Savannah River Remediation
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Technology Innovations

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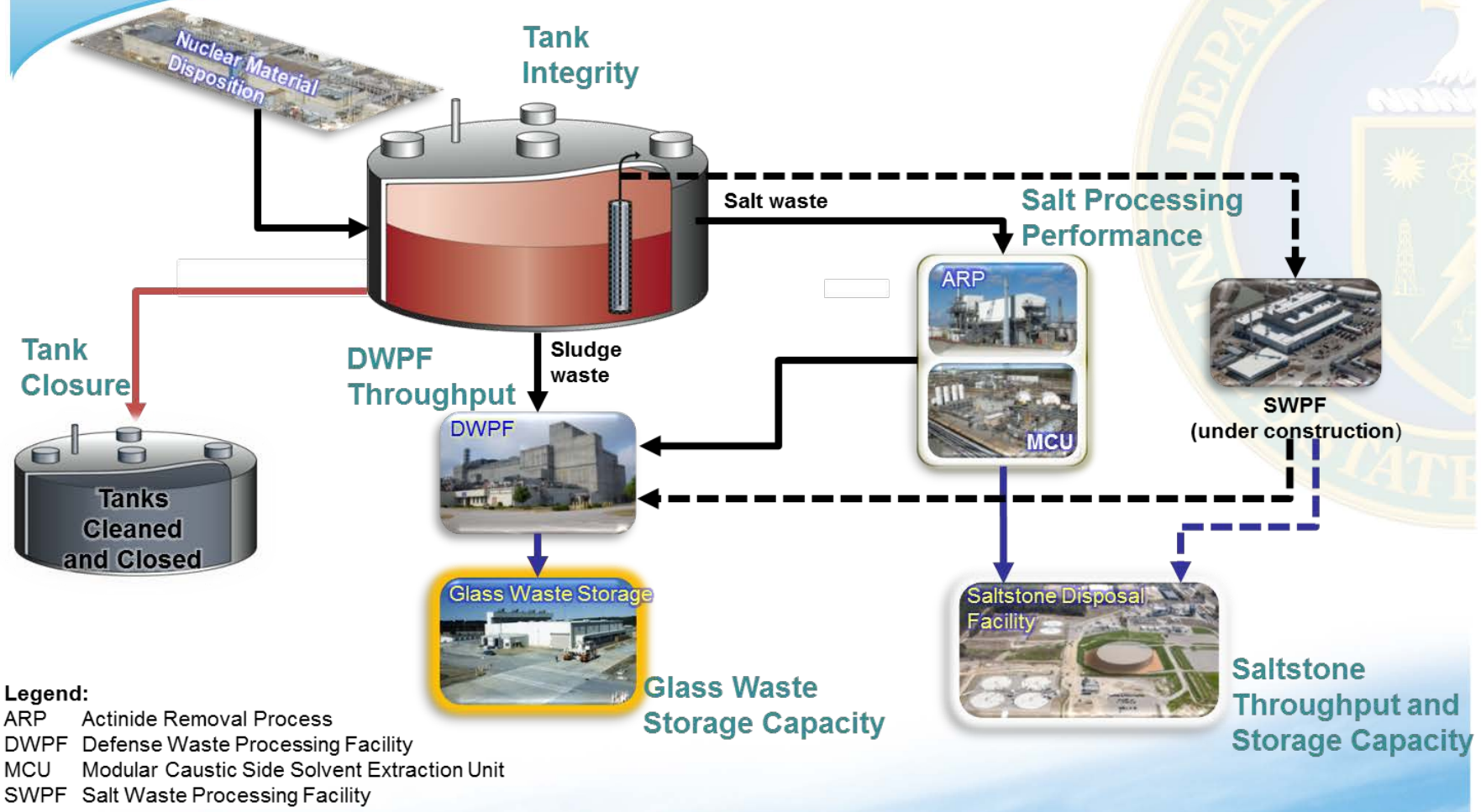
Savannah River Site
Waste Management Symposia 2015
March 17, 2015

Savannah River Site






Technology Innovations – *Glass Waste Storage*



Legend:

ARP	Actinide Removal Process
DWPF	Defense Waste Processing Facility
MCU	Modular Caustic Side Solvent Extraction Unit
SWPF	Salt Waste Processing Facility

