Tank Closure Topics

Formerly *Update: C-Farm Closure*

Volume 2, Issue 2

Providing the Washington State Department of Ecology's views on Hanford tank closure activities

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Why It Matters

The 586-square-mile Hanford Site is located in south-central Washington along the Columbia River. Hanford's mission included defense-related nuclear research, development, and weapons production activities from the early 1940s to approximately 1989. During that period, Hanford operated a plutonium production complex with nine nuclear reactors and associated processing facilities.

DEPARTMENT OF ECOLOGY
State of Washington

Barriers Slowing the Spread of Contamination

Each year, Ecology and the U.S. Dept. of Energy meet to discuss interim measures for protecting the environment until cleanup is complete at Hanford. The implementation of interim barriers over tank farms is a result of those meetings.

Until the waste is retrieved from the single-shell tanks (SSTs) and the tanks are officially closed, soil contaminants will continue to move toward groundwater, driven by natural precipitation and infiltration. As the current schedule for SST retrieval extends over the next few decades, interim barriers were constructed over two tank farms, T and TY farms.

The barriers collect and drain any precipitation away from the tank farms and into adjoining uncontaminated areas (T interim barrier) or into an evapotranspiration pond (TY interim barrier).

These interim barriers are being monitored to determine their performance in the shallow vadose zone. The vadose zone is the area between the ground surface and the water table.

While these barriers do not stop continued transport of contaminants in the deep vadose zone, interim barriers reduce the volume of water available to further spread contaminants.

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What's in the Toolbox for Retrieval?

The 2010 Consent Decree declared that waste retrieval be completed for the remaining 10 C-Farm single-shell tanks (SSTs) by September 2014. The U.S. Dept. of Energy (USDOE) Office of River Protection (ORP) knows it will take some good planning, efficient retrieval tools, and timely implementation to reach that deadline. Some tools are simple, others intricate and complicated.

In some tanks, the top layer of waste is similar to chunky or dried mud. In other tanks, the top layer is a dissolvable solid, like an animal salt lick block.

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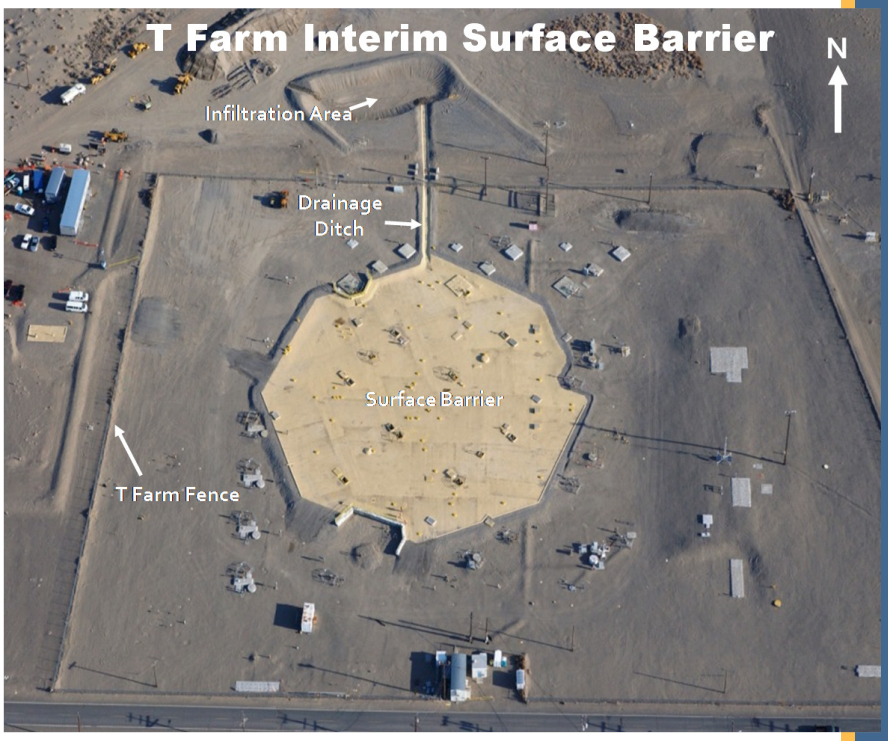

Extensive soil sampling and monitoring well data in the Hanford tank farms shows contamination distributed throughout the vadose zone.

Ecology doesn't think the volume of contaminants believed to have leaked from the SSTs, or spilled throughout years of tank farm operations, is big enough to infiltrate through the entire vadose zone to groundwater. That's a depth more than 200 feet below the tanks! But we believe water added to the soil from natural precipitation, and both planned and unplanned releases of water, has contributed significantly to driving released contaminants to groundwater.

A Tri-Party Agreement change package to Milestone M-45-98-03 was signed in March 2001. Three new milestones were added: M-45-56, M-45-57 and M-45-59. They addressed interim and corrective measures that would minimize the addition of liquid that could drive existing soil contamination to groundwater.

