DEPARTMENT OF
ECOLOGY
State of Washington

6 Hanford Tanks Of Current Concern Briefing

Hanford Advisory Board

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Washington State Department of Ecology

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Six Tanks of Current Concern

Summary Information

	Maximum Capacity	Sludge Volume	Salt Cake Volume	Supernatant	Drainable Liquids
T-111	530 kgal	447 kgal	0	0	38 kgal
B-203	55 kgal	49 kgal	0	1 kgal	5 kgal
B-204	55 kgal	49 kgal	0	1 kgal	5 kgal
T-203	55 kgal	36 kgal	0	0	5 kgal
T-204	55 kgal	36 kgal	0	0	5 kgal
TY-105	758 kgal	231 kgal	0	0	12 kgal

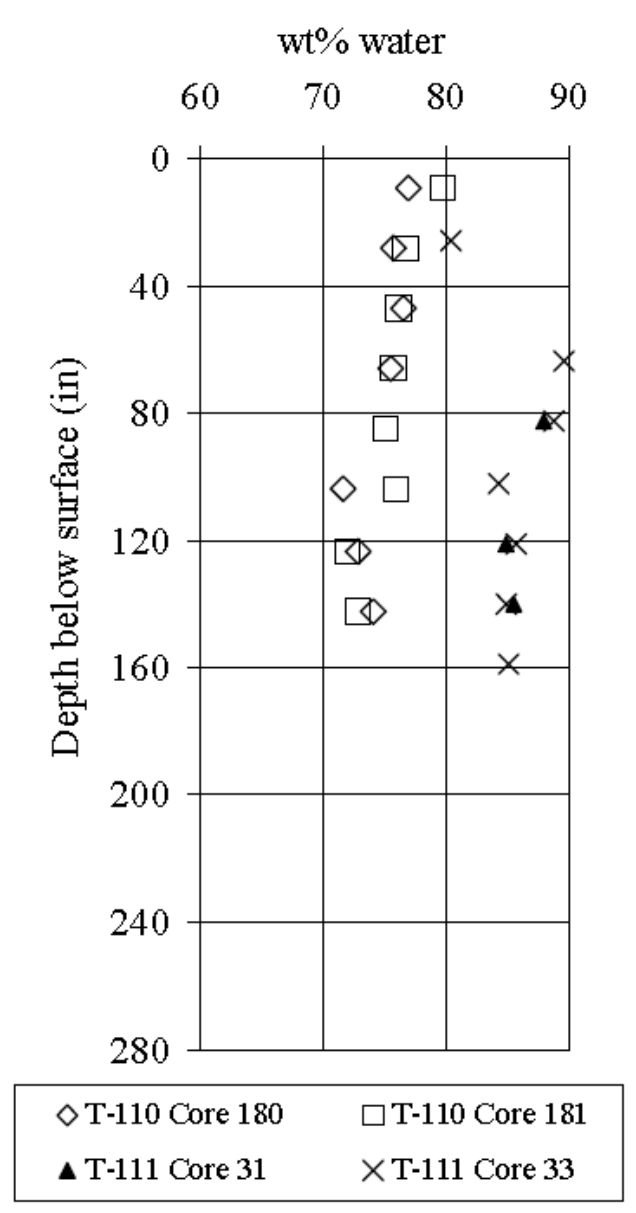
None of these tanks have elevated temperatures. Waste temperatures vary from 50 F to 75F.

Tank T-204, Core 188, Segment #3

B-204, Core 114, Segment #4

From PNNL-14221

This plot shows that the majority of the waste in T-111 is water. This data was obtained by heating core samples to 300 C. Most of this water does not appear to be drainable water but rather is an integral part of the sludge. Other TRU waste has similar water content.



From PNNL-14221

Six Tanks of Current Concern

- T-111, B-203, B-204, and TY-105 were already initially declared assumed leakers in 1977 to 1984
- T-111, B-203, B-204, T-203, and T-204 may be determined to be TRU tanks
- All six tanks were declared inactive by 1977
- All six tanks were Interim Stabilized by 1995
- T-111 and TY-105 are 75 feet in diameter
- B-203, B-204, T-203, and T-204 are 20 feet in diameter

Single-Shell Tank Interim Stabilization

- It is the drainable liquids in the tanks that can leak through the liner and get to the soil.
- All single-shell tanks have had as much of their pumpable liquids removed as was practicable.
- The majority of the Interim Stabilization program was conducted between 1978 and 2004.

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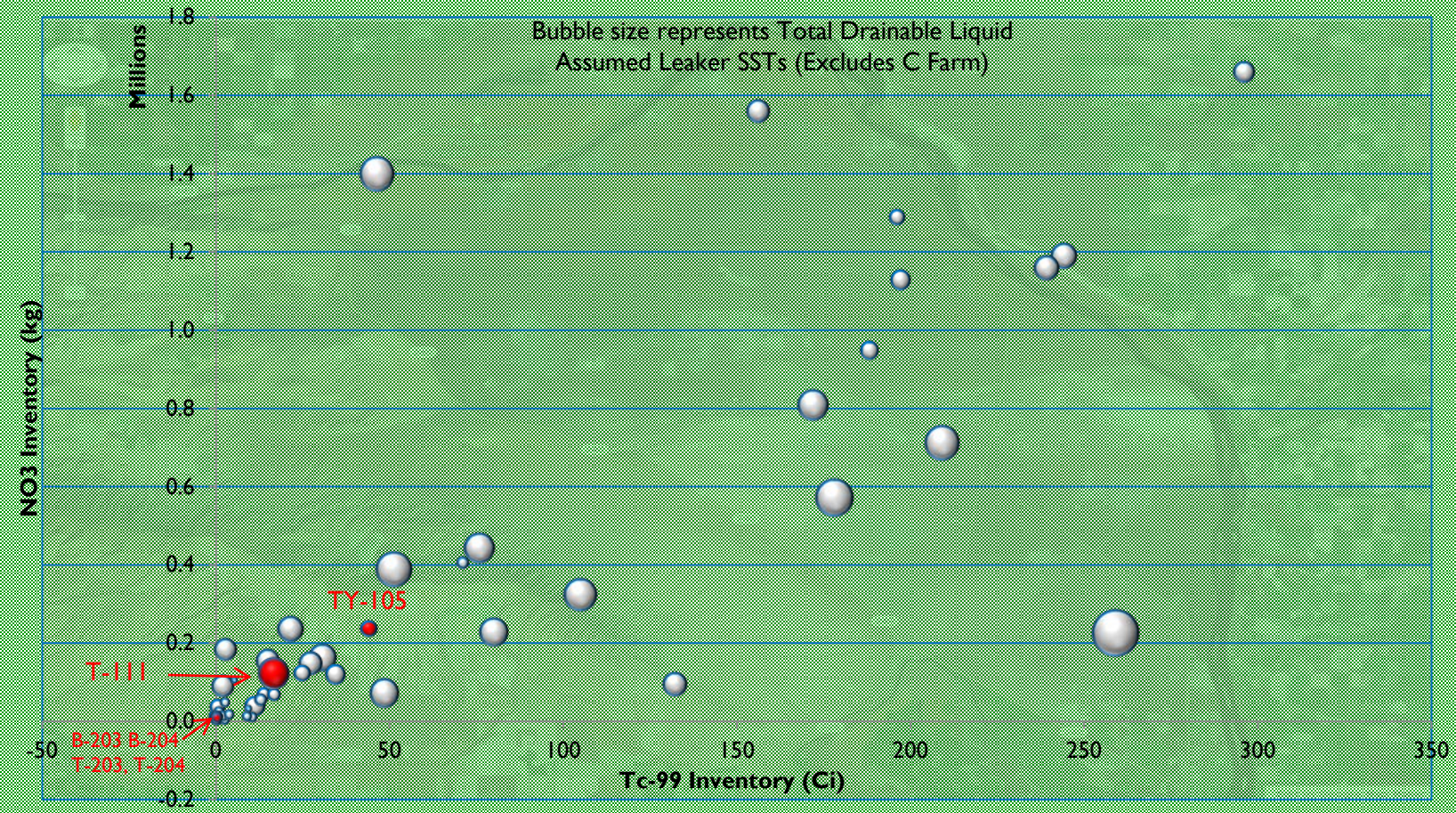
Inventory of Tc-99 and Nitrate



