for processing Tank 9H DSS were initiated.

Extensive balance of plant modifications and procurements were made, and assembly/installation of new equipment continued for Tanks 9H and 27F, as well as planning and work being initiated for Tanks 35H and 44F in preparation for salt waste removal and treatment. Salt dissolution scoping/design activities were performed for Tanks 3F, 28F, and 47F. Sludge removal scoping/design activities were performed for Tank 33F. Tank Farm preparations were completed to support transferring salt waste to the Salt Waste Processing Facility (SWPF) to support hot commissioning efforts in CY2020. Two one million-gallon salt batches were prepared, qualified and are serving as feed for SWPF; a third one million-gallon salt batch is currently being prepared.

SCDHEC and EPA approved on January 29, 2020 and January 31, 2020, respectively, reuse of Tank 10H and Tank 11H to support the processing of Tank 9H dissolved salt solution through TCCR Unit 1. In April 2019, the *2019 Suspension Agreement Federal Facility Agreement (FFA) High Level Waste (HLW) Tank Milestones* was incorporated into the FFA via an approved minor modification. The agreement suspended the remaining Appendix L milestones for completion of Bulk Waste Removal Efforts (BWRE) and operational closure of waste tanks, except the BWRE milestone to complete Tank 10H BWRE, which was completed in CY2019. In CY2020, DOE completed two FFA milestones which had been added under the agreement. On April 14, 2020, DOE notified SCDHEC and EPA of the completion of water addition to Tank 9H to begin saltcake dissolution. On June 17, 2020, DOE provided SCDHEC and EPA the *Savanah River Site F-Area Tank Farm Deactivation Plan and Closure Strategy*, thereby completing the FFA milestone to provide an F-Area Tank Farm (FTF) Deactivation Plan. In addition, DOE continued to make progress on a third FFA milestone added under the agreement, operational closure of F-Area

Diversion Box-5 (FDB-5) and FDB-6, with DOE, SCDHEC and EPA reaching concurrence to cease waste removal activities and enter into the sampling and analysis phase of the closure process for those two ancillary structures.

The United States Nuclear Regulatory Commission (NRC) did not perform any on-site monitoring visits in CY2020, However, SRR continued to provide documentation/information as requested by the NRC to support NRC and SCDHEC monitoring responsibilities under Section 3116(b) of the NDAA.

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Acronyms

BWRE	Bulk Waste Removal Efforts
CGCP	Consolidated General Closure Plan for Waste Tank Systems
CLSM	Controlled Low Strength Material
CSMPs	Commercial Submersible Mixer Pumps
CY	Calendar Year
D&R	Disassembly and Removal
DOE	United States Department of Energy
DSS	Decontaminated Salt Solution
ECSMP	Enhanced Commercial Submersible Mixer Pump
EPA	United States Environmental Protection Agency Region 4
FFA	Federal Facility Agreement for the Savannah River Site
FDB	F-Area Diversion Box
FTF	F-Area Tank Farm
GRM	Gas Release Mode
H&V	Heating and Ventilation
HLW	High-Level Waste
HTF	H-Area Tank Farm
ISS	Interim Safe Storage
LVMJ	Low Volume Mixing Jet
NDAA	Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005
NRC	United States Nuclear Regulatory Commission
PA	Performance Assessment
ROD	Record of Decision
SCDHEC	South Carolina Department of Health and Environmental Control
SDF	Saltstone Disposal Facility
SRS	Savannah River Site
SRR	Savannah River Remediation
STP	Submersible Transfer Pump
SWPF	Salt Waste Processing Facility
TCCR	Tank Closure Cesium Removal
VFD	Variable Frequency Drive

1.0 Introduction

Section IX.B.2 of the Federal Facility Agreement (FFA) for the Savannah River Site (SRS) requires the United States Department of Energy (DOE) to annually submit a report to the United States Environmental Protection Agency (EPA) – Region 4 and the South Carolina Department of Health and Environmental Control (SCDHEC):

> "…for each F and H Area high-level waste tank system or component installed after the effective date of this Agreement, the DOE shall prepare a written assessment, certified by a registered professional engineer, that the waste tank system or component has sufficient structural integrity and is acceptable for the storing or treating of hazardous and/or radioactive substances."

Section IX.B.3 further states:

> "The assessment(s) shall demonstrate that the foundation, structural support, seams, connections, and pressure controls (if applicable) are adequately designed and that the waste tank system(s) have sufficient structural strength, compatibility with the hazardous/ radioactive substances to be stored or treated, and corrosion protection to ensure that the waste tank system(s) or component(s) will not collapse, rupture, or fail. At a minimum, the assessment(s) shall include the information contained in Subsection B of Appendix B herein, entitled, *Design/Installation Standards for New and Replacement Tank System(s) and Components*."

These waste tank system component assessments are to be "submitted annually on or before March 9th of each year for all components installed during the previous year."

In addition, Section IX.E.3 of the SRS FFA states:

> "The DOE will submit to EPA and SCDHEC an annual report on the status of tanks being removed from service under Subsection E.1 herein. This report will include any requests, subject to review and approval, for changes to the existing plan(s) and schedule(s) approved under Subsection E.1. This annual report shall be submitted in conjunction with the assessments submitted under Subsection B.3 herein."

With respect to the waste tanks in F-Area Tank Farm (FTF) and H-Area Tank Farm (HTF), Appendix L, Item 18, of the SRS FFA states:

> "In connection with the annual report on the status of tanks being removed from service due by March 9th of each year in accordance with Section IX.E.3 of the FFA, DOE shall report on the status of bulk waste and heel removal activities for F Area and H Area tanks, F Area and H Area Tank Farm Performance Assessments, F Area and H Area Tank Farm General Closure Plans, operational closure of groups of tanks in F and H Areas, and implementation of Section 3116(a) of the Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005 with respect to F Area and H Area tanks."

The required assessments under Section IX.B are found in Appendix B of this report. The status of the old-style tanks being removed from service, as required in Section IX.E, are found in Appendix A of this report. Section 2 of this report contains the additional information required by Appendix L of the SRS FFA.

2.0 Overview of CY2020 Activities and Accomplishments

As of the end of Calendar Year (CY) 2020, of the 24 old-style tanks, eight tanks have been *operationally closed* (also referred to as *removed from service*): Tanks 5F, 6F, 17F, 18F, 19F, and 20F in FTF and Tanks 12H and 16H in HTF. Bulk Waste Removal Efforts (BWRE) have been declared complete on six additional old-style tanks: Tanks 4F, 7F, 8F, 10H, 11H and 15H. Tank Farm preparations were completed to support transferring salt waste to the Salt Waste Processing Facility (SWPF) to support hot commissioning efforts in CY2020. Two one million-gallon salt batches were prepared, qualified and are serving as feed for SWPF; a third one million-gallon salt batch is currently being prepared.

2.1 Highlights of Bulk Waste Removal Efforts, Operational Closure, and Post Closure Activities for the F- and H-Area Tanks

DOE operated Tank Closure Cesium Removal (TCCR) Unit 1 to process dissolved salt solution fed from Tank 10H with the resultant decontaminated salt solution (DSS) being transferred to Tank 11H, prior to subsequent transfer of this DSS to Tank 50H for eventual disposal in the Saltstone Disposal Facility (SDF). Processing of the first two batches through TCCR Unit 1 were completed in CY2019 with a total of approximately 210,000 gallons of DSS being processed. CY2019 tank 10H saltcake dissolution activities ended on August 8, 2019 with the failure of the submersible transfer pump (STP) during recirculation of Batch 3 material in Tank 10H.

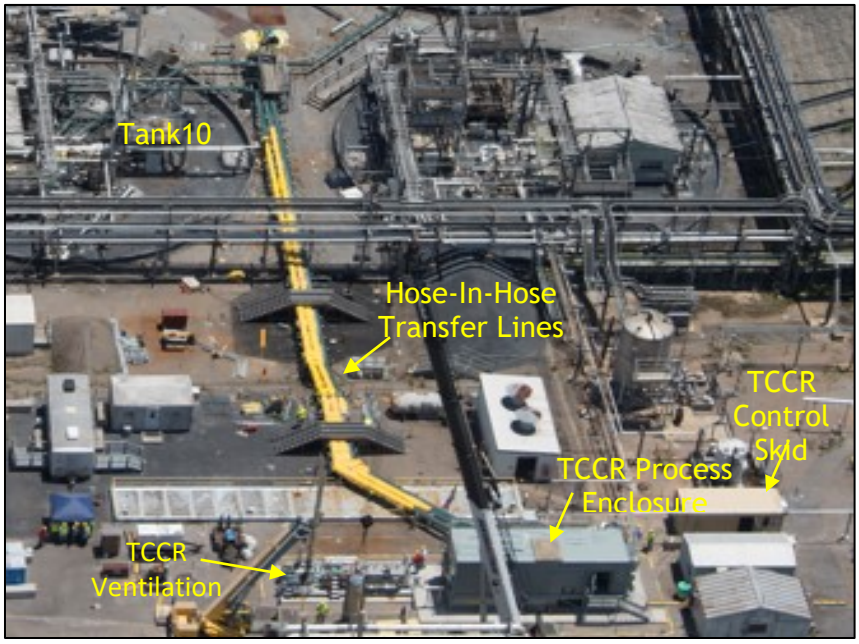
Activities to remove and replace the Tank 10H STP were completed in CY2020 and recirculation of the Tank 10H contents were restarted on March 10, 2020. Based on SRS transitioning to Essential Mission Critical Operations as a result of COVID-19, batch qualification activities for Batch 3 were deferred beginning April 9, 2020, after the planned recirculation period was completed. On May 27, 2020, SRS initiated the Phase 1 Return-to-Operations Plan, allowing batch qualification activities, among other high priority and/or low risk activities, to be initiated. Due to the extended down time, the Tank 10H contents were recirculated for some additional time prior to initiating batch qualification activities. Recirculation was restarted on May 30, 2020, batch qualification testing was initiated on June 16, 2020, and processing of Batch 3 started on July 30, 2020. Processing of Batch 3 completed on August 28, 2020, when feed was no longer available in Tank 10H. Approximately 89,000 gallons were processed during Batch 3. To date, the total amount processed through TCCR Unit 1 is 299,455 gallons representing approximately 1,057 hours of operation.

