



U.S. DEPARTMENT OF
ENERGY



Tank Closure Cesium Removal (TCCR) Program Update

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Program Status Update

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SRR-CWDA-2019-00072

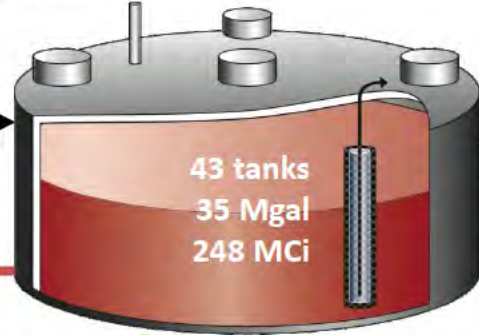
Outline

- Liquid Waste System Overview
- TCCR Process - Conceptual
- TCCR Unit 1 Operations Overview
- TCCR Unit 1 Batch Details
- Tank 10 Transfer/Recirculation Pump
 - Mechanical Failure
 - Proposed Solution
- Upcoming TCCR Program Milestones
 - TCCR Unit 1 Evaluation Report
 - Complete Tank 10 BWRE
 - Initiate Tank 9 BWRE
 - TCCR Unit 1 Tank 9 Operations
 - TCCR Unit 2 Feasibility
 - TCCR Unit 2 Project

SRS Liquid Waste Program



Liquid Waste



Salt waste
10.5 Mgal treated

Sludge waste
4.3 Mgal treated



<1% radionuclides remain in tanks

51 Tanks

- 8 grouted & operationally closed
- 1.2 million curies immobilized in grout
- 5 BWRE complete
- 67% empty or grouted (old style)
- 22% empty (new style)



Poured 4,202 cans of projected 8,121
61.6 million curies immobilized in glass

Most radionuclides to glass

Legend:

ARP	Actinide Removal Process
BWRE	Bulk Waste Removal Efforts
DWPF	Defense Waste Processing Facility
ISS	Interim Safe Storage
MCU	Modular Caustic Side Solvent Extraction Unit
TCCR	Tank Closure Cesium Removal
SWPF	Salt Waste Processing Facility

Operational Goals

- ✓ Radionuclides to glass
- ✓ Chemicals to Saltstone
- ✓ Tanks cleaned and operationally closed

← Salt Processing →

(Suspended Operations)
Ops: 2008-2019



(in Testing & Commissioning)

