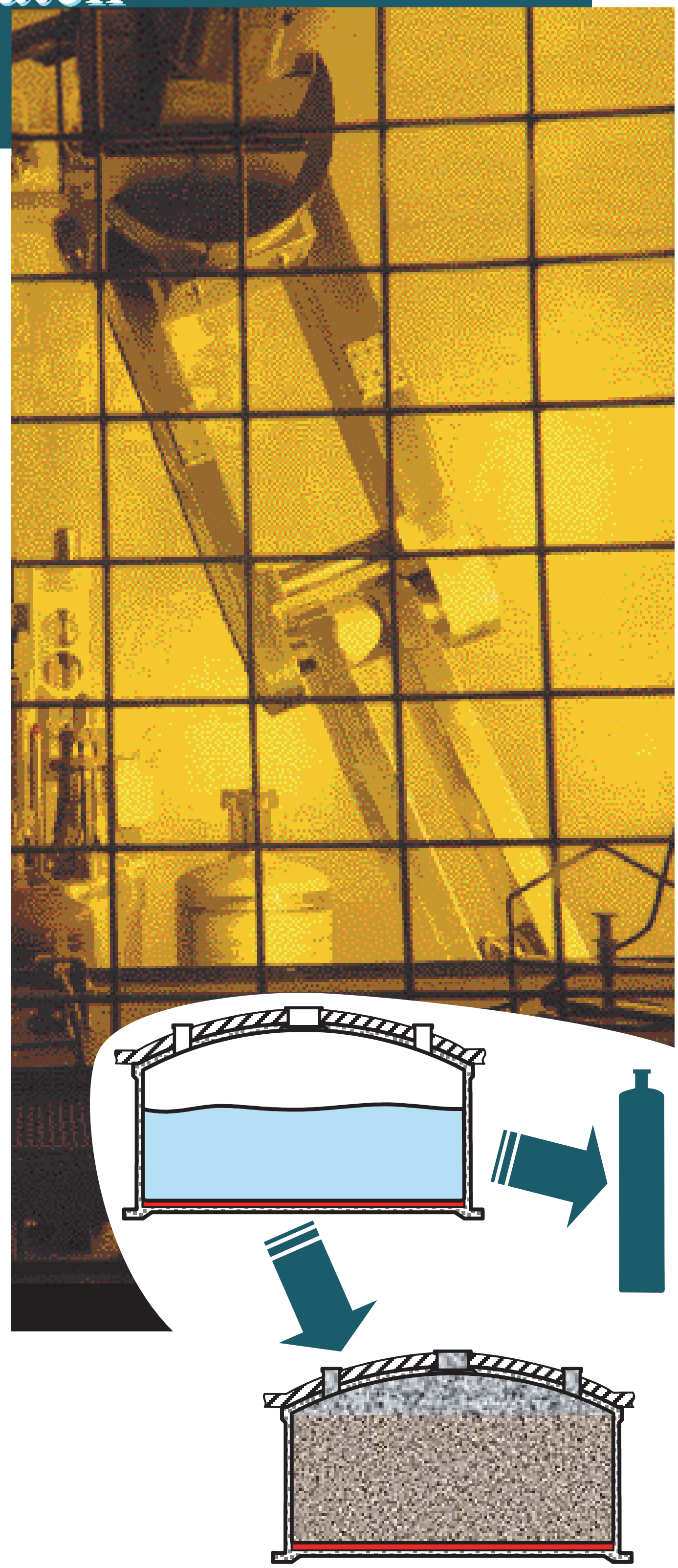
SRR-LWP-2016-00005

SALT Batch Plan

Savannah River Site Liquid Waste Planning Process

An Integrated System at the Savannah River Site



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SALT BATCH PLAN IN SUPPORT OF SYSTEM PLAN R-20

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- Table of contents did not update correctly in Rev 0. Rev. 1 corrected the discrepancy

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AFP	Alpha Finishing Process
Al	Aluminum
ARP	Actinide Removal Process—A process that removes actinides and strontium from Tank Farm salt solution using MST and filtration.
ASP	Alpha Sorption Process – A planned process similar to ARP that will remove actinides and strontium from Tank Farm salt solution using MST and filtration.
Ci/gal	Curies per gallon
Cs	Cesium
CSS	Clarified Salt Solution
CSSX	Caustic-Side Solvent Extraction - A liquid-liquid extraction process using a crown ether to remove Cs from an alkaline salt solution.
DDA	Deliquification, Dissolution, and Adjustment—A process for treating salt that is low in activity by removing the free supernate and interstitial liquid (deliquification), dissolving the salt that remains, and adjusting the salt concentration to acceptable SDF feed concentrations.
DF	Decontamination Factor
DOE	The United States Department of Energy
DSS	Decontaminated Salt Solution
DSSHT	Decontaminated Salt Solution Hold Tank
DWPF	Defense Waste Processing Facility—The SRS facility in which HLW is vitrified (turned into glass).
ELAWD	Enhanced Low Activity Waste Disposal
ETP	Effluent Treatment Project—The facility at SRS for treating contaminated wastewaters from F- & H-Areas.
FTF	F-Area Tank Farm
HLW	High Level Waste
HTF	H-Area Tank Farm
IL	Interstitial Liquid – Concentrated salt solution in the salt cake matrix
IX	Ion exchange
IW	Inhibited Water
Kgal	Thousand gallons
LLW	Low Level Waste
LW	Liquid Waste
LWHT	Late Wash Hold Tank
LWPT	Late Wash Precipitate Tank
LWSP	Liquid Waste System Plan

M	Molar (moles/liter)
MCU	Modular CSSX Unit—A small-scale modular unit that uses a CSSX process similar to SWPF.
Mgal	Million gallons
MST	Monosodium Titanate—A finely divided solid used in ARP that adsorbs actinides and Sr-90
NGS	Next Generation Solvent
ROMP	Risk and Opportunity Management Plan
SCIX	Small Column Ion Exchange
SDF	Saltstone Disposal Facility
SE	Strip Effluent
SPF	Saltstone Production Facility
SDU	Saltstone Disposal Unit
Sr	Strontium
SRS	Savannah River Site
SWPF	Salt Waste Processing Facility—A planned facility that will remove ^{137}Cs from Tank Farm salt solutions with the CSSX process and will remove Sr-90 and actinides with the ARP process.
TCCR	Tank Closure Cesium Removal – an ion exchange process for the removal of cesium from liquid salt waste
WAC	Waste Acceptance Criteria—a document describing the characteristics of a waste stream (composition, temperature, etc.) and other requirements for acceptance by a waste processing facility.

1 Executive Summary

This Salt Batch Plan provides the recommended sequence and timing of future Actinide Removal Process/ Modular Caustic Side Solvent Extraction Unit (ARP/MCU) and Salt Waste Processing Facility (SWPF) batches and validates the salt removal and processing sequence devised in concert with the overall processing scheme recommended by Revision 20 of the Liquid Waste System Plan (LWSP) [1]. This plan reflects the changes in the Liquid Waste Systems since Revision 19 of the LWSP [2].

Changes to salt waste processing that impact the LWSP are:

- ARP/MCU Batch 8 (Salt batch 8) was in Tank 49, qualified and ready to be fed to ARP/MCU.. Salt Batch 9 was compiled in Tank 21 in September 2015. Qualification sample analyses have been completed and the qualification is to be completed by April 2016.
- Filter Only ARP/MCU operation was started with Salt Batch 8 in 2016.
- Tank Closure cesium Removal (TCCR) is assumed to be deployed in FY2018 to treat dissolved salt waste from Tank 10.
- A six-month SWPF tie-in outage from July to December 2017 is planned, coincident with a Defense Waste Processing Facility (DWPF) melter change-out.
- The startup date for the SWPF is revised from October 2018 to December 3, 2018. SWPF processing rate begins at 4,625 Kgal for the first year of operation The processing volume then increases to 6,000 – 7,200 Kgal each year through FY21 with the availability of a second and third blend tanks. After the implementation of Next Generation Solvent (NGS) in FY22, the SWPF will process at a rate of 9,000 kgal/ year until the end of the program. The SWPF NGS outage is planned in October to December 2021, which would require a concurrent outage in DWPF.
- A Four-month DWPF Melter Replacement outage is planned in FY25, which would require a concurrent outage in SWPF.