Based on the information obtained and evaluated during TCCR operations in 2019, DOE made the decision to process salt waste from at least one additional waste tank using TCCR Unit 1, Tank 9H. SRR-CWDA-2019-00089, *Evaluation of the Technical Feasibility and Economic Efficiency of Savannah River Site Tank Closure Cesium Removal Unit 1 to Process Salt Waste from at Least One Additional Tank*, Revision 0, was provided to SCDHEC on September 26, 2019. The submittal of this report met the October 31, 2016 Salt Waste Dispute Resolution Agreement milestone to complete a technical feasibility and economic efficiency study of TCCR operations by September 30, 2019. SCDHEC and EPA provided comments on October 22, 2019 and November 4, 2019, respectively. In response to the comments, DOE provided an overview of the Safety Basis process and the potential Safety Basis impacts needed to support Tank 9H processing to SCDHEC during a visit to SRS on January 8, 2020. Based on the presentation, as well as

responses to other comments, SCDHEC approved the study on March 23, 2020. Figures 1 and 2 show the TCCR Unit 1 Process Enclosure and Ventilation Equipment skids and the overall layout of the TCCR System, respectively.

Figure 1: TCCR Process Enclosure and Ventilation Equipment

Figure 2: TCCR Salt Treatment System



The current saltcake dissolution technique is no longer efficient or effective at dissolving the Tank 10H saltcake. As a result, two Commercial Submersible Mixer Pumps (CSMPs) will be added to Tank 10H for salt/Burkeite dissolution, and to increase Tank 10H qualification space for Tank 9H dissolved salt solution. Design work for modifications to Tank 10H Risers 1 and 8 to accept CSMPs, turntables and electrical utilities has been completed. Procurement activities for the pump assemblies, Rotek bearings, variable frequency drives and power equipment for the two CSMPs

continues. Given that the current dissolution technique is no longer efficient or effective, field activities to prepare Tank 10H and the TCCR Unit for processing Tank 9H salt solution were initiated in CY2020. The four spent columns used during processing of Tank 10H salt solution have been removed and placed at the Interim Safe Storage (ISS) pad. Figures 3 and 4 show the columns being removed from the TCCR Unit and stored at the ISS. In addition, tie-in of the Tank 9H transfer line to Tank 10H was completed, supplemental ventilation design was completed for the TCCR Unit, and new pre-filters and a filter bypass line have been procured.

Figure 3: Removal of TCCR Columns

Figure 4: TCCR Columns at ISS Pad

In 2020, DOE continued efforts to prepare Tank 9H to dissolve saltcake waste and process the resulting dissolved salt solution through TCCR Unit 1. Dissolved salt solution from Tank 9H will be transferred to Tank 10H where it will be batched and sampled to determine processability through the TCCR ion exchange columns. The existing equipment and transfer lines currently in use for Tank 10H dissolved salt solution processing will continue to be used to feed TCCR Unit 1. Additional ion exchange media, columns, and integral shield assemblies will be procured to support processing of Tank 9H dissolved salt solution through TCCR Unit 1.

In-Tank and tank top modifications supporting Tank 9H saltcake dissolution continued in CY2020. Installation of a Low Volume Mixing Jet (LVMJ), downcomers, and an STP were completed. The STP manifold is shown in Figure 5. Heating and Ventilation (H&V) modifications were completed for both the primary tank and annulus. In addition, installation of the Gas Release Mode (GRM) skid containing hydrogen monitoring instrumentation and transfer controls was also completed. The GRM skid is shown in Figure 6.

Figure 5: Tank 9H STP Manifold

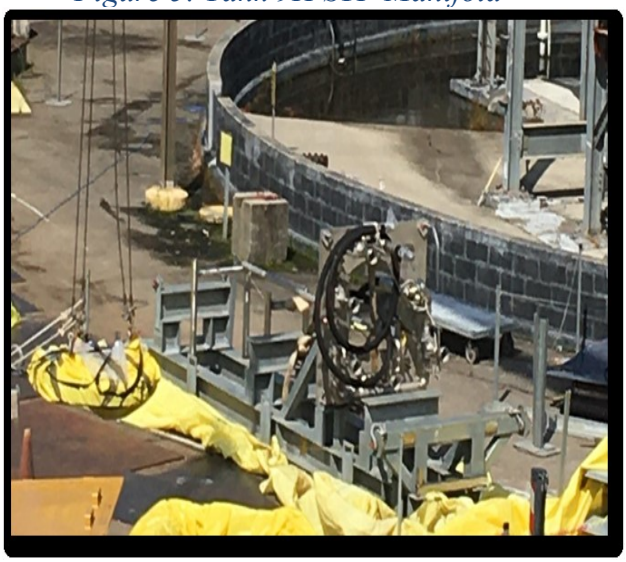


Figure 6: Tank 9H GRM Skid

DOE continued to make progress on modifications to Tank 27F in preparation for saltcake dissolution and removal. Three LVMJs were installed and STP installation was completed. In addition, transfer line modifications were completed, and the water addition skid was fabricated. Figures 7 and 8 show the transfer line modifications and the water addition skid is shown in Figure 9. The Tank 27F GRM skid was also installed in CY2020.

Figure 7: Tank 27F Transfer Line Modifications

Figure 8: Tank 27F Transfer Line

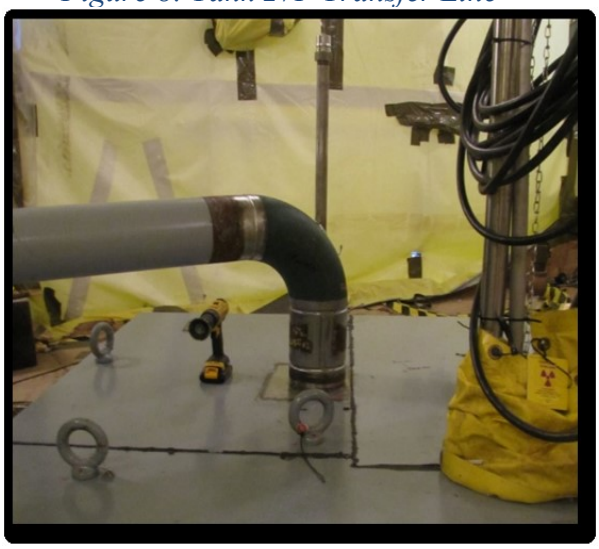


Figure 9: Tank 27F Water Addition Skid

Tank 35H activities in preparation of salt solution removal continued with design work, tank top modifications, and pump control system modifications occurring in CY2020. Field work included the H&V stack extension, initiation of D&R activities at Riser B8, and the installation of Variable Frequency Drives (VFDs) for controlling the pumps and turntables that will mix the material in the tank. The H&V stack extension is shown in Figure 10. Riser B8 D&R work is shown in Figure 11. Figures 12 and 13 show the Tank 35H VFDs.

Figure 10: Tank 35H Stack Extension

Figure 11:Riser B8 D&R Activities

Figure 12: 250-Horsepower VFD

Figure 13: 5-Horsepower VFD

Tank 44F Saltcake Dissolution modifications field work was initiated in CY2020 with a new H&V stack extension installed and LVMJ installation initiated. Figure 14 shows the Tank 44F stack extension.

Figure 14: Tank 44F H&V Stack Extension

Additional work in CY2020 included initiation of design work for continued Tank 3F saltcake dissolution using CSMPs, initiation of saltcake dissolution modification design input for Tanks 28F and 47F, and a design specification for procurement of an Enhanced Commercial Submersible Mixer Pump (ECSMP) was awarded to support future Tank 33F sludge removal activities.

In April 2019, the *2019 Suspension Agreement Federal Facility Agreement (FFA) High Level Waste (HLW) Tank Milestones* was incorporated into the FFA via an approved minor modification. The agreement suspended the remaining Appendix L milestones for completion of BWRE and operational closure of waste tanks, except one BWRE milestone to complete Tank 10H BWRE by November 30, 2019. The Tank 10H BWRE milestone was completed on October 31, 2019. New milestones associated with the Liquid Waste program were added to the FFA as part of this agreement:

1. Issue a F-Tank Farm Deactivation Plan by June 30, 2020;
2. Water addition to Tank 9H to begin saltcake dissolution by September 30, 2020;
3. Operational Closure of F-Diversion Box 5 (FDB-5) and FDB-6 by December 31, 2022; and
4. FTF Operable Unit Record of Decision (ROD) acceleration including issuance of a ROD by January 2040 and a Remedial Action Start by April 2041.

In CY2020, DOE completed two of the FFA milestones added under the agreement. On April 14, 2020, DOE notified SCDHEC and EPA of the completion of water addition to Tank 9H to begin saltcake dissolution. On June 17, 2020, DOE provided SCDHEC and EPA the *Savanah River Site F-Area Tank Farm Deactivation Plan and Closure Strategy*, thereby completing the FFA milestone to provide an FTF Deactivation Plan. In addition, DOE continued to make progress on a third FFA milestone added under the agreement, operational closure of FDB-5 and FDB-6. Savannah River Remediation, on behalf of DOE, presented *Proposal to Cease Waste Removal Activities in F-Area Diversion Boxes 5 and 6* to SCDHEC and EPA on July 13, 2020. On July 28, 2020, DOE sent a letter requesting concurrence to proceed to sample and analysis phase of the closure process for FDB-5 and FDB-6. SCDHEC concurred with a letter dated July 29, 2020 and EPA concurred with a letter dated August 11, 2020.

