Review of U.S. High-Level Waste Processing

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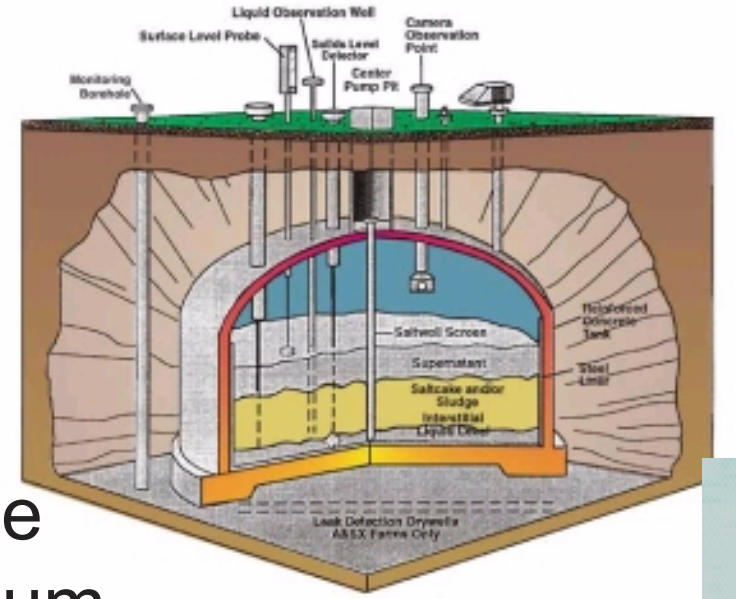
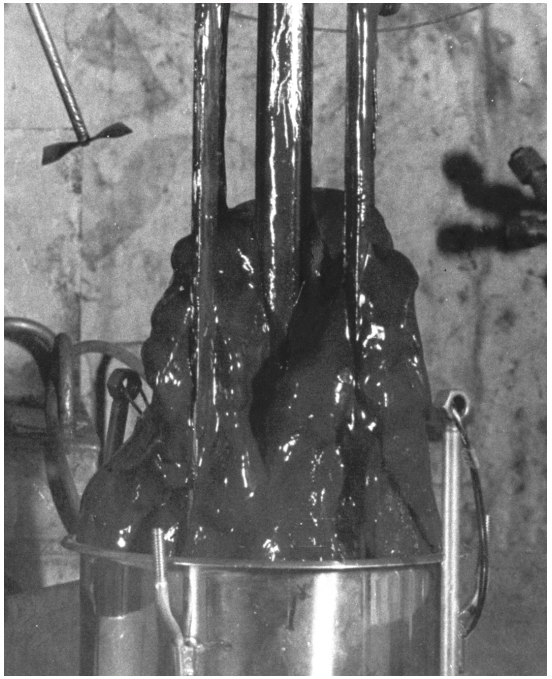
Department of Energy (DOE) Manages High-Level Waste (HLW) at Four Sites

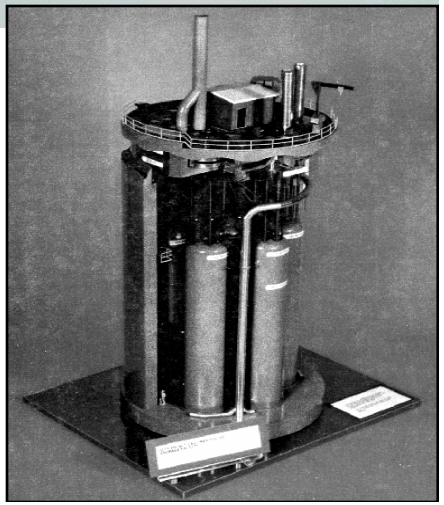
Site	HLW in tanks (cubic meters)	Vitrified HLW (canisters)	Total radioactivity (MCi)	Percent of total volume	Percent of total radioactivity
Hanford	196,000	0	330	58.1	39.7
Savannah River	132,000	1754	434	39.2	52.1
Idaho National Laboratory	9,000	0	45	2.7	5.4
West Valley Demonstration Project	Small (heel only)	275	23	< 0.1	2.8
Total	337,000	2017	832	100	100

