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Hanford Tank Briefing for Senate Energy, Environment, and Telecommunications Committee

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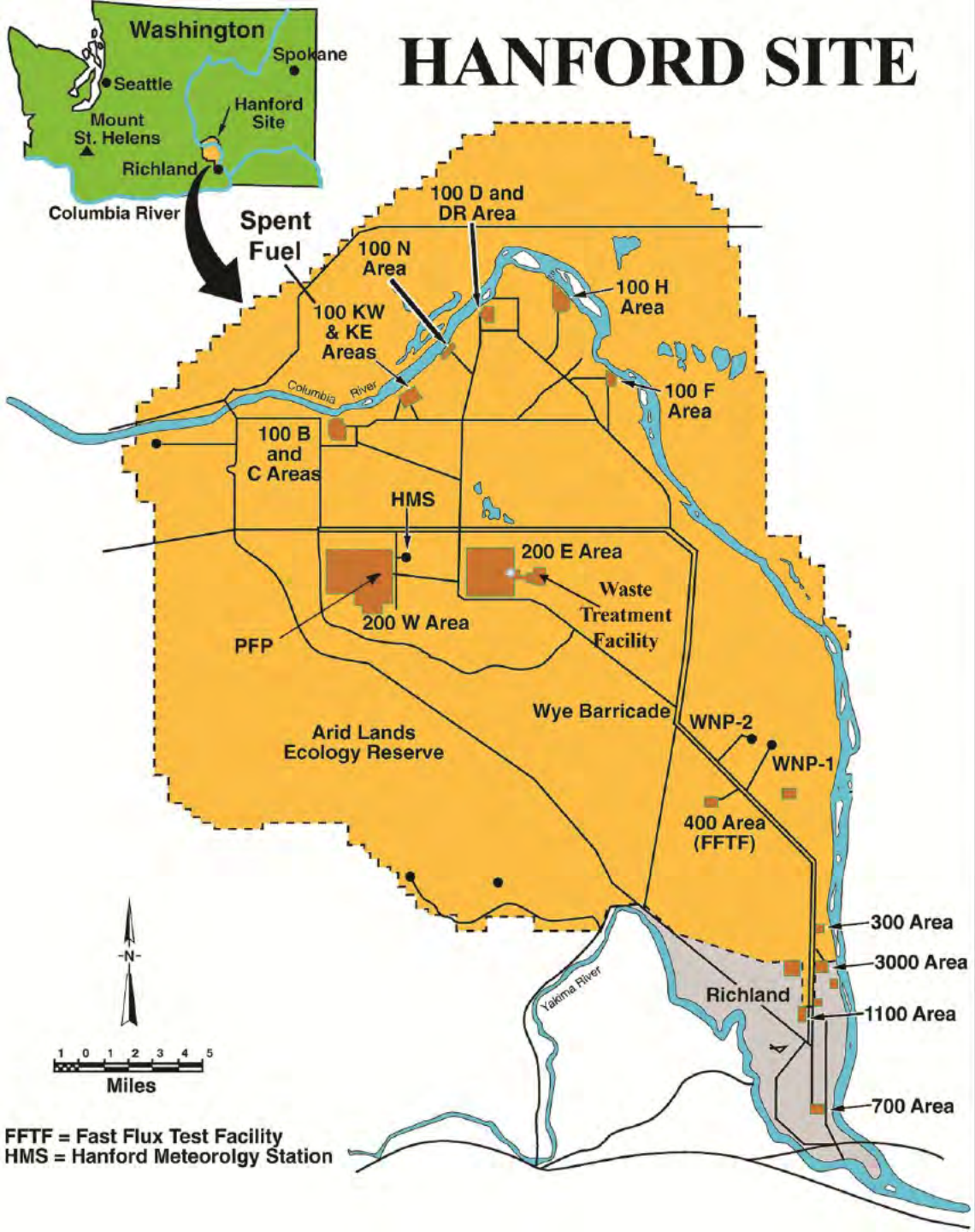
Washington State Department of Ecology
February 28, 2013

HANFORD SITE



- 586-square-mile site
- 50 miles of Columbia River run through it
- 2,400 waste management units/areas of concern
- 72 square miles of groundwater contaminated above drinking water standards (remaining)
- **177 high-level waste tanks buried underground**
- 9 plutonium production nuclear reactors (7 cocooned)
- 6 "canyon" processing buildings
- 2 sodium-cooled test nuclear reactors
- 72 radioactive landfills
- 43 miles of landfill trenches (remaining)