One objective was to reduce the volume of unplanned releases of liquids to the soil. Historically, unplanned releases of water to soil around tank farms have included:

1. Flooding of the tank farms from rapid runoff and infiltration of snowmelt (usually as a result of Chinook winds).
2. Acute and chronic leaks from water distribution lines in and around tank farms.
3. Testing of fire hydrants by turning them on and allowing discharge to soil.
4. Washing contaminants into the soil to reduce hazards to workers.
5. Hydro-excavation (digging with a high-pressure water stream).
6. Dust control.

A two-stage approach was adopted to correct the first two:

1. Construct a system of berms and gutters surrounding each tank farm to divert runoff from the tank farms.
2. Test all water distribution pipelines in and around the tank farms. Those in need of repair were remediated; those no longer needed were cut and capped to prevent further releases of water. Most, if not all, of these pipelines were well past their design life.

The last four drivers were stopped by adopting procedures prohibiting the activities.

These interim measures were completed in 2001 and 2002. Interim barriers are being considered in the near future at the SX, BX and BY tank farms.

The interim barriers are not the final remediation of these tank farms and will not affect permanent corrective measures that will be implemented when the tank farms are closed.

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Both types of waste can be broken apart and dislodged from the tank with water and pressure, like being doused with a fire hose. The "fire hose" process is called modified sluicing and uses high-pressure water jets placed through risers into the tank. The water breaks up and moves the waste toward a pump. Modified sluicing uses liquid waste recycled from double-shell tanks. This reuse of liquid reduces the overall retrieved waste volume. Also, an enhanced modified sluicing method was recently developed. With this new improvement, the jets are lowered very close to the waste surface to break up the waste particles with more force.

If the waste becomes difficult to break up, it may take a larger tool to aid in waste removal. The FOLDTRACK tractor has been successfully used in the SSTs and is ready for further deployment. The FOLDTRACK is a remotely-operated, track-mounted system that uses a wide blade to move waste from the bottom of the tank to a central pump. The front of this equipment is fitted with two water jetting systems to help move waste. The equipment can actually fold open after being lowered through a 12" diameter riser making it convenient to position in the SSTs. Operators direct the tractor's movement remotely, from a trailer outside of the tank farm. Controlled movement of the FOLDTRACK allows the operators to direct waste out of the reach of modified sluicing jets to the central pump.

In some tank waste removal operations, a larger but "gentler" tool is necessary to reach, break up and move the waste out of the tank. This tool is called the Mobile Arm Retrieval System (MARS). The MARS can be used in tanks that are suspected to have leaked or have questionable integrity. The complete system includes a robotic arm, a central pump and ancillary equipment to transfer the tank waste. The arm has a wide range of motion and a telescoping capability to reach all parts of the tank. It uses small volumes of high pressure liquids to move and break up the waste. One MARS unit will be designed with a vacuum at the end of the arm to assist in waste removal.

Chemical dissolution will be another retrieval tool to remove waste from the SSTs. This process consists of many steps, including washing the waste with water, adding chemicals like sodium hydroxide, soaking and pumping. The exact sequence and timing of the individual dissolution processes is commonly determined from laboratory testing with an actual waste sample.

Modified sluicing was successfully used in tank C-103. Waste was retrieved to less than one inch (depth) of waste. Enhanced sluicers with the extendable arm will be placed in at least three tanks. It is expected that the waste in these three tanks is hard and cemented and will benefit from the ability of the sluicing arms to reach close

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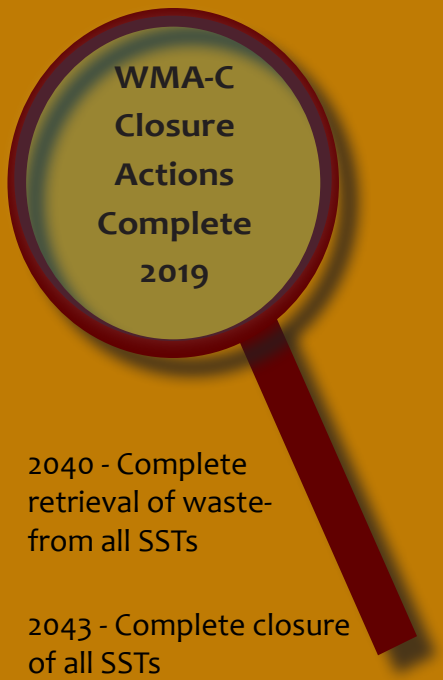
Tri-Party Agreement Dates for Tank Closure