Glass Waste Storage

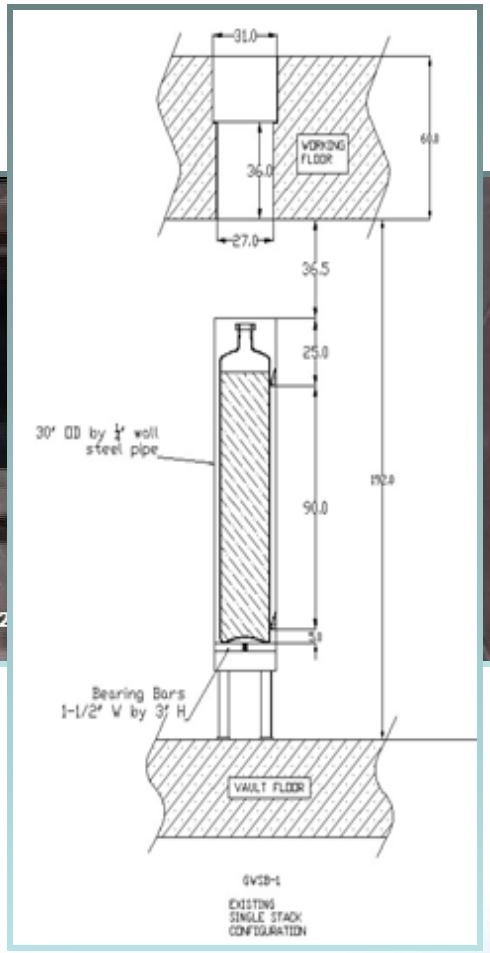
- Vitrified high level waste canisters are stored onsite
  - Total Storage Spaces 4583
  - Estimated Total Canisters To Be Produced ~ 8582 (Based on System Plan 19)
  - Total Canisters Produced To Date (February 2015) 3931 (~46%)
- Canisters produced projected to exceed current storage capacity in FY19
- Interim solution needed

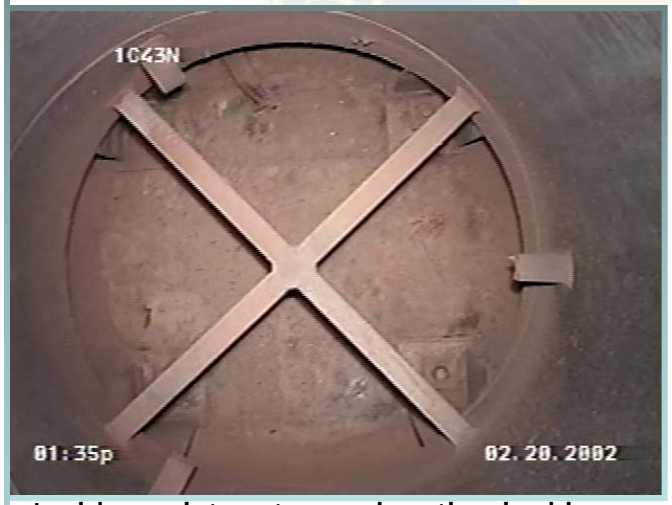

GWSB 1: 2244 locations


GWSB 2: 2339 locations

Glass Waste Storage (cont'd)

Inside vault looking across rows of canister supports

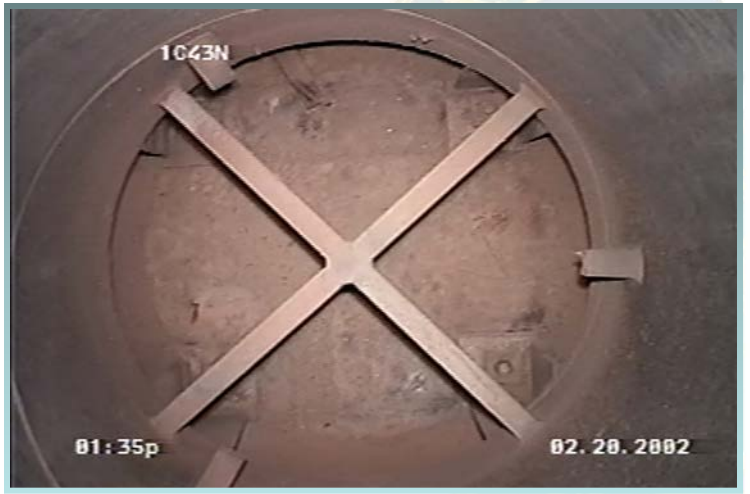


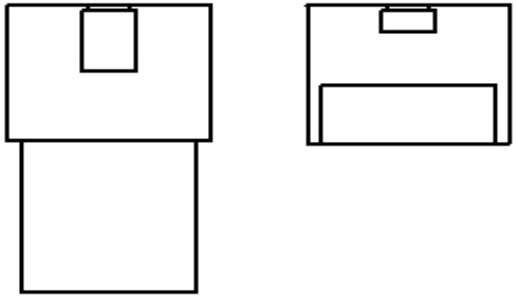


Inside canister storage location looking down on cross-bar

Glass Waste Storage (cont'd)

- In order to facilitate the additional height the canister support cross-bars must be replaced with a floor plate
- The new floor plate will serve to protect the existing assumptions regarding canister integrity (corrosion, structural support, etc.
- The modified shield plug design accommodates the increased height of the stacked canisters while ensuring adequate shielding for worker protection