Building underground waste storage tanks

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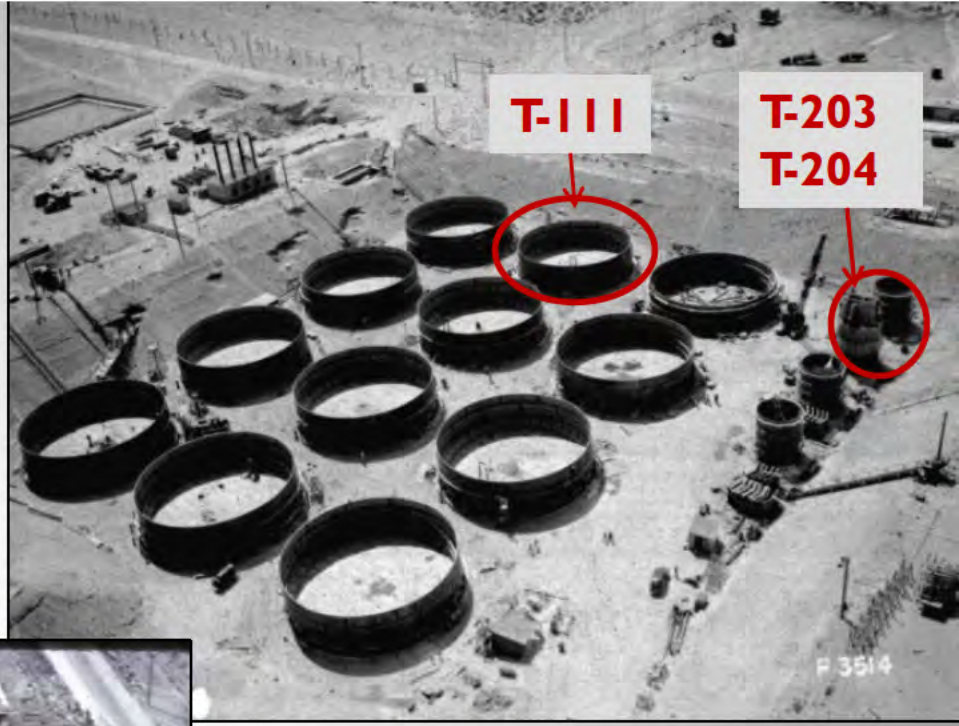
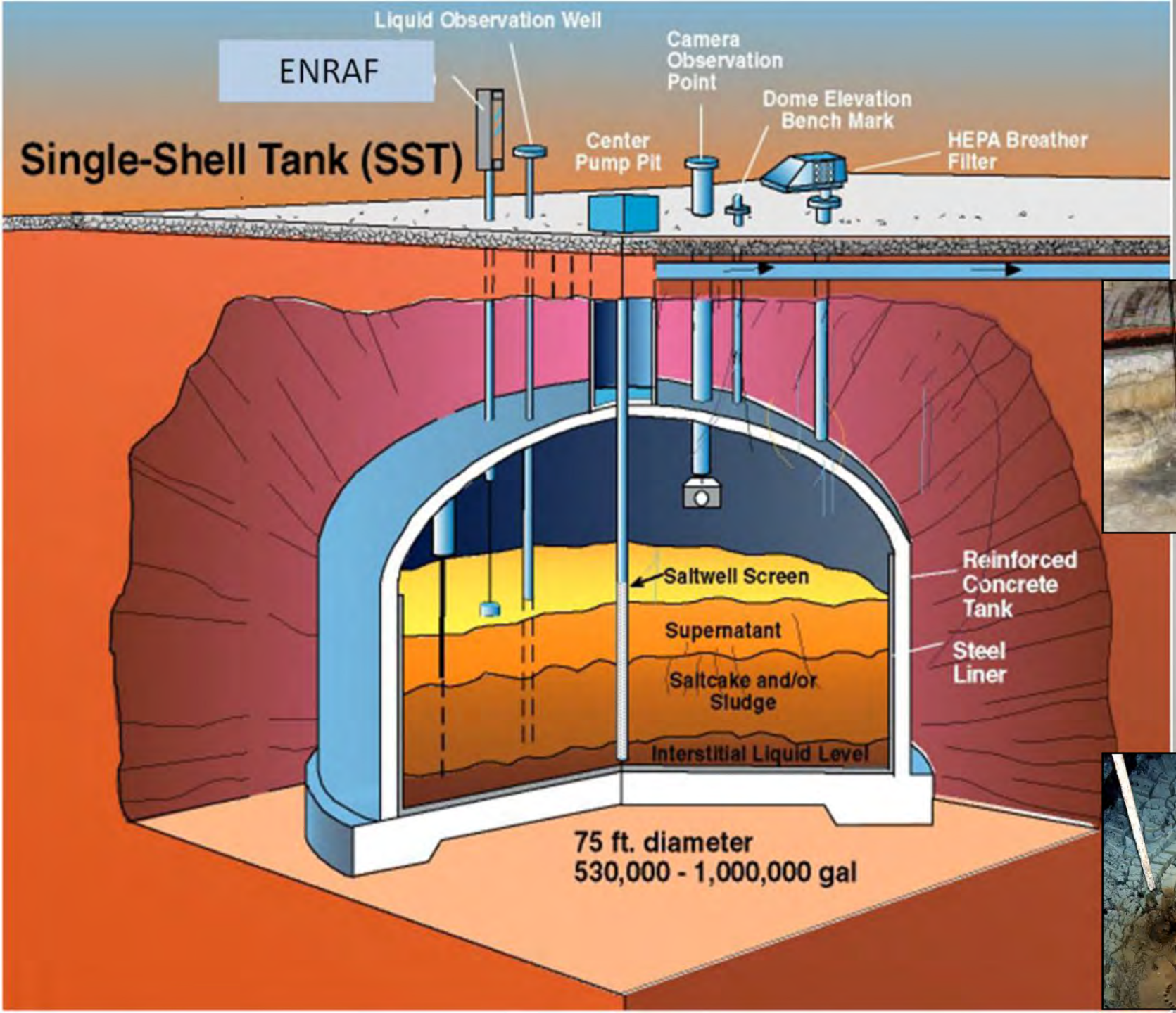
Single-shell tanks under construction



Above: T Tank Farm, 1944

Left: B Tank Farm, World War II


Liquid Observation Well
ENRAF
Camera Observation Point
Dome Elevation Bench Mark
Center Pump Pit
HEPA Breather Filter
Single-Shell Tank (SST)
Saltwell Screen
Supernatant
Saltcake and/or Sludge
Interstitial Liquid Level
Reinforced Concrete Tank
Steel Liner
75 ft. diameter
530,000 - 1,000,000 gal

