



**Savannah River
Remediation**

We do the right thing.

Chemical Cleaning Program Review

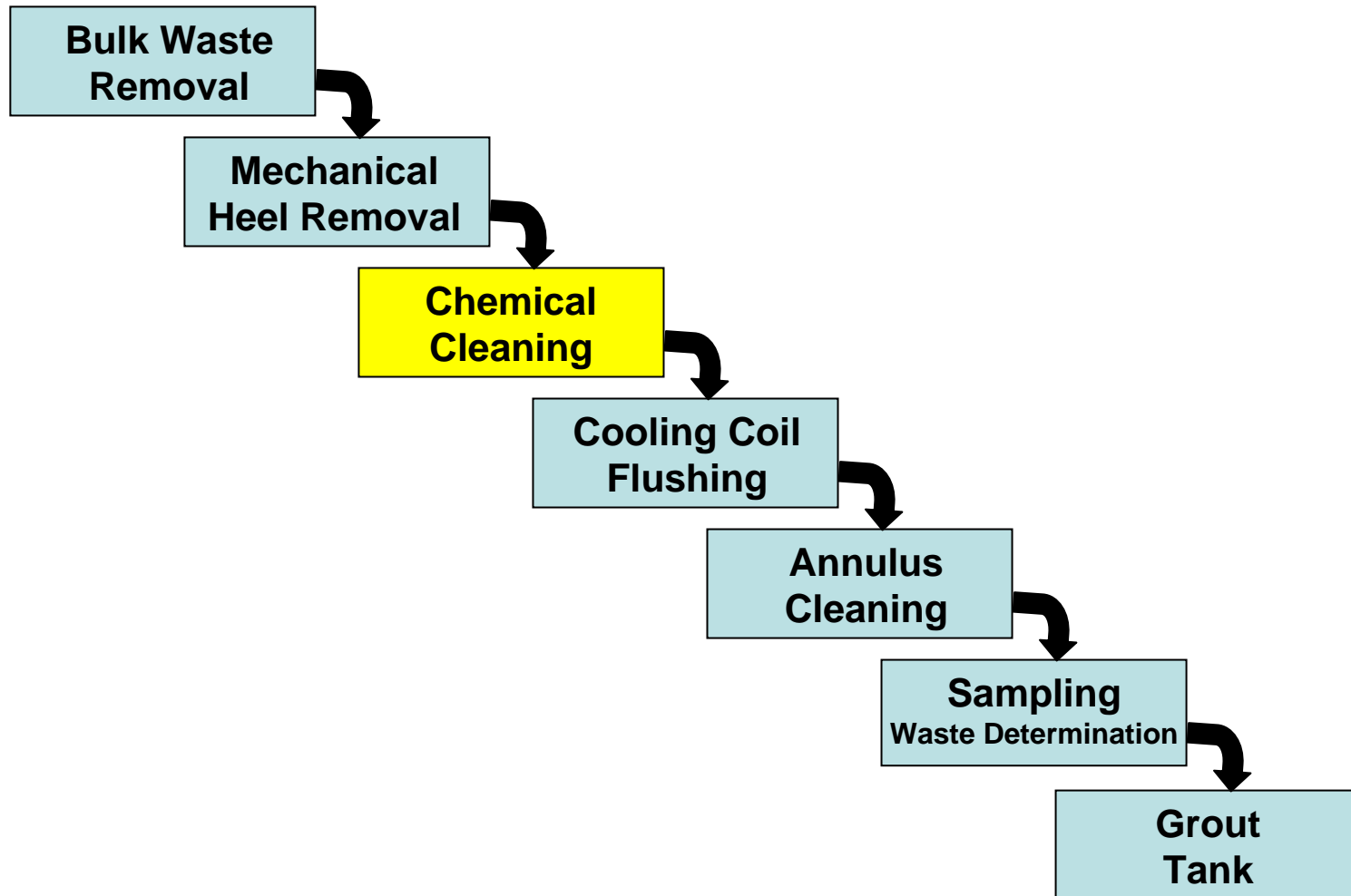
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Waste Removal & Tank Closure