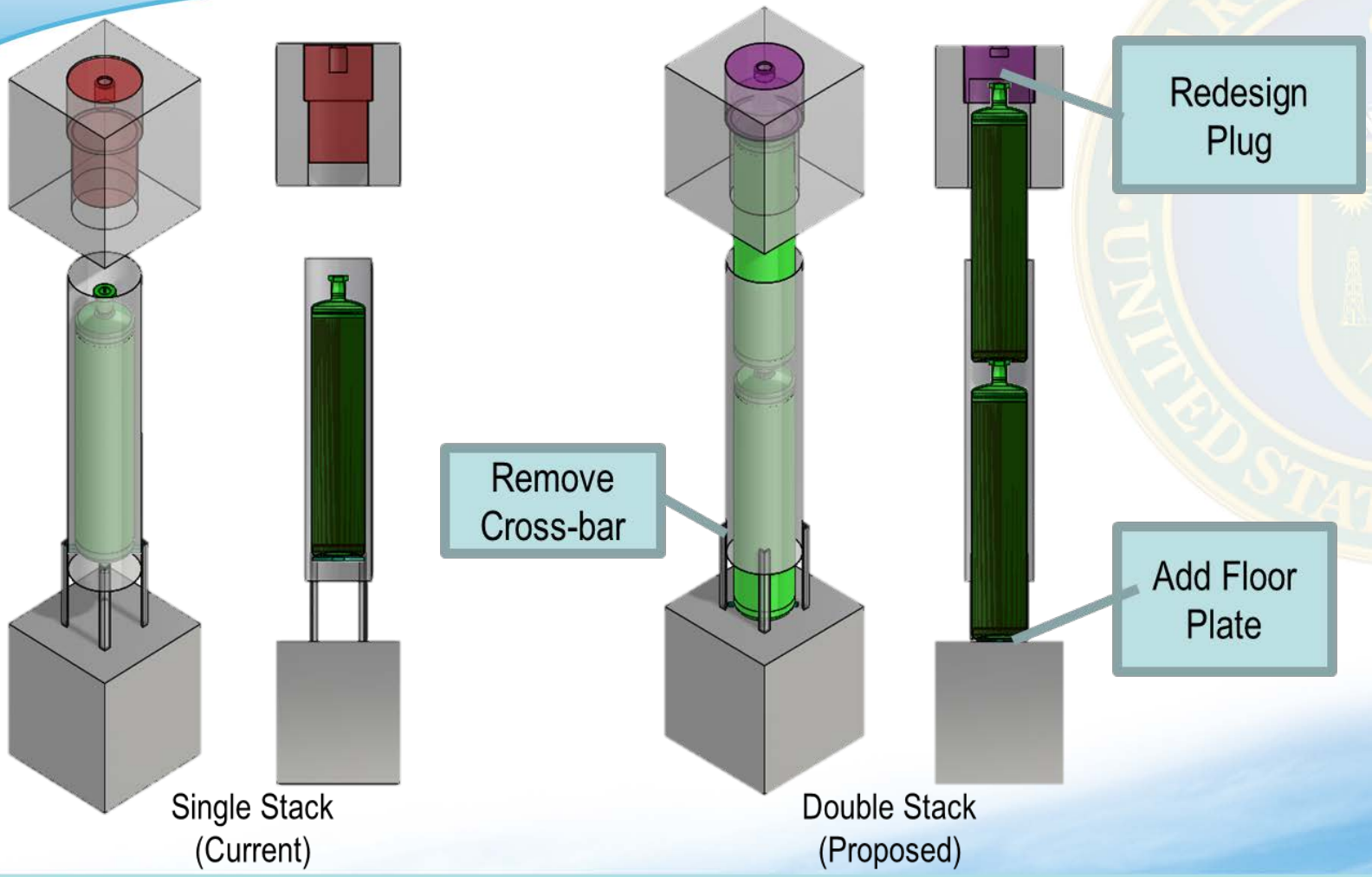




Original Plug (Concrete)

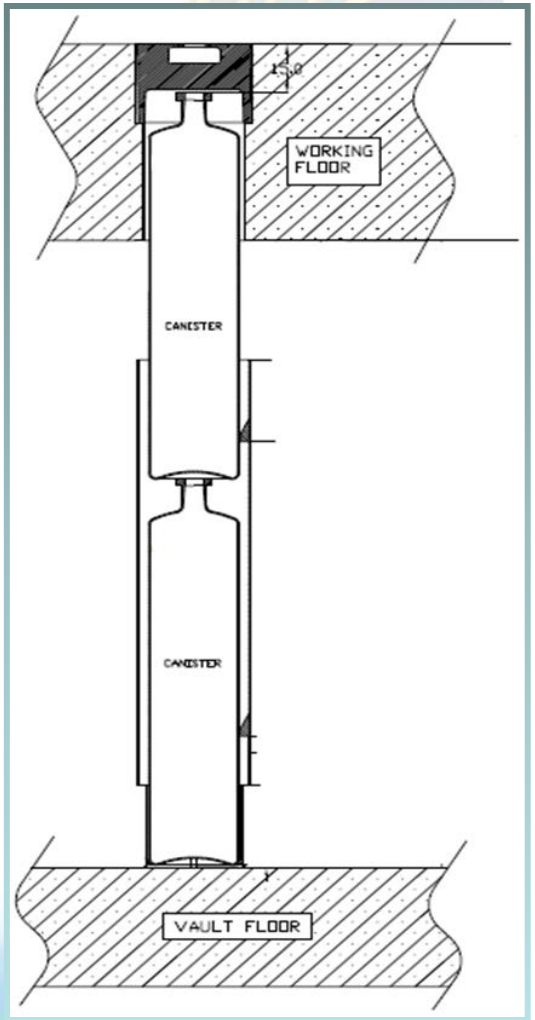
New Plug (Steel)

Glass Waste Storage (cont'd)