This document is intended for long-term planning and does not contain sufficient detail to guide operation of individual process steps. Any dates, volumes, and chemical composition contained herein are planning approximations only. To guide actual execution of individual processing steps in the future, detailed flow sheets are developed as needed.

The ARP/MCU batch planning is revised to reflect the changes in overall planning due to actual ARP/MCU processing rates. The planned sources of ARP/MCU feed are:

- Sludge Batch 5 (SB5), SB6, and SB10 aluminum dissolution leachate stored in Tank 8
- Tank 37 dissolved salt solution stored in Tank 23 and Tank 35
- Tank 41 salt dissolution using DWPF recycle (ongoing)
- Tank 37 salt dissolution (campaign 2016)
- 2H Evaporator liquor

ARP/MCU batches 10 to 12 are planned with Tank 21 as the Blend Tank and Tank 49 as the Feed Tank. These batches are nominally 1,000 Kgal each.

ARP/MCU will be shut down for six months in 2017 for SWPF tie-ins. The ARP/MCU projected processing volume is summarized below:

Table 1-1: ARP/MCU Processing Volumes

Fiscal Year	FY16	FY17	FY18	FY19
Processing Volumes (Kgal)	1,500	1,000	1,500	167

The SWPF batch plan is revised to support changes in ARP/MCU and DWPF processing per the Sludge Batch Plan [3]. SWPF will start up processing the remainder of ARP/MCU last salt batch in Tank 49 before the first SWPF batch coming in. The first SWPF batch will primarily consist of the remaining ARP/MCU feed material, which will meet the initial SWPF processing requirement of < 1.0 Ci/gal of ^{137}Cs. SWPF is scheduled to start processing on December 3, 2018. In this plan, 108 SWPF batches would be prepared for SWPF processing. The SWPF batches are nominally 1,000,000 gallons each. SWPF Processing rates are summarized below:

Table 1-2: SWPF Processing Rates

Fiscal Year	Dec 2018 - Nov 2019	FY20 – FY21	FY22 and beyond
Processing Rates (Kgal/year)	4,625	7,200	9,000

One blend tank, Tank 21, will be available to prepare initial feed. Tank 41 will become a second blend tank in FY20. Tank 26 will become a third blend tank in FY2022.

Tank 42 will replace Tank 26 in FY26. Tanks 21, 41, and 42 will remain as blend tanks through the end of the program.

Tank 49 will continue to be used as a feed tank for SWPF for the entire program.

2 Introduction

The Department of Energy (DOE) plans to treat the salt waste at the Savannah River Site (SRS) based on the radiological properties of those wastes as shown by tank waste characterization data. The plan is to separate the salt waste to segregate the low-activity fraction at SRS using a two-phase, three-part process.

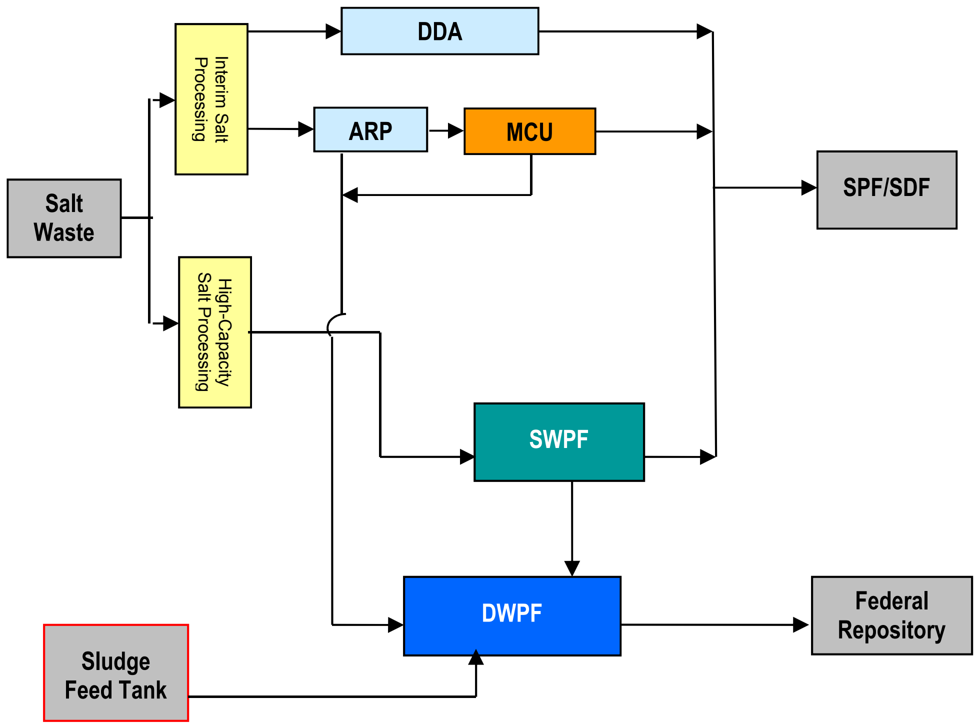
- ❖ Phase I involves two parts to treat the lower activity salt waste
  - Processing of a minimal amount of low activity salt waste from Tank 41 through a process involving deliquification, dissolution, and adjustment (DDA) of the waste (status: completed).
  - Using ARP/MCU, processing additional salt waste from low activity evaporator concentrated liquor, dissolved salt from Tanks 25, 41, 10, and 37, dissolved salt solution stored in Tank 35, aluminum-laden leachate from SB5, SB6, SB10 and from Tank 12 heel.
- ❖ Phase II, beginning December 2018, involves the separation and processing of the remainder (and by far the majority) of the salt waste
  - This second phase will begin when SWPF is operational.

After undergoing removal of radionuclides through ARP/MCU or SWPF, as the case may be, the decontaminated salt solution (DSS) will be solidified into a grout matrix and disposed of in the Saltstone Disposal Facility (SDF) Saltstone Disposal Units (SDUs) at SRS. The low-activity salt solution will be mixed with dry chemicals (cement, slag, and fly-ash) to form a homogeneous grout mixture in the Saltstone Production Facility (SPF) and the slurry will be transferred to SDF where it will solidify. SDF and SPF are commonly collectively referred to as the Saltstone Facility.

The first part of Phase I, DDA, has been completed. The second part, ARP/MCU, has successfully processed seven batches. Salt Batch 8 is in Tank 49 and expected to be processed through March 2016.

The salt processing pathways are shown in Figure 2-1.

Figure 2-1: Salt Processing Pathways



2.1 DDA

The DDA process was the first interim process and was only used to process a portion of the salt cake from Tank 41. The DDA process has been completed.

The DDA process involved the following steps in sequence:

- Deliquification step: This step involves removing the supernate from above the salt cake and extracting interstitial liquid (IL) within the salt cake matrix. The removal of free supernate and IL from the waste tank prior to dissolution of the salt cake significantly reduces the total ^{137}Cs inventory sent to SDF.

  Tank 25 has also undergone deliquification in preparation for treatment through ARP/MCU.

- Dissolution step: In this step, the deliquified salt cake is dissolved, and the resulting salt solution is transferred to a settling tank. To dissolve salt, the salt tank is filled with dissolution water or DWPF recycle until the salt cake surface is flooded. The resulting salt solution is then transferred to another waste tank that acts as a settling tank to settle entrained insoluble solids. The salt solution is then transferred to Tank 50 for SPF processing.

- Adjustment step: In this step, the salt solution might be mixed with other Tank Farm waste to adjust batch chemistry to meet the SPF Waste Acceptance Criteria (WAC) before transfer from Tank 50. The adjustment might be done in the settling tank before the solution is transferred to Tank 50.

Salt processing using DDA has been completed, and will no longer be used. One or both of the first two steps, however, will continue to be used for salt dissolution.