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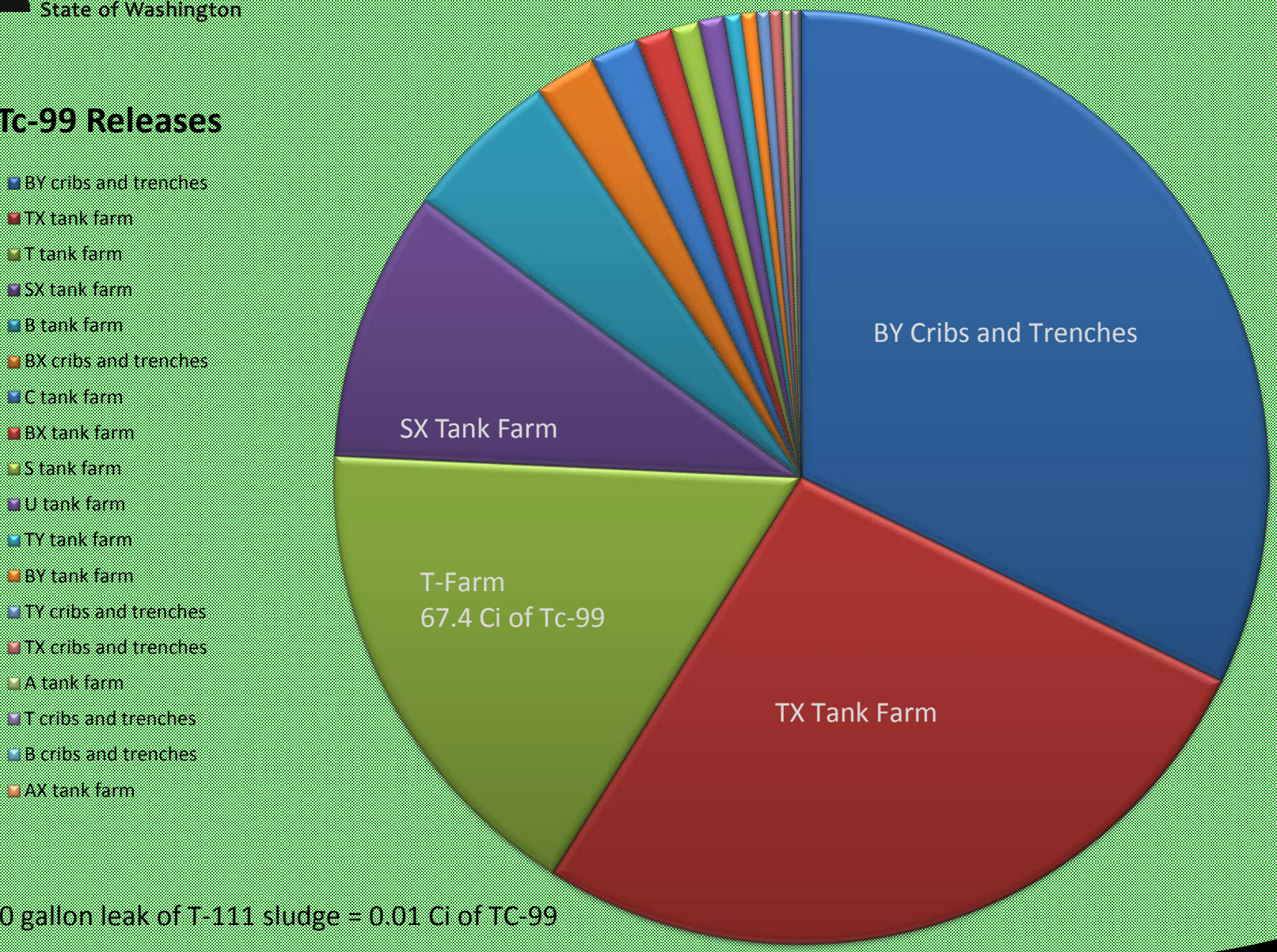
Tc-99 Releases