BWRE complete was declared in Tank 10H in October 2019 and for Tank 11H in May 2011. Per the SRS FFA, both SCDHEC and EPA must approve the reuse of Tank 10H and Tank 11H to store additional waste other than liquids added to the tank to support heel removal activities. Tanks 10H and 11H are needed to temporarily support the processing of Tank 9H dissolved salt solution through TCCR Unit 1. DOE requested approval to reuse Tank 10H and Tank 11H on January 27, 2020. Approval to reuse Tank 10H and Tank 11H was granted by SCDHEC on January 29, 2020 and by the EPA on January 31, 2020.

2.2 F- and H-Area Tank Farm Consolidated General Closure Plan Activities

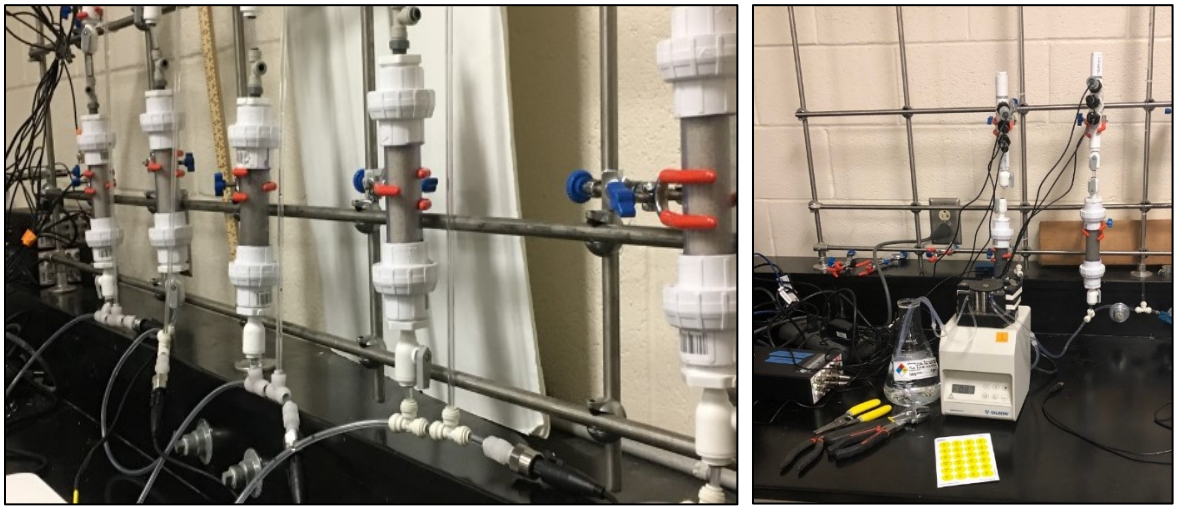
No revisions or updates to the Consolidated General Closure Plan (CGCP) occurred during CY2020. As discussed above, DOE continues to make progress towards the operational closure of FDB-5 and FDB-6 per the processes agreed upon by DOE, SCDHEC and EPA within the CGCP.

2.3 Tank Farm Performance Assessments and Section 3116 Waste Determinations Activities

As part of the ongoing performance assessment (PA) maintenance program consistent with DOE Manual 435.1-1, DOE continued testing designed to reduce uncertainty and validate/refine underlying PA geochemical modeling assumptions regarding residual waste release. The Tank

Farm PAs use a conceptual Waste Release Model to simulate stabilized contaminant release from the grouted waste tanks based on various chemical conditions in the waste tank which control solubility and thereby affect the timing and rate of release of contaminates from the residual waste layer. A waste release test plan was issued in 2019. Part 1 of the test plan work scope involved measuring the Eh and pH of eluate (open system, oxic conditions) and immersion (closed system, anoxic conditions) solutions associated with cementitious materials exposed to a simulant of SRS vadose zone liquid. This testing is intended to reduce uncertainty in the ranges of Eh and pH controlling radionuclide solubility. The cementitious materials selected for testing are candidates for waste tank bulk fill materials. The three grout formulations used in batch and column tests completed a 90-day cure in 2019. Batch tests using open and closed containers to create oxic and anoxic exposure conditions were initiated. Mockups of additional column tests were performed to calibrate probes and troubleshoot the overall apparatus. The test setup is shown in Figure 15.

Figure 15: Test Set Up for Batch Testing of Waste Tank Bulk Fill Materials



Column tests using both oxic and anoxic infiltrates were started in October 2019, and pH and Eh were monitored in the batch and column tests for at least 20 weeks. Following Eh/pH testing, Part 2 of the Scope of Work included characterization of the solid phase composition of the cementitious materials using applicable analytical techniques (e.g., X-Ray Diffraction) and X-Ray Fluorescence spectroscopy). This will guide validation and/or refinement of the geochemical modeling underlying PA radionuclide solubility assumptions. A summary of the batch equilibration results compared to previous geochemical modeling values for reducing grouts is provided in Figure 10. Relative to *Eh*, the "Open Atmosphere" created oxidizing ("Ox.") conditions, the "Reducing Atmosphere" created reducing ("Red.") conditions irrespective of the grout formulation, and the "N_2 Purged Atmosphere" was a neutral gas space allowing either oxidizing or reducing conditions to occur depending on the grout formulation. "Region II" and "Region III" refer to *pH* regimes with Region III denoting more aged, lower *pH*, conditions. The "Open Atmosphere" condition exposed samples to carbon dioxide as well as oxygen. The resulting carbonation reactions lowered *pH* over time such that with enough exposure samples would transition from Region II to Region III *pH* levels. However, only the Controlled Low Strength Material (CLSM) samples approached Region III *pH* levels through 150 days of exposure. The observed results are consistent to varying degrees with previous laboratory tests aimed at defining

achievable Eh and pH conditions in tank waste grouted systems. This targeted research work was initiated to specifically address the primary United States Nuclear Regulatory Commission (NRC) recommendations in both the FTF and HTF Technical Evaluation Reports.

In addition, grout testing during 2020 was performed to 1) identify the grout attributes affecting performance as liquid waste tank bulk fill material (e.g., slump flow bleed water), 2) define performance metrics and associated requirements and goals, 3) identify additional CLSM characterization needed to support Tank Farm PA revisions, 4) assess the pros and cons of the reference LP#8-16 and candidate CLSM mixes on an attribute-by-attribute basis, and 5) recommend the next steps toward selecting a bulk fill grout for the next tank closure.

The NRC did not perform any on-site monitoring visits in CY2020, However, SRR continued to provide documentation/information as requested by the NRC to support NRC and SCDHEC monitoring responsibilities under Section 3116(b) of the *Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005* (NDAA).

APPENDIX A: CY2020 Individual Tank Status Reports for the F- and H-Area Radioactive Liquid Waste Tank Farms

Individual Tank Status Report

Introduction:

Appendix A provides information on the F-Area and H-Area Tank Farms' Waste Storage Tanks 1 through 24 being removed from service. Information in this appendix, including volumes of material in the tanks, is reported as of the end of CY2020.

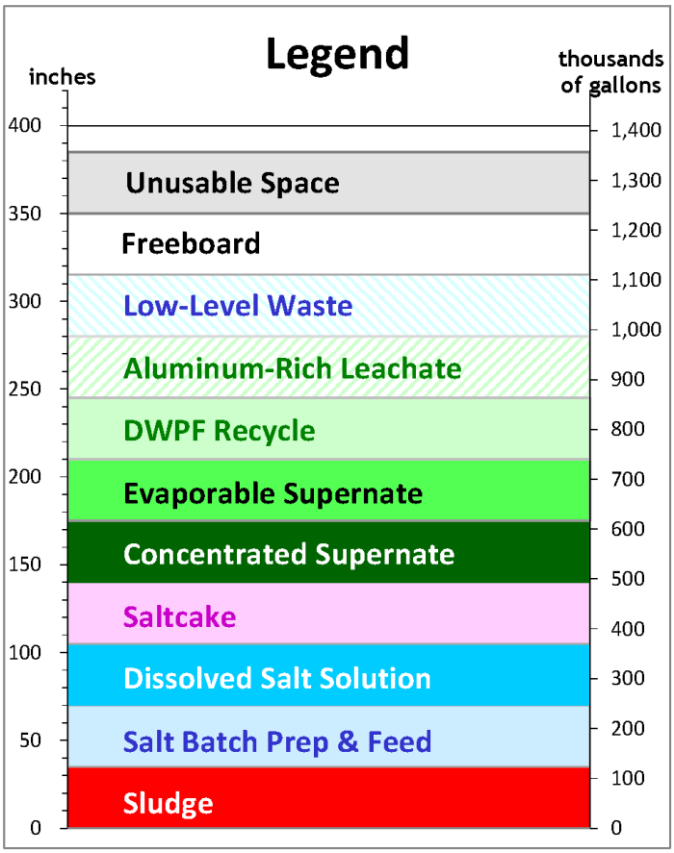
Several of the tanks experienced leakage in the past. A dark green background in the tank diagram indicates a tank that has a leakage history; tank storage liquid levels are currently maintained below the lowest known leak site.

