Minimizing Environmental Risk Through the Use of Evaporation – 15090

Jeremy Johnson *
* U.S. Department of Energy

ABSTRACT

At the Hanford Site, work is being done to utilize a portable exhauster to reduce the remaining free liquid in the older underground storage tanks. Use of an exhauster allows the water in the free liquid to be evaporated reducing the possibility that mobile contaminants will leak into the soil and groundwater. Transferring the remaining liquid waste to newer tanks requires major infrastructure installation. Currently one set of tanks is undergoing the retrieval of solids and liquids. This retrieval requires substantial infrastructure in order to mobilize and pump the waste to newer tanks. Reducing the remaining liquid waste by pumping would require much of the same retrieval infrastructure and is cost prohibitive. The use of a portable exhauster will require minimal infrastructure and is much more efficient. Past results have demonstrated that this technology can be successfully used on various sizes of underground storage tanks. A portable exhauster is planned to be connected to the one tank believed to be leaking and will be used to evaporate the remaining free liquid, beginning in 2015.

INTRODUCTION

The Hanford Site is located in Southeastern Washington State and stores millions of gallons of hazardous radioactive waste in underground storage tanks. Waste was generated during the production of plutonium for use in nuclear weapons. Waste is currently being transferred from 149 older tanks single-shell tanks (SST), many of which are known to have leaked in the past, to newer more robust double-shell tanks where it will be stored prior to treatment and disposal. As the treatment and disposal mission is extended, many of the older tanks will be required to store waste for several decades.

Older tanks and connecting pipelines and infrastructure have been declared unfit for use because they do not meet current environmental regulations. Prior to the system being taken out of service, the majority of the drainable liquids in the tanks were pumped out to newer tanks. This removal of liquid waste minimized the threat of a tank leak, which could introduce mobile contaminants into the surrounding soil and groundwater. While the majority of the liquid was removed, the older leak-prone tanks still contain over 2 million gallons of liquid waste. Many of the older tanks experience slow intrusions of water, which over the course of many years, have accumulated considerable volumes of liquid capable of mobilizing contaminants. One tank which was previously stabilized by removing liquids in 1995 was determined to be leaking in 2013.

INTERIM STABILIZATION

As many as 61 SSTs are assumed or known to have leaked waste to the environment [1]. In order to mitigate the threat of large volumes of waste leaking from the SSTs, efforts began in the 1970s to remove as much liquid waste as possible. Liquid waste was pumped out of the SSTs and into the newer double-shell tank system. Approximately 7.5 million gallons of liquid waste was removed from the SSTs during interim stabilization efforts. In 2002 however, the entire SST system was determined to be noncompliant with leak integrity requirements contained in *Resource Conservation and Recovery Act of 1976* [2] regulations and considered not fit for use

[3]. Transfer lines and other infrastructure used during interim stabilization were no longer viable for use based on this determination.

Following interim stabilization efforts, access points to the tanks were sealed with foam and active water lines were cut and capped outside the tank farms (Figure 1). Surface water was also directed away from the tanks using berms and ditches. These efforts were completed to prevent rain and snow melt from entering the underground tanks.

Figure 1. Water Intrusion Prevention Measures.

WATER INTRUSION IDENTIFICATION

An in-depth evaluation of the long-term waste level trends in all 149 SSTs identified a number of SSTs in which the waste levels had been slowly increasing [4]. Over the course of 2 years, visual inspections were performed in the identified tanks using remote video cameras. Visual inspections confirmed that water intrusions were occurring in 15 of the tanks inspected [1]. Estimated intrusion rates in the tanks ranged from less than 50 gallons per year to as much as 1,000 gallons per year per tank [5]. While intrusion prevention measures appeared to be functioning, confirmed intrusions indicate that there are other pathways for water to enter some tanks.

REGULATORY REQUIREMENTS

At the time water intrusions were being investigated, regulatory requirements were in place that required all intrusions into SSTs be stopped. Identifying sources of the water intrusions into the tanks looked to be a daunting task. The most obvious pathways had already been sealed and measures were in place to minimize the amount of water that could enter the tanks.