2003 - First SST emptied - C-106, followed by C-203

2014 - Complete WMA-C Closure Demo

2019 - Waste Treatment Plant begins treating waste



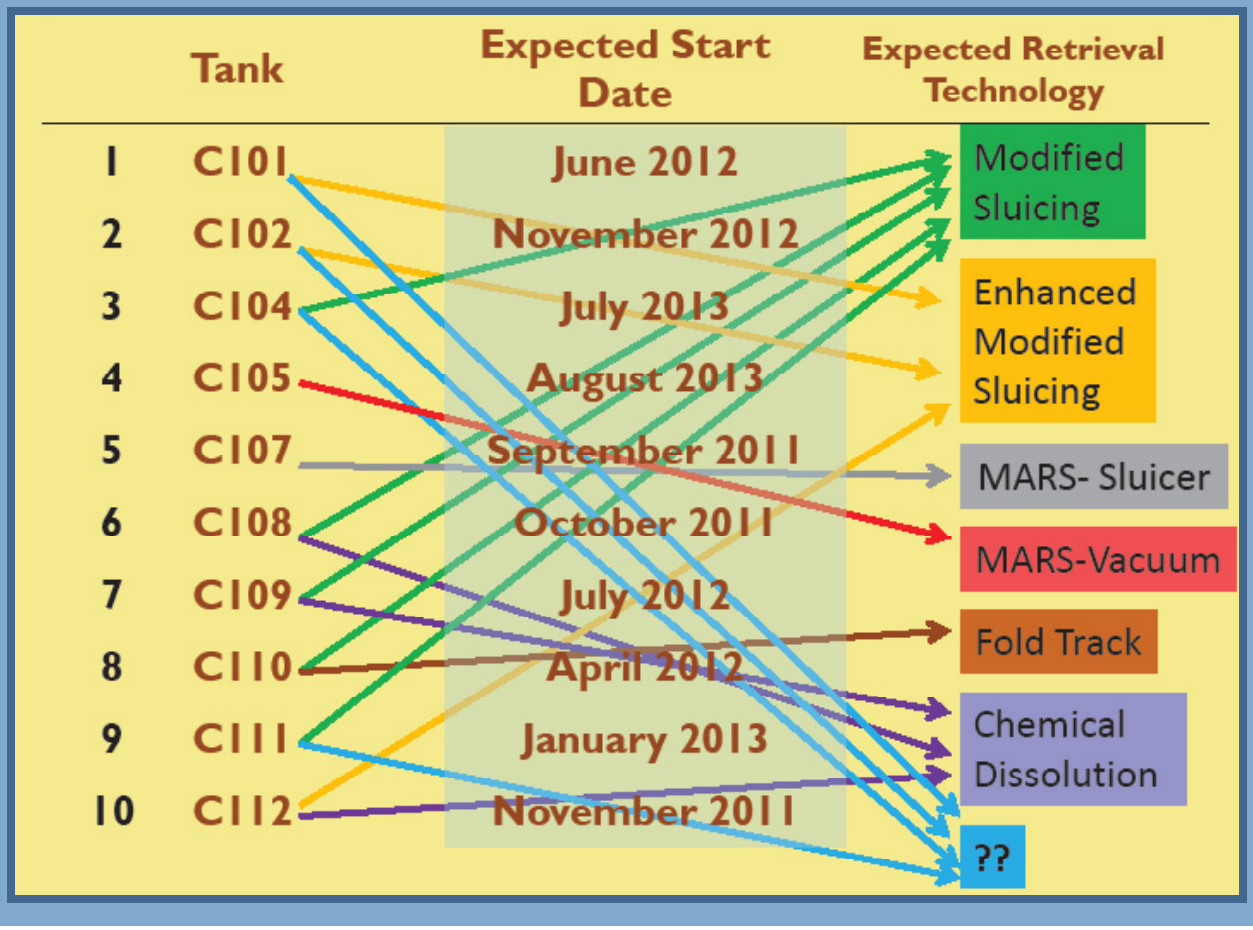
2040 - Complete retrieval of waste- from all SSTs

2043 - Complete closure of all SSTs

Current C-Farm timelines are based on landfill closure.

Barriers to water intrusion, will be placed over tank farms which will prevent the spread of contamination left in the soil.

C-Farm is the first waste management area scheduled for closure. Retrieving the waste to 360 cubic feet or less as required in the Tri-Party Agreement will be challenging and take many different tools. The current schdeule is shown below.



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and break up the waste. If the sluicers do not remove waste to less than 360 cubic feet of waste remaining, then the Consent Decree requires a second technology be used to remove more waste.

MARS is currently working in C-107 and is expected to remove waste to less than 360 cubic feet with all the tools incorporated into it. The direct water pressure and a large backstop can both be used to move more waste toward the pump than any other retrieval tools used to date.

Retrieval plans vary from tank to tank; however, waste retrieval is expected to be completed in C-Farm tanks by 2014. The current plan is to use the tools in the graphic above. The waste in the SSTs will be removed in the most efficient manner and with the best retrieval tools. The toolbox of retrieval technologies is fairly full. We have high expectations that waste retrieval will be completed by 2014. Do you?

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DEPARTMENT OF ECOLOGY
State of Washington
Nuclear Waste Program
hanford@ecy.wa.gov * 800-321-2008