Eight of the tanks are operationally closed:

- Tank 5 closed December 2013
- Tank 6 closed December 2013
- Tank 12 closed April 2017
- Tank 16 closed September 2015
- Tank 17 closed December 1997
- Tank 18 closed September 2012
- Tank 19 closed September 2012
- Tank 20 closed July 1997

Acronyms:

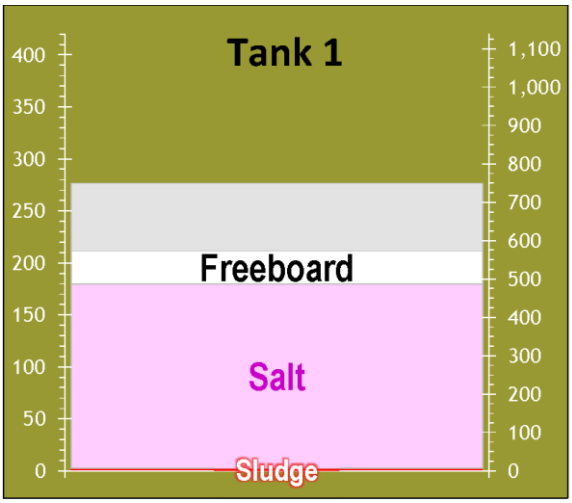
BWRE:	Bulk Waste Removal Efforts
DSS	Decontaminated Salt Solution
DWPF:	Defense Waste Processing Facility
EOY:	End of Year (December 31, 2020)
EPA:	Environmental Protection Agency
LTAD	Low Temperature Aluminum Dissolution
SCDHEC:	South Carolina Department of Health & Environmental Control
SWPF	Salt Waste Processing Facility
TCCR	Tank Closure Cesium Removal



Tank 1:

Area: F-Area
Service: Inactive Waste Storage Tank Under Active Surveillance
Type: I
EOY Volume: 486,990 gallons

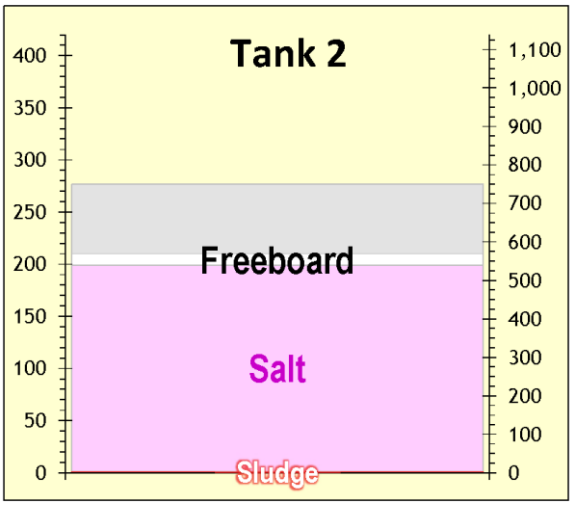
Status: There were no transfers in or out of Tank 1 during 2020.



Tank 2:

Area: F-Area
Service: BWRE activities planning have been initiated
Type: I
EOY Volume: 540,100 gallons

Status: There were no transfers in or out of Tank 2 during 2020.



Tank 3:

Area: F-Area
Service: BWRE activities are ongoing
Type: I
EOY Volume: 382,110 gallons

Status: During 2020, approximately 64,000 gallons of rainwater were transferred from the F-Area Catch Tank to Tank 3. Of this, 42,000 gallons were transferred to Tank 7.
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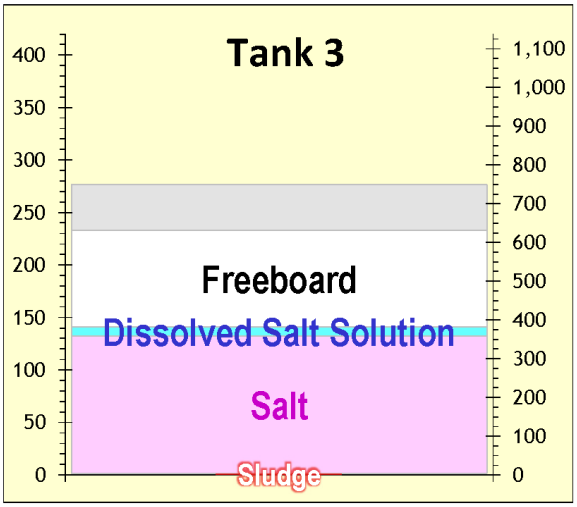
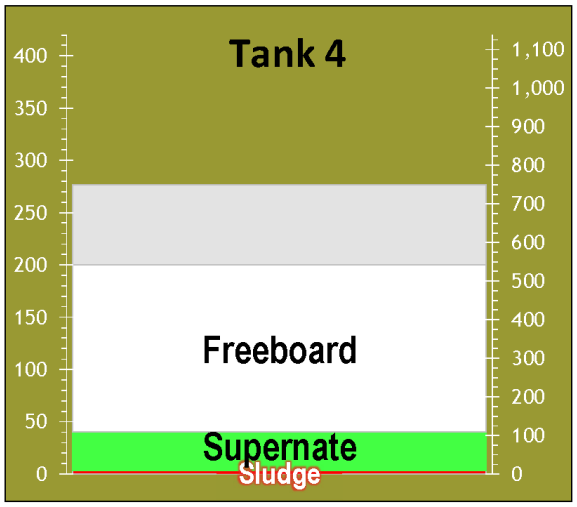


Tank 4:

Area: F-Area
Service: BWRE Complete – In 2011, SCDHEC and EPA approved the continued use of Tank 4 for storage of supernate for the purpose of keeping the remaining sludge hydrated to facilitate future tank cleaning activities.
Type: I
EOY Volume: 108,940 gallons

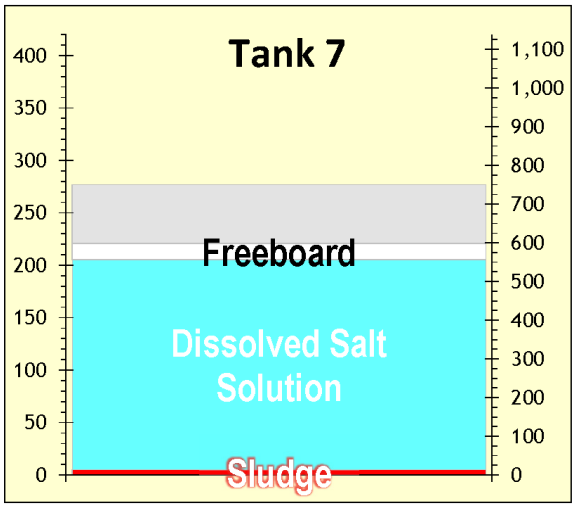
Status: There were no transfers in or out of Tank 4 during 2020.



Tank 7:

Area: F-Area
Service: BWRE Complete – Approved by SCDHEC and EPA in 2018 for use as hub tank to receive Tank 3 dissolved salt solution.
Tank Type: I
EOY Volume: 556,910 gallons

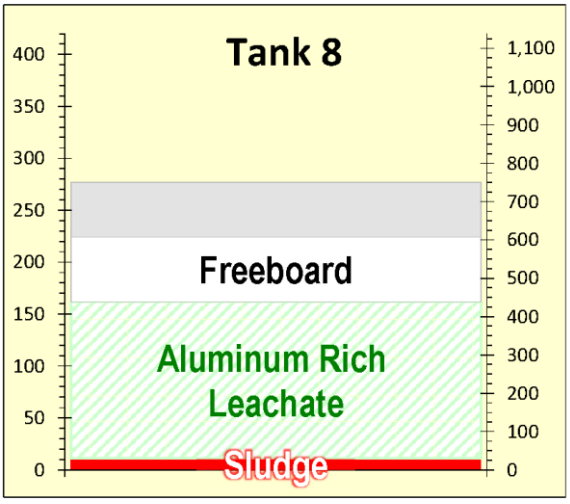
Status: Tank 7 received approximately 42,000 gallons of dissolved salt solution from Tank 3.



Tank 8:

Area: F-Area
Service: BWRE Complete – Approved by SCDHEC and EPA in 2018 for storage of aluminum-rich leachate from LTAD in support of Sludge Batch 10 preparation.
Type: I
EOY Volume: 438,750 gallons

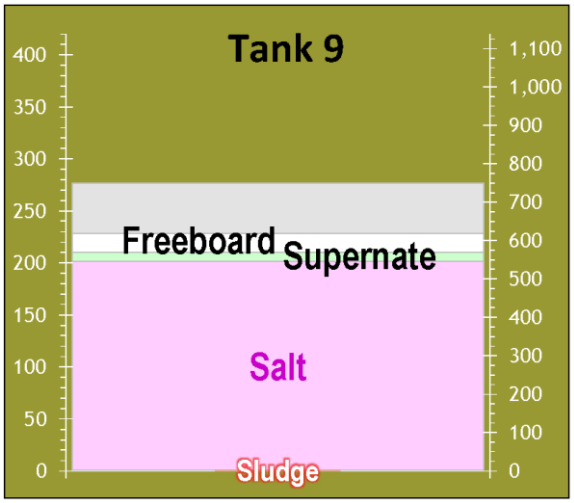
Status: There were no transfers in or out of Tank 8 during 2020.



Tank 9:

Area: H-Area
Service: BWRE planning activities have been initiated
Type: I
EOY Volume: 569,100 gallons

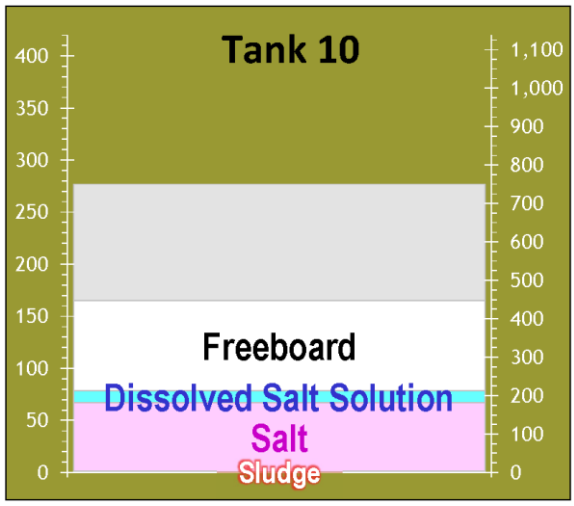
Status: During 2020, 19,000 gallons of water were used to remove old equipment enabling installation of new transfer equipment to support TCCR processing in 2021. Caustic was added (1,200 gallons) to maintain corrosion chemistry.