DOE HLW Occurs in Multiple Forms

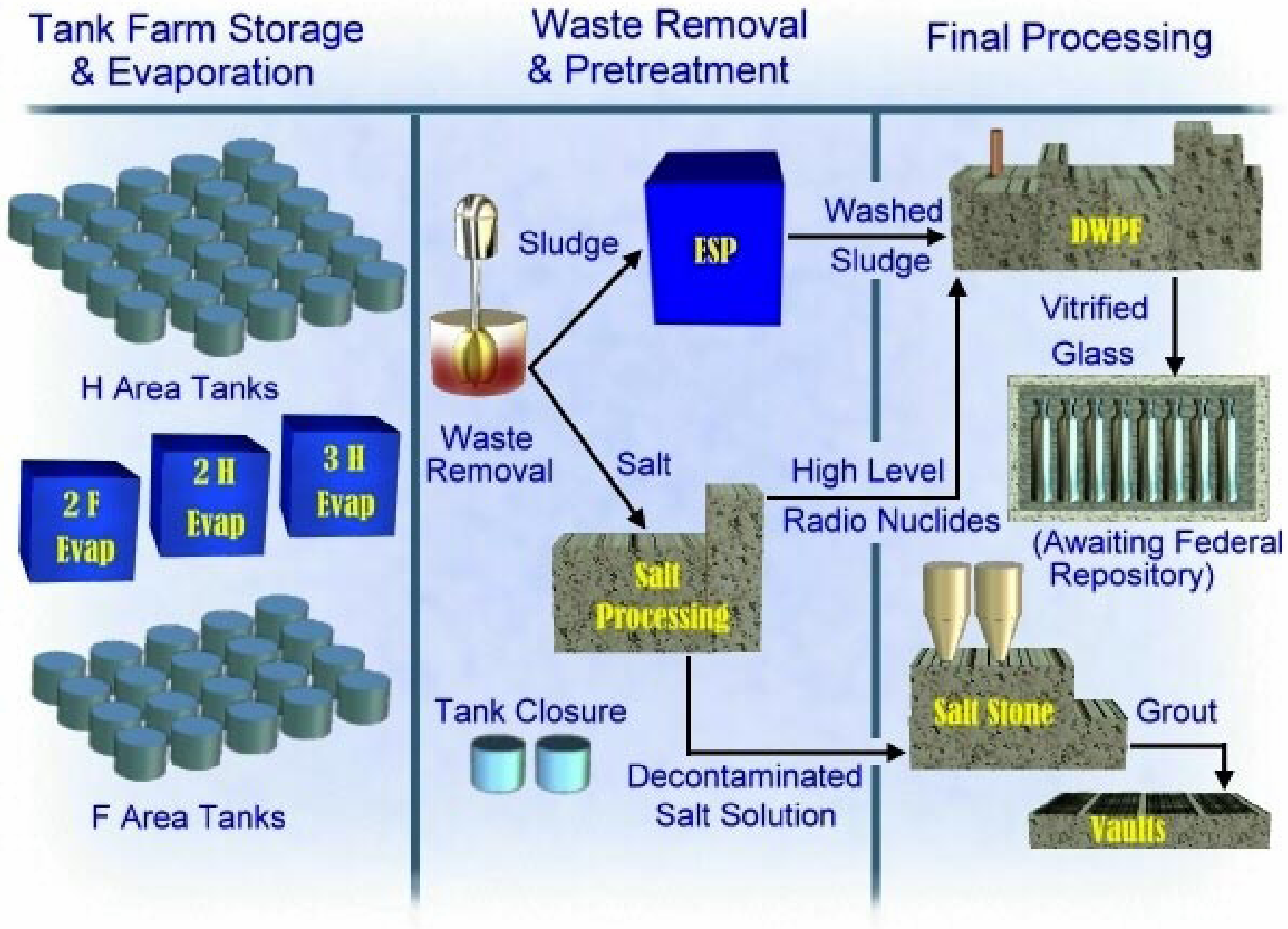
- Sludge: Viscous, insoluble
- Supernatant water: Alkaline with soluble chemicals and cesium
- Salt cake: Precipitated salts such as sodium nitrate
- Calcine: Oxide powder resulting from heating HLW







Typical HLW Processing Approach



U.S. HLW Definition

- In the U.S. HLW is

(A) the highly radioactive waste material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and

(B) other highly radioactive material that the Commission, consistent with existing law, determines by rule to require permanent isolation

HLW Definition Has Complicated Waste Management

- No provision in HLW definition to allow it to be reclassified as a waste type that does not require repository disposal
- Complication: HLW must be reclassified to allow on-site disposal of some wastes as low-level waste (LLW) or off-site disposal as transuranic waste
  - Residual waste in tank
  - Low-activity waste