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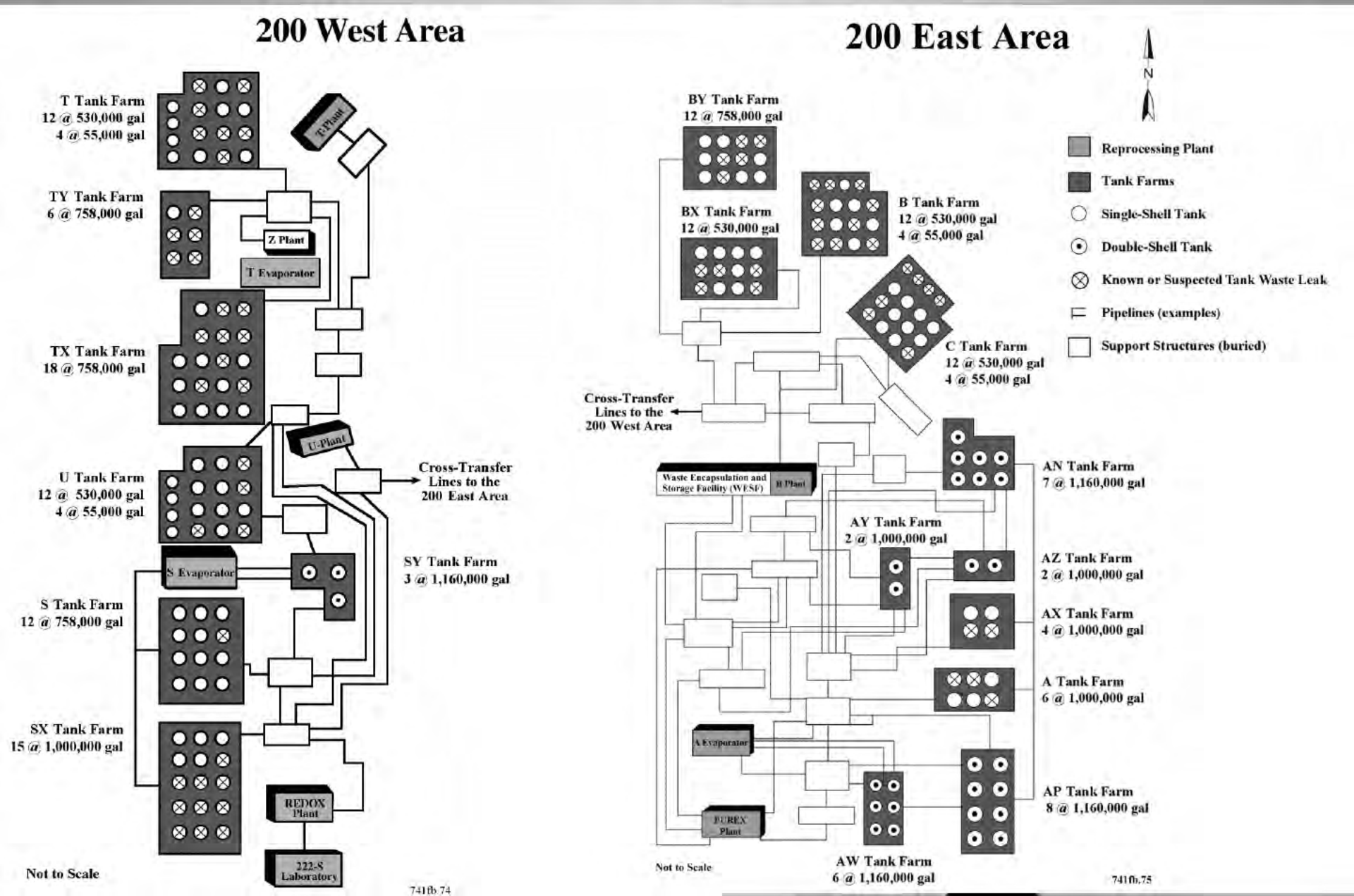
Hanford's 177 underground tanks