300 gallon leak of T-111 sludge = 0.01 Ci of TC-99

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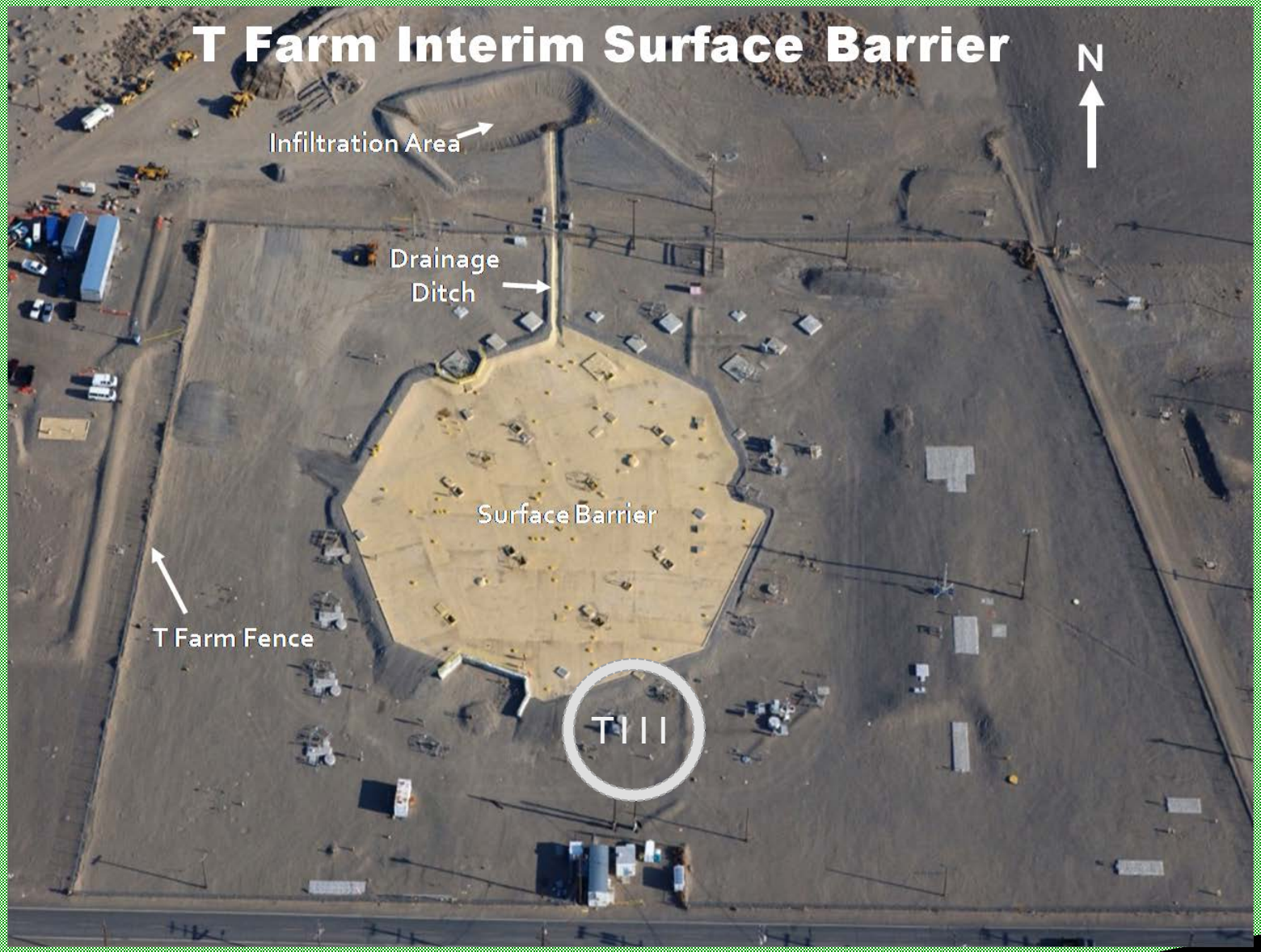
T Farm Interim Surface Barrier



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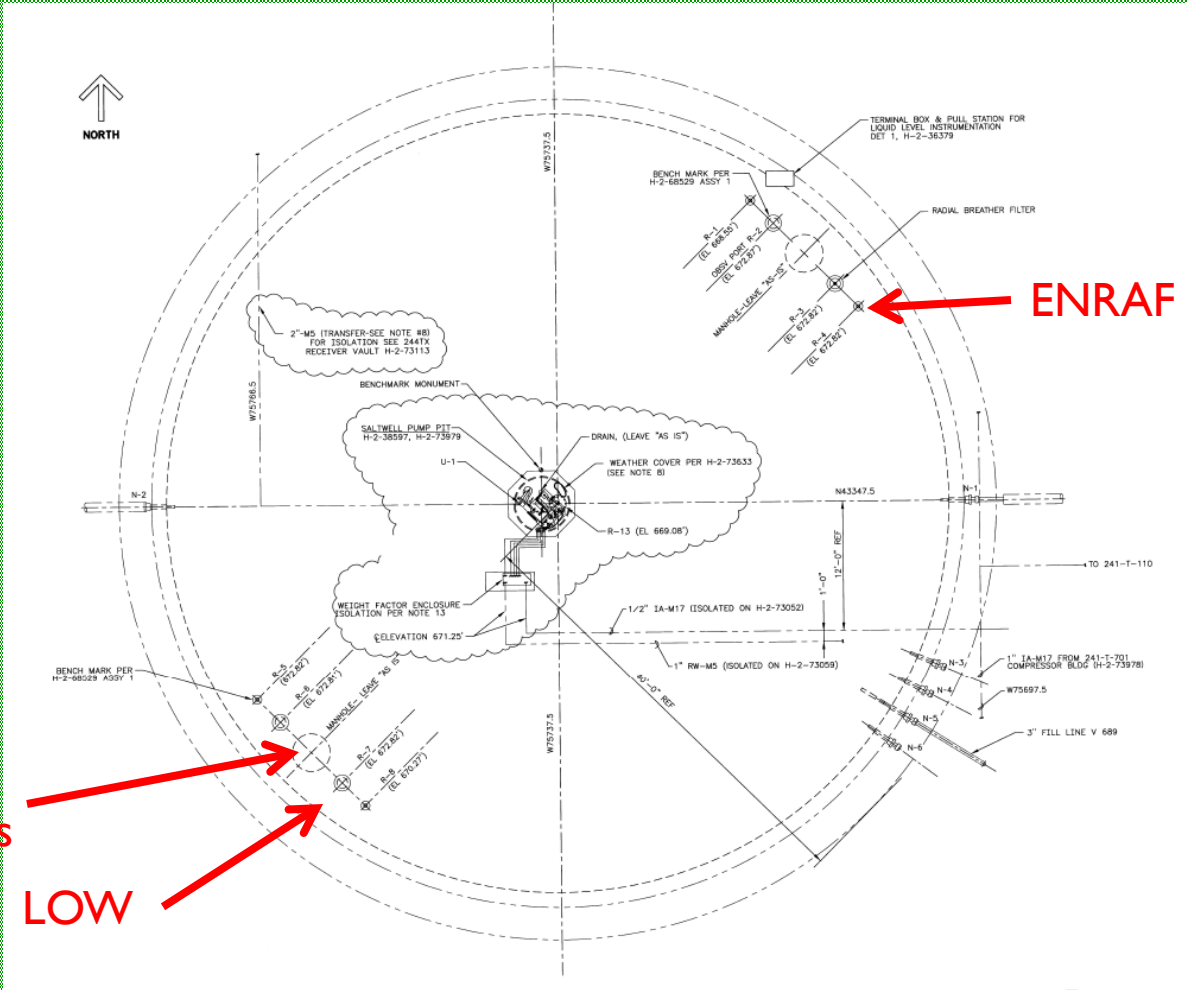
Plan View of T-111