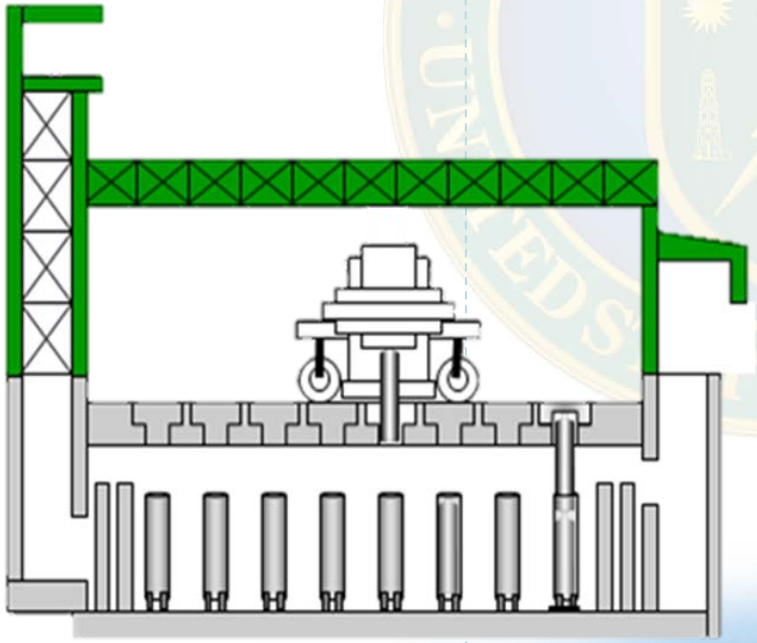
Glass Waste Storage (cont'd)

- Heat Model supports canisters produced-to-date and forecast canisters
- Seismic/Structural calculations support adequate margin for static and seismic performance category and canister integrity
- Remote cutting tool technology exists, will be deployed and operated by SRR
- Radiological calculations support acceptable dose rates during modification w/o emptying vault
- No safety basis or fire hazard concerns

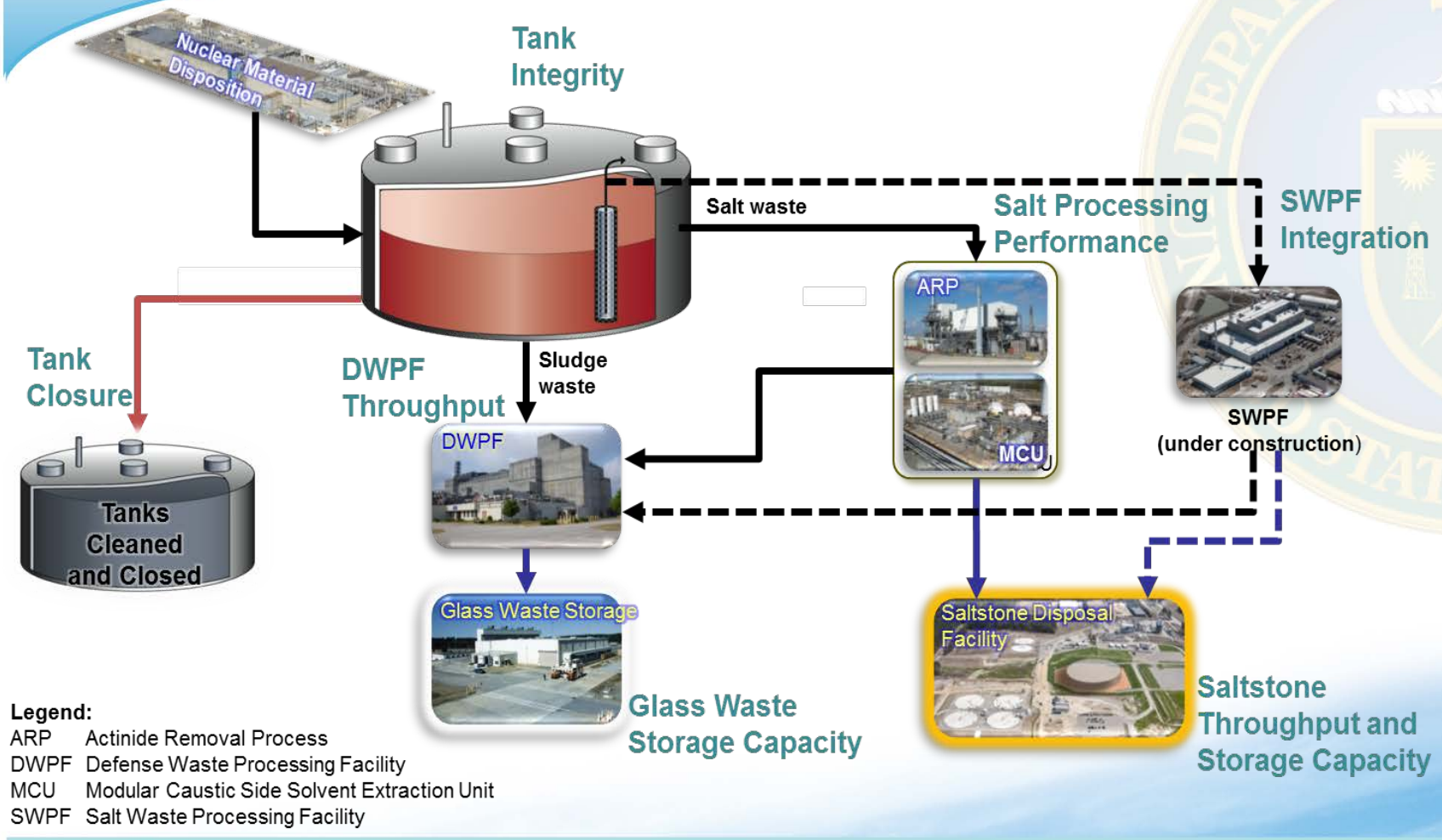


Glass Waste Storage (cont'd)

