Hanford Advisory Board Draft Advice

Topic: Leaking Tanks *(revised from prior draft advice Double-Shell Tank AY-102)*
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Originating Committee: River & Plateau
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Background:

The U.S. Department of Energy – Office of River Protection (DOE-ORP) has recently confirmed that interim stabilized single-shell tank T-111 has resumed actively leaking. The Secretary of Energy also indicated that five other single-shell tanks may be leaking. DOE-ORP is reassessing the status of these and other single-shell tanks.

Significantly, DOE-ORP announced at the Tank Waste Committee meeting on April 10, 2013 that the cause of the leak in the bottom of double-shell tank AY-102 was due to corrosive materials on the tank floor. Waste has leaked into the annular space and is now in contact with the thinner, secondary tank. This is a concern due to the short design service life for the thinner secondary tank, coupled with the inability to monitor the conditions of waste that may have leaked under the tank. There is also potential to compromise an active air cooling system which helps regulate thermal heat generated by tank contents. As occurred with the primary tank, when built there were extensive weld repairs required on the secondary tank.

Tank waste at Hanford has a history of chemical change over time resulting in the waste deviating from specification controls and becoming corrosive. In addition, because of tank design and construction, there is no way to directly assess the condition of the secondary tank under the refractory, the chemistry of the waste between the tanks, or to adjust that chemistry and bring it into balance. As a result, corrosion protection of the secondary tank cannot be assured. The most recent Ecology inspection field monitoring report (AY-102 201303-14 Riser 83 Field Monitoring Report) indicates that the waste in the annulus space has continued to slowly increase over time.

The RPP-ASMT-53793 Rev 0, *Tank 241-AY-102 Leak Assessment Report* indicates that the contents of AY-102 have not been sampled since 2005. The history of ongoing chemical changes in tank waste, the lack of sampling of waste in contact with the bottom of the tank, and the occurrence of a leak in the floor of a double-shell tank demands a more aggressive chemistry and corrosion monitoring program.

The RPP-ASMT-53793 Rev 0, *Tank 241-AY-102 Leak Assessment Report* indicates that the waste in the tank is thermally hot as a result of the addition of waste from C farm tanks. It is evaporating up to seventy-two gallons of water per day. Based on previous history, the waste liquids alone cannot be pumped out of the tank to minimize leakage. This action would cause the remaining sludge to overheat, chemically react, and possibly lead to flammable chemical generation and other problems. Therefore, when waste is removed, all of the waste must be pumped, both liquids and sludge. Sluicing the waste may also lead to increased leakage. If

pumping is delayed, the rate of leakage may increase through additional corrosion. Urgent pumping is required.

The Washington State Department of Ecology and DOE-ORP have agreed to pump out the contents of double-shell tank AY-102. The tanks receiving this waste will need to be carefully assessed to assure that transfer of AY-102 waste to these receiving tanks does not lead to additional tank failures. Many of these tanks will exceed their design lives before the retrieval mission is completed. Failures must be expected over time and contingencies built into this process. Systematic solutions need to be developed that will look at the options available in the tank farms. The Hanford Advisory Board (Board) believes that pumping leaking tanks must not be delayed.

Advice[1]**:**

1. The Board advises DOE to urgently remove the drainable liquid from single-shell tanks, focusing first on leaking tanks.
2. The Board advises DOE to fully retrieve leaking single-shell tanks as soon as possible to prevent further leakage to the environment.
3. The Board advises DOE to provide for monitoring the soil around known leaking tanks to determine the nature and extent of leaked waste, determine possible leak locations, and monitor migration pathways during the retrieval planning process and during and after retrieval operations.
4. The Board advises DOE to reinstate a routine monitoring program in the existing single-shell tank drywells, giving priority to tanks known or suspected to be leaking and/or containing significant quantities of drainable liquid.
5. The Board advises that waste should be removed from leaking single-shell and double-shell tanks as soon as possible.
6. The Board advises DOE to request additional funding starting in FY2014 and 2015 for removing waste from leaking tanks and initiate an accelerated process of building new double-shell tanks.
7. New tanks are needed. The Board advises DOE to initiate immediately the process for the funding and design of new tanks.
8. The Board advises DOE to conduct a root cause analysis of the failure to report and to respond to the leak in AY-102 in a timely manner when the leak was first detected in 2011. Corrective Actions should be issued as a result of the investigation.

[1] *PLEASE NOTE: These advice bullets are numbered for ease of editing; they do not reflect order of importance and will be revised to a bulleted list following the editing process.*

9. The Board advises DOE to evaluate lessons learned from the AY-102 event to improve safety culture, especially regarding the reporting and investigation of abnormal events and the conduct of operations.

10. The Board advises DOE to revise the emergency pumping guide and RCRA-compliant contingency planning to include the revision of procedures and the retraining of management and operations as necessary.

11. The Board advises DOE to obtain samples from the bottom of AY-102 to identify the chemicals in contact with the bottom of the tank. This characterization will support assessment of the reasons for failure of this tank and will help determine appropriate receiving tanks for this waste. Additionally, the analysis will help with the evaluation of other tank wastes that have potential to cause additional double-shell tank failures. Lastly, this characterization will support implementation of necessary chemical additions or other changes to tank operations needed to minimize corrosion damage.

12. In addition, the Board advises DOE to evaluate the expansion of the sampling program to first include the six double-shell tanks of similar age and design, and to then focus on the double-shell tanks. Specifically, we suggest an increase in the routine sampling frequency as needed. The sampling program may need to be adjusted depending on the response indicators and chemistry of the tanks. DOE should also consider seeking independent expert advice on how to design a defensible sampling program focusing on frequency and location of samples. This recommendation expands on HAB Advice #263 *Double-Shell Tank Integrity*. The Board recognizes that sampling is expensive and difficult; however, the potential costs of a double-shell tank failure are much higher.

13. The Board advises DOE to annually update the integrity assessment documents for the double-shell tanks, describing sampling in the double-shell tanks and their annuli, detailing the sampling event(s), temperature variations, ventilation issues, abnormal findings, and corrective actions taken. This update should also include an annual readiness review of the equipment needed to pump a tank.