In Tank Monitoring

- Surface level in all single-shell tanks
- Interstitial liquid level in 80 single-shell tanks
- Infrequent visual inspections

Single-Shell Surface Level Monitoring

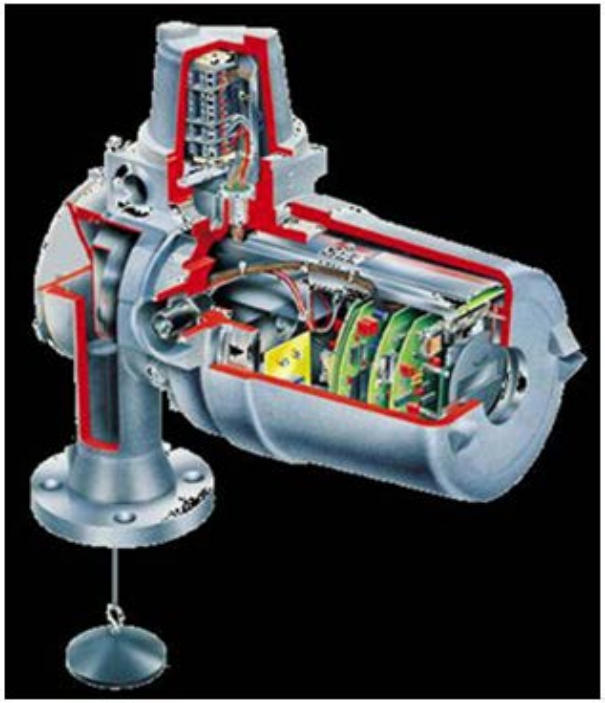


Image in T-111 from approximately 60 feet

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.

Single-Shell Tank Interstitial Liquid Level Monitoring

- A Liquid Observation Well (LOW) is a fiberglass, plastic, or metal tube capped on the bottom to keep the inside dry
- The 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

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Image of T-111 Waste Surface Showing Shallow Pool of Liquid Around Central Salt Well

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Waste Surface in T-111

Thermocouple

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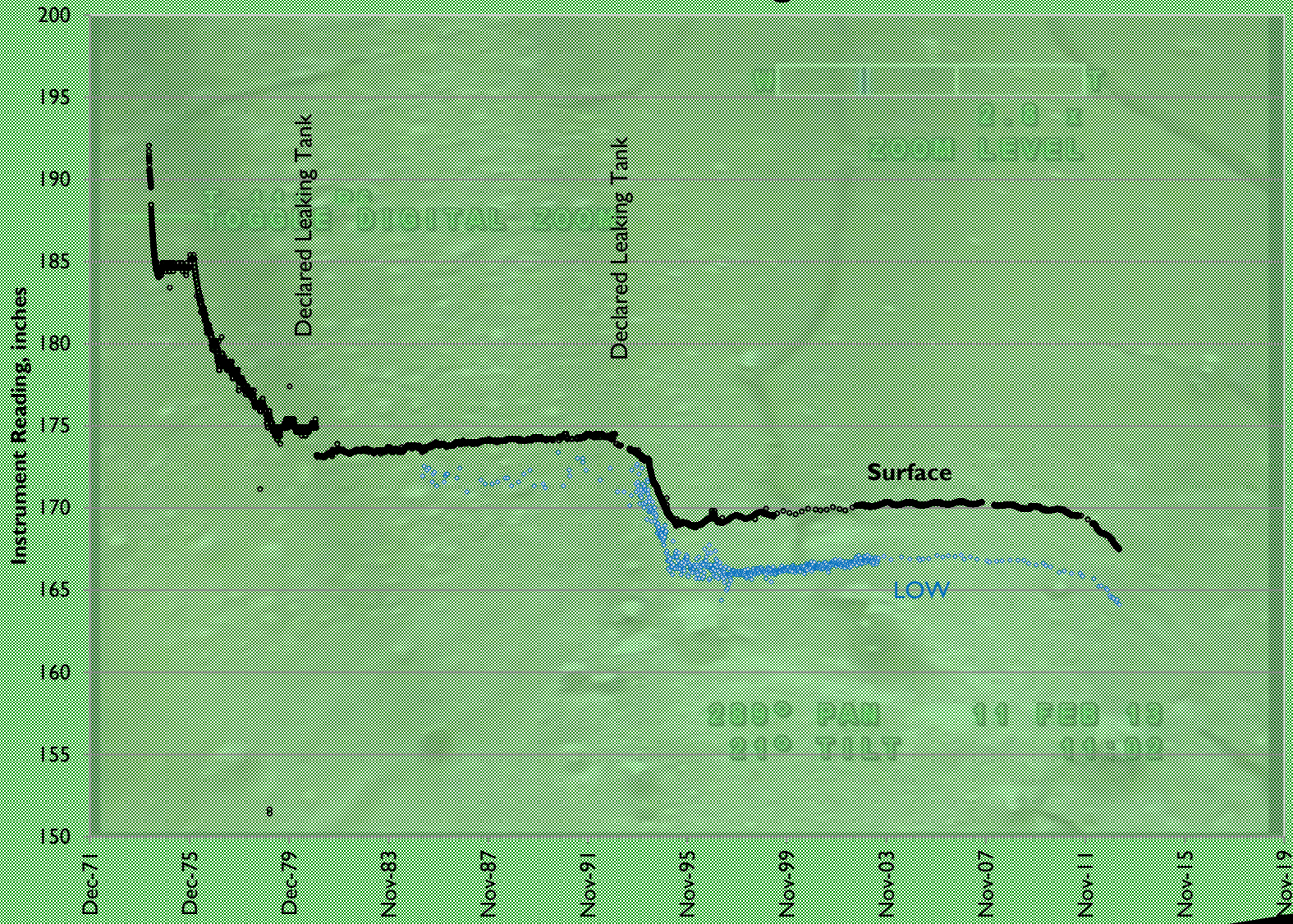
T-111 Monitoring Data



Interim Stabilization Offset

- The following data includes a data set that reflects an increase of 5.7 inches in the ENRAF data for the time after the Interim Stabilization was completed.