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SRR-STI-2009-00464

- Regulatory drivers
- Process overview
- Preliminary results
- Lessons learned
- Path forward

- The Federal Facilities Agreement establishes milestones for the removal of bulk waste and closure of each non-compliant tank
- Per the Dispute Resolution:
 - “DOE shall complete operational closure of Tanks 19 and 18 by 12/31/2012”
 - “DOE shall complete operational closure of 4 tanks by 9/30/2015”
- SRR intention to close 4 tanks by 9/30/2010, or as soon as possible
- Tanks 5 & 6 will be 2 of the 4 tanks



- Site-specific conditions drive the tanks to be very clean prior to closure
 - SRS tanks have a high specific activity
 - the tanks farms are in a small geographical area with the anticipated POC 100 meters from the facility boundary
 - the tank bottoms are close to or in the water table
- The presence of cooling coils makes everything more difficult
 - obstructs bulk waste removal
 - significant contaminated surface area
- Quantifiable regulatory requirements must be met to protect human health and the environment, *and*
- The tanks must be cleaned to the Maximum Extent Practical

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- Schedule 40
- Carbon steel
- 2" diameter
- 4-5 miles/tank
- 2" above tank floor
- 12 support columns
24" diameter

Model is Tank 16

- Cleaned during late 1970's
- 4 wt % oxalic acid
- Added at 90°C
- Vigorous mixing via 4 standard slurry pumps
- Removed 99.9% of original waste volume
- Left thin coating of solids
- Most areas of the tank were visibly clean
- Majority of activity remaining after cleaning was Sr-90

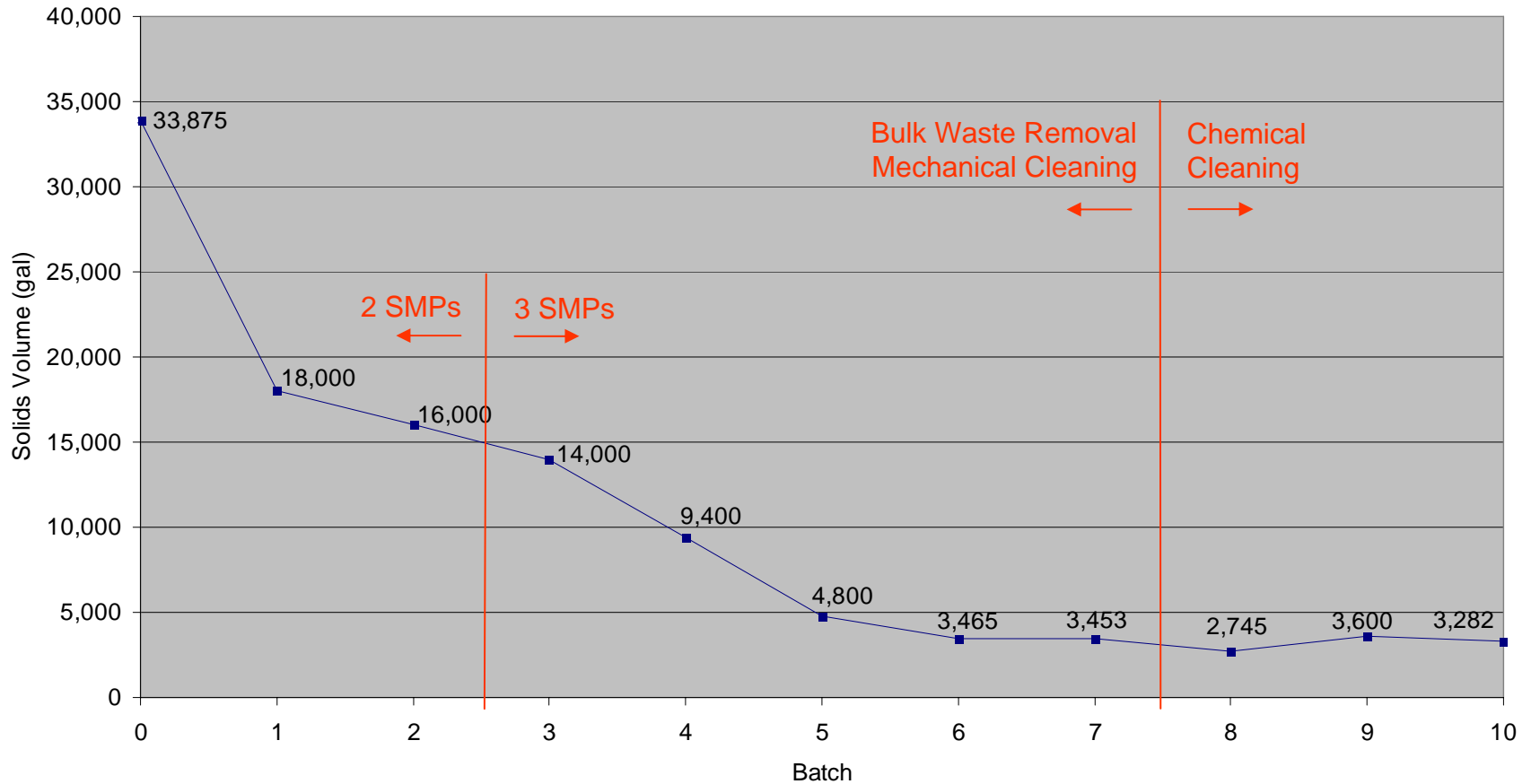
As planned:

