Hanford Advisory Board

A Site-Specific Advisory Board, Chartered under the Federal Advisory Committee Act

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RE: Responding to Leaking High-Level Radioactive Waste Tanks

Dear Mr. Vance, Mr. Bowen, and Mr. Einan:

Background:

The April 29, 2021 announcement of a new active leak in Hanford's Single Shell High-Level Nuclear Waste Tank (SST) B-109 reminded the Hanford Advisory Board (Board) that the SSTs are long past their designed life and will likely continue to develop new leaks in the future. Current estimates[1] are that 3.37 million gallons of leakable liquid still reside in the SSTs, despite a previous campaign decades ago to remove the majority of the pumpable liquid into double shell tanks. At the time of the initiation of that previous campaign, the anticipated completion of SST retrievals was 2018. Now, per System Plan 9 the completion of tank retrievals is projected to be 2061, and the completion of all tank waste treatment is projected to be 2066.

The remaining drainable liquid in SSTs contains a significant inventory of soluble chemicals and radionuclides that have the potential to move through the vadose zone into the groundwater aquifer and then into the Columbia River. Currently, around 2 billion gallons of contaminated groundwater per year is being removed and remediated through the

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groundwater pump and treat system. New SST leakage would add to the long-term management burden, schedule, and cost to clean up the Central Plateau.

"Do no harm during cleanup" is a value that has been held by the Hanford Advisory Board since its inception in 1994. More SSTs are certain to leak during the next four decades. Allowing them to leak unabated while they await their turn for retrieval is inconsistent with the values and expectations of all Hanford stakeholders as well as the Hanford Advisory Board.

The Board believes as a policy that a more organized, consistent, and timely approach to identifying and proactively abating leaking single-shell tanks is critical. Tanks are leaking now and will inevitably leak in the future. The best way to mitigate future leaks is to prevent them. The need for a plan is urgent. Accordingly, the Board offers the following advice.

Advice:

- **The Board believes the Tri-Party Agreement agencies should remove liquid waste, including the interstitial liquids from the SSTs as soon as possible, before they have a chance to leak into the environment, contaminating the water table and potentially the Columbia River.**

- **Develop Abatement Technologies.** A long-time value of the Hanford Advisory Board is to develop and deploy new technology, without impeding cleanup activities. Further, cleanup should move forward using the most practicable, timely, available technology, while leaving room for future innovation. Accordingly, the Board advises DOE to invest in and support technologies to proactively mitigate tank leaks or to mitigate the spread of waste into the surrounding vadose zone once they have leaked. The Board recommends that new technologies focus on addressing both drainable interstitial liquids inside the tanks and adding barriers outside tanks to slow the spread of the leaked radioactive material. The Board is specifically interested to see analysis of enhanced saltwell pumping, application of the TBI/ TSCR concept to extracted interstitial tank liquids, and/or onsite storage options for interstitial liquids once highly radioactive constituents are removed. The Board supports a pilot test of enhanced salt well pumping in an SST as proposed in the December 2020 letter from Ecology to DOE[2].

- **Develop a comprehensive long-term plan to address SST Leak Detection, Characterization, Mitigation, Cleanup, and Communication.** Certain key elements of The Plan are advised below.

  - **The Plan should include input from the public, Tribes, EPA, and State of Washington.** The plan should be revised periodically, also with external involvement.

  - **Timely Assessment and Communication of SST Leaks.** When a leak occurs in the future, timely assessment and communication is essential. The assessment must include the determination of risk to human health and ecological receptors from potential contaminants of concern in the leaking fluids, and that risk must be communicated to the public in a clear and understandable manner. The lead regulatory agency should be involved as soon as a leak is suspected.

For example, the assessment could include, but not be limited to, the following:

- The magnitude of the leak.
- The composition of the leak.
- How long it will take potential contaminants of concern to move through the vadose zone to groundwater using an appropriate modeling code such as Subsurface Transport Over Multiple Phases (STOMP).
- The magnitude (mass, percent, etc.) of the leak that will be transported to groundwater in a given amount of time and determining the magnitude of the leak that will remain in the vadose zone in that given amount of time.
- The length of time it will take potential contaminants of concern to reach the Columbia River by movement through the groundwater aquifer system using an appropriate modeling code such as MODFLOW.
- The risk to human health or the environment using standard Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) baseline risk assessment methodology as has been employed in the recent risk assessment of Waste Management Area C and determining for radionuclides the dose impact to human health using the methodology employed in the current composite analysis project.
- An evaluation of the potential cumulative risk from the entire 3.37 million gallons of single-shell tank interstitial liquids if they were to leak before removal of all wastes from SSTs. This risk assessment may support prioritization of SST leak response planning actions.

– **Timely Response to SST Leaks.** The Board states as a policy that responding to tank leaks through abatement or mitigation actions to the extent necessary and feasible must not be delayed by lengthy processes. The public should be afforded a formal comment opportunity on those response options. The Board sees value in having a team that is equipped and trained to proactively remove SST liquids and respond to emerging leaks.

– **Assess the Feasibility of Current and Potential Future Abatement Technologies that address:**

- Effectiveness and implementability of alternative abatement technologies.
- Costs to develop and implement (similar to cost profiles in System Plan 9).
- Budget profile effects.
- Disposition pathways.

The outcome of this additional analysis should clarify technological and policy solutions to address both B-109 and the risk of future SST leaks and feed into broader formal planning.