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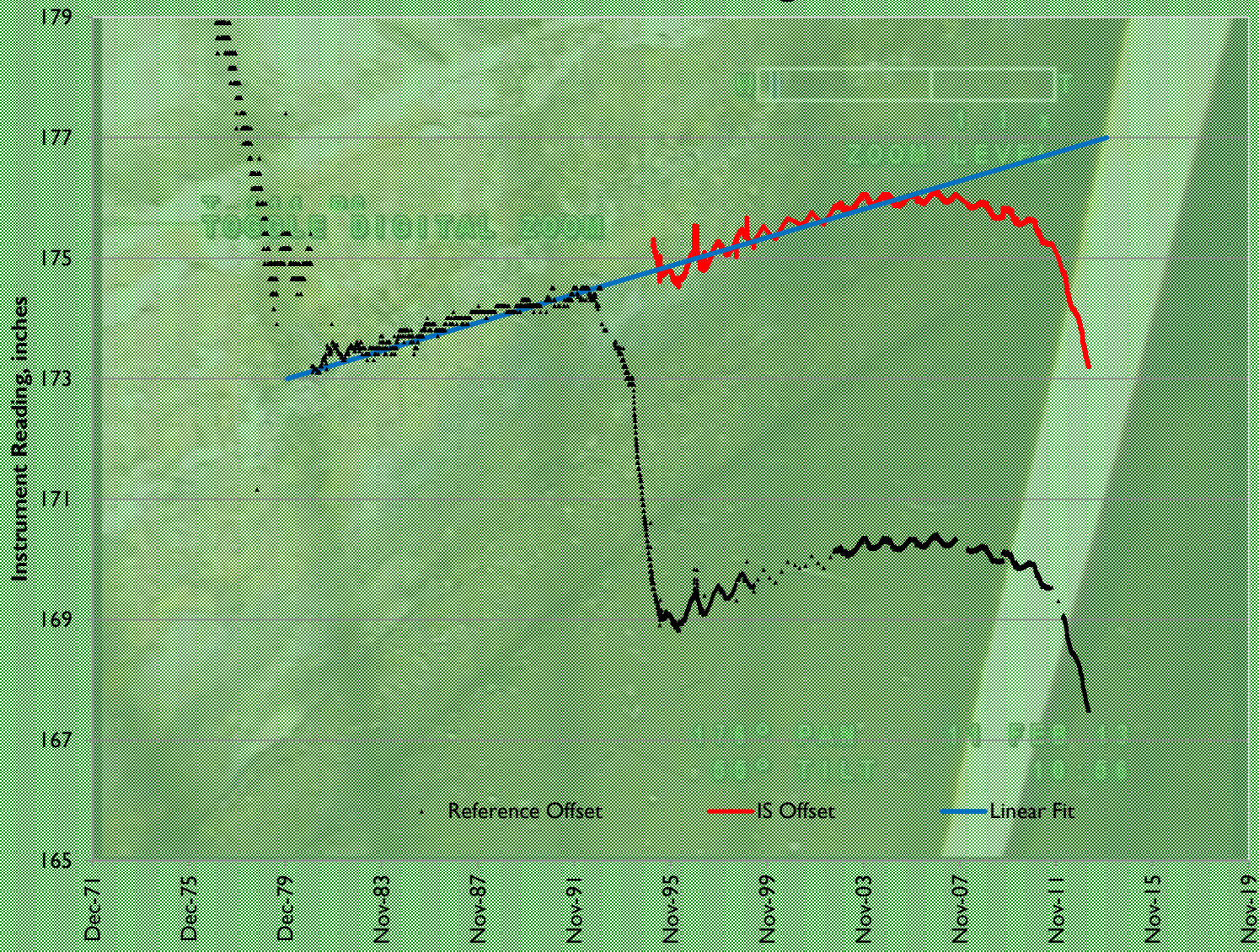
T-111 Monitoring Data



T-111 LOW and ENRAF Data Trends

- LOW and ENRAF data have been tracking each other with an offset of 3.5 inches
- ENRAF data shows annual fluctuations of approximately one-eighth of an inch
- Current surface level is approximately where it was after tank was taken out of service (when consideration is given to liquids removed during interim stabilization)
- If one uses the last two months of level data to calculate a level decrease rate, the rate equates to about 4,000 gallons per year <u>if</u> it is caused by a leak.

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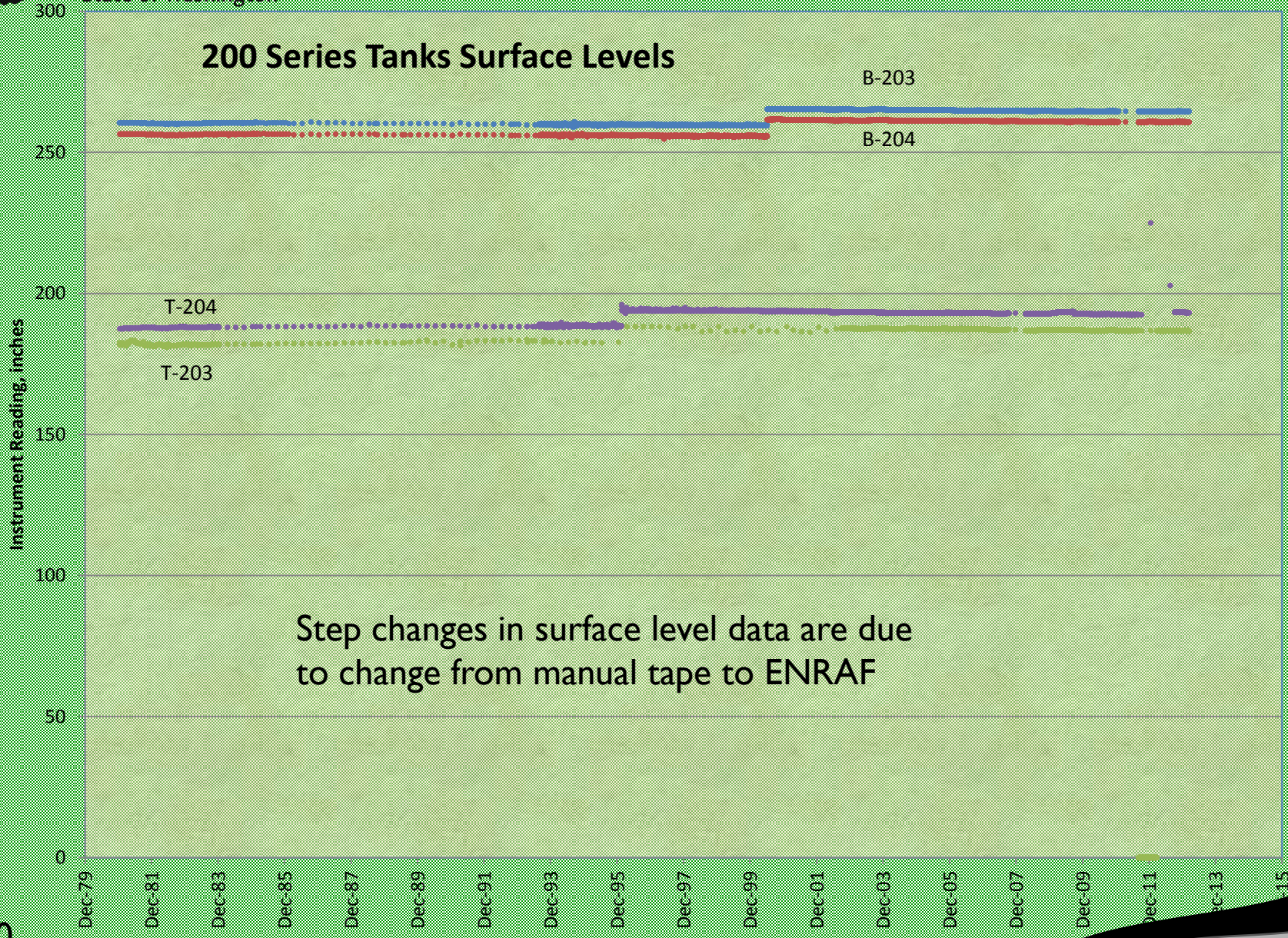