- Complete bulk waste removal
- Wash sludge with well water to reduce Na
- Add 8 wt % oxalic acid
- 50°C
- Mixer pumps operating for 1st batch
- Three acid strikes:
 - 20:1
 - 13:1
 - 13:1 via spray nozzles to clean tank internals
- Water wash with well water via spray nozzles
- Mix well water/residuals and transfer out

As executed:

- Removed as much free supernate as possible
- Washed remaining supernate heel with well water
- Added 8 wt % oxalic acid
- 50°C
- 1 mixer pump operated on 1st batch
- **Two+** acid strikes:
 - 20:1
 - 13:1
 - **3rd strike reduced to 5:1 via spray nozzles**
- Spray wash with DI water
- Added well water, mixed and transferred out
- Mapped solids after each evolution

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Prior to chemical cleaning

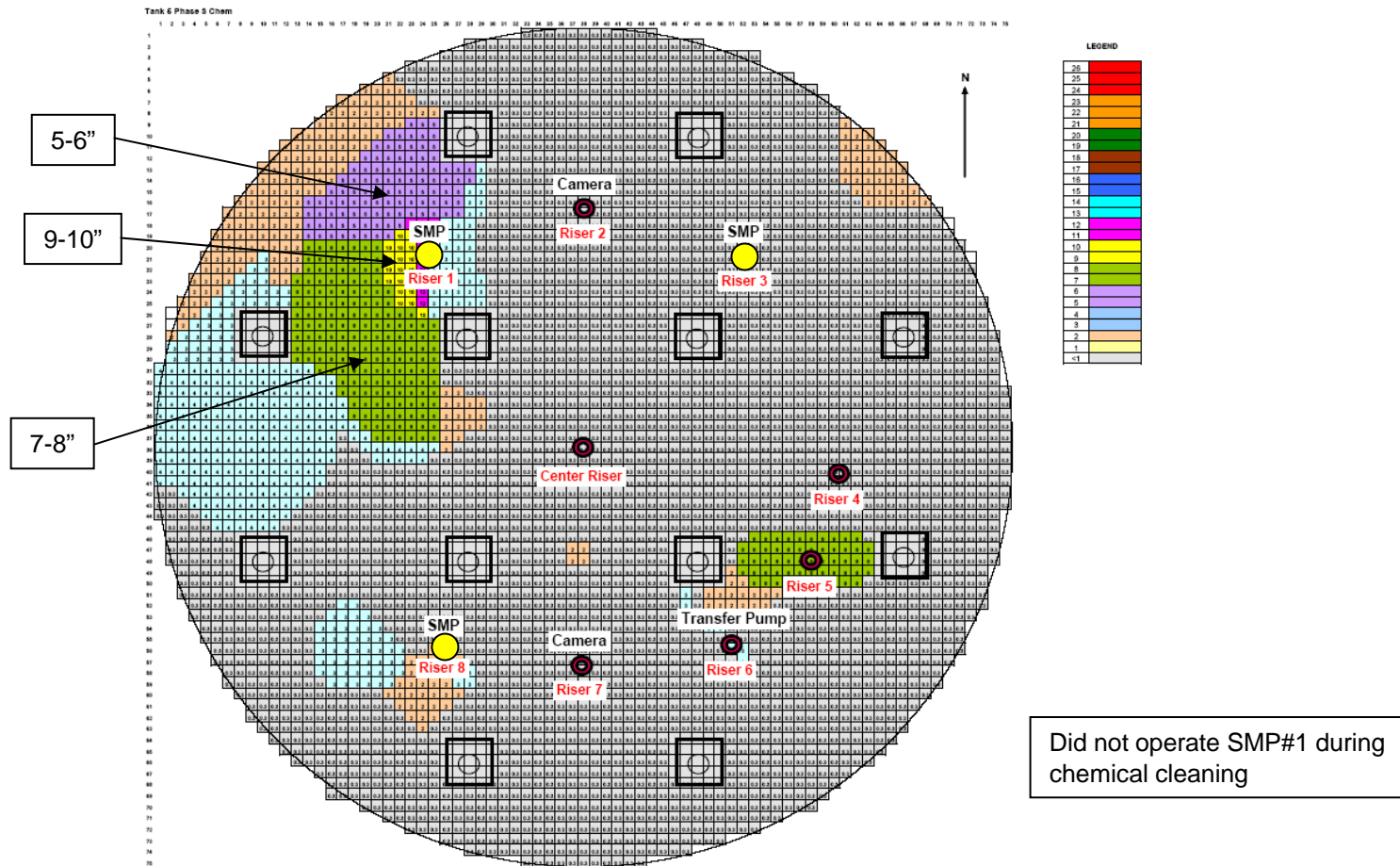
- 3 bulk waste removal batches
 - 2 with 2 SMPs, 1 with 3 SMPs
 - 33,875 gal to ~14,000 gal residual solids
- 4 mechanical heel removal batches with 3 SMPs
 - ~14,000 gal to 3,453 gal residual