Tank 10:

Area: H-Area
Service: BWRE activities are complete
Type: I
EOY Volume: 213,010 gallons

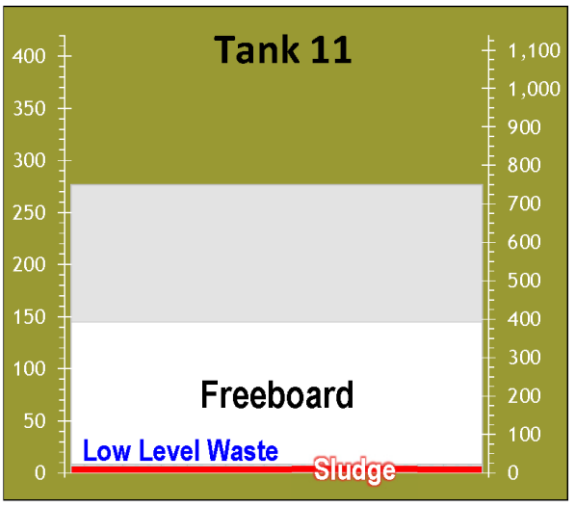
Status: Approximately 44,600 gallons of water were added to continue dissolution of the saltcake. One batch (89,000 gallons) of dissolved salt solution was fed to TCCR for treatment.



Tank 11:

Area: H-Area
Service: BWRE Complete – Approved by SCDHEC and EPA in 2017 for receipt and storage of DSS from TCCR
Type: I
EOY Volume: 22,222 gallons

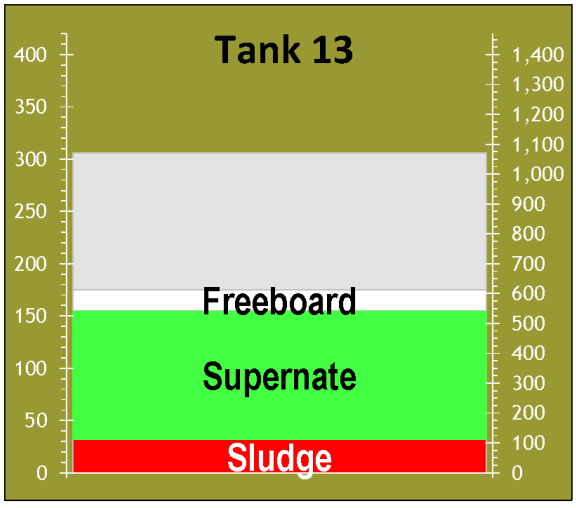
Status: Tank 11 received 89,000 gallons of DSS from TCCR operations in 2020. Subsequently, Tank 11 transferred 150,000 gallons of DSS to Tank 50 for disposition at Saltstone.



Tank 13:

Area: H-Area
Service: Active Waste Tank that will be used as a Hub Tank in the support of future cleaning activities for Tanks 9, 10, 11, 14, and 15
Type: II
EOY Volume: 543,200 gallons

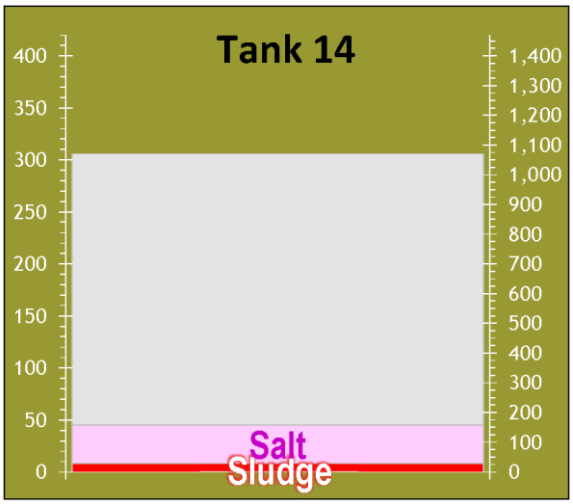
Status: There were no transfers in or out of Tank 13 during 2020.



Tank 14:

Area: H-Area
Service: Inactive Waste Storage Tank Under Active Surveillance
Type: II
EOY Volume: 157,500 gallons

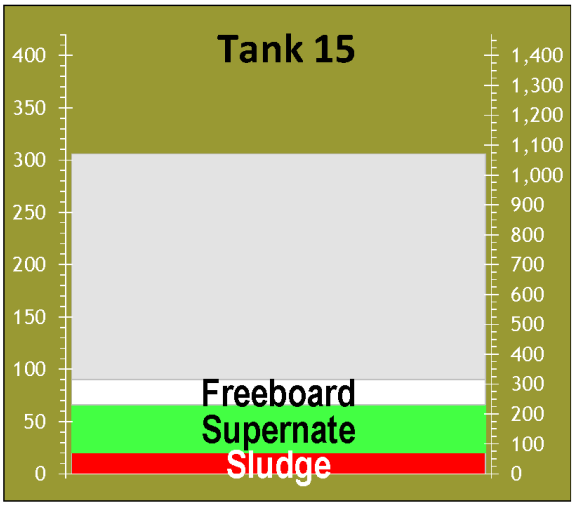
Status: There were no transfers in or out during 2020.



Tank 15:

Area: H-Area
Service: BWRE Complete; Heel Removal in preparation for grouting and removal from service is ongoing
Type: II
EOY Volume: 23,350 gallons

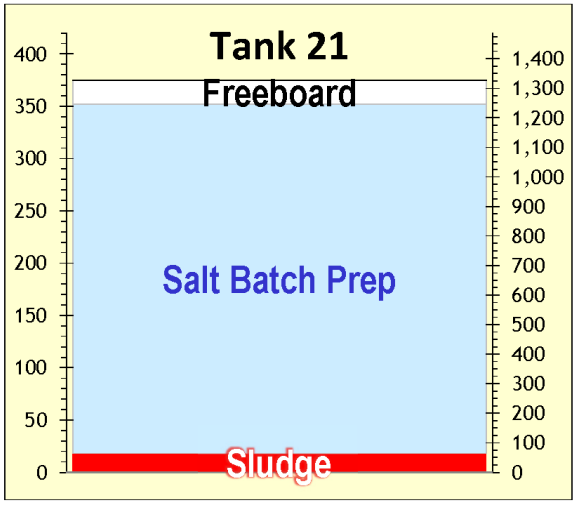
Status: There were no transfers in or out during 2020.



Tank 21:

Area: H-Area
Service: Salt Batch Blend Tank
Type: IV
EOY Volume: 1,245,700 gallons

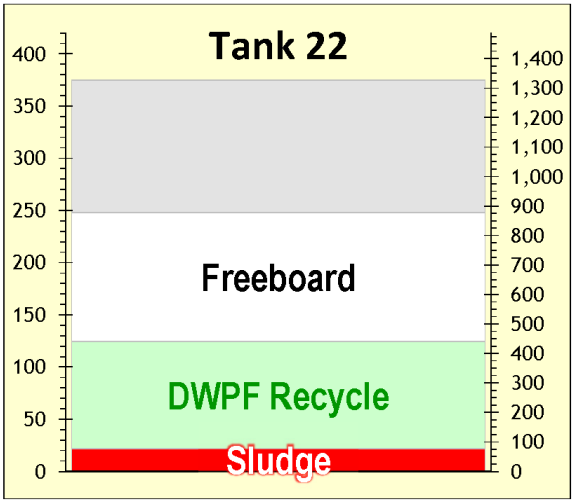
Status: There were no transfers in or out during 2020.



Tank 22:

Area: H-Area
Service: Storage Tank for DWPF Recycle
Type: IV
EOY Volume: 441,080 gallons

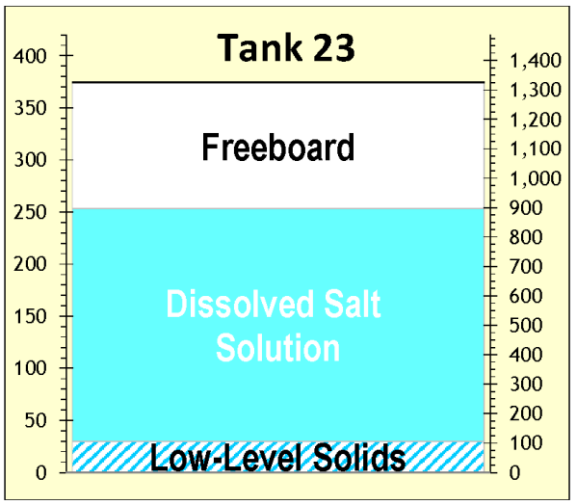
Status: In 2020, Tank 22 continued receiving and storing DWPF Recycle waste. This DWPF Recycle is volume reduced in the 2H Evaporator System.