Step changes in surface level data are due to change from manual tape to ENRAF

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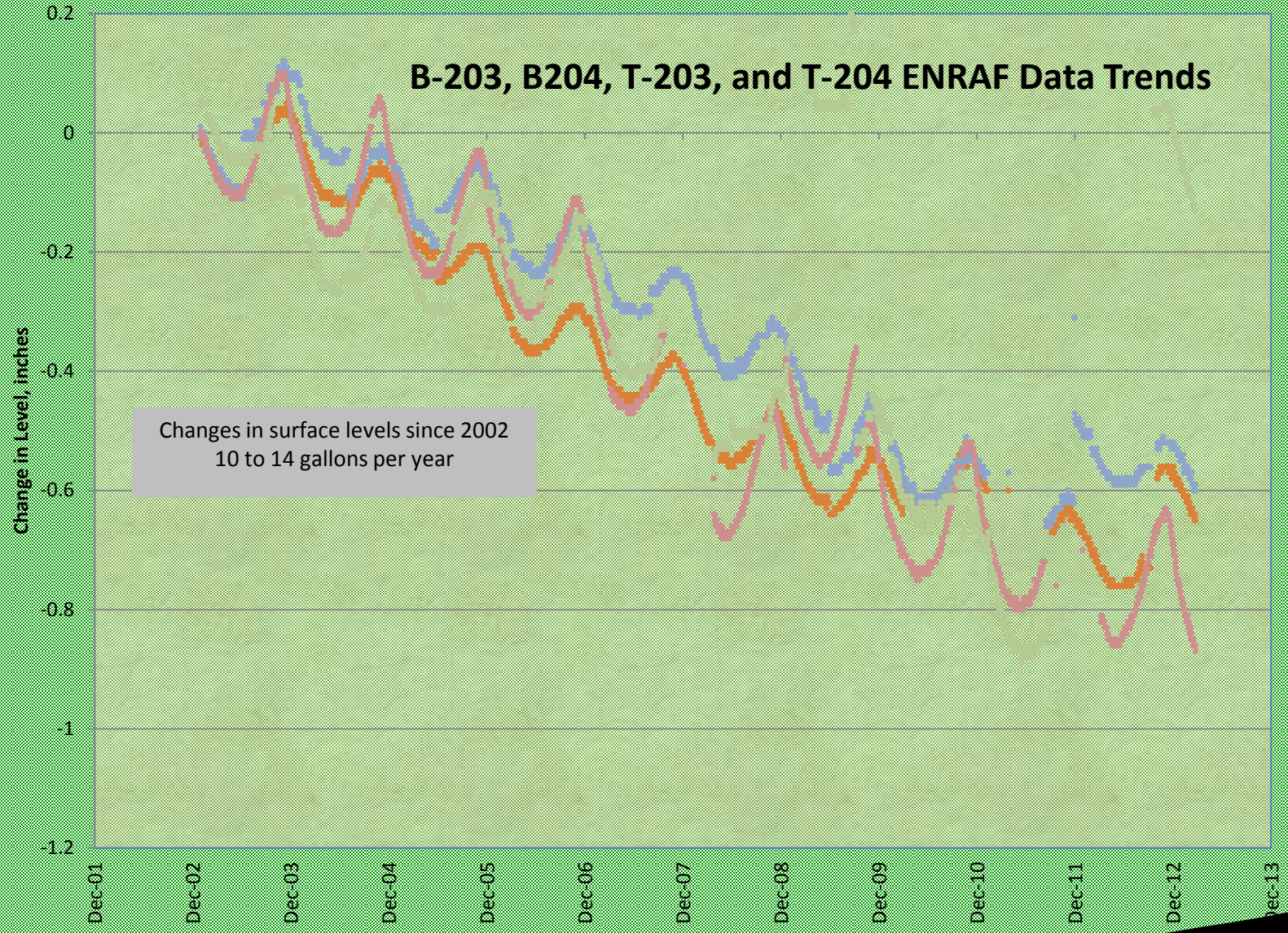