Radionuclides

Recycle

Solid (not hazardous) waste



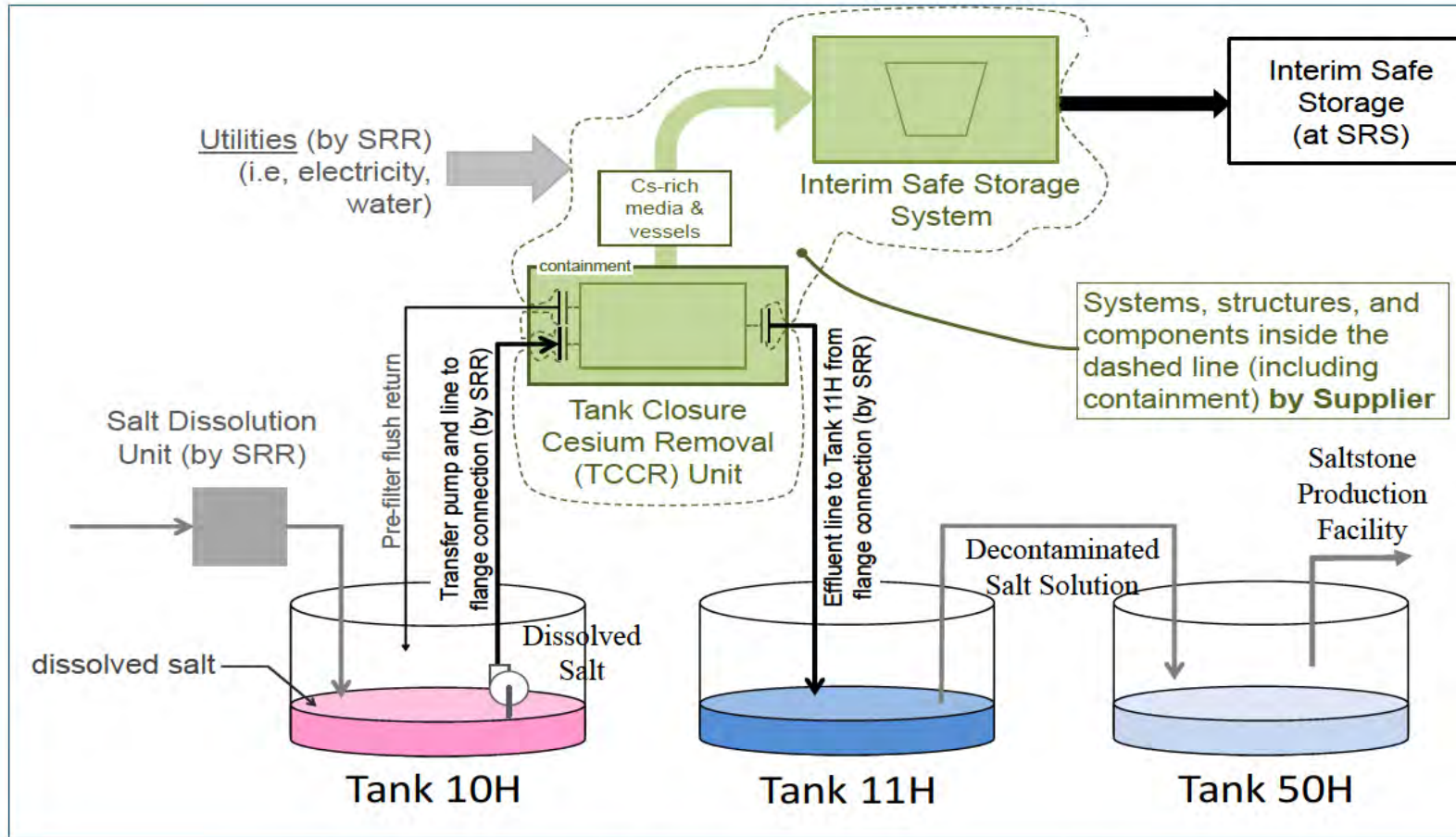
17.8 Mgal LLW disposed containing 736 kCi (>35 Mgal grout)