DOE Has Used Administrative Procedures to Reclassify HLW

- Low-activity waste disposed at Hanford site
- Residual waste in closed Savannah River tanks
- Sodium-bearing waste retrieved from Idaho tanks
- Residual sodium-bearing waste in Idaho tanks

NRC Advised DOE on HLW Reclassifications

- NRC did not regulate DOE
- NRC advised and consulted on technical aspects of criteria
  - Remove key radionuclides to the maximum extent technically and economically practical
  - Radionuclide concentration not greater than Class C LLW
  - Meet NRC requirements for near-surface disposal

Congress Established New HLW Reclassification Criteria (1)

- Criteria established by law in 2004
  - Apply to only Savannah River and Idaho
  - West Valley has criteria in a separate law
  - Criteria to be used at Hanford are uncertain
- NRC still does not regulate DOE but must provide consultation concerning DOE's reclassification proposals

Congress Established New HLW Reclassification Criteria (2)

- New criteria state that reclassified waste:
  - Not require disposal in a geologic repository
  - Be processed to remove radionuclides to the maximum extent practical
  - Meet NRC near-surface disposal requirements
- Implementation to be monitored by NRC and state in which waste resides

Current Status of Reclassification Proposals

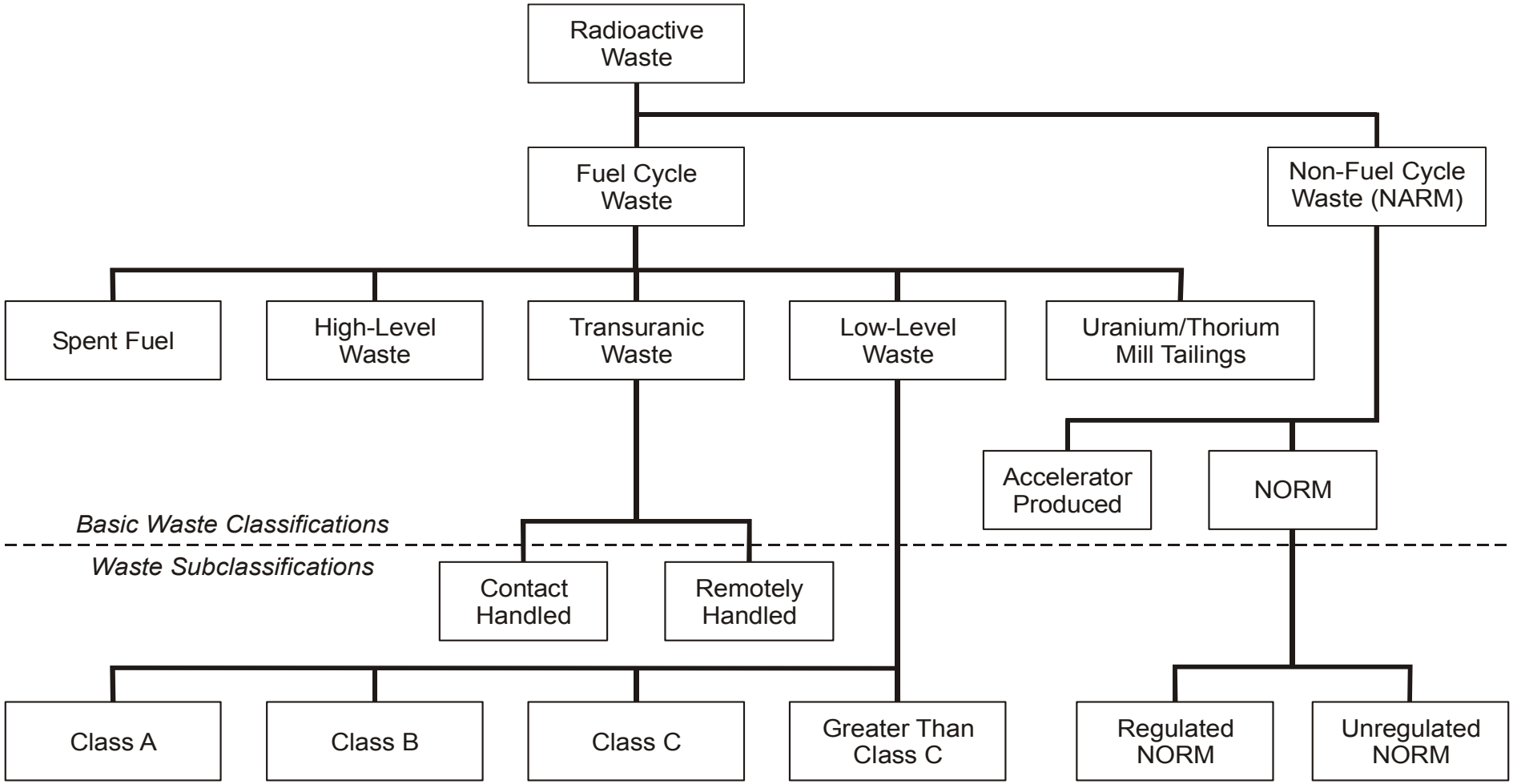
- HLW reclassification now moving forward
  - Savannah River proposal for reclassification of HLW to allow near-surface disposal of low-activity waste has been sent to NRC
  - Others anticipated from Savannah River and Idaho
  - NRC staff reviewing Hanford reclassification issues
  - West Valley HLW reclassification will be addressed in an Environmental Impact Statement

