PROTECTING NORTHWEST STAKEHOLDERS FROM HANFORD'S TANK WASTE

Suzanne Dahl
Washington State Department of Ecology

ABSTRACT

Hanford's 177 tanks are located twelve to fifteen miles from the Columbia River, in southeastern Washington State. Currently, Hanford's tanks contain about 53 million gallons of highly radioactive and chemically hazardous waste. Sixty-seven of Hanford's tanks have leaked an estimated one million gallons of this waste into the soil. Further releases to the ground, ground water and the Columbia River are the inevitable result of tank failure. The contamination already in ground water under Hanford could reach the Columbia River in as little as 20 years and continue for the next 5,000 years. The risk from this waste is recognized as a threat to the Northwest as a region.

Construction and operation of a Treatment Complex is the only viable permanent solution to reducing the risk posed by this tank waste. All other Federal sites with liquid high-level radioactive and chemically hazardous waste have treatment facilities, but at Hanford the process to remove and treat the tank wastes is barely underway. There is now general agreement about the right treatment method for Hanford tank waste - "vitrification" or immobilizing tank waste by turning it into a glass - but serious concerns exist about the Federal government's ability to fund a treatment complex for Hanford.

The Washington State Department of Ecology (Ecology) supports the vitrification of Hanford tank waste; it is a technically sound and viable approach. Efforts to secure the necessary facilities have seen repeated false starts and delays over the past ten years. The most recent setback , in summer of 2000, was the failed privatization approach to contracting. In late 2000, United States Department of Energy (USDOE) has shown commitment towards a Treatment Complex by issuing a construction contract. Successful removal and treatment of Hanford's tank waste will take at least thirty years and require a national commitment equivalent to that spent putting a man on the moon.

Time is running out for Hanford's tanks. Continued storage of an enormous volume of dangerous waste in Hanford's leaking and aging tanks poses catastrophic risks to the human, environmental and economic health of the Pacific Northwest. Failure to retrieve and treat the waste is not an option. Washington State is willing to do whatever is necessary to ensure acquisition of a treatment complex for tank waste - succeeds this time around. We must all work together to make the present approach succeed.

Washington State is seeking enforceable commitments that will hold the USDOE accountable, and ensure swift action to protect the environment, human health and the Columbia River. Washington State is also working to inform stakeholders about this regional problem – through regular status reports and building a Pacific Northwest consensus and outcry for a Tank Waste Treatment Complex. Ecology is working with Congress to ensure adequate funds the project.

The extended treatment timeline and enormous amounts of money needed, have led to the *crisis of commitment* we are experiencing now. For the sake of the Pacific Northwest, the Federal government (Congress and the United States Department of Energy) must move beyond this crisis and commit to building a tank waste Treatment Complex at Hanford.

*Success is possible***,** but it will require *commitment*.

Commitment — from the United States Department of Energy to define a path forward and follow it without more delays or false starts
C*ommitment* — from the U. S. Congress to fund the project
Commitment — from the state of Washington to force accountability
Commitment — from the region to demand that a treatment complex must be built. The waste must not be left in the tanks to leak to groundwater and threaten the Columbia River.
Commitment — from the region to make this a national issue that deserves the type of funds needed.

INTRODUCTION

The Hanford Site is located along the last free-flowing segment of the Columbia River, in an area where people depend on ground water and the river for drinking water, irrigation of crops, and recreation. The livelihood of this area is endangered by the waste on the Hanford Reservation. One of the most significant risks comes from the high level radioactive hazardous waste stored in underground tanks in the central part of the Hanford Site.

This paper will discuss the environmental risk associated with the tank waste, the actions needed to reduce the risks from the tank waste, examine past attempts to build a treatment complex, and highlight how the Washington State is working to insure a successful tank waste remediation. In other words, what can the State do to promote protection of the Pacific Northwest stakeholders from the Hanford tank waste?

Background

Hanford Reservation is located in southeast portion of Washington State along a stretch of the Columbia River. The site is comprised of 560 square miles and was selected in the early 1940's, to produce grade plutonium for nuclear weapons, as part of the Manhattan Project. The plutonium was produced by a series of steps that began with specially designed uranium metal (fuel) being exposed to neutrons (irradiation) in a total of nine reactors along the Columbia River. All nine reactors were not in operation at one time – they were phased in throughout 1940's –1960's. The irradiated fuel was then shipped to the center of the site where it was reprocessed in one of five chemical facilities. This process produced a tremendous amount of liquid waste, much of which was less radioactive and was directly disposed of to the ground through trenches, ponds and cribs. The worst of the waste from these reprocessing facilities – the high level radioactive mixed waste that contained most of the radioactive elements waste was placed into underground carbon steel storage tanks, so that it could not impact the environment. Carbon steel was chosen due to cost and the shortage of stainless steel during World War II. Prior to pumping, the acidic high level radioactive mixed waste into the carbon steel tanks, it was mixed with sodium hydroxide to neutralize the waste and make is very basic (pH 9-14). The high level radioactive mixed waste contains large quantities of nitric acid, organic chemicals, solvents, and fission products. (1)