<<1% radionuclides to saltstone

Spent Columns
ISS

2019-06-30

TCCR Unit 1: Conceptual Process Diagram

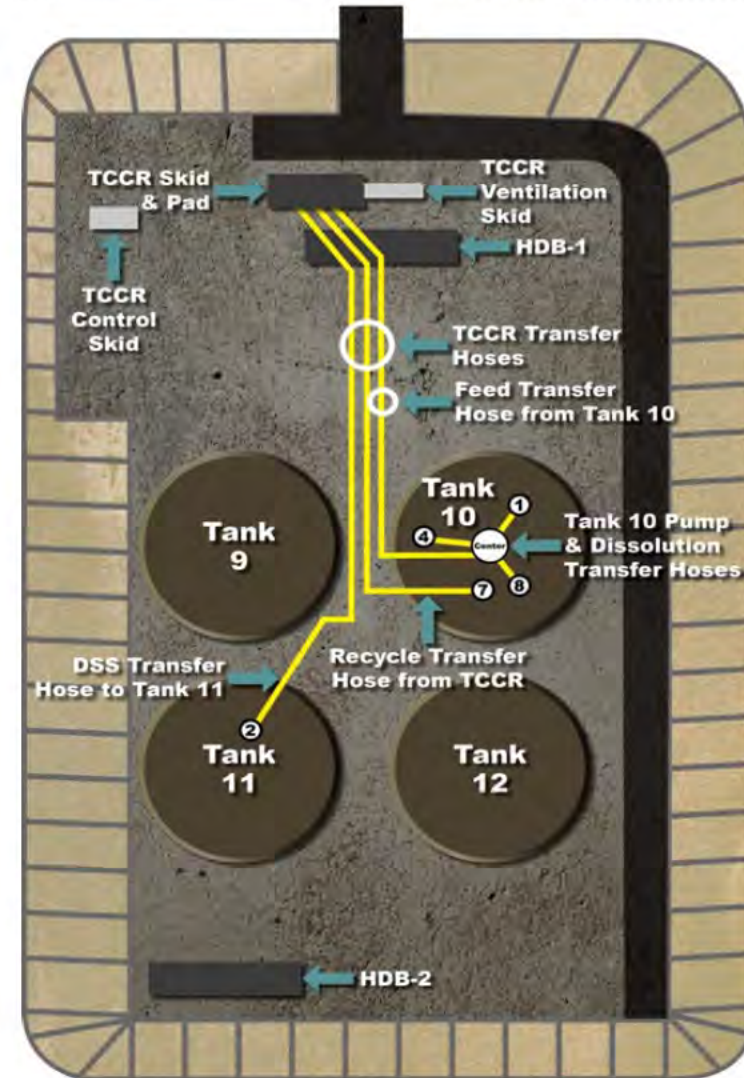


TCCR Concept – Tank 10 Demonstration Operations Diagram

TCCR – Unit 1 Operations Overview

• TCCR Unit 1 – Tank 10

- Initiated submersible transfer pump (STP) recirculation for Batch 1 salt dissolution on 11/11/18
- Started TCCR operations processing on 1/16/19
- Batch 1A processing, ~150 Kgal
 - *Low solubility Burkeite salt layer realized*
- Batch 2 processing, ~60 Kgal
 - *Extensive recirculation time was required*
- Hydro-lanced in the center riser to breakup the Burkeite
- Attempt to process Batch 3
 - *Two 25 Kgal water additions*
 - *STP failed during recirculation on 8/8/19*
- Path Forward
 - *Recognition that current technical approach was no longer effective and a new approach is needed*
 - *Replace the STP (needed to send material to TCCR)*
 - *Commercial Submersible Mixing Pumps (CSMPs) will be added in the external risers for Burkeite/heel removal*



TCCR – Unit 1 Operations (continued)

Batch 1

- Initial salt sounding (salt level determination at Riser 7) ~72 inches
- 150 kgal well water added (Riser 3)
 - Tank liquid level 135.8 inches
- Tank recirculation started on 11/11/18 for 7 days
- Tank sampled, batch qualification CST vials deployed on 11/20/18, retrieved 11/30/18.
- Batch remediated with 16 kgal of NaOH on 12/10/18 followed by recirculation
- CST vials deployed on 12/19/18 and removed 12/31/18; analysis completed 1/11/19
- Processing of Batch 1 started on 1/16/19
~152 kgal processed
- Realized presence of Burkeite salt layer
- Batch 1 completion on 2/15/19

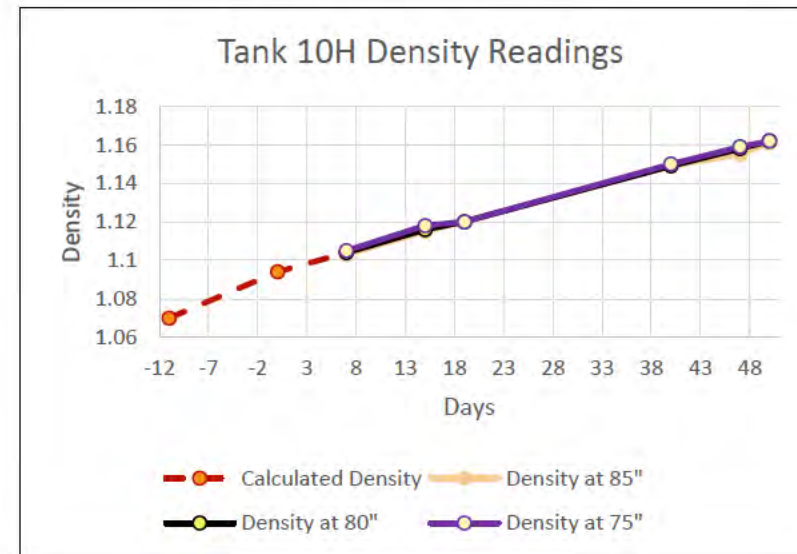


CST Sample Vials
(Crystalline Silicotitanate)

TCCR – Unit 1 Operations (continued)