Tank 23:

Area: H-Area
Service: Salt Solution Hold Tank
Type: IV
EOY Volume: 897,390 gallons

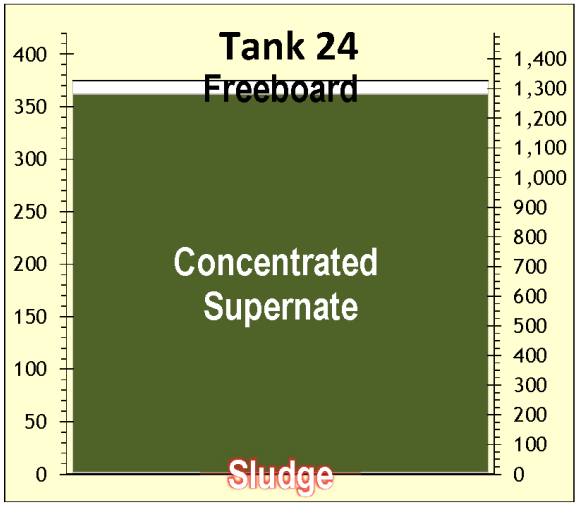
Status: In 2020, Tank 23 received 876,000 gallons from Tank 41 and transferred 429,000 gallons to Tank 41 to support Salt Dissolution in Tank 41. Tank 23 also received 233,000 gallons of dissolved salt from Tank 35 to make space in Tank 35 for receipt of Tank 37 salt dissolution material.



Tank 24:

Area: H-Area
Service: Waste Storage Tank
Type: IV
EOY Volume: 1,282,200 gallons

Status: Tank 24 received 150,000 gallons of concentrated supernate from Tank 42 in July to make space to deliquor the 3H Evaporator system into Tank 42.



APPENDIX B: CY2020 Federal Facility Agreement System / Component Assessment Reports

Report Number	Title
M-ESR-H-00551 / Rev. 0	Tank 9 Center Riser Repair
M-ESR-H-00550 / Rev. 0	Cap HPP6 Waste Transfer System Line Core and Jacket at Tank 41 Riser C3
M-ESR-F-00285 / Rev. 0	Waste Tank 27F Riser C1 to FDB-4 Transfer Line Modification

Savannah River Site

FEDERAL FACILITY AGREEMENT
ASSESSMENT REPORT

FOR

TANK 9 CENTER RISER REPAIR

M-ESR-H-00551
REVISION 0

DISCLAIMER

APPROVAL SIGNATURES / SUMMARY OF CHANGES

APPROVALS

	DATE
PREPARER Jeremy Brackman Jeremy Brackman, Design Services Mechanical Engineer Project Management, Design and Construction Services	10/14/2020
REVIEWER Suresh Soorma Suresh Soorma, Design Services Mechanical Engineer Project Management, Design and Construction Services	10/14/2020
APPROVAL Seth Campbell, Tank 9 Design Authority Tank Farm Engineering	10/19/2020
APPROVAL Michael B. Wood Michael B. Wood, Design Services Project Engineer, Project Management, Design and Construction Services	10/19/2020

SUMMARY OF CHANGES

Rev. No	Reason for Change	Pages Affected	Issue Date
0	Initial Issue	N/A	

TABLE OF CONTENTS

1.0 Executive Summary

This Assessment Report is being submitted to satisfy requirements of Section IX and Appendix B of the Savannah River Site (SRS) Federal Facility Agreement (FFA, Ref. 2.3.1 and 2.3.2).

The Tank 9 Center Riser concrete was previously damaged and repaired at some unknown time. As part of M-DCP-H-17011 (Ref. 2.3.3), the existing riser plug was removed causing the non-structural repair to degrade, leaving the damaged riser.

The scope of this FFA is to repair the riser by installing a reinforced concrete band around it, encapsulating the riser and creating a new waste tank confinement boundary. This will also provide adequate support for the new riser cover and equipment installed in the Center Riser. This modification will be conducted per Design Change Form (DCF) C-DCF-H-04530 (Ref. 2.3.4).

This task is not divided into two or more FFA reports.

2.0 Design Information

2.1 Design Change Form C-DCF-H-04530 (Ref. 2.3.4) includes the following activities:

- 2.1.1 Installation of a reinforced concrete band around the Tank 9 Center Riser.

2.2 Applicable SRS Engineering Standards and Engineering Guides:

- 2.2.1 SRS Engineering Standard 01060, Rev. 12, Structural Design Criteria
- 2.2.2 SRS Engineering Standard 01110, Rev. 6, Civil Site Design Criteria

2.3 Reference Documents

- 2.3.1 WSRC-OS-94-42, Administrative Document Number 89-05-FF, Federal Facility Agreement for the Savannah River Site, August 16, 1993
- 2.3.2 Assessment Report Phase II for the F and H-Area High-Level Radioactive Waste Tank Farms, Rev 0, August 1991
- 2.3.3 M-DCP-H-17011, Rev. 0, Tank 9 STP Installation
- 2.3.4 C-DCF-H-04530, Rev 2, Tank 9 Center Riser Repair
- 2.3.5 T-CLC-H-01332, Rev. 0, Tank 9H Center Riser Repair Calculation (NCR Disposition)
- 2.3.6 T-CLC-H-00500, Rev. 13, Type I Tank 9-H Tank Top Vertical Loading Evaluation

2.3.7 C-QIP-G-00044, Rev. 16, Quality Inspection Plan for SC, SS and PS Civil/Structural Commodities

3.0 Waste Compatibility

Waste characterization remains unchanged. The materials of construction used in this modification are compatible with the waste streams. The modification will not introduce any other materials that will invalidate the existing waste characterization.

4.0 Foundation Support

The reinforced concrete band structural integrity was evaluated in calculations T-CLC-H-01332 (Ref. 2.3.5) and T-CLC-H-00500 (Ref. 2.3.6) and was found to be satisfactory.

5.0 Leak Detection and Past Leaks

Installation of the reinforced concrete band will create a new waste tank confinement boundary that will continue to meet Section IX and Appendix B of the FFA (Ref. 2.3.1). In addition, the riser cover will be adequately supported to perform its' intended confinement boundary function as well.
As stated in the Phase II Assessment Report (Ref. 2.3.2), there are no known past or present leaks involving the Tank 9 risers.

6.0 Inspections

The reinforced concrete band inspection shall be in accordance with the C-DCF-H-04530 (Ref. 2.3.4) and C-QIP-G-00044 (Ref 2.3.7).

7.0 Determination of Secondary Containment

There are no changes to the present Secondary Containment systems associated with the waste tank riser.

8.0 Professional Engineer Certifications (Design and Construction)

Design

This assessment report was prepared under my supervision and direction. I certify that the design for the modifications detailed in Design Change Form C-DCF-H-04530 comply with applicable engineering standards and the requirements of Appendix B of the Federal Facility Agreement. These standards have been generally accepted as adequate in demonstrating leak tightness.

Stamp

Name:
License Number:

Construction and Installation

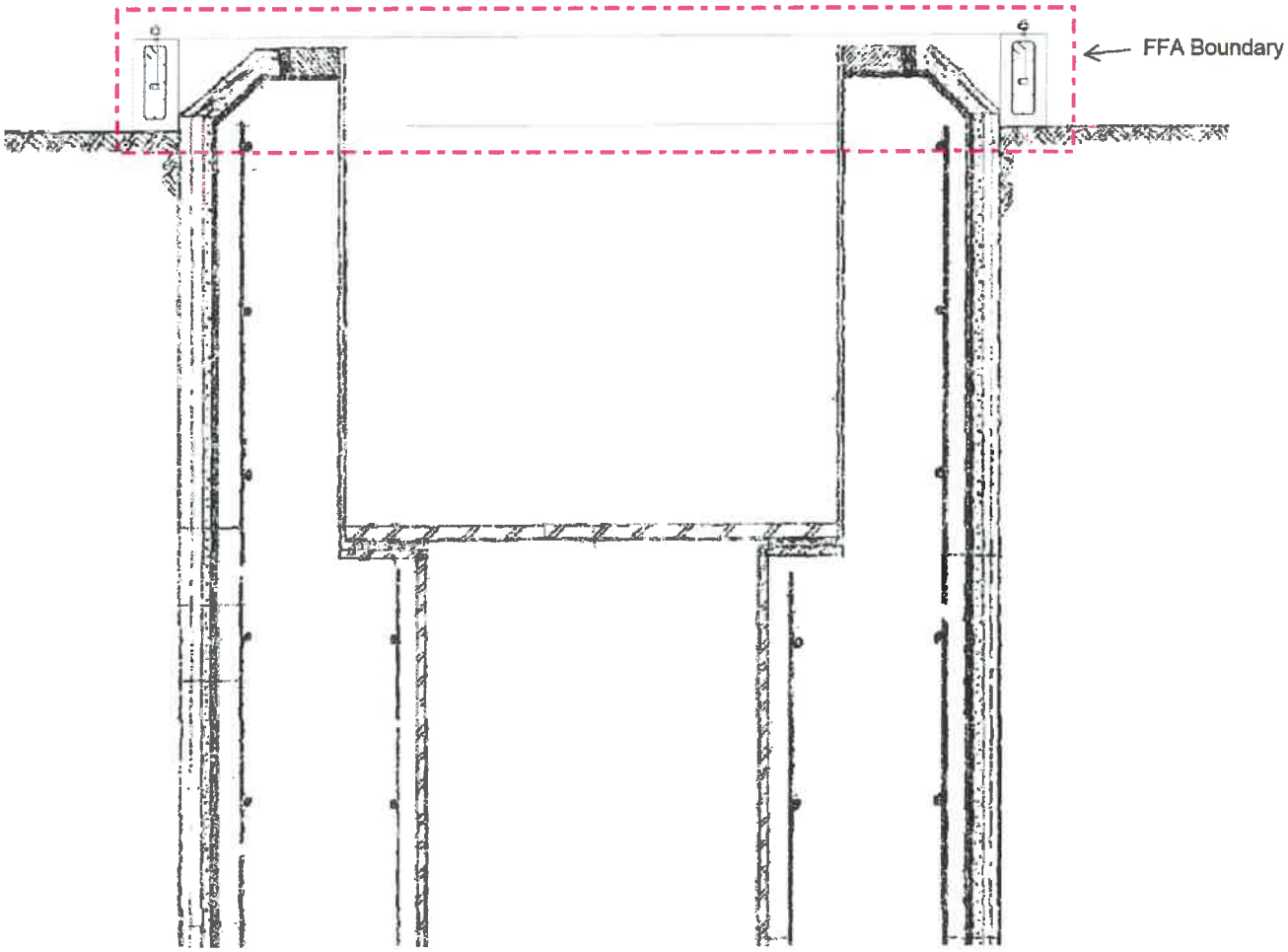
I have conducted an inspection, to the extent possible, of the completion of the modified system. Based upon the inspection, I certify that, to the best of my knowledge, information, and belief, the installation of the reinforced concrete band was constructed in accordance with the approved design in Design Change Form C-DCF-H-04530.