2.2 ARP and MCU

The second part of Phase I used for slightly higher activity salt waste entails use of the ARP and 512-S to remove Sr and actinides and of MCU to remove cesium before the resultant low-activity salt waste stream is sent to SPF. To serve as a source tank of feed to ARP/MCU, a salt tank has to have a relatively low concentration of ^{137}Cs. The salt cake can then be dissolved into salt solution to feed ARP/MCU. Tanks 25, 41, 10, and 37 are the salt cake source tanks for ARP/MCU.

Tank 25 salt dissolution for ARP/MCU processing has been completed, and the Tank has been returned to service as a 2F evaporator drop tank.

Tank 37 salt dissolution 2015 campaign has been completed. The dissolved salt solution with higher ^{137}Cs concentration is stored in Tank 35, and the lower ^{137}Cs concentration salt solution is stored in Tank 23 . IL removal was not performed on Tank 37. However, after Tank 37 free supernate was removed, some of the IL was flushed out with sludge wash water. This operation served the same goal as IL removal which is to remove the high ^{137}Cs IL, so the dissolved salt solution followed could be used for salt batch feed ARP/MCU.

2.2.1 ARP

The ARP facilities provide the capability to treat salt solution from the Tank Farms to remove soluble radioactive Sr and actinides by addition of MST. Salt feed for ARP will be prepared and qualified in a blend tank.

The ARP operates with 2 small MST strike tanks. Tank 49 receives qualified feed material from the blend tank (Tank 21) to feed the process. From Tank 49, the waste is transferred into either of two MST Strike Tanks in 241-96H. MST is added to the strike tanks with inhibited water to 0.2 gram/L MST concentration to provide optimum conditions for sorption of Sr-90 and actinides onto the MST.

Following the addition of MST to either Strike Tank, the contents are agitated for a reaction period between 4 and 12 hours based on the radioactivity of the soluble actinides to be removed. The resulting slurry is then transferred from either of the Strike Tanks into the Late Wash Precipitate Tank (LWPT) located in 512-S.

In Filter Only ARP operation, salt waste is transferred from Tank 49 to LWPT in 512-S for filtration. MST strikes are not used.

The batch received in the LWPT is circulated through a cross-flow filter to remove and concentrate the insoluble solids and the MST solids loaded with Sr and actinides. The cross-flow filtration process yields a Clarified Salt Solution (CSS) which is received in the Late Wash Hold Tank (LWHT). The CSS is sent to MCU for Cs removal.

The solids are concentrated in the LWPT over a number of batches depending on the entrained solids loading of the waste incoming to ARP. The concentrated solids heel in the LWPT is then washed and filtered to remove soluble sodium salts. The washed MST/sludge slurry is transferred to DWPF for vitrification processing. Spent wash water from the solids washing operation is transferred to Tank 50 to feed to the SPF. For Filter only (no-MST) operations, it is expected that without the MST it would take more batches to reach the designed solids concentration in the LWPT. As a result, there will be less MST/Sludge volume transferred to the DWPF and less washed water to be disposed at SDF. The ARP/MCU rate will reach 2.0 Mgal/year salt waste throughput.

2.2.2 MCU

MCU utilizes the caustic side solvent extraction (CSSX) process to remove Cs from the prepared salt waste solution. The solvent extraction process uses an organic solvent to remove Cs ions from the waste stream. The solvent and salt solution are fed to a bank of annular centrifugal contactors which ensure mixing of the waste in the annular region and extraction of the solvent and Cs from the salt waste stream. The Cs is then stripped from the solvent using a dilute nitric acid stream in another bank of contactors. The Strip Effluent (SE) is sent to DWPF for vitrification. The solvent is continuously recycled during this process. The DSS resulting from solvent extraction is sent to Tank 50 or directly to SPF.

MCU is a short-term Cs removal process that is operated downstream of ARP before SWPF becomes operational. MCU utilizes the same technology as will be used by SWPF. To support ARP/MCU extended operation, necessary upgrades of MCU have been made to ensure operation past its current design basis of a three-year operating life. NGS was introduced in September 2013, and is delivering a higher decontamination factor (DF) for Cs.

MCU will be permanently shut down six months prior to SWPF becoming operational in order to allow equipment modifications required for SWPF.

2.3 Tank Closure Cesium Removal (TCCR)

The Tank Closure Cesium Removal (TCCR) initiative consists of an ion exchange (IX) process for the removal of Cs from liquid salt waste to provide supplemental treatment capacity. Building on the experience of modular commercial nuclear plant decontamination and following the disaster response associated with Fukushima, technology exists to efficiently accomplish large scale, selective removal of the Cs component of the bulk salt waste. The configuration would be built as an "at-tank" modular arrangement. (Ref. 1)

In this plan, this sytem will be deployed to treat dissolved salt waste from Tank 10. The configuration is expect to consist of a temporary structure located near Tank 10 and Tank 11 so the cesium removal process would take place outside of the tank. The DSS will be temporary stored in Tank 11 before transfer to Tank 50 and then to SPF for disposal. (Ref. 1)

2.4 SWPF

SWPF is being constructed as a large scale facility combining ARP and CSSX. SWPF will utilize the same technologies as ARP and MCU to remove Sr, actinides, and Cs from the salt waste. SWPF will provide a decontamination factor (DF) of 40,000 for Cs [4]. DFs for Sr and actinides provided by SWPF will be similar to those provided by ARP [5]. Increased shielding and larger scale enable SWPF to process salt solution feed with a higher concentration of ^{137}Cs and produce a lower ^{137}Cs concentration DSS to feed SPF.

In order to accommodate the high volume SWPF processing rate, salt feed will be prepared and qualified in multiple blend tanks. The qualified batches will then be transferred into the Feed Tank (Tank 49) to be fed to SWPF. Dissolved salt solution and supernate may be stored in Staging Tanks and Hub Tanks while waiting for a Blend Tank to become available.

SWPF will receive waste feed from Tank 49 in the High-Level Waste (HLW) Tank Farms. The waste feed will be processed in SWPF to remove Sr, actinides, and Cs, so the resulting DSS can be sent to SPF for disposal as low-level waste (LLW). MST will be used to remove the Sr and actinides in the Alpha Strike Process (ASP) and Alpha Finishing Process (AFP) of SWPF. A CSSX process will be used to remove Cs from the waste processed by the ASP. If the first MST treatment in the ASP does not sufficiently reduce the Sr/actinide concentrations, DSS from the CSSX is sent to the AFP for a second MST treatment (strike). Should a third strike be deemed necessary, the filtrate from the ASP can be recycled back for a second strike in the ASP, and the third strike can be accomplished in the AFP.

SWPF will send DSS from the Decontaminated Salt Solution Hold Tank (DSSHT) to Tank 50 and from there to SPF, where it will be incorporated into a grout solution for disposal at SDF. The MST/sludge slurry containing concentrated Sr and actinides will be sent to DWPF for vitrification. The SE stream from the CSSX process, which contains concentrated ^{137}Cs, will also be sent to the DWPF for vitrification.

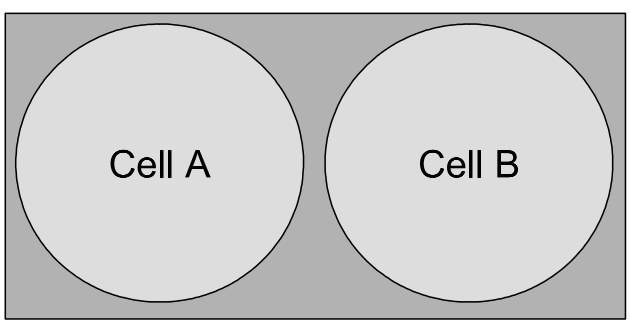
2.5 Saltstone Facility

The Saltstone Facility is used for final treatment, stabilization and disposal of the salt waste. This facility, located in Z-Area of SRS, consists of SPF and SDF.

SPF will receive and mix low-activity salt solution from the H-Canyon, Effluent Treatment Project (ETP) ARP/MCU, and SWPF processes with cement, fly-ash, and slag to form a homogeneous grout mixture or slurry. The slurry will be mechanically pumped into SDUs, located in SDF, where the grout solidifies into a monolithic, non-hazardous, solid low-level waste form called “Saltstone”.