Batch 2

- **Modified salt dissolution path forward to accommodate burkeite**
 - Smaller batch size with recirculation between water adds
- **Initiated Campaign 2 on 2/23/19 by adding ~ 50 kgal water (on two different occasions @ 25 kgal each)**
- **Density measurements indicated continual, but slow progress in salt/burkeite dissolution through a 65 day recirculation period.**
- **Final salt sounding (Center Riser) ~67 inches**
- **Processing of Batch 2 started on 6/21/19, and completed 6/29/19, ~ 58 kgal processed**

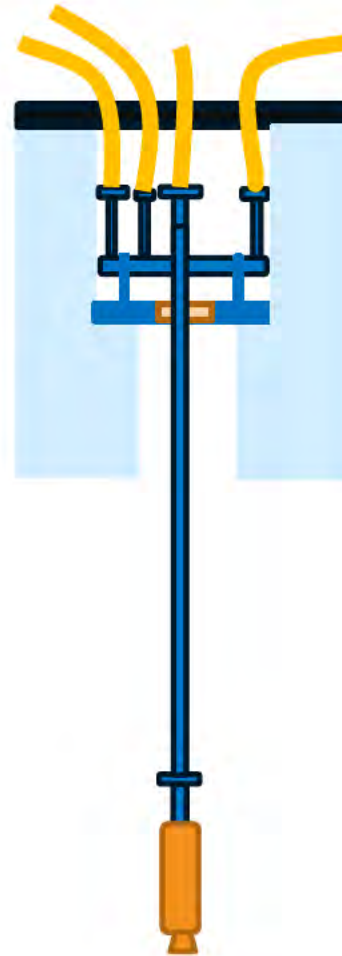


Tank 10 Density Readings

Hydro-lanced the center riser prior to beginning Batch 3 salt dissolution

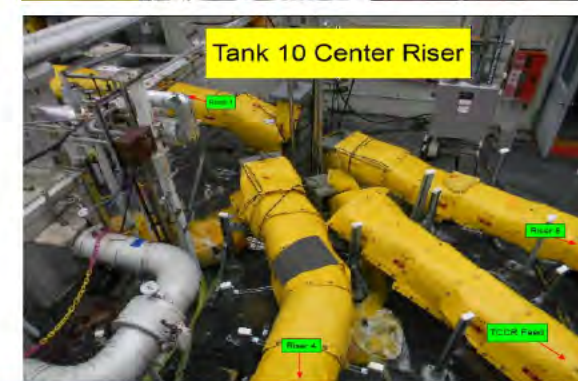
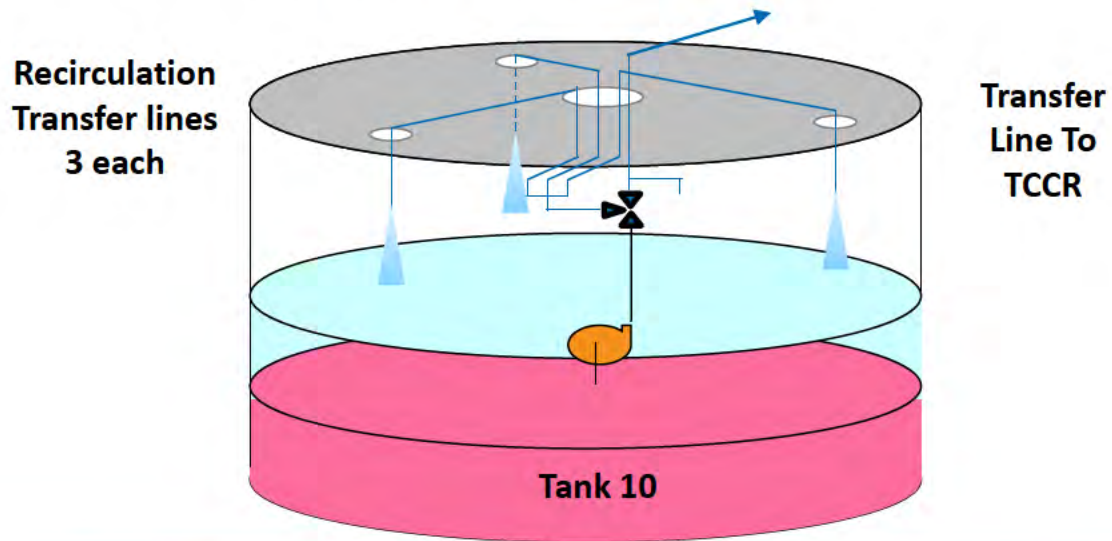
Attempt to process Batch 3