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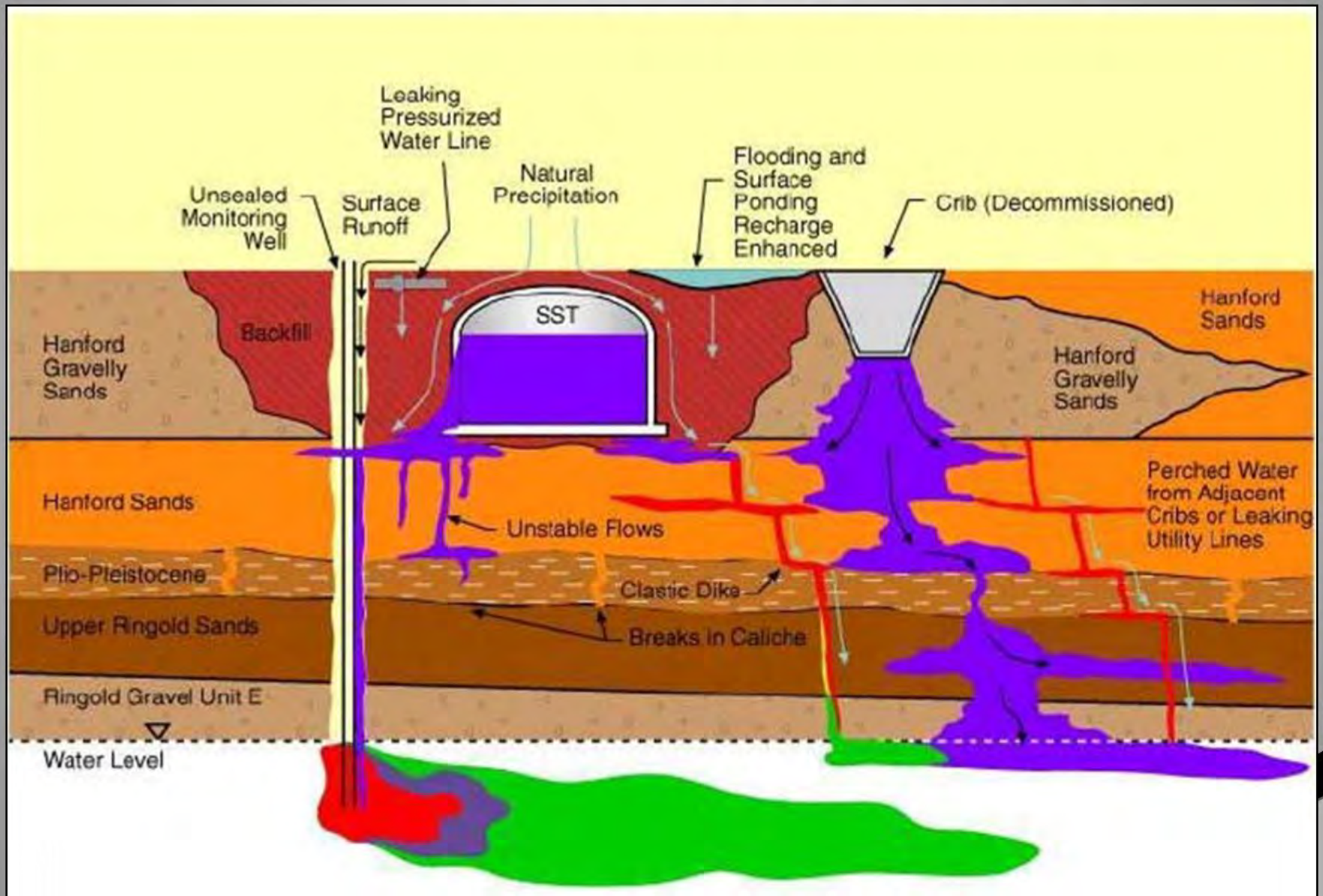
Conceptual Model of Hydraulic Drivers at SST Farms



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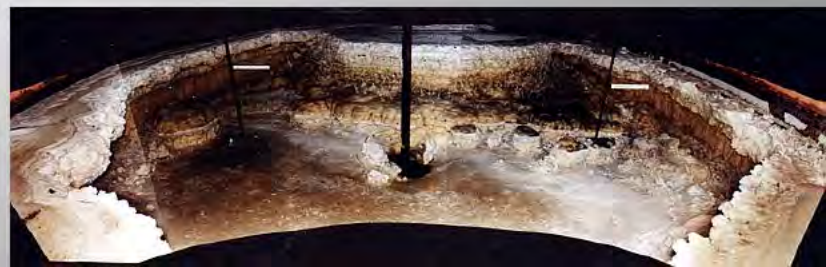
Tank Contents & History

- 177 underground storage tanks
  - 28 double-shell tanks (DST) (built 1968-1986)
  - 149 single-shell tanks (SST) (built 1944-1964)
- High-Level Waste – millions of curies of radioactive materials, long- and short-lived (300 years)
- Dangerous Wastes – acids, caustic sodas, solvents, toxic heavy metals, cyanides
- Tanks exhibit constant chemical/radiochemical reactions generating gaseous chemicals and new chemicals
- 67 SSTs in 12 farms leaked over 1 million gallons, contributing to Hanford's ~72 square miles of contaminated groundwater
- In 2004, USDOE completed interim stabilization (all free liquids pumped from SSTs). The six tanks of current concern were stabilized between 1981 and 1995.

Right: Remaining tank waste "heel" being dissolved to reach 99% waste removal.



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Recent Tank Issues

- Precipitation entering SSTs (intrusion)
- 6 SSTs declared leaking
- DST AY-102 leaking between shells (annulus)
- New, compliant tanks may be needed to support SST retrievals and vitrification plant operations
- The greater concern is over the amount of mobile contaminants (technetium-99, nitrates) in the leaked liquids, not just the total gallons of leaked liquids

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SSTs in Question

Tank	Capacity	Current vol.	~ leak rate	Leaked before 2013?
B-203	55,000 gal	49,000 gal sludge 1,000 gal liquids	15 gal/yr	yes
B-204	55,000 gal	49,000 gal sludge 1,000 gal liquids	15 gal/yr	yes
T-111	530,000 gal	447,000 gal sludge	300 gal/yr	yes
T-203	55,000 gal	36,000 gal sludge	15 gal/yr	no
T-204	55,000 gal	36,000 gal sludge	15 gal/yr	no
TY-105	758,000 gal	231,000 gal sludge	300 gal/yr	yes

Hanford tanks vary in capacity from 55,000 to 1 million gallons.

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In-Tank Monitoring Options

- In-tank data is available measured by:
  1. Tracking one location on the waste surface over time (ENRAF)
  2. Tracking one location of the interstitial liquid level over time (LOW, used in 80 tanks)
- Visual inspections conducted through risers

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Ex-Tank Monitoring Options

- Dry wells around the tanks can be logged to detect leaked radioactive material near the dry well
- Resistive methods can be used to track changes in the soil conductivity and characterize potential soil contamination

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SST Next Steps

- Independently analyze data that led USDOE to believe 6 SSTs are leaking
- Consider options to confirm leaks and mitigate releases to soil, for example:
  - Increase monitoring and sampling
  - Remove liquids with portable evaporator?
  - Place interim barriers?
  - Develop new waste retrieval technologies?