SDU-1 and SDU-4 have been filled. The currently active SDUs, SDU-2 (which is full), SDU-3, and SDU-5, have the same design, shown in Figure 2-2, which consists of two (2) cylindrical concrete cells nominally 22 feet high and 150 feet in diameter each. After accounting for interior obstructions (support columns, drainwater collection systems, etc.) and the requirement for a 2-foot cold cap, the nominal useable volume of a cell is 2,300 kgal. Recent operating experience results in approximately 1.76 gallons of grout being produced for each gallon of DSS feed, thus yielding a nominal cell capacity of approximately 1,300 kgal of DSS.

Figure 2-2: SDF SDU 2, 3 and 5



Beginning with SDU-6 through SDU-13, SDUs will consist of a single cell 375 feet in diameter by 43 feet high. The total capacity for these SDUs will be 32 Mgal, which will have a capability, after accounting for cold cap requirements, of receiving 30 Mgal of contaminated grout or 17.1 Mgal of DSS. In this Plan, SDU-6 is required to begin operations by April 2017.

Enhanced Low Activity Waste Disposal (ELAWD) Modification

This is a two phase planned improvement modification of SPF and SDF.

- ELAWD Phase I was completed in July 2012. The ELAWD Phase I scope included:
  - New hopper with agitation and flushing capability,
  - New mixer,
  - Dry feed isolation capability,
  - Additional flushing capability downstream of the new four-way dump valve.
- ELAWD Phase II (SPF Dry Feed Modifications): Streamlining the SPF dry feed preparartion system will be accomplished in the second phase of ELAWD. These modifications are required to enable SPF to accommodate the increases in DSS influents from SWPF. The ELAWD phase II scope will provide additional capacity in order to ensure that SWPF is fully supported with adequate operating margin.

  Additionally, to support SWPF processing rates above 6 Mgal/year, SPF operations will be conducted on a 24/7 schedule which will require increased staffing over the current 4/10 schedule.

  Fabrication and installation of ELAWD phase II and hiring of additional staffing for SPF are driven by funding and planned to be performed from FY22 through FY24.

3 Major Salt Waste Processing Inputs and Assumptions

The following are key assumptions and bases for successful Salt Batch Plan Implementation.

- Processing using DDA alone has been completed. No more DDA processing is planned.

3.1 *Salt Cake Removal Inputs and Assumptions:*

- A generic factor of 3 is used to convert volumes of drained salt to salt solution. For volume balance purposes, salt solution sodium molarity is estimated to be 8.0 M when the salt cake is dissolved. The salt solution is subsequently diluted to 6.44M during salt batch preparation.
- It is assumed that for each salt dissolution evolution, the affected salt volume will be dissolved completely. Residual insoluble solids in the salt tank after dissolution are not evaluated in this plan.
- It is assumed that salt cake in each tank is homogeneous and dissolves at a uniform composition, top to bottom. This assumption simplifies blending calculations.

3.2 *ARP/MCU Inputs and Assumptions*

- For ARP/MCU salt batches, the plan for processing of salt solution feed from Tank 49 is summarized in Table 3-1:

Table 3-1: ARP/MCU Processing Volumes

Fiscal Year	FY16	FY17	FY18	FY19
Processing Volumes (Kgal) [6]	1,500	1,000	1,500	167

- ❖ The ARP/MCU facilities will operate until permanently shut down when SWPF starts up. A Six-month ARP/MCU outage is planned from July thru December 2017 to allow SWPF tie-in and modification to Tank 49. (Ref. 6)
  - ➢ Necessary upgrades of ARP/MCU have been completed to ensure operation past its current design basis of a three-year operating life within a five-year processing window. [7].
  - ➢ The ARP and MCU facilities will operate within the curie limits of the *Savannah River Site Liquid Waste Disposition Processing Strategy* as amended [8]

3.3 Other Inputs and Assumptions:

- ❖ SWPF becomes operational in December 3, 2018
  - ➢ SWPF tie-ins will require a 6-month ARP/MCU shutdown (July thru December 2017).
- ❖ The SWPF processing [6] and product streams rates (*) are summarized in Table 3-2

Table 3-2: **SWPF Processing Rates [6 and 9]**

Salt Feed (Kgal/year)	SE (Kgal/year)	MST sludge Kgal/year)	DSS (Kgal/year)	Duration
4,625	369	79	5,911	First Year
7,200	575	123	9,201	FY20 – FY21
9,000	576 (**)	153	11,502	FY22 and beyond

(*) SWPF product stream rates are derived from SWPF Mass Balance for 1 strike (Ref. 9 , Table 2-1 and 4-1)

(**) When SWPF throughput exceeds 7.2 Mgal/year, SE will be limited to 576 kgal/yr [1].

- ❖ The SWPF feed chemistry is to meet the requirements of the SWPF *Waste Acceptance Criteria* [10].
- ❖ Tank 49 modifications will allow concurrent feed to SWPF and receipt of qualified batches from blend tanks.
- ❖ SPF and SDF processing rates will support DSS from ARP/MCU, SWPF and the ancillary ETP and H-canyon streams, as needed.
- ❖ Tank 50 will continue to support storage of DSS resulting from ARP/MCU and SWPF processing.
- ❖ It is assumed that modifications in the facilities will provide sufficient contingency storage capacity to minimize impact to SWPF, MCU, or ETP due to SPF and SDF outages.
- ❖ A three-month SWPF outage to implement NGS is planned in FY22, which will require a concurrent outage in DWPF.
- ❖ There will be four-month DWPF Melter replacement outages in FY25, which will require a concurrent outage in SWPF.

Additional inputs and assumptions used for Salt Batch Plan development and applied specifically for ARP/MCU and SWPF are listed at the beginning of each processing section.

4 Salt Waste Removal Sequence

The following generalized priorities are used to determine the sequencing of salt waste removal (supernate removal and salt cake dissolution) and disposition from the waste tanks:

- Provide salt drop space in the 3H Evaporator system to enable:
  - Continued sludge batch preparation
  - Continued receipt of waste from H-Canyon
- Provide Blend tank and Hub tank space to support preparation of adequate salt solution volume to feed SWPF at full capacity.
- Remove waste from tanks with a leakage history while safely managing the total waste inventory.
- Ensure that the curies dispositioned to the SDF are as low as practical to meet the aforementioned goals.

A listing of Type I, Type II, Type II and Type IV tanks is available in Table 4-1. This Table also shows the tanks with identified leak sites and closed tanks.

Table 4-1: **Tank Types**

Tanks with Identified Leak Sites [11]	F Tank Farm: Type I: 1and 4 H Tank Farm: Type I: 9, 10, and 11 Type II: 13, 14, and 15
Tanks with no known Leak sites	F Tank Farm: Type I: 2, 3, 7, and 8 Type III/IIIA: 25, 26, 27, 28, 33, 34, 44, 45, 46, and 47 H Tank Farm: Type III/IIIA: 29, 30, 31, 32, 35, 36, 37, 38, 39, 40, 41, 42, 43, 48, 49, 50, and 51 Type IV: 21, 22, 23, and 24
Closed Tanks	F Tank Farm: Type IV: 5, 6, 12(*), 16, 17, 18, 19 and 20

Note: (*) The grouting of Tank 12 started in January 2016, and it will be completed in a few months.

In addition to the salt waste removal activities required to meet the generalized priorities for salt waste removal and disposition, the following priorities are used to determine the sequence of both supernate removal and salt cake dissolution required to support sludge batch preparation and tank closure.

- Supernate removal and salt dissolution activities for the tanks containing sludge waste that are either part of future sludge batches or are required to support sludge batch preparation should be completed as required to support the sludge batch sequencing as outlined in the latest revision to the *Sludge Batch Plan* [3]. The listing of these tanks is provided in

- Table 4-2. Some tanks require supernate removal before salt dissolution can occur; therefore, these tanks are listed as requiring both salt dissolution and supernate removal.