- **Recirculation started on 7/16/19 with the remaining heel from Batch 2, added ~ 50 kgal water (on two different occasions @ 25 kgal each)**
- **Density measurements indicated limited progress in salt/burkeite dissolution through a 21 day recirculation period.**
- **On 8/8/19, the pump failed and salt dissolution efforts suspended**
 - Suspected failure due to lengthy time required for burkeite dissolution in a radiation environment



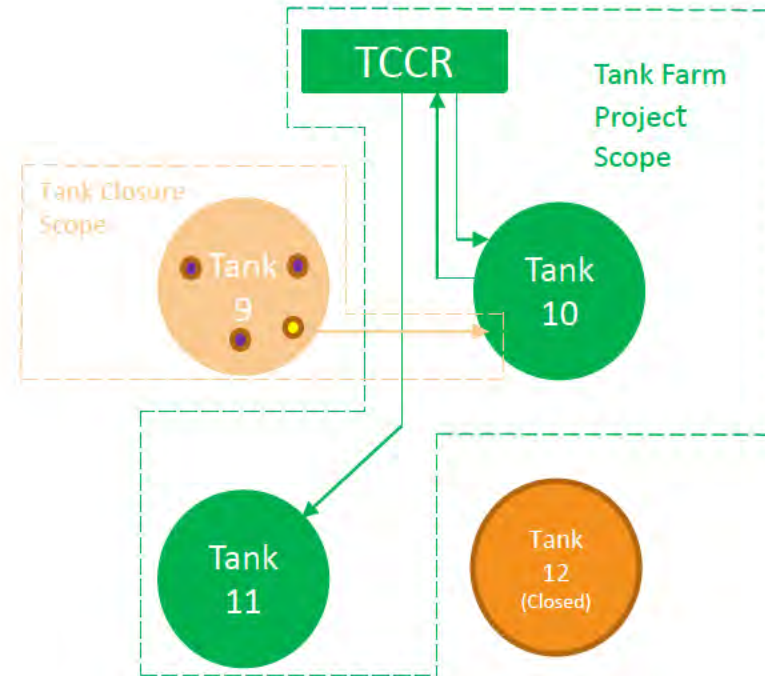
Tank 10 - Failed Transfer/Recirculation Pump Resolution

- Recognition that current approach had reached limits of effectiveness
- New technical approach needed to proceed with heel removal
 - Replace the transfer pump with minor modifications
 - Add two CSMPs for Burkeite dissolution, and to increase Tank 10 operational space for Tank 9 materials
 - Process remaining material to gain technical/operational data to optimize TCCR operations for Tank 9 materials