Current Status of NRC Consultation

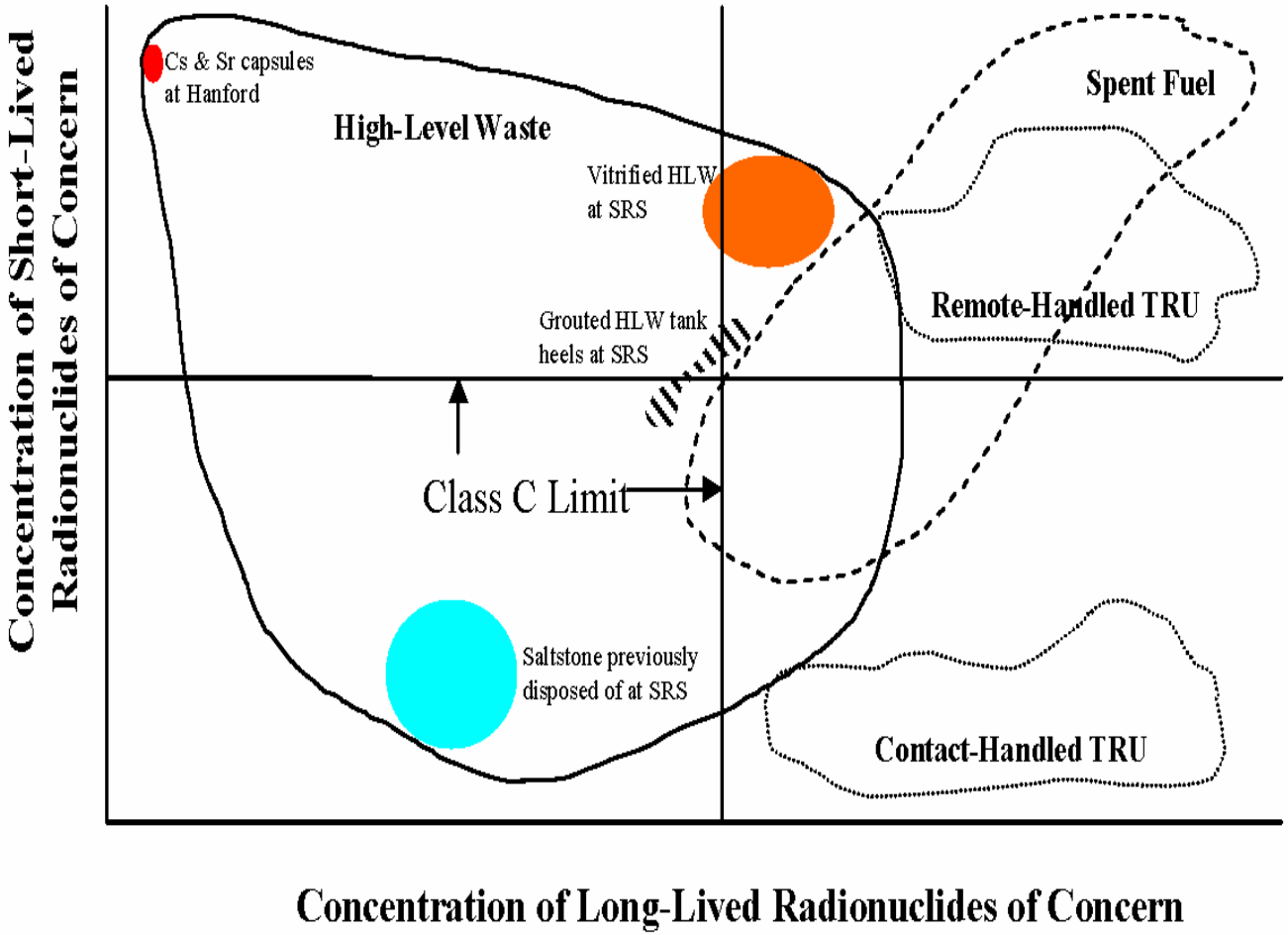
- NRC developing a Standard Review Plan to provide consistent reclassification reviews
  - ACNW Workshop in July
  - Potential NRC staff workshop later in the year
- ACNW considering implications to LLW disposal regulations