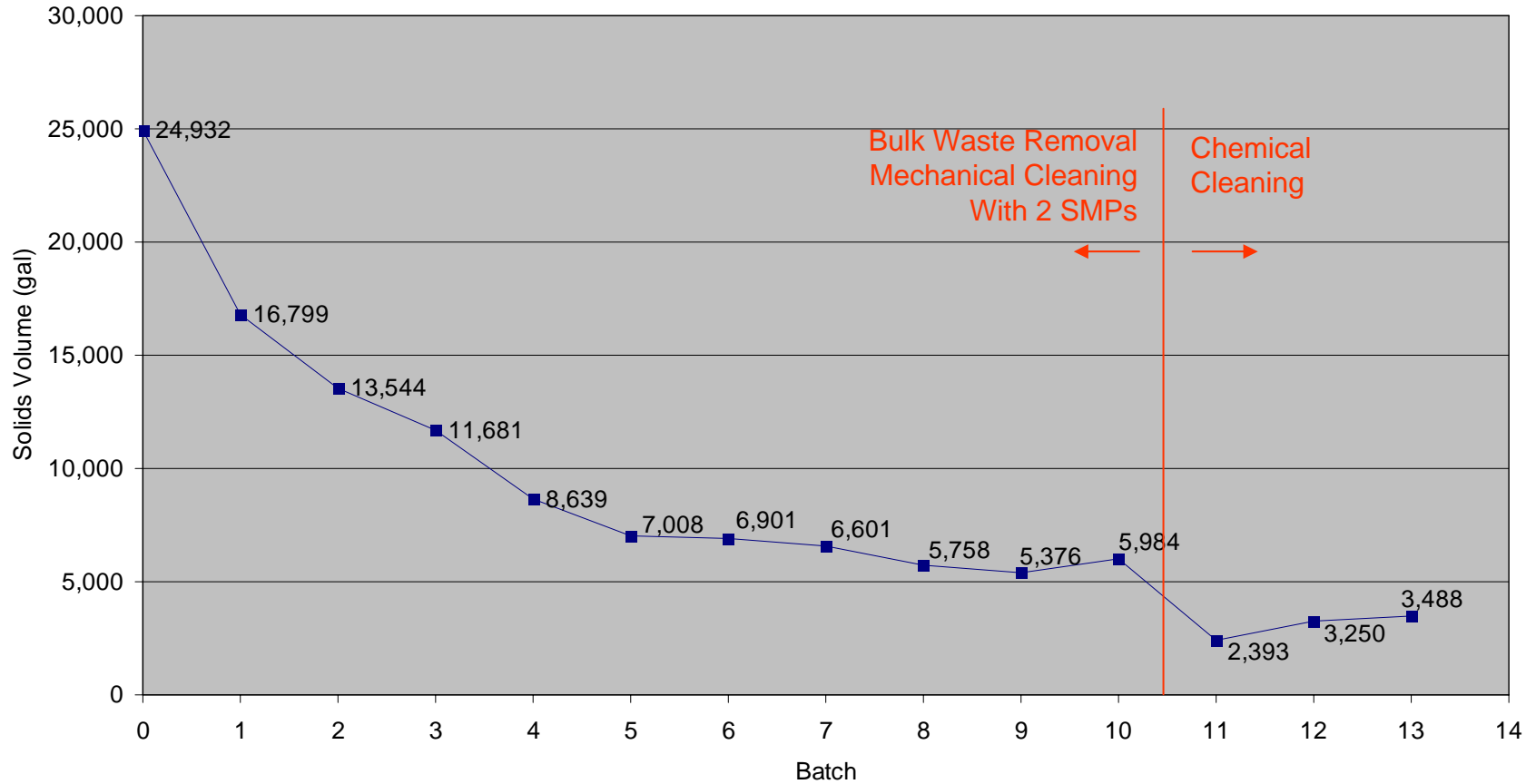
Chemical Cleaning

- 2+ acid strikes and 1 water wash
 - 3,453 gal to 3,282 gal residual solids

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Tank 5
12/29/2008





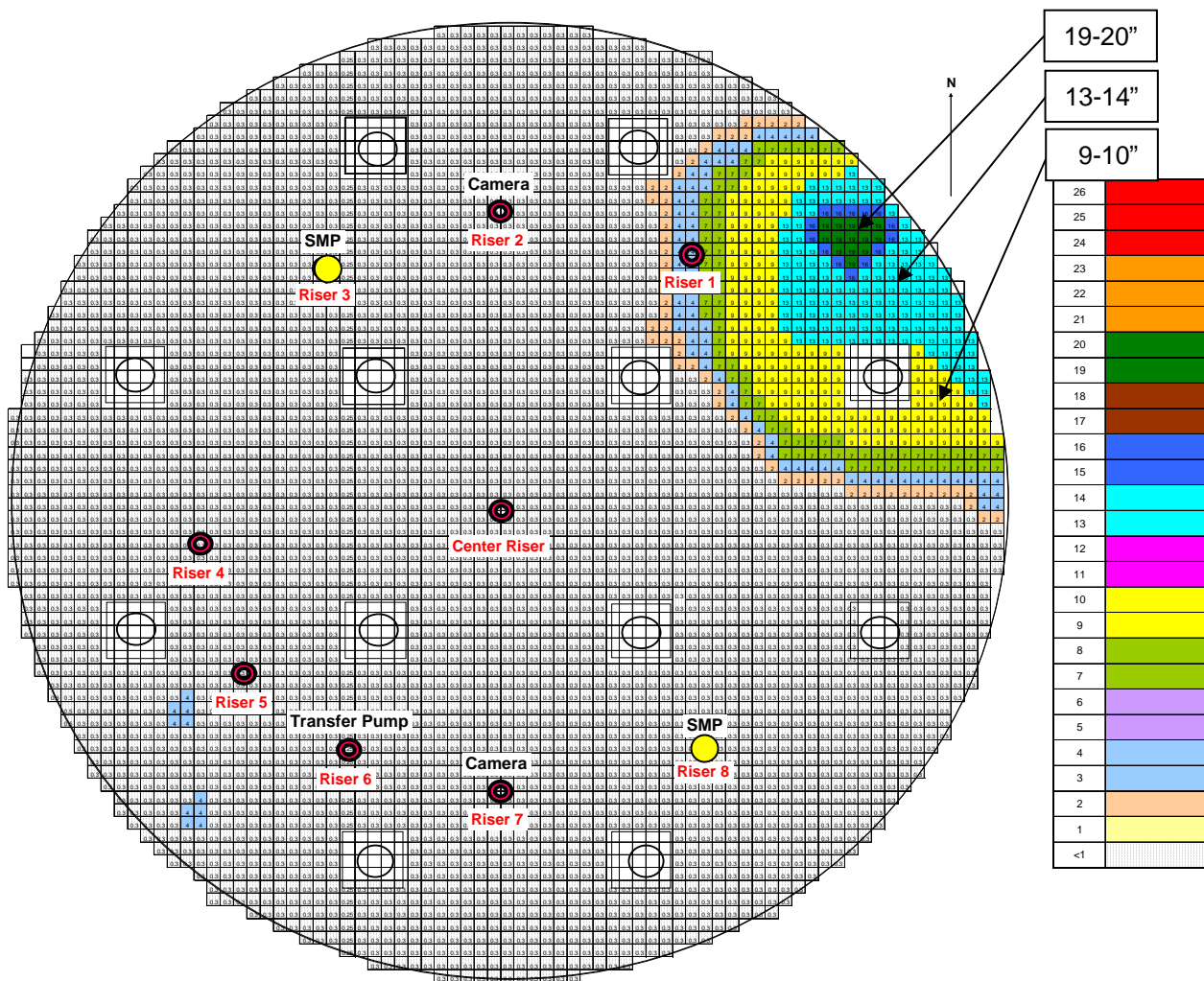
Prior to chemical cleaning

- 5 bulk waste removal batches with 2 SMPs
 - 24,932 gal to 7,008 gal remaining
- 6 mechanical heel removal batches
 - 7,008 gal to 5,984 gal residual solids

Chemical Cleaning

- 2+ chemical cleaning strikes
 - 5,984 gal to 3,250 gal residual solids
- 1 water wash
 - 3,250 gal to 3,488 gal residual solids