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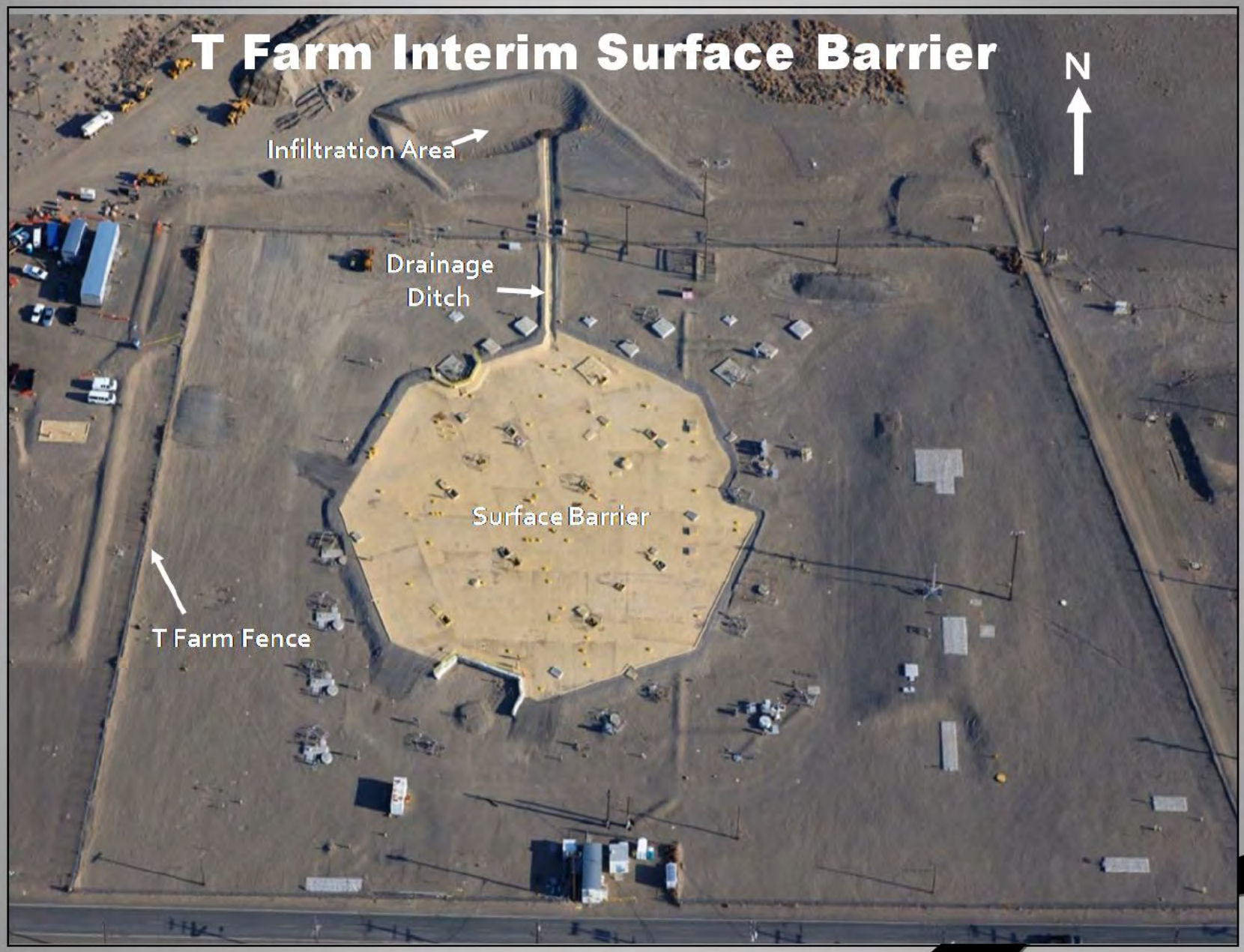

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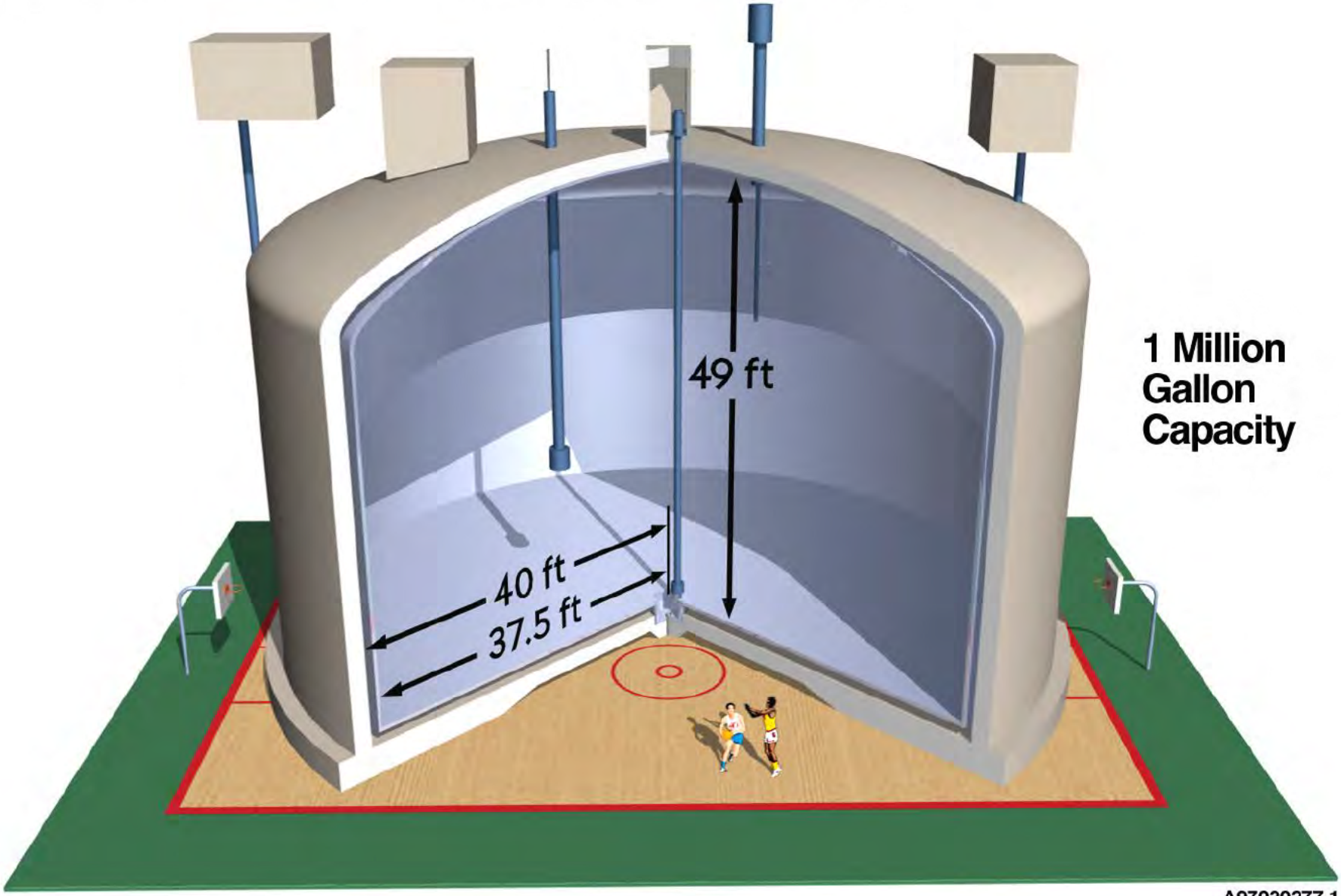
DST AY-102 Leak