Backup Slides

U.S. Waste Classification System

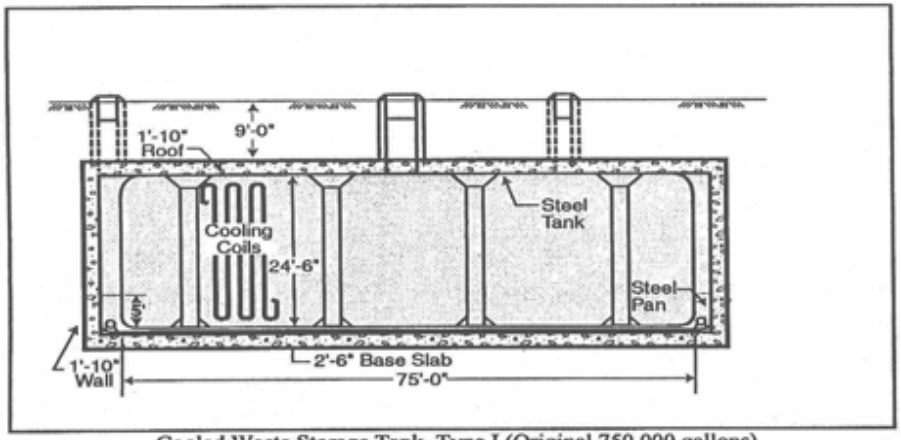


Waste Radionuclide Concentrations vs 10 CFR 61 Class C Limits



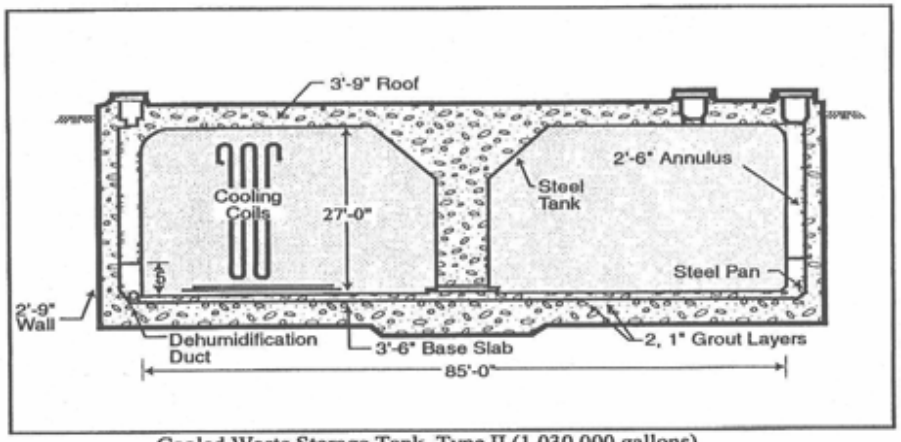
Source: *Risk and Decisions about Disposal of TRU and High-Level Radioactive Waste,* National Research Council (2005)

High-Level Waste Tank Designs at Savannah River Site



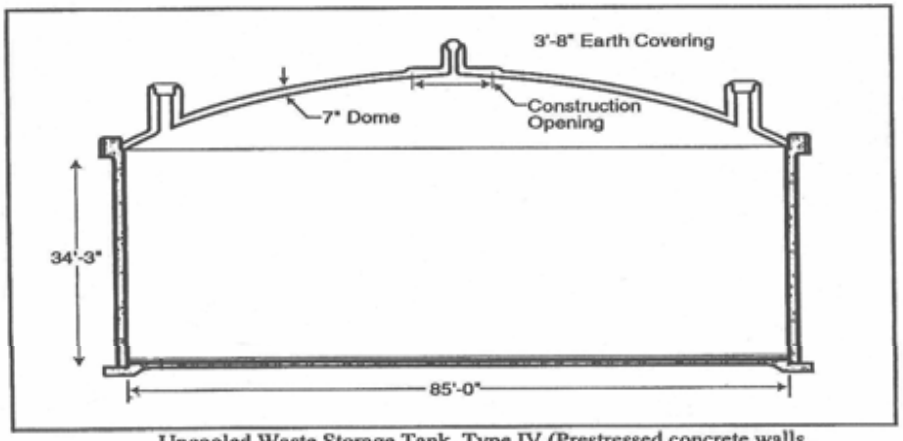
Cooled Waste Storage Tank, Type I (Original 750,000 gallons)