- **Allocate Budget for Managing SST Leaks.** The Board advises DOE to use a budget line item to fund the development and maintenance of SST leak mitigation and abatement. This gives DOE greater budget flexibility to respond to future SST leaks. The budget should include funding for the aforementioned proactive response team.

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Sincerely,

Steve Wiegman, Chair
Hanford Advisory Board

References

1. Waste Tank Summary Report for Month Ending May 31, 2021, HNF-EP-0182 Rev 401, A.M. Templeton, July 13, 2021: https://pdw.hanford.gov/document/AR-14788
2. Department of Ecology's Review of Single-Shell Tank Liquids Retrieval Study, RPP-RPT-62098, Rev. 0, and Fulfillment of Tri-Party Agreement (TPA) Milestone M-045-093, Jeffery J. Lyon, December 8, 2020: https://pdw.hanford.gov/document/AR-04419
3. Washington Administrative Code (WAC) 173-303-640: https://app.leg.wa.gov/WAC/default.aspx?cite=173-303-640&pdf=true
4. Hanford Advisory Board Advice #271, "Leaking Tanks (HAB Consensus Advice #271), September 6, 2013: https://www.hanford.gov/files.cfm/HABAdv_271.pdf
5. Single-Shell Tanks Liquid Retrieval Study, KA White, May 2020: https://pdw.hanford.gov/document/AR-04274
6. Hanford Tank Waste Strategy – Test Bed Initiative-Phase II, DOE Office of River Protection, January 9, 2019: https://www.hanford.gov/files.cfm/Final_TWC_TBIPhaseII_010919.pdf

Attachments

1. Hanford Advisory Board Advice #298, "Double-Shell Tank Failure (HAB Consensus Advice #298)," September 20, 2018: https://www.hanford.gov/files.cfm/HAB_Advice_298.pdf
2. Hanford Advisory Board Advice #271, "Leaking Tanks (HAB Consensus Advice #271)," September 6, 2013: https://www.hanford.gov/files.cfm/HABAdv_271.pdf
3. Department of Energy Response to HAB Advice #271: https://www.hanford.gov/files.cfm/HAB_ORP_Response271.pdf

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Appendix: Supporting Background Context

This appendix contains the informed thinking that supported development of the advice.

The April 29, 2021 announcement of leaking SST B-109 came after two years of assessment and study. Current estimates show 13,000 to 15,000 gallons of drainable liquid remaining that may take anywhere from a few to a dozen years before the liquid drains completely into the soil. Due to suspected ongoing water infiltration into the tank, it may continue to release to the environment until it is retrieved. Under current planning, retrieval of this tank would not begin until the year 2043.

In public forums, DOE has said that it would prefer to take no additional action to stem the leak of SST B-109. DOE has referred to the amount of contamination leaking from B-109 as "small" in comparison to contamination which was previously discharged or leaked from tanks and cribs in the same area. While it is expected that contamination from the B-109 tank leak would begin to reach groundwater in 20-25 years and be captured by the pump and treat system, it would continue to add contamination to the groundwater long into the future.

We understand that there are no transfer lines attached to B-109 and putting lines in place would be expensive and potentially pull funding away from tank waste treatment. However, inaction goes against the Board's "do no harm" value and defies legal requirements to act, by withdrawing leaking tanks from service, and draining as much liquid waste as necessary to stop the leak immediately or as soon as feasible[3]. In 2013, when the SST T-111 was similarly declared to be leaking, Washington's Governor announced that the State has a "Zero Tolerance" policy for new tank leaks. Board Advice 271[4] advised DOE to, "remove the drainable liquid from Single-Shell Tanks, focusing first on leaking tanks." We do hope that DOE will pursue technologies, such as removal of only the interstitial leakable liquid without the need for transfer lines, that will address tank leaks to prevent waste materials from moving through the soil towards groundwater.

Based on the Monthly Waste Tank Summary Report from May 2021[1], there are approximately 3.37 million gallons of drainable interstitial liquid and supernatant still contained across all the SSTs (6% of the 56 million total gallons of waste in the Hanford tanks). Current estimates are that it will be over four decades before the last SST is retrieved. More tanks are certain to leak. The Board believes an actionable/implementable plan is needed, encompassing development of the tools and risk management response strategies necessary for safeguarding human health and the environment from the release of these liquid wastes.

The Board notes the 2020 Hanford SST Liquid Retrieval Study[5] found that enhanced saltwell pumping was tied as the top contender for methods to remove additional interstitial liquid from a tank. Successfully used at the Savannah River Site to remove interstitial liquid from their tanks, it was highly rated in the 2020 study for its design maturity and likelihood of success. In response to the study, Washington State Department of Ecology (Ecology) proposed[2] that DOE pursue pilot projects implementing the top two technologies in an actual Hanford tank. This proposal was suggested before it was known that B-109 had formally become an active leaker. The Board champions a pilot project, as it seems a worthy goal to try to add a new liquid

removal capability to the tool set at Hanford. It could proactively prevent harm to the environment if deployed in tanks with high release potential.

The Board also observes that the Test Bed Initiative (TBI) proposes to use an in-tank pump with integrated pretreatment, followed by offsite disposal of the resulting low activity waste[6]. The Board would like to see a formal assessment of whether simple adjustments can make this concept compatible with enhanced saltwell pumping of SST interstitial liquid to allow offsite disposal of that portion of the tank waste that is presently at the highest risk of reaching the environment.