- ~1 million gal capacity
  - 151,000 gal sludge
  - 696,000 gal liquid waste
- The contractor, USDOE, Ecology and Health are meeting regularly to discuss options and decide on next steps
  - "The Secretary and I agree that the State of Washington and the federal government must have a thorough and candid discussion about the need for additional storage tanks. Frankly, the State Department of Ecology is not convinced that current storage is adequate to meet legal and regulatory requirements." – Gov. Inslee

Left: Waste inside the annulus of Tank AY-102.

Hanford High-level Waste Radioactive Underground Storage Tanks are Large



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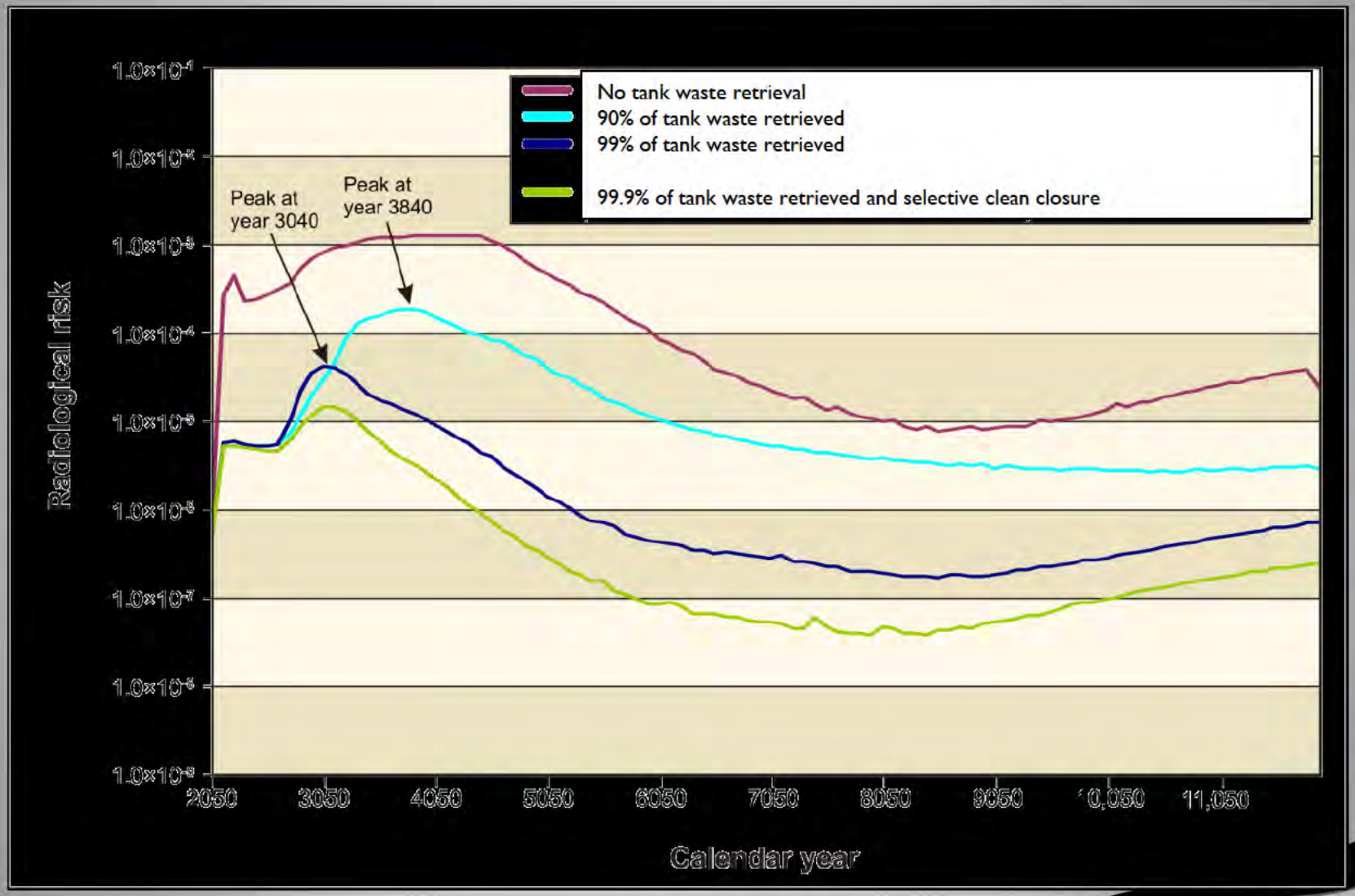
Why waste must be retrieved