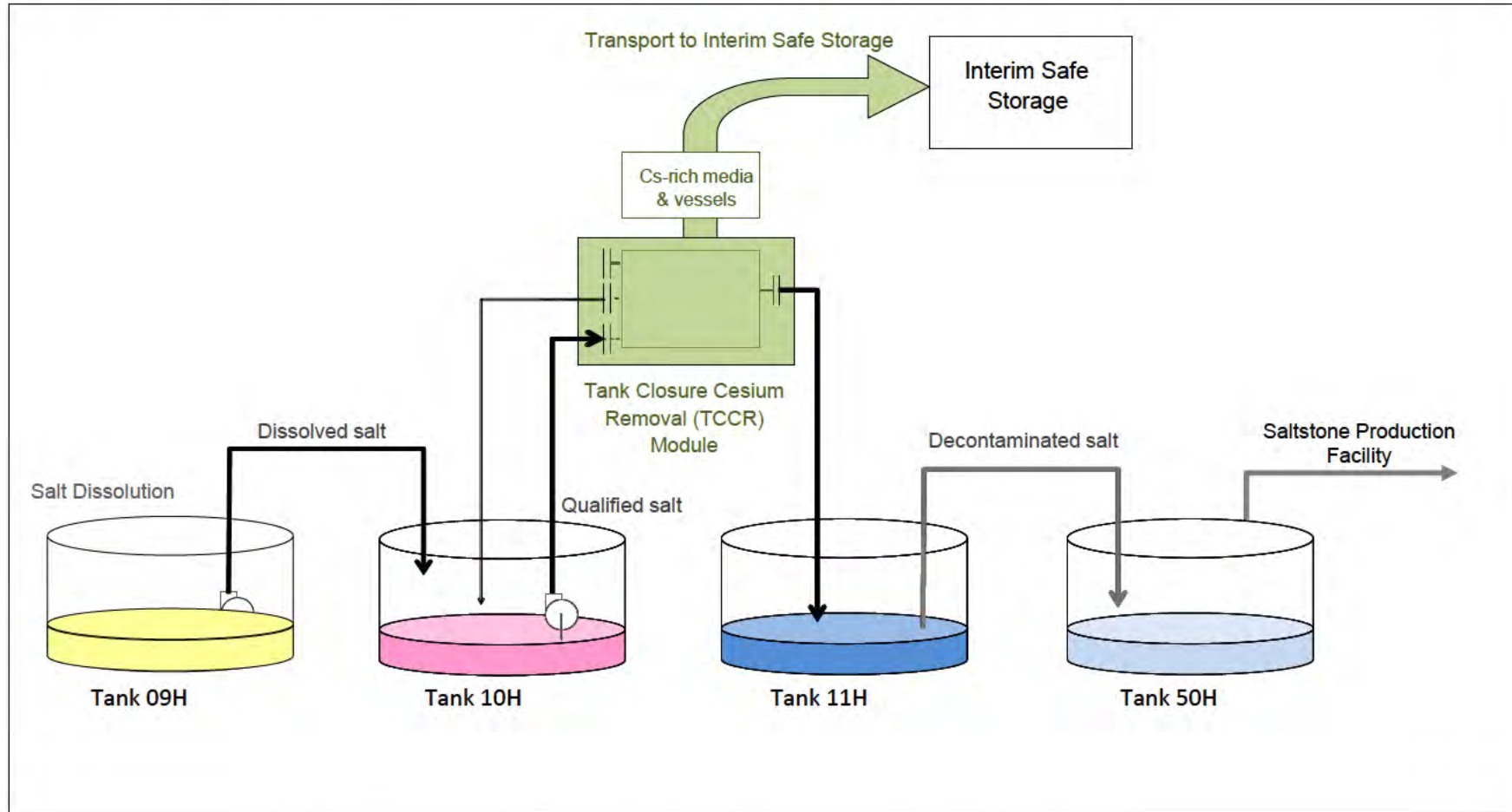


TCCR Moving Forward

- **TCCR Evaluation Report**
 - Commitment under the Dispute Resolution Agreement (due 09/30/2019)
 - Addresses the technical feasibility and economic efficiency of TCCR Unit 1
 - Submission pending
- **Tank 10 BWRE Completion**
 - Commitment under the Federal Facilities Agreement (FFA) (due 11/30/2019)
 - Basis for milestone completion underway
- **Tank 9 BWRE Initiation**
 - Install BWRE (salt dissolution & transfer mods) to transfer dissolved salt from Tank 9 to Tank 10
 - On schedule to meet FFA commitment date of 09/30/2020 for water addition to Tank 9 to begin salt dissolution



TCCR Unit 1: Tank 9 Conceptual Process Diagram



TCCR Concept – Tank 9 Demonstration Operations Diagram

TCCR Moving Forward (continued)

- **TCCR Unit 1 (Tank 10)**
 - Replacement of transfer/recirculation pump needed for resuming operations
 - *Apply TCCR optimization/enhancements*
 - *Complete remaining material and prepare for Tank 9 feed*
- **TCCR Unit 1 (Tank 9)**
 - Procure new prefilters, additional ion exchange columns (IXCs) and resin
 - Expand interim safe storage for spent IXCs
 - DSA review and changes
 - Construct transfer line between Tank 9 and Tank 10
- **TCCR Unit 2 – Potential Future Project**
 - Evaluate the technical feasibility and economic efficiency for a 2nd TCCR unit
 - Commitment under the Dispute Resolution Agreement to deliver a plan on TCCR Unit 2 processing rates by 05/01/2022 (if determined to be technically feasible and economically efficient)