- Increases GWSB1 capacity from 2254 to 4508 canisters
- Provides adequate storage of canisters through FY26
- No 3rd Glass Waste Storage Building (GWSB) (~ $130 million)
- Glass Waste Storage Project (GWSP) Being Developed to Provide Supplemental Canister Storage in above ground storage containers similar to commercial SNF storage (GWSP can be deferred until FY18)



Technology Innovations – *Saltstone Disposal Facility*



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Saltstone Processing and Storage

- Processing Improvement - Development of cement free grout
- Grout Performance - Studies on Tc release from grout
- Storage Alternative - Mega Saltstone Disposal Units (SDU)

Saltstone Storage

Evolution of Saltstone Storage

- SDU 1 consists of a single row of six reinforced concrete cells, 100’ x 100’ with a height of 25’
  - Cells A, B, and C are full of grout and capped with a concrete roof
  - The remaining cells are empty or storing miscellaneous equipment
- SDU 4 consists of two units
  - Each unit is subdivided into six reinforced 100’ x 100’ concrete cells
  - The overall dimension is 200’ x 600’ with an average cell height of 27’

Saltstone Storage (cont'd)

- SDU 2, 3 & 5 each consist of two reinforced concrete cells
- Each cell is 150' in diameter, side wall height of 22', capable of storing ~3 million gallons of grout

SDU 2: Placed into Service in 2011;
Filled in 2013

SDUs 3&5: Placed into Service in 2013;
Accepting Grout Through 2017

Saltstone Storage (cont'd)

- Budget constraints led to a Cost Savings Initiative for future Saltstone Disposal options
- The Mega SDU was determined to be an improved approach
  - 30 Mgal; based on commercial water storage tanks
  - 43-foot tall, 375-foot diameter
  - $/gallon projected to be ~1/2 the cost of SDUs 2, 3 & 5

Saltstone Storage (cont'd)

Life cycle cost savings estimated by DOE to be approximately $300M based on 82 smaller SDUs

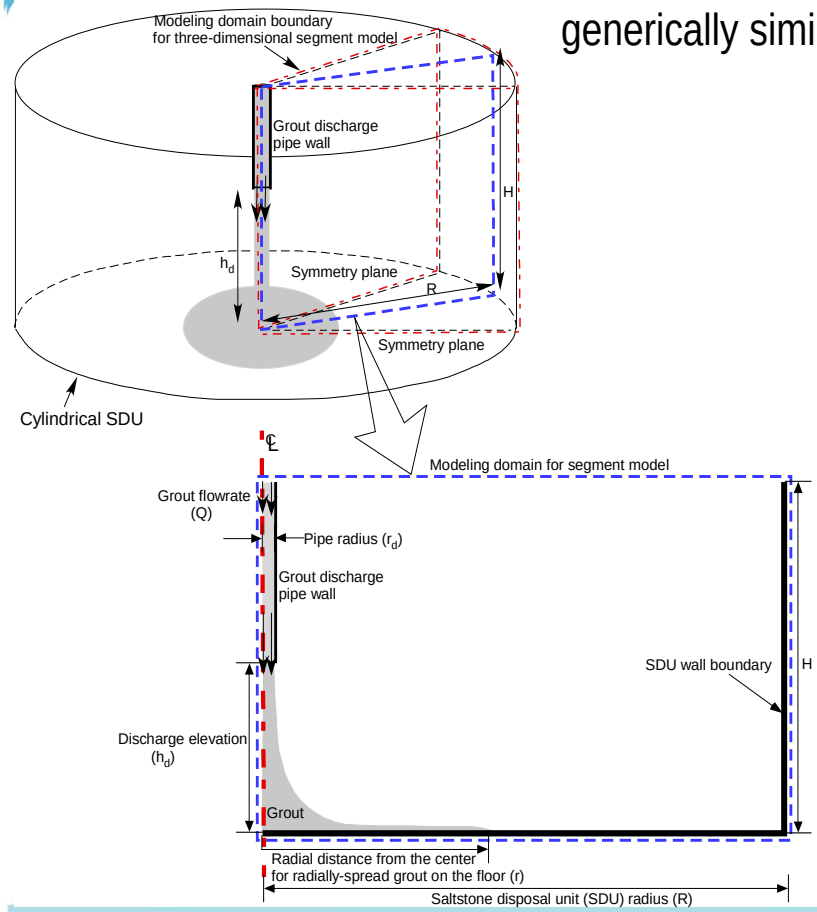
Saltstone Storage (cont'd)