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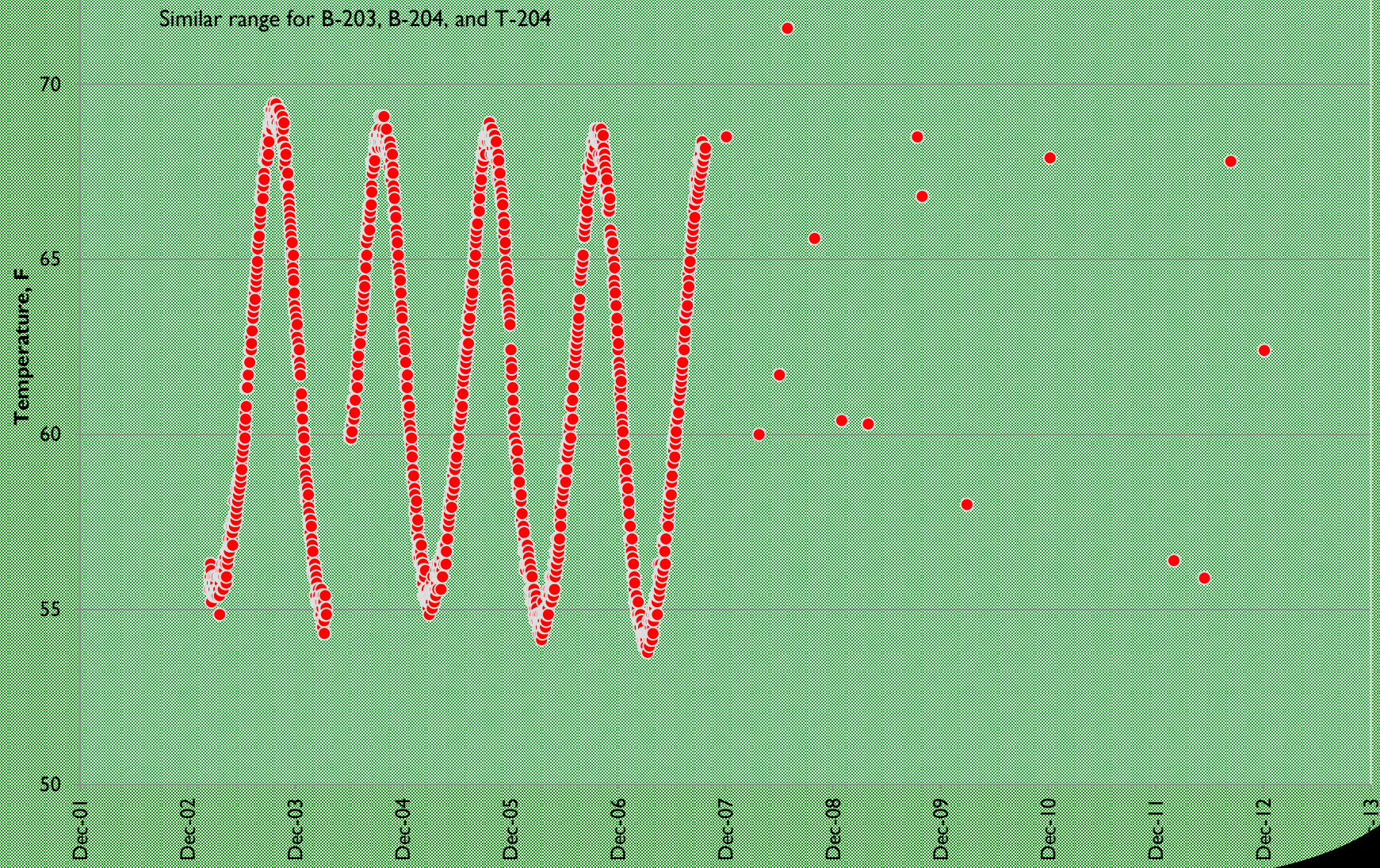
T-203 Thermocouple #1 Temperature

Similar range for B-203, B-204, and T-204



200 Series Tanks

- Tanks B-203, B-204, T-203, and T-204 all show very similar data trends over the past 10 years. Periodic annual fluctuations of about the same magnitude are visible for all four tanks, and the rate of decrease in level is almost identical for all four tanks.
- Tanks B-203 and B-204 are known gas-generating tanks. The manual ventilation valves are checked weekly to assure they are opened due to gas buildup concerns.
- Seems too coincidental that all four tank behaviors have such similar features.

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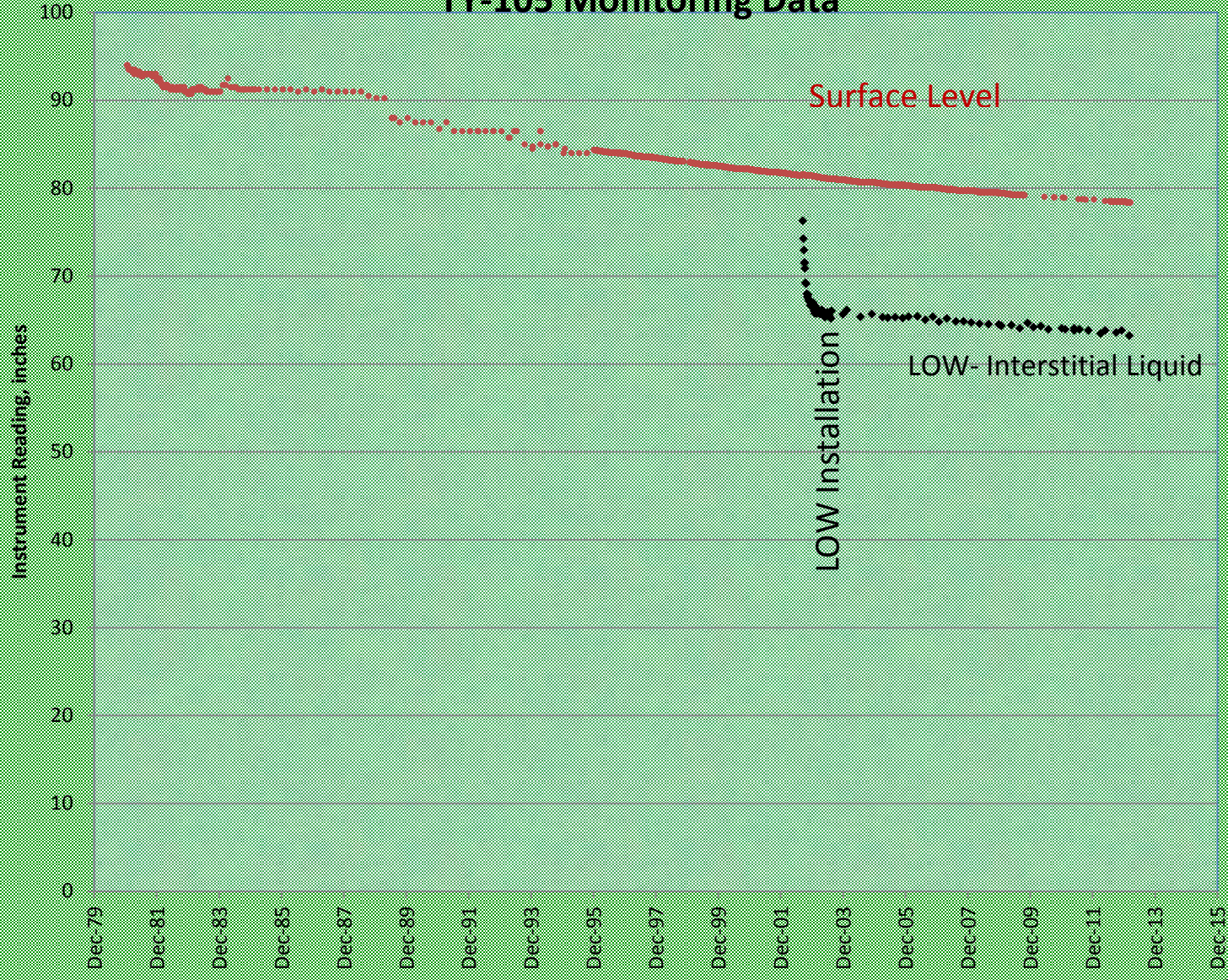
TY-105 Monitoring Data