Table 4-2: Salt Waste Removal Required for Sludge Processing

Required supernate removal	F Tank Farm: 4, 7, 8, 26, 33, 34, and 47. H Tank Farm: 11, 13, 21, 22, 23, 32, 35, 39, 42, and 43
Required Salt Dissolution	F Tank Farm: 33, 34, and 47 H Tank Farm: 14, 15, and 32

- ❖ Supernate removal and salt dissolution activities required to support Liquid Waste (LW) tank closure should be completed as required to meet the tank closure sequencing as outlined in the Agreement of Key Input Bases and Assumptions for LWSP Rev. 19 [1]. A listing of these non-sludge tanks is provided in Table 4-3.

Table 4-3: Salt Waste Removal Required for Tank Closure

Required supernate removal	F Tank Farm: 25, 27, 28, 44, 45, and 46 H Tank Farm: 24, 29, 30, 31, 36, 37, 38, 48, 49, and 50
Required Salt Dissolution	F Tank Farm: 1, 2, 3, 25, 27, 28, 44, 45, and 46 H Tank Farm: 9, 10, 29, 30, 31, 36, 37, 38, and 41

- ❖ If individual tank requirements for salt waste removal need dates or sequencing are not specified in either the *Sludge Batch Plan* or *the Key Agreement* and are not required to meet generalized priorities listed above, the following priority should be used to determine ordering for salt waste removal activities:

1) F-Area tanks
2) H-Area tanks (West Hill)
3) H-Area tanks (East Hill)

It must be noted that the Batch Plan Tables (for ARP/MCU and SWPF Salt Batches) are intended for long-term planning and are not intended to guide operation of individual process steps. This plan utilizes simplified inputs and assumptions for each process so that removal, processing, and disposal of SRS salt waste can be modeled at a reasonable level of complexity. Dates and volume information contained in these tables are planning approximations only. To guide actual execution of individual processing steps in the future, detailed flow sheets and/or operating plans will be developed that contain detailed rates, compositions, and schedules, sometimes including possible ranges of each of these parameters.

5 ARP/MCU Salt Batching Plan

5.1 ARP/MCU Salt Batch Processing Current or Near Term Conditions

- The last DDA batch stored was transferred to Tank 50 in September 2009. The processing using DDA alone has been completed. DDA has been processed in SPF with the DSS effluent from ARP/MCU.
- The processing of ARP/MCU B7 was completed in June 2015.
- ARP/MCU B8 was assembled and qualified in Tank 21. The first transfer of Salt Batch 8 from Tank 21 to Tank 49 was performed in June 2015.

5.2 Inputs, Assumptions, and Batching Plan for ARP/MCU

This batching plan for ARP/MCU is in concurrence with the salt removal and processing sequence devised in concert with the overall processing scheme recommended by Revision 20 of the Liquid Waste System Plan (LWSP) [1].

- ARP/MCU Batch 12 will be the last ARP/MCU batch.
- ARP/MCU future batches will continue to be prepared and qualified in the ARP/MCU blend tank, Tank 21. It is assumed that it takes two months for assembling and qualifying an ARP/MCU batch and at least additional month for transfer from Tank 21 to Tank 49. Tank 49 is the feed tank for ARP/MCU.
- Source materials for ARP/MCU are:
  - Tank 41 dissolved salt solution,
  - Tank 37 dissolved salt solutions obtained in 2015 and temporarily stored in Tank 23 and Tank 35,
  - Tank 37 dissolved salt solution to be obtained in FY2017,
  - Tank 8 aluminum-rich leachate from SB5, SB6, and SB10 aluminum dissolutions,
  - 2H concentrated DWPF recycle from Tanks 38, 43 and unconcentrated DWPF recycle from Tank 22.
- Tank 23 and Tank 35 are temporary Hub Tanks used to store dissolved salt from Tank 41 and Tank 37 for future ARP/MCU salt batches. Tank 35 will store the higher curie (Ci) concentrations of dissolved salt solution from Tank 37, and Tank 23 will store the lower Ci concentration material from Tank 37 and Tank 41.
- Tank 41 salt dissolution will continue while Tank 41 serves as DWPF recycle alternate storage tank. Tank 41 dissolved salt solutions will be temporarily stored in Tank 23 if needed. Additional storage space is also under evaluation.
- Tank 37 salt dissolution was completed in May 2015, and its dissolved salt solution is currently stored in Tank 35 and Tank 23. The dissolved salt solution has been used for ARP/MCU B9 and will be incorporated in future salt batches.

  - All ARP/MCU batches are blended to target feed specification requirements, including [Cs] below 1.0 Ci/gal, [Na] between 5.5 and 7.0 M, and [Al] below 0.25 M.
  - ARP/MCU batches (10 – 12) planned volume blends are shown in Table 5-1. Excel spreadsheets are used for blend calculations using the current volume (from the Tank Farm Morning Report [12], revision 91 of the Waste Tank Equipment Manual, SW11.1-WTE-7.2 [13]), chemistry (from HLW Tank Farm Chemistry for supernate [14], and supernate sample reports [11,15, 16, 17 , 18, 19 and 20]). Tank 21 will be the Blend Tank for batch preparation.

- Each ARP/MCU salt batch will be a combination of dissolved salt solution, Al dissolution leachate and 2H Evaporator concentrated liquor. DWPF recycle, sludge wash water and other dilute waste may be used for sodium and/or ^{137}Cs adjustment. Additional sodium hydroxide (50 wt. %) may be used for hydroxide adjustment if needed. Table 5-1 shows the detailed plan for future ARP/MCU batches 10 – 12 [21]. This information is for planning purposes only. The blending of ARP/MCU batches must be evaluated individually when sample results are available.

Table 5-1: ARP/MCU Batch Plan

Batch No	Transfer	Volume (gal)	Date Processing	
			Start Date	End Date
ARP/MCU B9 (*)	Tk 23 - Tk 21 (Tk 37 Salt Dissolution)	558,010	5/9/2016	10/31/2016
	Tk 43 - Tk 21 (2H liquor)	37,281		
	Tk 35 - Tk 21 (Tk 37 salt dissolution)	201,415		
	Tk 41 - Tk 21 (Tk 41 Salt Dissolution)	116,970		
	Caustic - 21	54,546		
	Tk 21 - Tk 49 (Feed Tank to ARP/MCU)	1,000,000		
ARP/MCU B10	Tk 23 - Tk 21 (Tk 37 Salt Dissolution)	380,000	12/9/2016	6/30/2017
	Tk 43 - Tk 21 (2H liquor)	200,000		
	Tk 8 - Tk 21 (Al dissolution leachate SB5 & 6)	160,000		
	Tk 41 - Tk 21 (Tk 41 Salt Dissolution)	200,000		
	Caustic - 21	47,000		
	Tk 21 - Tk 49 (Feed Tank to ARP/MCU)	996,962		
SWPF Tie-in Outage			**7/1/2017**	**12/31/2017**
ARP/MCU B11	Tk 23 - Tk 21 (Tk 37 salt dissolution)	400,000	2/15/2018	7/31/2018
	Tk 43 - Tk 21 (2H liquor)	130,000		
	Tk 35 - Tk 21 (Tk 37 salt dissolution)	215,000		
	Tk 8 - Tk 21 (Al dissolution leachate SB10)	150,000		
	Tk 41 - Tk 21 (Tk 41 Salt Dissolution)	50,000		
	Caustic - 21	60,000		
	Tk 21 - Tk 49 (Feed Tank to ARP/MCU)	1,000,000		
ARP/MCU B12	Tk 23 - Tk 21 (Tk 37 salt dissolution)	270,000	9/1/2018	12/31/2018
	Tk 43 - Tk 21 (2H liquor)	150,000		
	Tk 35 - Tk 21 (Tk 37 salt dissolution)	200,000		
	Tk 8 - Tk 21 (Al dissolution leachate SB10)	150,000		
	Tk41 - Tk21 (Tk 41 Salt Dissolution)	170,000		
	Caustic - Tk21	60,000		
	Tk 21 - Tk 49 (Feed Tank to ARP/MCU)	1,000,000		

Note: (*) Salt Batch 9 has been compiled in Tank 21, and the qualification samples analytical results have been issued. The qualification of Salt Batch 9 is in progress. Tank 49 currently contains Salt Batch 8 which projected to be completed by April 2016.