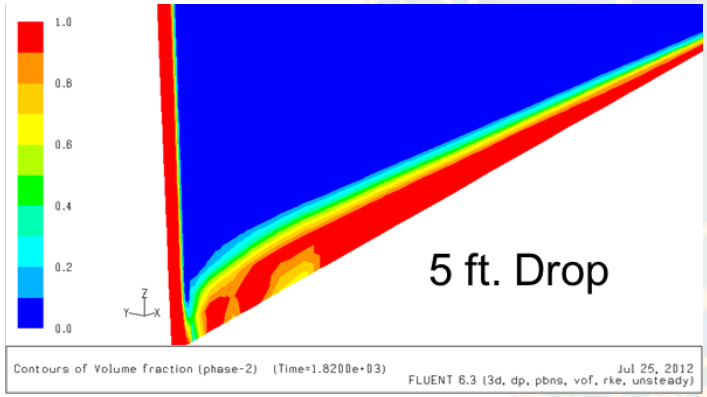
- Evaluation has been performed in several areas with respect to adopting the larger SDU design, such as:
  - Higher drop height
  - Longer flow distance
  - Thinner lifts

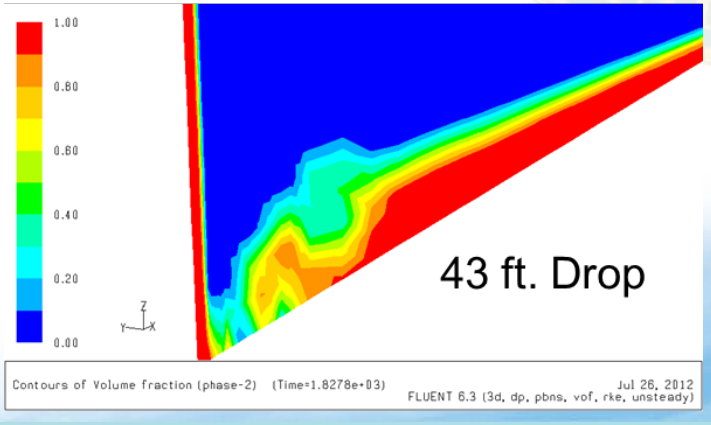
Saltstone Storage (cont'd)

Higher Drop Height

CFD model shows more splashing locally around drop point, however generically similar flow characteristics radially regardless of drop height



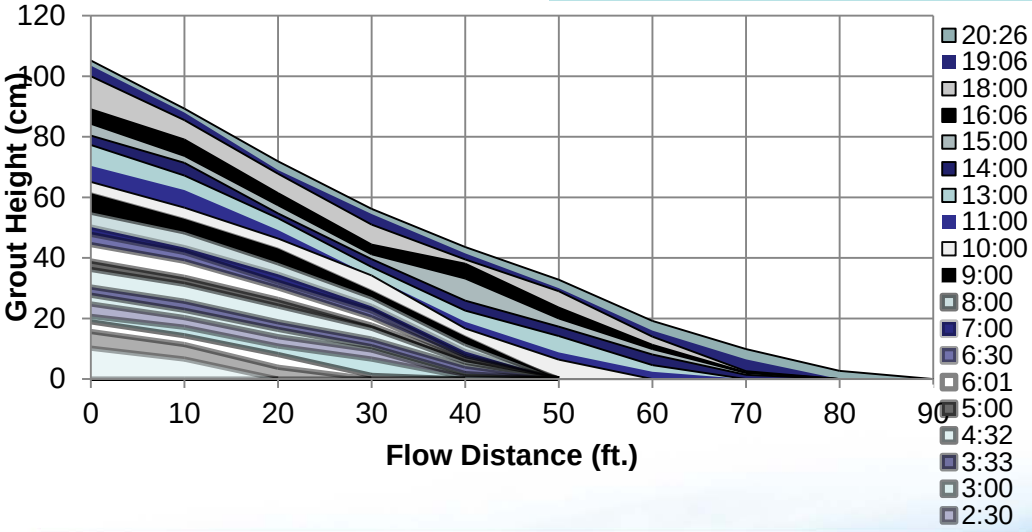




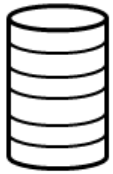
Saltstone Storage (cont'd)

Longer Flow Distance

Measured grout thickness and consistency at flow distances



Saltstone Storage (cont'd)

Lift Orientation		Pour Day‡											
		Pour Height (in.)	T	M	T	M	T	M	T	M	T	M	T	M
Vertical		0.5	X	X	X	X	X	X	X	X	X	X	X	X
		1	-	-	X	X	X	X	X	X	-	-	-	-
		3	-	-	X	X	-	-	-	-	-	-	-	-
		6	-	-	X	-	-	-	-	-	-	-	-	-
Horizontal		0.5	-	-	X	X	X	X	X	X	-	-	-	-
		1	-	-	X	X	X	-	-	-	-	-	-	-
		1.5	-	-	-	X	X	-	-	-	-	-	-	-

‡M-Monday; T-Thursday

Thinner Lifts

- Results showed reduced compressive strength with a cold joint, but no minimal impact from increased number of cold joints
- Results showed minimal impact from cold joints on leachability, hydraulic conductivity