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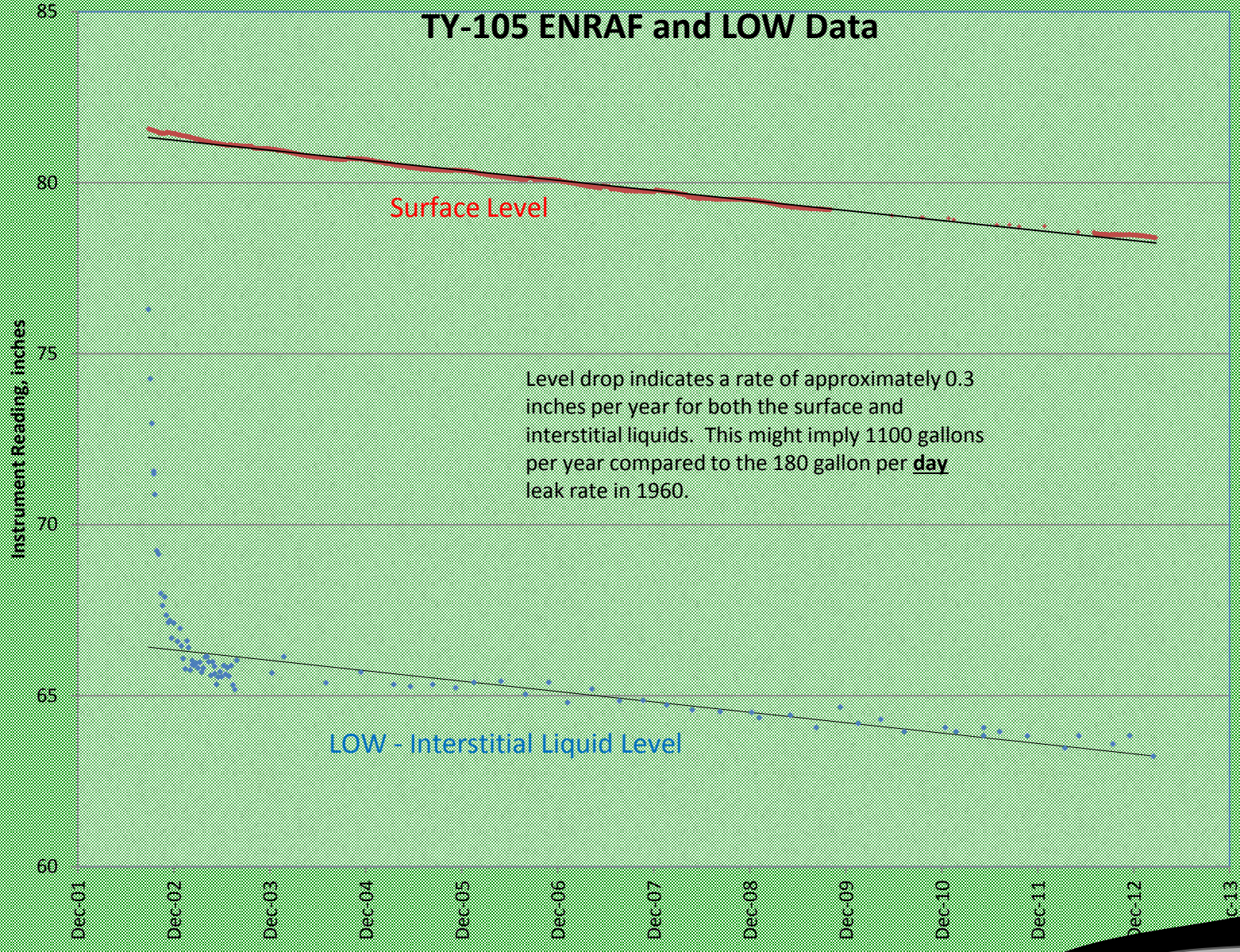

Possible Causes of Level Increases in Single-Shell Tanks

- Intrusion of atmospheric water
- In-flow of waste (however, all inlet lines to single-shell tanks are plugged or capped)
- Gas generation in the waste due to radiolysis or chemical processes. Many sludge containing tanks have such gas generation. SY-101, the "burping tank" had significant increases and decreases in surface level due to retained gas.

Possible Causes of Level Decreases in Single-Shell Tanks

- Breach of the carbon steel liner due to corrosion or other causes and drainable liquids leaving the tank. This is the most likely cause of new tank leaks.
- Breach of the carbon steel liner due to failure caused by high temperature. Many previous leaks were caused by this problem.
- "Reopening" a leak that had "sealed" itself.
- Evaporation of the water or other liquids in the waste.
- Release of previously trapped gases from the waste. Historically, gas generation and release have been associated with sludge waste. Retained gas is currently a concern for some double-shell tanks.

Hypothetical Case for Gas Retention

- All of the six tanks considered here are sludge containing and each shows periodic, annual fluctuations in the surface level corresponding with tank temperature fluctuations. This could be due to expansion/contraction of bubbles.
- The surface of T-111 shows pits consistent with the escape of gas bubbles.
- Tanks T-111 and TY-105 show the surface and interstitial liquid levels changing at the same rates. It is expected that liquids draining from the tanks would lower the interstitial liquid level much faster than the free surface.

Summary

- The available data clearly shows changes in the monitoring data for the waste levels in these tanks.
- Evaporation and gas release may explain at least some of the level changes.
- We do not know with certainty how fast these tanks might be leaking – further analysis and monitoring is required.
- Steps to reduce the adverse impact of possible leaks should be undertaken.