(12 Each)



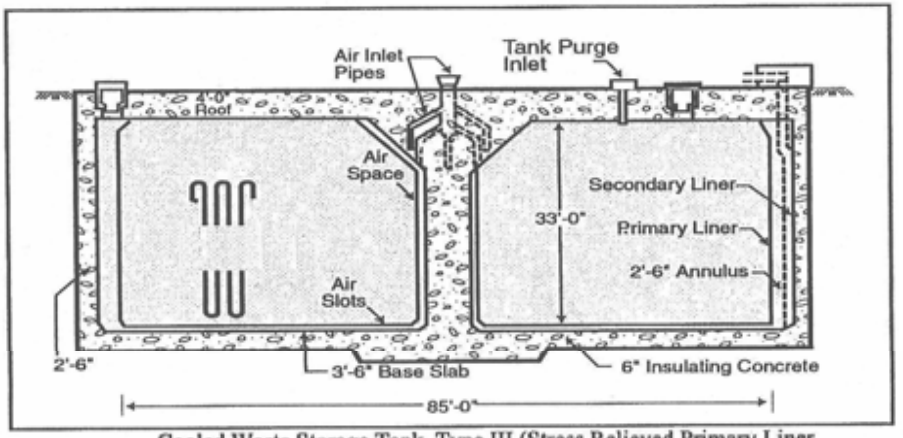
Cooled Waste Storage Tank, Type II (1,030,000 gallons)

(4 Each)



Uncooled Waste Storage Tank, Type IV (Prestressed concrete walls, 1,300,000 gallons)

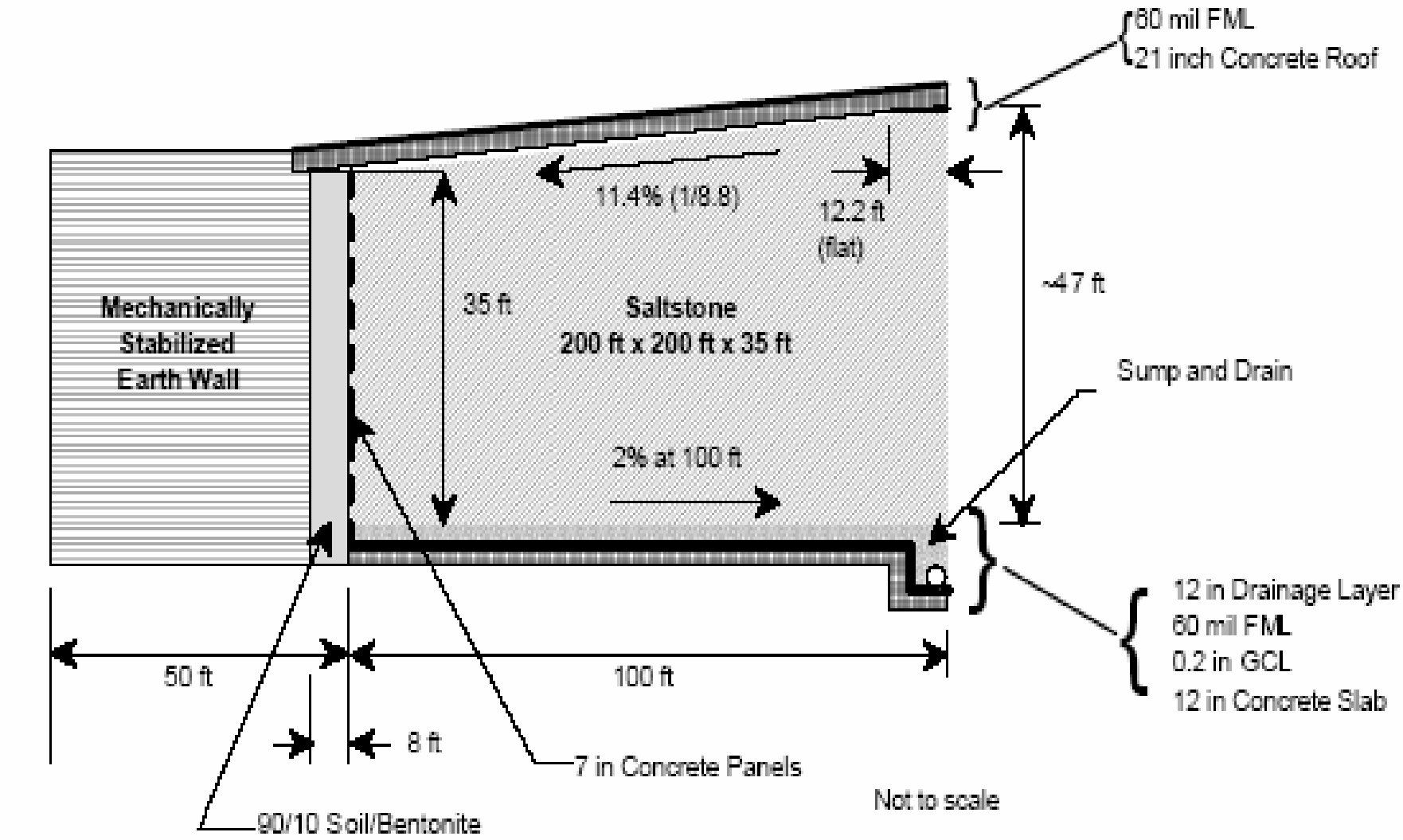
(8 Each)