The U.S. Department of Energy (DOE) worked with the regulator, Washington State Department of Ecology (Ecology), to evaluate whether the requirement to stop all intrusions was appropriate. DOE and Ecology agreed that a change to the regulatory requirement made sense in order to allow a graded approach to dealing with water intrusions. The regulatory requirement was modified such that all intrusions would be identified and the two agencies would work collaboratively to determine the most prudent response to each water intrusion. DOE and

Ecology have agreed to pursue the use of a portable exhauster to remove the water from the tanks.

PORTABLE EXHAUSTER PLAN

Portable exhausters have been used in the past at Hanford to dry underground storage tanks. A portable exhauster is a large ventilation skid, which draws ambient air in and exhausts humid air out of an underground tank, evaporating free water in the process. An existing portable exhauster skid, seen in Figure 2, was refurbished in 2014. The exhauster was last used in 2006 and 2007 and evaporated approximately 350 gallons of water from underground catch Tank 241-ER-311. The first tank to utilize the refurbished exhauster will be SST 241-T-111, which was identified as a tank in which intrusion is occurring. This tank is also the only SST that is assumed to be actively leaking to the environment [6]. The tank is estimated to contain as much as 3,000 gallons of liquid on the surface of the solid waste [7]. SST 241-T-111 is planned to be connected to the portable exhauster in 2015 and removal of the water in the liquid waste is estimated to take less than 6 months [7]. If the portable exhauster is successful at SST 241-T-111, DOE and Ecology will be evaluating continued use of the exhauster at other tanks with identified water intrusions.

Figure 2. Portable Exhauster Skid in 241-T Tank Farm.

CONCLUSIONS

While past water intrusion prevention measures are largely effective, hundreds of gallons of water continue to accumulate in SSTs each year. Many of the SSTs will be required to continue storing waste for several decades. Water accumulation increases the risk of mobilizing contaminants, which could enter the environment, if a tank were to leak. In order to minimize this risk, DOE will be working with their regulator to evaluate the use of a portable exhauster to evaporate water that has accumulated in SSTs. Removing the water from the tanks using evaporation does not require a large investment in infrastructure as would be required to pump

the liquid from the tanks. If the portable exhauster proves successful at evaporating the remaining water in SST 241-T-111, it will be deployed at other SSTs as an efficient means of reducing the environmental risk posed by the accumulation of water in the underground storage tanks at Hanford.

REFERENCES

1. D.I. Weyns, HNF-EP-0182, *Waste Tank Summary Report for Month Ending September 30, 2014*, Rev. 321, Washington River Protection Solutions LLC, Richland, Washington (2014).
2. *Resource Conservation and Recovery Act of 1976*, 42 USC 6901, et seq.
3. Letter 02-OMD-036, 2002, "Submittal of M-23-24 Single-Shell Tank (SST) System Integrity Assessment Report," (external letter to M. A. Wilson, Washington State Department of Ecology) from J.E. Rasmussen, U.S. Department of Energy, June 27.
4. M.R. Sax, RPP-RPT-50799, *Suspect Water Intrusion in Hanford Single-Shell Tanks*, Rev. 0, Washington River Protection Solutions LLC, Richland, Washington (May 16, 2012).
5. J. Schofield, RPP-RPT-50799, *Suspect Water Intrusion in Hanford Single-Shell Tanks*, Rev. 2, Washington River Protection Solutions LLC, Richland, Washington (xx, 2014).
6. D.J. Washenfelder, RPP-RPT-54964, *Evaluation of Tank 241-T-111 Level Data and In-Tank Video Inspection*, Rev. 1, Washington River Protection Solutions LLC and Columbia Energy and Environmental Services, Richland, Washington (July 25, 2013).
7. J. Schofield, RPP-PLAN-57554, *Portable Exhauster Usage Plan for Evaporation of Supernatant Liquid in Selected Single-Shell Tanks*, Rev. 0, Columbia Energy and Environmental Services and Washington River Protection Solutions LLC, Richland, Washington (August 19, 2014).