Stamp

Name: Andrew R. Redwood
License Number: 20525

9.0 ATTACHMENT

9.1 Reinforced Concrete Band



Tank 9 Center Riser

Savannah River Site

FEDERAL FACILITY AGREEMENT
ASSESSMENT REPORT

FOR

CAP HPP6 WASTE TRANSFER SYSTEM LINE CORE AND JACKET AT TANK 41 RISER C3

M-ESR-H-00550

REVISION 0

DISCLAIMER

APPROVAL SIGNATURES / SUMMARY OF CHANGES

APPROVALS

	DATE
PREPARER Oren Webb, Design Services Mechanical Engineer Project Management, Design and Construction Services	Aug. 6, 2019
REVIEWER Mike Petrulla, Design Services Mechanical Engineer Project Management, Design and Construction Services	8/06/2019
APPROVAL Geoffrey Clendenen, H-Tank Farm Engineering Tank Farm Engineering	8/15/19
APPROVAL Ashok Gupta, Design Services Project Engineer, Project Management, Design and Construction Services	8/6/2019

SUMMARY OF CHANGES

Rev. No	Reason for Change	Pages Affected	Issue Date
0	Initial Issue	All	

TABLE OF CONTENTS

1.0 Executive Summary

This Assessment Report is being submitted to satisfy requirements of Section IX and Appendix B of the Savannah River Site (SRS) Federal Facility Agreement (FFA, Ref. 2.4.1).

A new radiation hardened pump will be installed in Tank 41, Riser C3.

In preparation for the new pump, dismantle and remove (D&R) of the existing transfer hose (core and jacket) at Riser C3 hose and cap the core (1 ½"-WTS-L-1577-PS200D) and jacket (4"-WTS-L-1578-PS101D) pipes. The subject of this FFA is the D&R activity around this line.

This modification will be conducted per Design Change Package (DCP) P-DCP-H-19011 (Ref. 2.4.2). This task is not divided into two or more FFA reports.

2.0 Design Information

2.1 This modification includes the following activities:

- 2.1.1 Detach the core and jacket hose from 1 ½"-WTS-L-1577-PS200D and 4"-WTS-L-1578-PS101D.
- 2.1.2 Cap 1 ½"-WTS-L-1577-PS200D and 4"-WTS-L-1578-PS101D at hose end points

2.2 Applicable SRS Engineering Standards and Engineering Guides:

- 2.2.1 SRS Engineering Standard 01110, Rev. 6, SRS Civil Site Design Criteria
- 2.2.2 SRS Engineering Standard 15060, Rev. 20, Additional Requirements for SRS Piping
- 2.2.3 SRS Engineering Guide 15060-G, Rev. 8, Application of ASME B31.3

2.3 Applicable National Codes & Standards:

- 2.3.1 ASME B31.3-2016 Edition, Process Piping

2.4 Reference Documents

- 2.4.1 WSRC-OS-94-42, Administrative Document Number 89-05-FF, Federal Facility Agreement for the Savannah River Site, August 16, 1993
- 2.4.2 P-DCP-H-19011, Rev. 0, Tank 41 C3 Riser to HPP-6 Transfer Line/Hose/Snell House D&R Package

2.4.3 Assessment Report, Phase II for the F and H Area High Level Radioactive Waste Tank Farms, Rev. 0, 1991

2.4.4 M-QIP-H-00416, Rev. 0, Tank 41 Riser C3, D&R Quality Inspection Plan

3.0 Waste Compatibility

The modifications in the scope of this assessment and their waste characterization will remain unchanged. The materials of construction used in the modifications are compatible with the waste stream. The modifications will not introduce any other materials that will invalidate the existing waste characterization.

4.0 Foundation Support

The integrity of 1 ½"-WTS-L-1577-PS200D and 4"-WTS-L-1578-PS101D is not impacted by hose removal welded caps. The hoses did not provide structural support for the jacketed pipe core and jacket pipe.

5.0 Leak Detection and Past Leaks

The affected transfer lines will continue to meet Section IX and Appendix B of the FFA. These lines will still follow the design presented in Section 3.7.2 of the Phase II Assessment Report (Ref. 2.4.3), for Type II transfer lines.

6.0 Inspections

Piping material, fabrication, installation, inspection, examination, and testing shall be in accordance with:

- ASME Code B31.3-2016 (Ref. 2.3.1)
- SRS Engineering Standard 15060 (Ref. 2.2.4)
- SRS Engineering Guide 15060-G (Ref. 2.2.6)
- Piping Data Sheets and Quality Inspection Plan (QIP) are within Ref. 2.4.2.

7.0 Determination of Secondary Containment

The primary and secondary containments associated with this modification will replicate the existing line arrangement which satisfies FFA requirements and the requirements stated in Section 2.1 of the Phase II

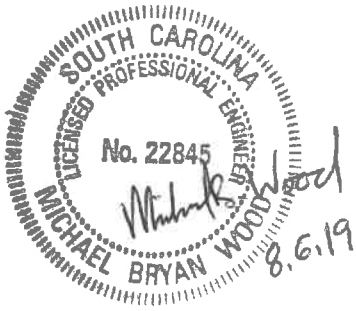
Assessment Report (Ref. 2.4.3) as previously evaluated in Section 3.7.2 of this same report. Therefore, no further assessment is needed.

8.0 Professional Engineer Certifications (Design and Construction)

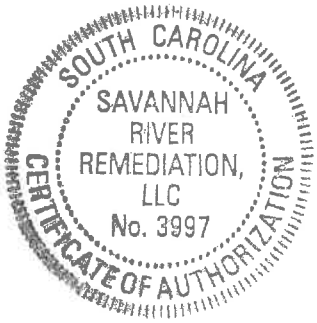
Design

This assessment report was prepared under my supervision and direction. I certify that the design for the modifications detailed in Design Change Package P-DCP-H-19011 (Ref. 2.4.2) complies with applicable engineering standards and the requirements of Appendix B of the Federal Facility Agreement. These standards have been generally accepted as adequate in demonstrating leak tightness.

Stamp



8.6.19



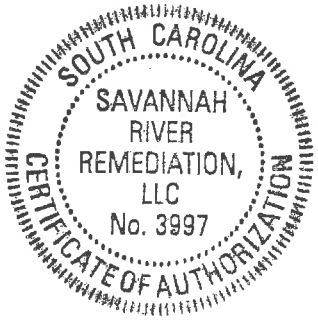
Name: MICHAEL B. WOOD
License Number: 22845

Construction and Installation

I have conducted an inspection, to the extent possible, of the completion of the modified system. Based upon the inspection, I certify that, to the best of my knowledge, information, and belief, the capping of the core and jacket lines was constructed in accordance with the approved design in Design Change Package P-DCP-H-19011 (Ref. 2.4.2). The tests conducted to demonstrate leak tightness and the results were found acceptable.

Stamp

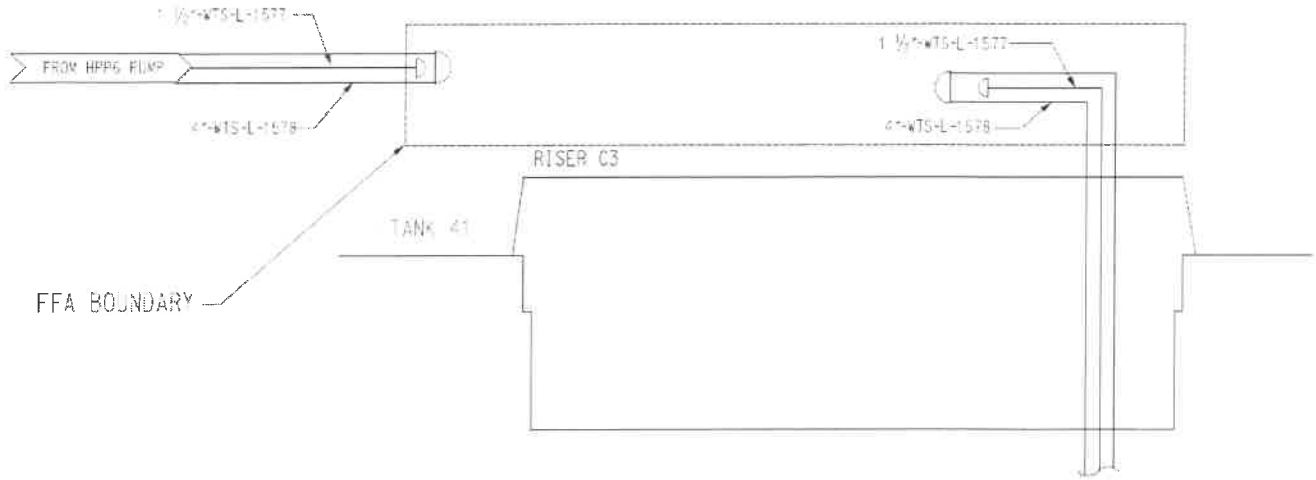
8/19/2020



Name: Andrew R. Redwood
License Number: 20525

9.0 ATTACHMENT

9.1 Waste Tank 41H C3 Riser Sketch



Savannah River Site

FEDERAL FACILITY AGREEMENT
ASSESSMENT REPORT

FOR

WASTE TANK 27F RISER C1 TO FDB-4
TRANSFER LINE MODIFICATION

M-ESR-F-00285

REVISION 0

DISCLAIMER

APPROVAL SIGNATURES / SUMMARY OF CHANGES

APPROVALS

	DATE
PREPARER David Massey David Massey, Design Services Mechanical Engineer Project Management, Design and Construction Services	9/10/2020
REVIEWER Jeremy Brackman Jeremy Brackman, Design Services Mechanical Engineer Project Management, Design and Construction Services	9/10/2020
APPROVAL Brian C. Wilson Brian Wilson, Sampling, Isolation & Grouting Design Authority Tank Farm Engineering	9/10/2020
APPROVAL Michael B. Wood Michael Wood, Design Services Project Engineer, Project Management, Design and Construction Services	9/11/2020