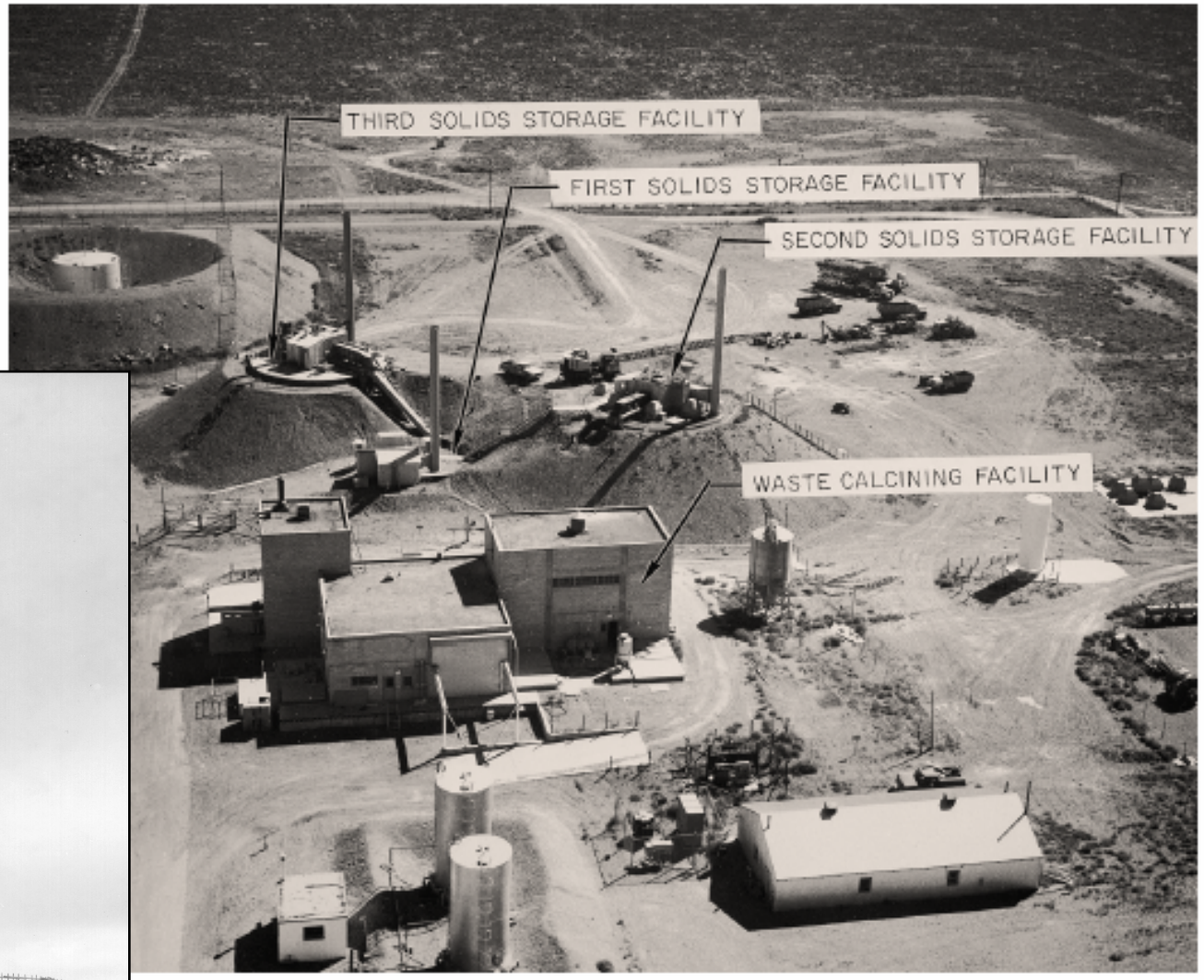
Cooled Waste Storage Tank, Type III (Stress Relieved Primary Liner, 1,300,000 gallons)