Saltstone Storage (cont'd)

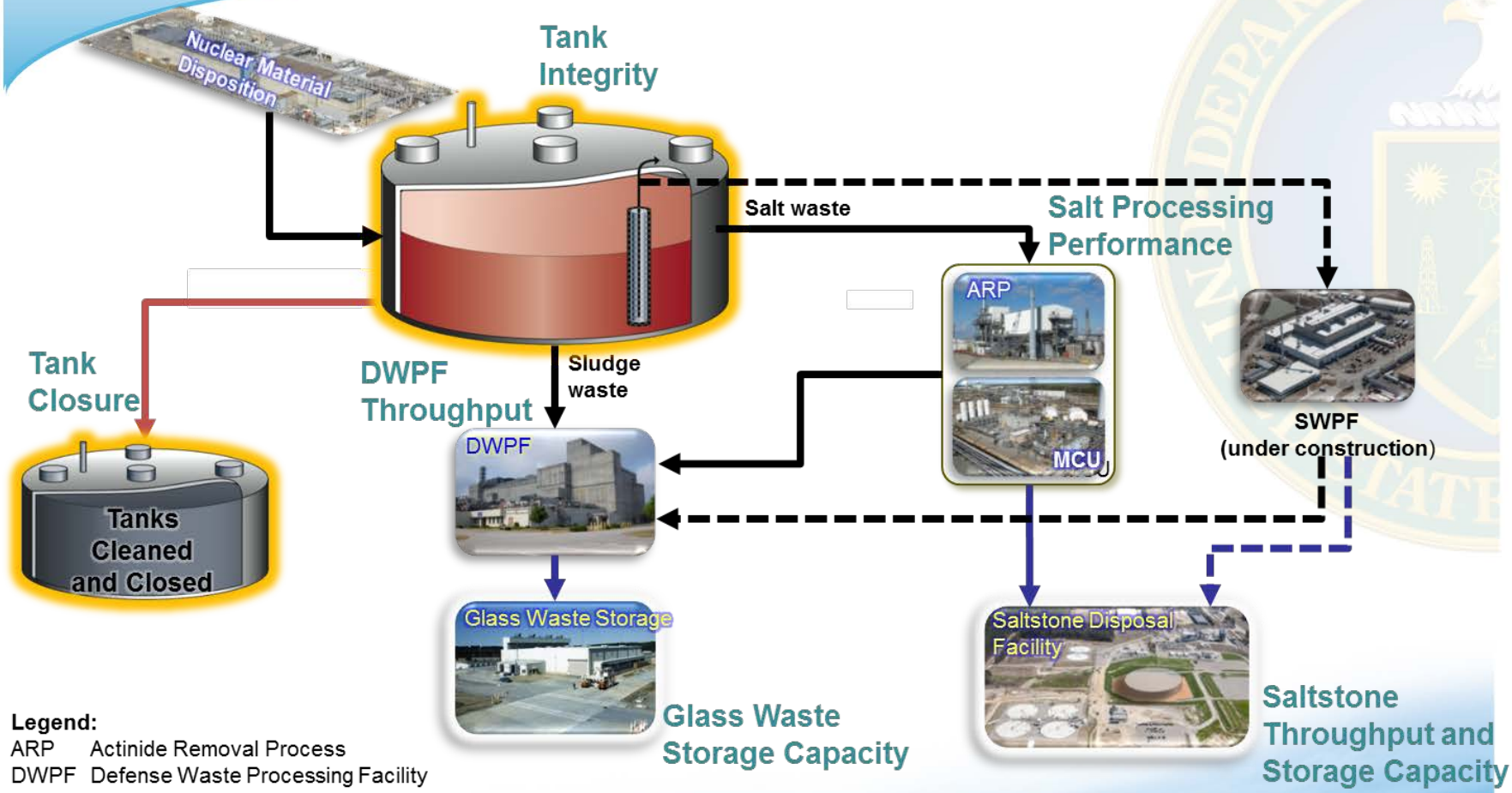
- Moving from the rectangular to the circular SDU was a tremendous step forward in improving long term safe storage of low activity grout at Savannah River
- Moving from the small circular SDU to the Mega SDU enhances this improvement
  - Less construction
  - Cost Savings
  - Reduces overall environmental footprint
- SRR will continue to evaluate ways to make storing low activity grout on site as safe and cost-effective as possible

Saltstone Storage (cont'd)

Saltstone Storage (cont'd)

SDU-6 Construction is 50-60% complete; on track to receive grout in FY2017

Technology Innovations – *Tank Closure*



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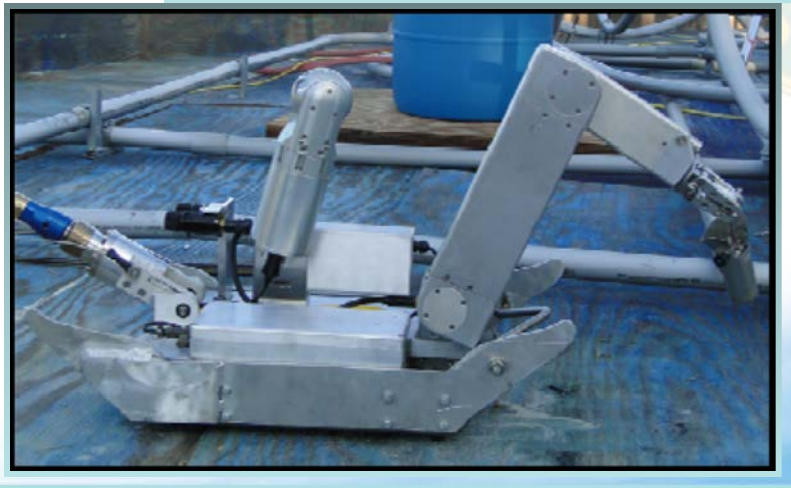
Tank Closure/Tank Integrity