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Tank Waste Treatment Issues

Policy issues

- 2010: Vitrification plant start-up date delayed 8 years, after 3 false starts and 2 delays in the current plan – resulting in 21 years of delay in total
- Budget shortcomings and technical issues
- Now more delays may occur

Technical issues

- Black cell design
- Erosion/corrosion
- Pulse jet mixers
- Particulate build-up
- Flammable gas

Above: $12.3-billion vitrification plant Bechtel National, Inc., is constructing at Hanford.

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Questions?

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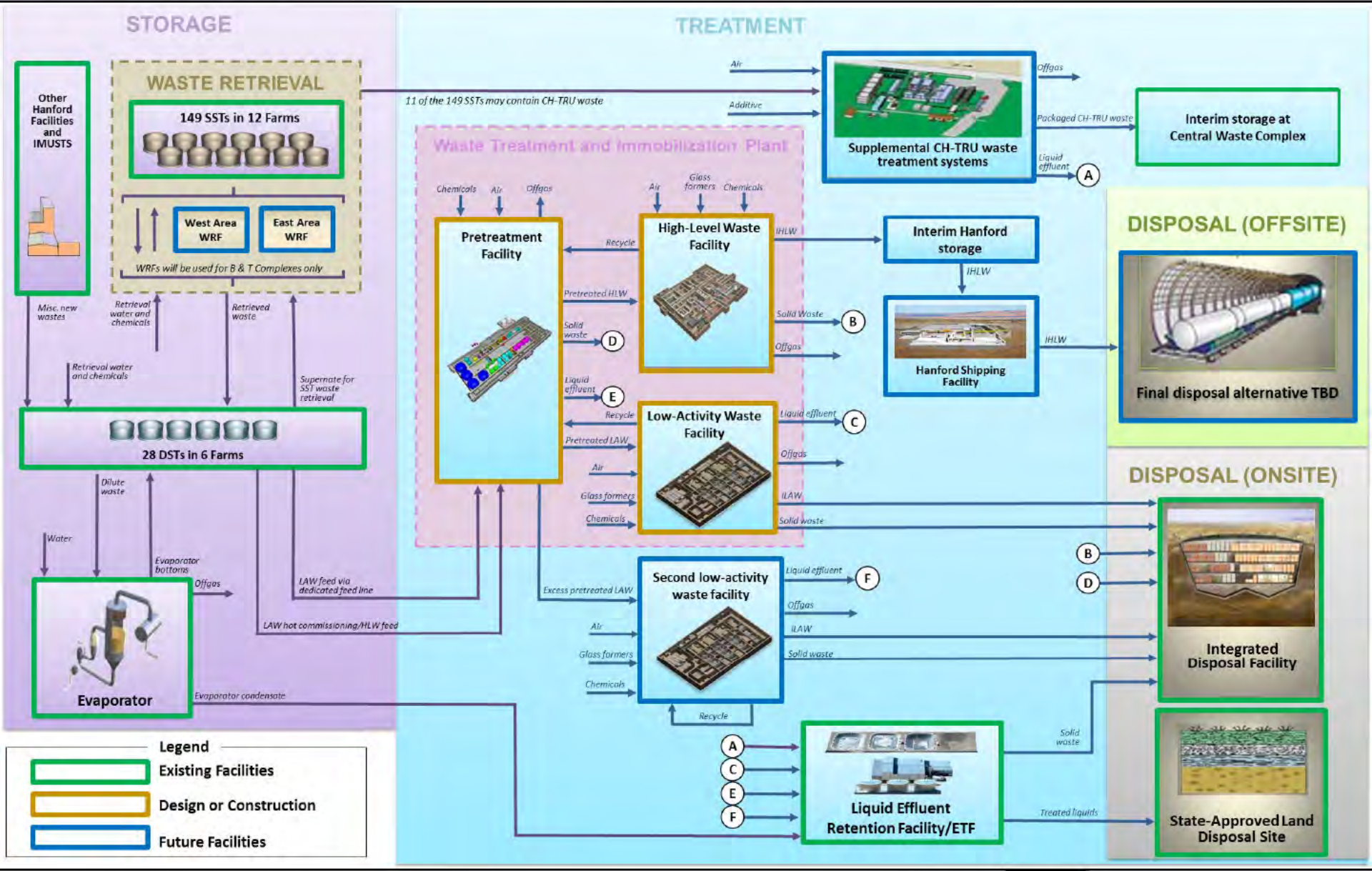