(27 Each)

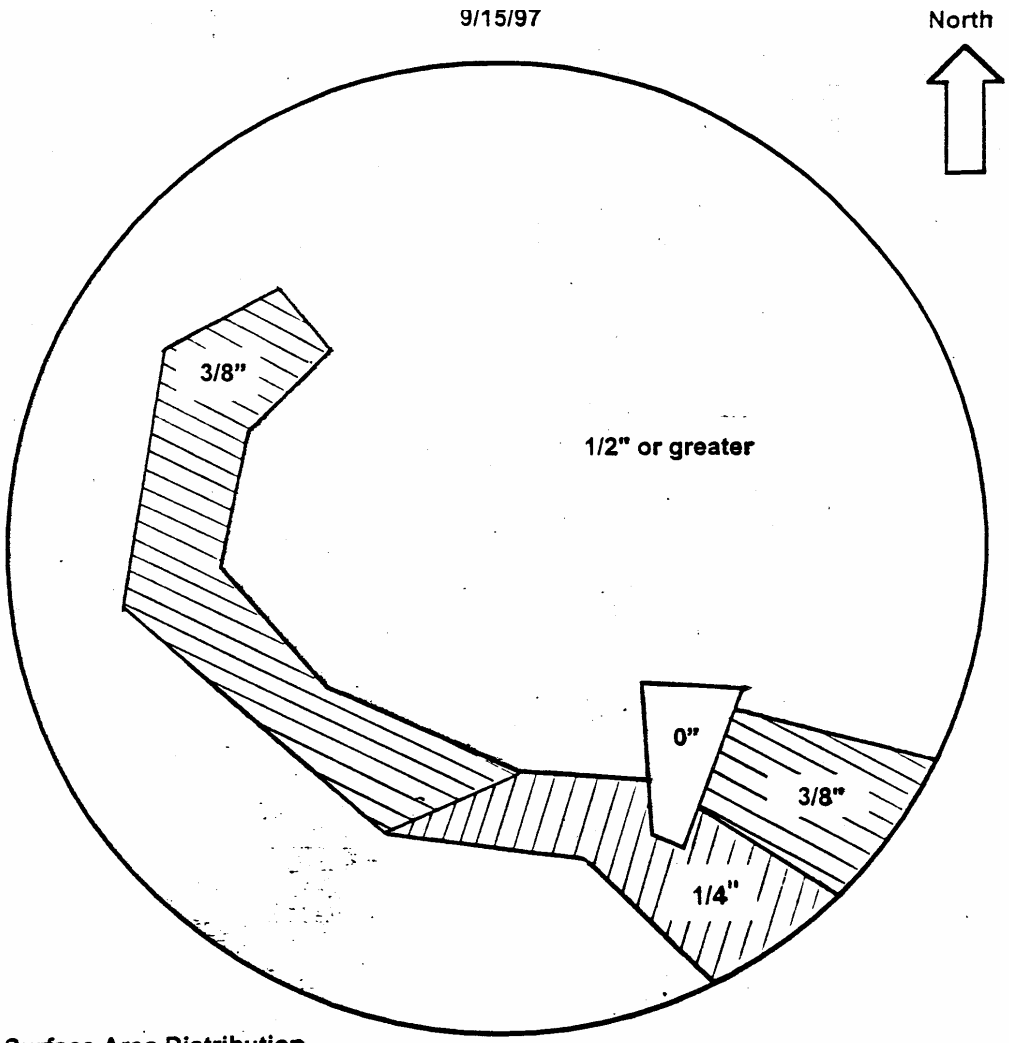
Saltstone Vaults at Savannah River



Idaho Calcine Bins



Residual Waste Depth in SRS Tank



Surface Area Distribution

* 1/2" or greater = 80%
* 3/8" = 13%
* 1/4" = 5%
* 0" = 2%

Closed SRS HLW Tank Fill