- Opportunities to increase efficiency; improve accuracy
  - Sonar residual waste volume determination methods
  - Laser residual waste volume determination methods
  - Untethered crawler for residual waste sampling and characterization
  - Tank inspection

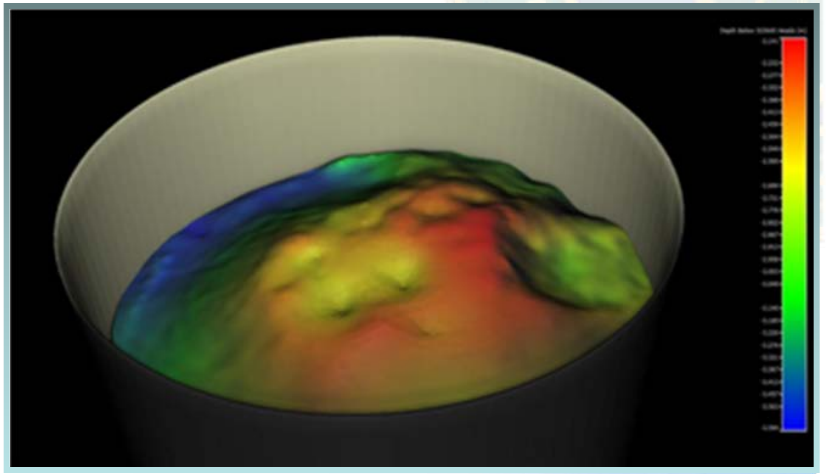


Tank Closure/Tank Integrity (cont'd)

Sonar Residual Waste Volume Determination

Advantages

- Allows solids volume determination without transferring out a majority of the supernate - schedule and space gain
- Allows the reuse of supernate for further solids mixing
- Improves accuracy
- Beneath the surface solids profile could assist in "targeting" mixing w/slurry nozzles



Disadvantages

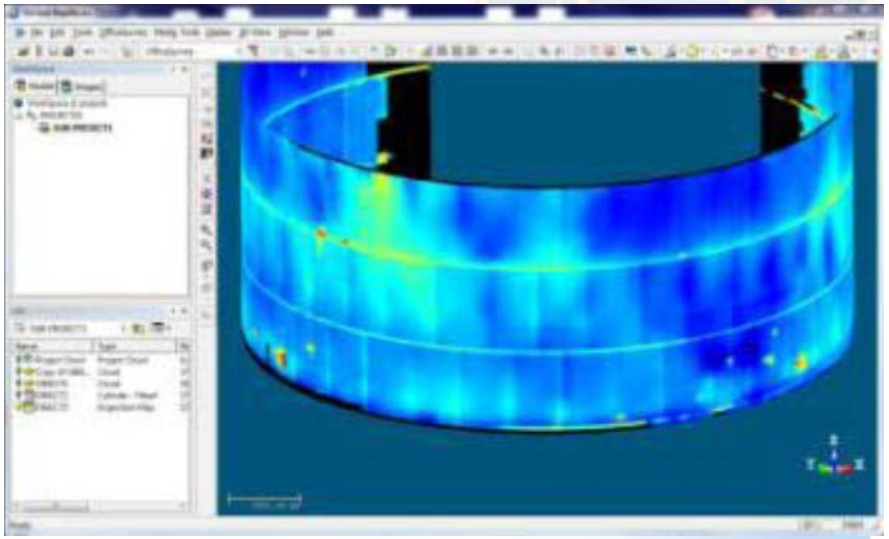
- Requires multiple tank entries for a single scan
- Internal cooling coils, columns, and equipment degrade results of scan
- Requires high liquid level to obtain optimal scan (>100 in.)

Tank Closure/Tank Integrity (cont'd)

Laser Residual Waste Volume Determination

Advantages

- Improves accuracy of overall volume determination
- Aids in determining sampling strategy by determining obstruction location



Disadvantages

- Requires multiple tank entries for a optimal scan
- Internal cooling coils, columns, and equipment degrade results of scan
- Requires exposed solids to perform scan

Tank Closure/Tank Integrity (cont'd)

Untethered Crawler for Residual Waste Sampling and Characterization

Advantages

- Eliminates the possibility of losing use of crawler due to tether becoming entangled with internal tank components (cooling coils, pumps etc.)
- Reduces exposure from deployment / management of tether
- Expedites sample retrieval

Disadvantages

- Requires in-tank battery charging (challenging due to waste buildup on charging connectors, crawler not in appropriate location for charging)