6 SWPF Feed Batching Plan

6.1 *Salt Dissolution for SWPF Feed*

To prepare salt solution batches to support the desired SWPF processing rates, tank agitation (e.g., liquid only mixer pumps) may be required. The density gradient techniques employed to prepare DDA and ARP/MCU feed may not support the necessary SWPF processing rates. These techniques also may not support completing the initial waste removal campaign in a salt tank.

Vigorous agitation will be required during heel removal to remove insoluble solids that are known to exist in salt tanks. Historically, three mixing pumps were used to successfully remove salt cake in the 1980s from Tanks 17, 19, 20 and 24. The number of mixing pumps required to dissolve salt cake for SWPF feed must still be determined.

For planning purposes, it is assumed that all salt cake will be removed during dissolution and salt cake is assumed to dissolve homogeneously throughout the tank.

6.2 *SWPF Feed Preparation*

One of the objectives of interim processing and early SWPF batch preparation has been to create enough available tank space so that Tank 49, the SWPF Feed Tank, can be operated in a "feed and bleed" mode instead of batch feeding SWPF. Modeling has demonstrated that "feed and bleed" operation of Tank 49 significantly increases feed preparation capacity (15-17%) versus batch operations [22]. To accomplish this, Blend Tanks must be available to prepare and qualify salt batches. Also, infrastructure to support simultaneous transfers in and out of Tank 49 is needed.

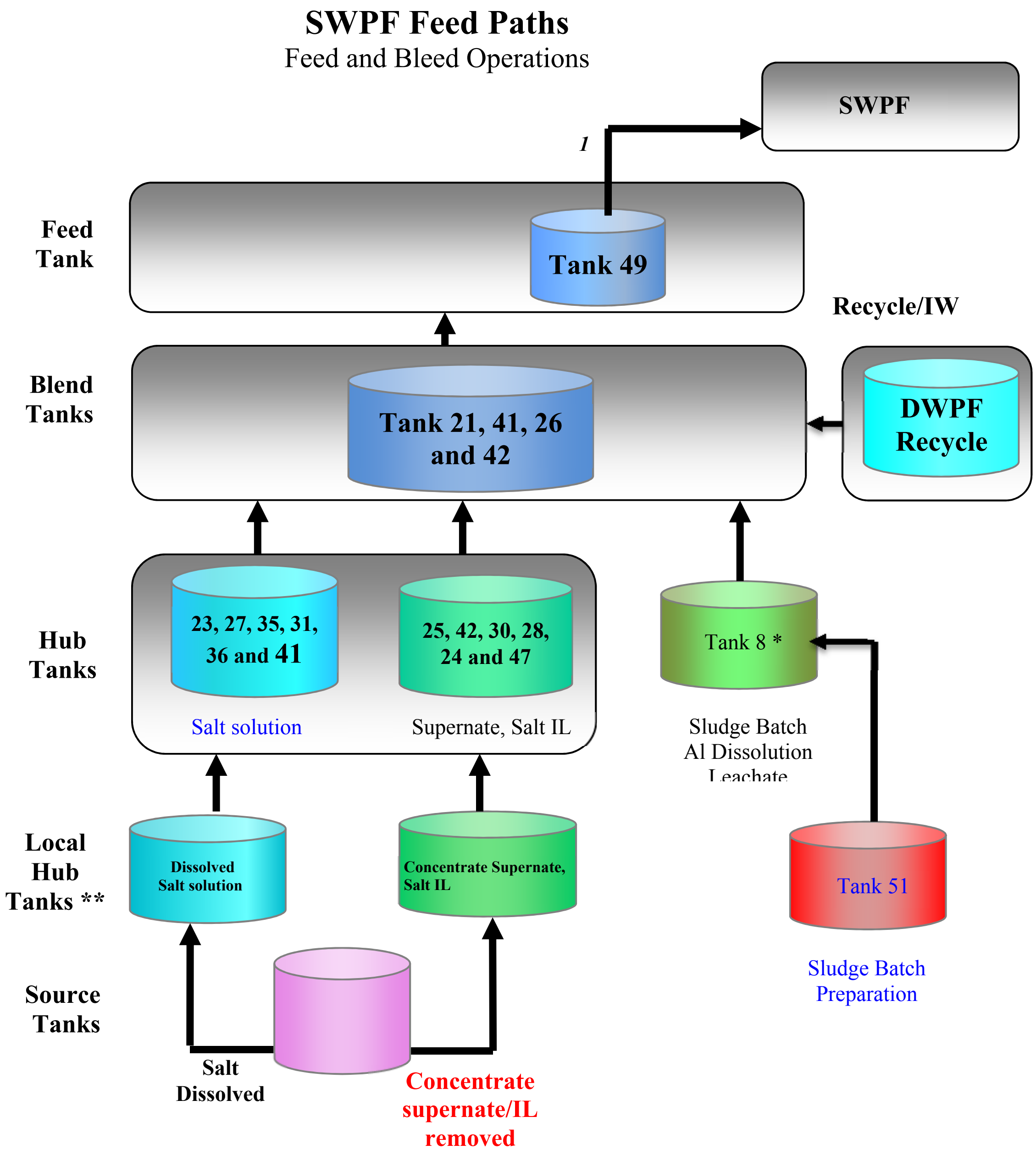
Salt solutions and/or supernate from designated waste tanks (Source Tanks) located in F and H-Area Tank Farms may be transferred to local Hub Tanks. Having a Hub Tank available for salt dissolution allows dissolution to occur independent of other salt processing activities, such as waste blending and feeding SWPF. This is shown in Figure 6.1. In this plan, temporary Hub Tanks are created by utilizing available tank space to store concentrated supernate, interstitial liquid and salt solution to accelerate salt feed preparation. When necessary or convenient, salt dissolution can be done directly from a salt tank to a blend tank without the use of a Hub Tank. Similarly, concentrated supernate can be transferred directly from a source tank to a blend tank.

Based on the results of process samples, a designated volume of salt solution/supernate is transferred to the designated blend tank. Sodium and hydroxide adjustments to the salt batch are performed using concentrated DWPF recycle and 50 wt. % caustic solution. Qualification samples are taken and analyzed to ensure that the batches meet SWPF WAC before sending to the feed tank, Tank 49.

The volume of feed delivered to Tank 49 from each blend tank for each SWPF batch is 1,000,000 gallons for planning purposes. The actual amount delivered will be more or less depending on the specific tank used.

Availability of the currently designated Blend Tanks will be dependent upon the future availability of the tanks. Figure 6-1 shows the conceptual flow sheet for SWPF feed preparation, including the designated Blend Tank for each SWPF feed batch.

Figure 6-1: Conceptual Flow Sheet for SWPF Feed Preparation



(*) Tank 8 has served as Hub Tank for sludge batches aluminum dissolution leachate and will continue to do so until its heel removal in FY26. Additional leachate storage space maybe required.
(**) In this Plan, any available tanks could serve as a Local Hub (Transition Hub) when the designated Hub Tanks or transfer lines are not available.

6.3 *Batching Plan for SWPF*

This batching plan for SWPF is extrapolated from the salt removal and processing sequence devised in concert with the overall processing scheme recommended by Revision 20 of the Liquid Waste System Plan (LWSP) [1 , 6]. In this Plan,

- SWPF startup is on December 3, 2018.
- The numbers of planned SWPF batches are 108 .
- Tank 49 will serve as the Feed Tank for SWPF.
- Bend Tanks for SWPF Batches are planned as below:
  - Initially, Tank 21 will be the first blend tank for SWPF.
  - Tank 41 will become the second blend tank around the end of FY20 ,
  - Tank 26 will serve as a temporary third blend tank in FY22 until Tank 42 is available,
  - Tank 42 will replace Tank 26 as a blend tank in FY26,

Tanks 21, 41, and 42 will remain as blend tanks to the end of the program. Blend tanks designated for the individual SWPF batches until FY22 are detailed in Table 6-2.