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Key Rads & Non-Rads	Tank 5			Tank 6		
	PA	Actual	Ratio	PA	Actual	Ratio
U-234	0.00137	<1.7	<124	0.0169	<0.1	<6
Np-237	0.0232	0.4	17	0.00586	0.1	17
Pu-239	2.67	263	99	1.73	178	103
Tc-99	6.57	0.1	0.015	7.82	1	0.13
Am-241	49.1	1650	34	59.5	3421	58
Hg	0.4	37	93	0.63	93	148
Mn	18.5	875	47	20.1	267	13
Ni	9.3	2138	229	30.7	1216	40

PA is the assumption made in the draft F Tank Farm Performance Assessment
 PA and Actual alues are in Ci

- Remove as much sludge as possible
- Remove as much supernate as possible
 - pre-wash solids
 - use DI water to avoid adding minerals
- Start with dilute OA
 - do not use 8 wt % solution (already at saturation)
- Maintain pH ~2
 - prevent precipitation
- Transfer when reaction is complete (~2-3 days)
 - prevent precipitation
- Mix, mix, mix
 - OA will dissolve most solids
 - OA physically changes insoluble solids to increase mobility

- We believe the Bulk Oxalic Acid flowsheet can be effective
- We plan to use it on 1-3 more tanks
 - potential for Tanks 5-6 (Systems Engineering Evaluation in progress)
 - planned for one additional tank in F Tank Farm
- Lessons Learned will be incorporated to improve the flowsheet
- Expedite Enhanced Chemical Cleaning