SUMMARY OF CHANGES

Rev. No	Reason for Change	Pages Affected	Issue Date
0	Initial Issue	All	

TABLE OF CONTENTS

1.0 Executive Summary

This Assessment Report is being submitted to satisfy requirements of Section IX and Appendix B of the Savannah River Site (SRS) Federal Facility Agreement (FFA, Ref. 2.4.1).

Waste Tank 27F is a salt tank located in the F-Area Tank Farm Facility. Currently, Tank 27F neither has a viable transfer path nor an installed system through which salt dissolution can be performed. The bulk of the waste in Tank 27F must be removed and processed to continue its progress towards final tank closure.

In order to dissolve and process the salt waste for cesium removal, a transfer path must first be provided at Tank 27F for the transfer of supernate waste to Tank 25F via Diversion Box FDB-4.

This will require a new transfer route. Line WTS-L-105 will be cut and capped at Riser C1 (capped portion is renamed WTS-L-1055) and will be rerouted from FDB-4 to Riser H and connected to the STP.

The scope of this FFA is the modification and rerouting of WTS-L-105. See Attachment 9.1 for the changes and FFA modification boundary.

This modification will be conducted per Design Change Package (DCP) M-DCP-F-17003 (Ref. 2.4.2) and associated DCFs, P-DCF-F-00888 (Ref. 2.4.7), C-DCF-F-01623 (Ref. 2.4.8), C-DCF-F-01629 (Ref. 2.4.9), P-DCF-F-00893 (Ref. 2.4.10), E-DCF-F-03472 (Ref. 2.4.11), E-DCF-F-03451 (Ref. 2.4.12), and M-DCF-F-04971 (Ref. 2.4.13). This task is not divided into two or more FFA reports.

2.0 Design Information

2.1 This modification includes the following activities:

- 2.1.1 Cut and cap existing waste transfer line WTS-L-1055 (originally WTS-L-105) at Riser C1.
- 2.1.2 Reroute waste transfer line WTS-L-105 to Waste Tank 27F, Riser H.
- 2.1.3 Coat underground waste transfer piping per SRS Engineering Guide 09903-G (Ref. 2.2.1), insulate per SRS Engineering Guide 15250-G (Ref. 2.2.2), and backfill per SRS Engineering Guide 01110 (Ref. 2.2.3).

2.2 Applicable SRS Engineering Standards and Engineering Guides:

- 2.2.1 SRS Engineering Guide 09903-G, Rev. 3, Corrosion Protection – Underground Steel

2.2.2 SRS Engineering Guide 15250-G, Rev. 3, Mechanical Insulation

2.2.3 SRS Engineering Standard 01110, Rev. 7, SRS Civil Site Design Criteria

2.2.4 SRS Engineering Standard 15060, Rev. 21, Additional Requirements for SRS Piping

2.2.5 SRS Engineering Standard 05057, Rev. 7, Control of Welding

2.2.6 SRS Engineering Guide 15060-G, Rev. 8, Application of ASME B31.3

2.3 Applicable National Codes & Standards:

2.3.1 ASME B31.3-2018 Edition, Process Piping

2.4 Reference Documents

2.4.1 WSRC-OS-94-42, Administrative Document Number 89-05-FF, Federal Facility Agreement for the Savannah River Site, August 16, 1993

2.4.2 M-DCP-F-17003, Rev. 0, Tank 27F STP Installation and Transfer Line Modification

2.4.3 M-ML-F-02656, Rev. 5, Waste Tank 27F Modifications

2.4.4 Assessment Report, Phase II for the F and H Area High Level Radioactive Waste Tank Farms, Rev. 0, 1991

2.4.5 T-CLC-F-00561, Rev. 0, Tank 27 STP Pump

2.4.6 M-QIP-F-00104, Rev. 4, Tank 27 STP and Transfer Line Installation Quality Inspection Plan

2.4.7 P-DCF-F-00888, Rev. 0, Bulk Waste Removal Tank 27 Waste Transfer Line

2.4.8 C-DCF-F-01623, Rev. 0, Tank 27 Transfer Line Core Supports Details

2.4.9 C-DCF-F-01629, Rev. 1, Tank 27 Transfer Line Shielding Base Plates and Drawing Updates

2.4.10 P-DCF-F-00893, Rev. 0, Tank 27 Instrument Air Piping Modification

2.4.11 E-DCF-F-03472, Rev. 0, Spare Cables for the Tank 27 Domestic Water Skid

2.4.12 E-DCF-F-03451, Rev. 0, Replace 30A Fuse with 50A Fuse in 480V MCC-2, Compartment 1L

2.4.13 M-DCF-F-04971, Rev. 0, Tank 27 STP Installation

3.0 Waste Compatibility

The modifications in the scope of this assessment and their waste characterization will remain unchanged. The materials of construction used in the modifications are compatible with the waste stream. The modifications will not introduce any other materials that will invalidate the existing waste characterization.

4.0 Foundation Support

The integrity of waste transfer line WTS-L-105, and all pipe supports, were evaluated and were found to be satisfactory, see T-CLC-F-00561 (Ref. 2.4.5).

Support for underground waste transfer lines is provided by the backfill per SRS Engineering Guide 01110 (Ref. 2.2.3) and insulation per SRS Engineering Guide 15250-G (Ref. 2.2.2). The Backfill material was evaluated and was found to be satisfactory to support capped waste transfer lines WTS-L-1055, see M-DCP-F-17003 (Ref. 2.4.2) for backfill requirements.

5.0 Leak Detection and Past Leaks

The Leak Detection system (LD) for the affected transfer lines will continue to meet Section IX and Appendix B of the FFA. These lines will still follow the design presented in Section 3.7.2 of the Phase II Assessment Report (Ref. 2.4.4), for Type II transfer lines.

As stated in the Phase II Assessment Report, there are no known past or presents leaks involving the core pipes and secondary containment jackets associated with any of the Type II waste transfer lines used in this modification.

6.0 Inspections

Piping material, fabrication, installation, inspection, examination, and testing shall be in accordance with:

- ASME Code B31.3-2018 (Ref. 2.3.1)
- SRS Engineering Standard 15060 (Ref. 2.2.4)
- SRS Engineering Standard 05057 (Ref. 2.2.5)
- SRS Engineering Guide 15060-G (Ref. 2.2.6)
- Piping Data Sheet Package M-ML-H-07285 (Ref. 2.4.3)
- Quality Inspection Plan M-QIP-F-00104 (Ref. 2.4.6).

7.0 Determination of Secondary Containment

The primary and secondary containments associated with this modification will replicate the existing line arrangement which satisfies FFA requirements and the requirements stated in Section 2.1 of the Phase II Assessment Report (Ref. 2.4.4) as previously evaluated in Section 3.7.2 of the same report. Therefore, no further assessment is needed.

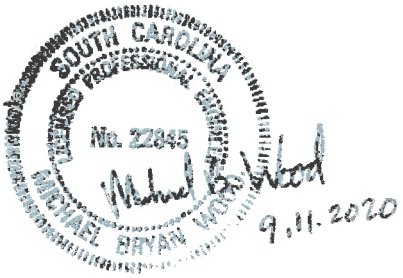
8.0 Professional Engineer Certifications (Design and Construction)

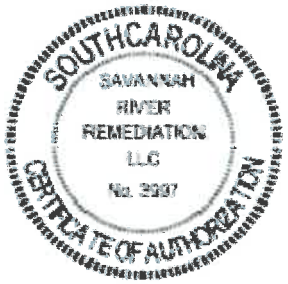
Design

This assessment report was prepared under my supervision and direction. I certify that the design for the modifications detailed in Design Change Package M-DCP-F-17003 (Ref. 2.4.2) and associated DCFs comply with applicable engineering standards and the requirements of Appendix B of the Federal Facility Agreement. These standards have been generally accepted as adequate in demonstrating leak tightness.

Stamp

Name:
License Number:





Construction and Installation

I have conducted an inspection, to the extent possible, of the completion of the modified system. Based upon the inspection, I certify that, to the best of my knowledge, information, and belief, the installation of the new waste transfer line was constructed in accordance with the approved design in Design Change Package M-DCP-F-17003 (Ref. 2.4.2) and associated DCFs. The tests conducted to demonstrate leak tightness were found acceptable.

Stamp

Name: Andrew R. Redwood
License Number: 20525

9.0 ATTACHMENT

9.1 Waste Tank 27F New Waste Transfer Line