- In this plan, material will be transferred from designated hub tanks to the blend tanks for SWPF salt batch preparation. Each blend tank batch will have two designated hub tanks, one for dissolved salt solution and one for concentrated supernate/IL. A hub tank can supply two blend tanks at the same time. Table 6-1 shows the blend tanks and their designated hub tanks.

Table 6-1: SWPF Blend Tanks and Theirs Designated Hub Tanks

Hub Tanks	Blend Tanks			
	Tank 21	Tank 41	Tank 26	Tank 42
For Dissolved Salt Solution	Tank 23	Tank 35, then 31	Tank 27	Tank 24, then Tank 36
For Concentrated Supernate/IL	Tank 42, then 30	Tank 42, then Tank 30	Tank 25	Tank 30

- SWPF batches are nominally 1,000,000 gallons.
- It is assumed that it will take 3 months to prepare a SWPF salt batch. The preparation includes assembling the blend, qualifying the batch, and transfer to the Feed Tank (Tank 49).
- Any available tank may serve as a temporary Hub Tank or staging tank. Some of these tanks include Tank 7, 13, 28, and 34.
- Al-rich supernate from sludge batch aluminum dissolution will be stored in Tank 8 and blended into the SWPF salt batches. Additional leachate storage may be required.
- DWPF recycle, sludge wash water, and other dilute waste will be added into the SWPF salt batches to adjust the sodium concentration if needed.
- 50 wt. % sodium hydroxide (caustic) will be added into salt tanks during salt dissolution and into Hub Tanks and Blend Tanks for chemistry adjustment, as needed.

Table 6-2 shows the batching plan thru FY22.

Table 6-2: General SWPF Batch Plan

Fiscal Year	Batch	Blend Tank	Date available for Processing (in Tk 49)	Volume to Feed Tank (gal)	Source Tanks
FY19	**SWPF B0**	**TK 21**	**12/3/2018**	NA	Leftover from ARP/MCU B12 in Tank 49
	SWPF B1	**TK 21**	**3/1/2019**	1,000,000	Tk 23 liquid (Tk 37 SD from Tk 37 and Tk 35, Tk 41 SD); Tk 42 concentrated supernate; Tk 8 liquid (SB5, SB6, and SB10 LTAD leachate)
	SWPF B2	**TK 21**	**4/15/2019**	1,000,000	Tk 23 liquid (Tk 37 SD and Tk 41 SD from Tk 35, Tk 41 SD, and Tk 9 SD via Tk11); Tk 42 concentrated supernate; Tk 8 liquid (SB10 LTAD leachate)
	SWPF B3	**TK 21**	**7/1/2019**	1,000,000	Tk 23 liquid (Tk 37 SD and Tk 41 SD from Tk 35, Tk 41 SD, and Tk 9 SD via Tk11); Tk 42 concentrated supernate (includeing Tk 26 and Tk 27 concentrated supernate stored in Tk25); Tk 8 liquid (SB10 LTAD leachate)
FY20	**SWPF B4**	**TK 21**	**10/1/2019**	1,000,000	Tk 23 liquid (Tk 37 SD from Tk 35, Tk 41 SD, Tk 27 SD via Tk 26, and Tk 9 SD via Tk11); Tk 42 concentrated supernate (3H liquor, Tk 26 and Tk 27 concentrated supernate stored in Tk25); Tk 8 liquid (SB11 LTAD leachate)
	SWPF B5	**TK 41**	**12/1/2019**	1,000,000	Tk 35 liquid (Tk 37 SD, Tk 41 SD, and Tk 27 SD via Tk 26); Tk 42 concentrated supernate (3H liquor, Tk 26 and Tk 27 concentrated supernate stored in Tk25); Tk 8 liquid (SB11 LTAD leachate)
	SWPF B6	**TK 21**	**2/1/2020**	1,000,000	Tk 23 liquid (Tk 27 SD via Tk 26, and Tk 9 SD via Tk11); Tk 42 concentrated supernate (Tk 26 and Tk 27 concentrated supernate via Tk 25); Tk 8 liquid (SB11 LTAD leachate)
	SWPF B7	**TK 41**	**3/15/2020**	1,000,000	Tk 35 liquid (Tk 37 SD, Tk 41 SD, and Tk 27 SD via Tk 26); Tk 42 concentrated supernate (3H liquor, TK 25(Tk 26 and Tk 27 supernate/IL), and from Tk 13(Tk 34 supernate/IL); Tk 8 liquid (SB11 LTAD leachate)
	SWPF B8	**TK 21**	**5/1/2020**	1,000,000	Tk 23 liquid (Tk 27 SD via Tk 26, and Tk 9 SD via Tk11); Tk 42 concentrated supernate (Tk 26 and Tk 27 concentrated supernate via Tk 25 and Tk 34 concentrated supernate via Tk 13); Tk 8 liquid (SB11 LTAD leachate)
	SWPF B9	**TK 41**	**7/1/2020**	1,000,000	Tk 35 liquid (Tk 37 SD, Tk 41 SD, and Tk 27 SD via Tk 26); Tk 42 concentrated supernate (3H liquor, TK 25(Tk 26 and Tk 27 supernate/IL), and from Tk 13(Tk 34 supernate/IL); Tk 8 liquid (SB11 LTAD leachate)
	SWPF B10	**TK 21**	**8/15/2020**	1,000,000	Tk 23 liquid (Tk 27 SD via Tk 26, and Tk 3 SD via Tk7); Tk 42 concentrated supernate (Tk 26 and Tk 27 concentrated supernate via Tk 25 and Tk 34 concentrated supernate via Tk 13)

Note: (*)SWPF B0 is what leftover from LT/MCU B14 in Tank 49

Table 6-2: General SWPF Batch Plan (Continue…)

Fiscal Year	Batch	Blend Tank	Date available for Processing (in Tk 49)	Volume to Feed Tank (gal)	Source Tanks
FY21	**SWPF B11**	**TK 41**	10/1/2020	1,000,000	Tk 23 liquid (Tk 27 SD via Tk 26, and Tk 3 SD via Tk7); Tk 42 concentrated supernate (Tk 25 (Tk 26 and Tk 27 supernate/IL) and Tk 34 concentrated supernate via Tk 13)
	SWPF B12	**Tk 21**	12/1/2020	1,000,000	Tk 23 liquid (Tk 27 SD via Tk 26, Tk 3 SD via Tk7, and Tk 37 SD); Tk 42 concentrated supernate (Tk 26 and Tk 27 supernate via Tk 25,Tk 34 supernate via Tk 13, and Tk 31 supernate)
	SWPF B13	**TK 41**	1/15/2021	1,000,000	Tk 35 liquid (Tk 34 SD via Tk 26); Tk 42 concentrated supernate (Tk 13(Tk 34 supernate/IL), and Tk 31 supernate/IL); and 3H liqour from Tk 30
	SWPF B14	**Tk 21**	3/1/2021	1,000,000	Tk 23 liquid (Tk 37 SD, from Tk 27 (Tk 3 SD via Tk7), and Tk 34 SD via Tk 26); Tk 42 concentrated supernate (from Tk 25 (Tk 26 and Tk 27 supernate/IL),Tk 34 supernate/IL via Tk 13, and Tk 31 supernate/IL), Tk 8 liquid (SB12 LTAD)
	SWPF B15	**Tk 41**	5/1/2021	1,000,000	Tk 35 liquid (Tk 34 SD via Tk 26 and Tk 31SD); Tk 42 concentrated supernate (from Tk 25 (Tk 26 and Tk 27 supernate/IL),Tk 34 supernate/IL via Tk 13, and Tk 31 supernate/IL); 3H liquor from Tk 30; Tk 8 liquid (SB12 LTAD)
	SWPF B16	**Tk 21**	6/15/2021	1,000,000	Tk 23 liquid (Tk 37 SD, from Tk 27 (Tk 3 SD via Tk7), and Tk 34 SD via Tk 26); Tk 42 concentrated supernate (from Tk 25 (Tk 26 and Tk 27 supernate/IL),Tk 34 supernate/IL via Tk 13, and Tk 31 supernate/IL), Tk 8 liquid (SB12 LTAD)
	SWPF B17	**Tk 41**	8/1/2021	1,000,000	Tk 35 liquid (Tk 34 SD via Tk 26 and Tk 31SD); Tk 42 concentrated supernate (from Tk 25 (Tk 26 and Tk 27 supernate/IL),Tk 34 supernate/IL via Tk 13, and Tk 31 supernate/IL); 3H liquor from Tk 30; Tk 8 liquid (SB12 LTAD)