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Surface-Level Monitoring

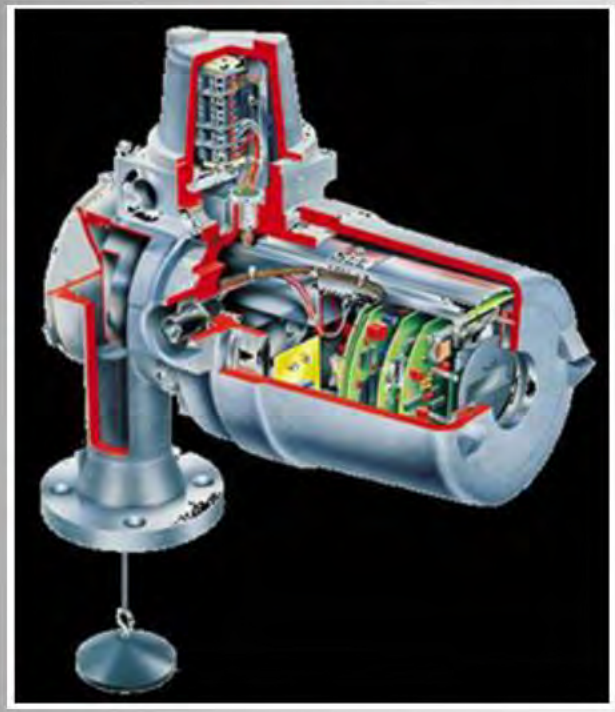

Image in T-111 from approximately 60 feet

ENRAF sensor attaches to riser above ground and detects the surface by monitoring tension in cable as plummet is lowered. ENRAF readings are normally collected once per day for the vast majority of the single shell tanks. All single-shell tanks have ENRAFs.

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Interstitial Liquid Level Monitoring

- Liquid Observation Well (LOW) - fiberglass, plastic, or metal tube capped on the bottom to keep the inside dry
- LOW extends from a riser above ground to near the bottom of the tank
- A neutron probe is lowered through the LOW and location of the liquid is determined by the change in the response due to the hydrogen in liquid/water
- LOW readings are normally collected on a monthly to quarterly cycle
- 80 SSTs equipped with LOWs

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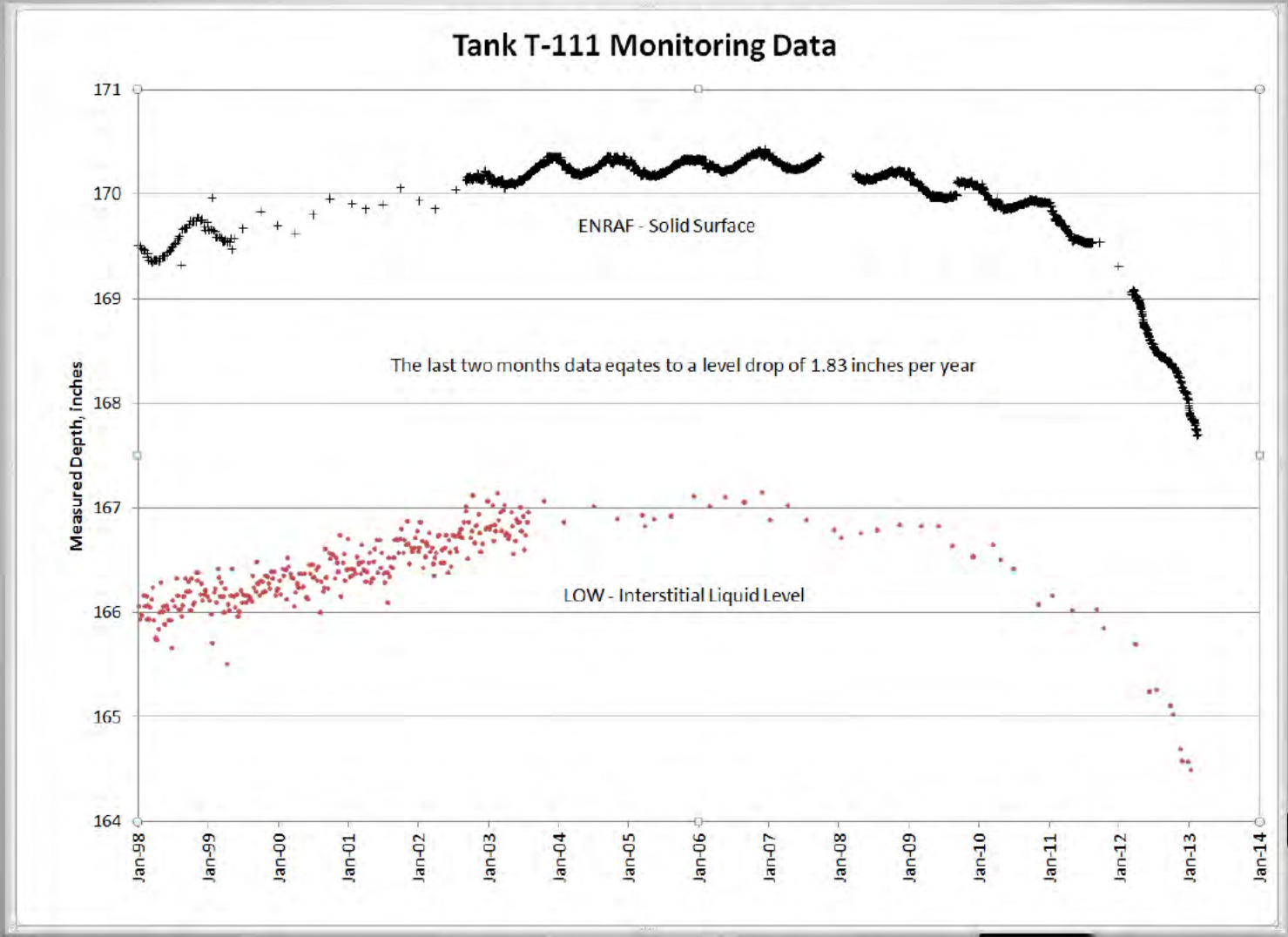
T-111 LOW and ENRAF Data