Table 6-2: General SWPF Batch Plan (Continue…)

Fiscal Year	Batch	Blend Tank	Date available for Processing (in Tk 49)	Volume to Feed Tank (gal)	Source Tanks
FY22	**SWPF B18**	**Tk 21**	9/15/2021	1,000,000	Tk 23 liquid (Tk 37 SD, from Tk 27 (Tk 3 SD via Tk7), and Tk 34 SD via Tk 26); Tk 42 concentrated supernate (from Tk 25 (Tk 26 and Tk 27 supernate/IL),Tk 34 supernate/IL via Tk 13, and Tk 31 supernate/IL), Tk 8 liquid (SB12 LTAD)
	Next Generation Solvent Outage (10/1/2021 thru 12/31/2021)				
	SWPF B19	**Tk 41**	2/1/2022	1,000,000	Tk 35 liquid (Tk 31 SD); Tk 42 concentrated supernate (from Tk 25 (Tk 26 and Tk 27 supernate/IL),Tk 34 supernate/IL via Tk 13, and Tk 31 supernate/IL)
	SWPF B20	**Tk 21**	3/21/2012	1,000,000	Tk 23 liquid (from Tk 35 (Tk 37 SD, Tk 14 SD via Tk 13), from Tk 13 (Tk 14 SD), and from Tk 26 (Tk 34 SD)); Tk 42 concentrated supernate (from Tk 25 (Tk 26,Tk 27, 31, 33, and 34 supernate/IL),Tk 34 supernate/IL via Tk 13, and Tk 31 supernate/IL).
	SWPF B21	**Tk 26**	4/15/2022	1,000,000	Tk 27 liquid (Tk 2 and Tk 3 SD via Tk 7, and Tk 27 SD); Tk 25 concentrated supernate (Tk 31 and Tk 33 supernate/IL)
	SWPF B22	**TK 41**	6/1/2022	1,000,000	Tk 35 liquid (Tk 31 SD); Tk 42 concentrated supernate (from Tk 25 (Tk 26 and Tk 27 supernate/IL),Tk 34 supernate/IL via Tk 13, and Tk 31 supernate/IL)
	SWPF B23	**TK 21**	7/20/2022	1,000,000	Tk 23 liquid (from Tk 26 (Tk 34 SD) and Tk 31 SD); Tk 42 concentrated supernate (from Tk 25 (Tk 26,Tk 27, 31, 33, and 34 supernate/IL),Tk 34 supernate/IL via Tk 13, and Tk 31 supernate/IL)
	SWPF B24	**Tk 26**	8/20/2022	1,000,000	Tk 27 liquid (Tk 2 and Tk 3 SD via Tk 7, and Tk 27 SD); Tk 25 concentrated supernate (Tk 31 and Tk 33 supernate/IL)
	SWPF B25	**Tk 41**	9/20/2022	1,000,000	Tk 31 direct SD; Tk 42 concentrated supernate (from Tk 25 (Tk 31 and Tk 33 supernate/IL); Tk 8 liquid (SB13 LTAD

7 Risks and Issues

The following risks could have impacts on the success of this plan. All of these issues have been identified incorporated in Risk and Opportunity Management Plan (ROMP), Rev. 10 [23]. The new risks which are identified in this plan will be incorporated in the revision of the ROMP.

7.1 Salt and Supernate Characterization

This risk is identified in in ROMP as Risk # 221.

7.2 Risks for Estimating Salt Compositions and Volumes

This risk is identified in in various risks of ROMP in Risk # 121, 040, 129, 221, 041, 069, and 070.

7.3 Intermittent Operation of SWPF

This risk is identified in ROMP as Risk # 205.

7.4 *DWPF Rate When Coupled to SWPF*

This risk is identified in ROMP as Risk # 264.

7.5 Impact of Evaporator Operation

This risk is identified in in ROMP as Risk # 030, 116, and 344.

7.6 Impact of Chemical Cleaning

The impact of tanks heel removal using chemical cleaning has not been evaluated in this plan.
This risk is identified in ROMP as Risk # 117.

7.7 Impact of Heavier Transfer Traffic when SWPF Starts up

This risk is identified in in the ROMP as Risk # 090.

7.8 Impact of Tank 49 Transfer Line Modifications

This risk is identified in in the ROMP as Risk # 297.

7.9 Impact of the deployment of Tank Closure Cesium Removal (TCCR)

There are some risks to the success of the plan associated with the deployment of TCCR. These risks are: TCCR is not available when planned; TCCR does not peformed as required; and TCCR ion exchange media may cause processing issues to down stream facilities. These risks will be identified in the next revision of the ROMP as Risk # 479, 480, and 481.

8 Conclusions and Recommendations

In this Plan, several assumptions have changed from the previous Salt Batch Plan. SWPF start up date was revised from October 2018 to December 2018. ARP/MCU operation will continue until July 2017 when it will temperarily shut down for SWPF tie-in modifications until December 2017. ARP/MCU will restart after the tie in modification and continue processing until SWPF startup.

ARP/MCU batches 9 to 12 (during Batch 12 processing, ARP/MCU operation will be replaced with SWPF) are currently planned. ARP/MCU batches are nominally 1,000 Kgal with Tank 21 as the Blend Tank and Tank 49 as the Feed Tank. These batches will be processed at the rate from 800 Kgal to 2,000 Kgal each year.

Tank Closure cesium Removal (TCCR) is assumed to be deployed in FY2018 to treat dissolved salt waste from Tank 10.

For this Plan, 108 SWPF batches are planned for SWPF processing. The SWPF batches are nominally 1,000 Kgal each. The processing rate is 4.625 to 9,000 Kgal/year. Blend tanks are Tank 21, Tank 41 (beginning FY 20), and Tank 26 (beginning FY22). Tank 42 will replace Tank 26 as a blend tank in FY26. Tanks 21, 41, and 42 will remain as blend tanks until the end of the program. Tank 49 will continue to be used as a feed tank for SWPF for the entire program.

This Plan’s success is dependent on:

1. Both on-time start up and operation of SWPF as planned,
2. Efficiency of salt dissolution in the salt tanks,
3. Availability of the aging infrastructure and supporting systems (i.e., air, steam, chromate water …),
4. Successful deployment of TCCR, and
5. Operation of DWPF.

Several modifications are recommended to obtain and maintain high flow rates into and out of SWPF. This Plan assumes that the modifications take place in time to allow the flow rates in this plan to be realized. The modifications are as follows:

- Additional mixing capability for salt dissolution tanks is recommended to raise efficiency for salt dissolution.
- Implementation of a “Feed and Bleed” Blend Tank strategy to meet the 9,000 Kgal/year processing rate at SWPF. It is important to be able to transfer 22,000 gallons of approved feed to SWPF from the Feed Tank, Tank 49, every 21 hours. Each transfer will take approximately eight hours to perform. However, as currently configured, transfers from Tank 49 to SWPF may be interrupted when transfers are being made into Tank 49. Tank 49 transfer facilities should be reconfigured to allow simultaneous transfers into and out of Tank 49.
- Higher capacity pumps will likely be required in the Blend Tanks and Feed Tank to allow higher transfer rates to SWPF.
- Mixing must be available in the Blend Tanks to ensure homogeneity of the SWPF feed.
- Consideration should be given to redundant equipment such as Variable Speed Drives and Conductivity Probes, to limit the impact of equipment failures on the capability to maintain feed for SWPF.

Risk mitigation strategies should continue to be developed. Equipment and infrastructure related problems are likely to dominate risks that are within the control of the program. These will be the focus of planned risk mitigation efforts.

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