The underground storage tanks were built on an as needed basis as more and more waste was created. By 1964, Hanford had 149 single shell tanks. These tanks ranged in size from 55,000 to 1,000,000 gallons. By the 1950's it was realized that some of the single shell tanks had leaked and from then on double shell tanks were built. There are a total of 28 double shell tanks ranging in capacity from 1,000,000 to 1,100,000 gallons. The tanks are arranged in 18 tank farms with 12 single shell tanks farms and 6 double shell tank farms. (1) Sixty-seven of the single shell tanks are known or suspected leakers and the amount released to soil and groundwater is conservatively estimated at 1 million gallons. In 1997 it was determined that several single shell tank farms had impacted the groundwater (200 feet below) with waste. (2)

The amount of high level radioactive hazardous (mixed) waste stored in the 177 tanks at Hanford is 53 million gallons of which 35 million gallons is in the single shell tanks and 18 million gallons are in the double shell tanks. The waste in Hanford tanks accounts for 60 percent of the USDOE's total high level radioactive waste. The waste is comprised of 245,000 tons of chemicals and 190 million curies of radioactivity. Generally the waste types are divided into three types, liquids, saltcake and sludge. More specifically, of the curries in the double shell tanks 72% is from cesium-137, 27% is from strontium-90, and rest of radionuclide contribute 1% of the total radioactivity. Of the curies in the single shell tanks, 75 % is from strontium-90, 24% is from cesium-137, and rest of radionuclide contribute 1% of the total radioactivity.

The radioactive and chemical make up, volume, and the consistency of the waste in each tank are products of the various processing approaches, the neutralization of the waste with large volumes of sodium hydroxide to make the waste compatible with the carbon steel tanks, the evaporation campaigns, and additional reprocessing to recover uranium, cesium and strontium. The neutralization of waste was done by adding large amounts of sodium hydroxide caused the waste to be highly basic separate into different radioactive and chemical layers, the evaporation caused the waste to precipitate and reduce the physical volume, and the various processing and reprocessing approaches added various chemicals to the waste. The tank waste can be described as a witch's brew of chemicals and radioactive elements and the specific content of each tank is a bit of a mystery. From short-term risk, the strontium and cesium are the major contributors and from a long-term risk perspective to groundwater and Columbia River the Uranium-238 and Technitium-99 are the major contributors. (1)

Regulatory Regime for Hanford Tank Waste

Hanford Reservation is owned and operated by the U.S. Department of Energy (USDOE). During much of the site's history it was self-regulated under the Atomic Energy Act. In the 1980's, USDOE was forced to submit to Federal and state regulations and the some of the responsibilities for regulation were passed on to other agencies. Beginning in 1986, regulators from U. S. Environmental Protection Agency (EPA), Washington State Department of Ecology (Ecology) and the USDOE began to meet to decide how to best bring the Hanford Site into compliance with Resource Conservation Recovery Act (RCRA) and Comprehensive

Environmental Response Compensation and Liability Act (CERCLA). In January 1989, the Hanford Federal Facility Agreement And Consent Order (Tri Party Agreement) was signed by the three parties. The Tri Party Agreement is the primary framework for CERCLA and RCRA regulation of the Hanford Site. This Agreement and Consent Order specifically addresses the regulation of the tank farms and the high level radioactive mixed waste in the tanks through the RCRA provisions. The three groups agreed to develop one compliance agreement that set agreed upon milestones for cleaning up past disposal sites under RCRA and bring operating facilities into compliance with RCRA

There are ten major Tri Party Agreement milestone series that address the primary aspects of waste safe storage, retrieval, waste treatment, and waste disposal. After repeated failure and delays in the program that removed liquids from the single shell tanks, USDOE and Ecology recently signed a Consent Decree in front of a judge to schedule the removal of pumpable liquids from the single shell tanks as an interim protective measure prior to full retrieval. In late 2000, the parties added to this Consent Decree a commitment that USDOE would award a contract to a contractor to design and build a Treatment Complex.

ENVIRONMENTAL RISK OF TANK WASTE

Risk to the Air

The enormous volume of tank waste stored at Hanford results in a significant near term risk potential and potential catastrophic risk to the Northwest in the long term. Near term risk associated with the tank waste is related to potential for release to the air. Past unresolved safety issues posed several different mechanisms that could cause in-tank explosions that could release contamination into the air. Most of the safety issues have been resolved with further tank characterization. However the issue of flammable gas generation will continue to be a concern and is being mitigated with safe engineering practices. Another path for air release is infrastructure failure. As the infrastructure (both tanks and pipes) grows older, failures are occurring and will continue to occur in the future. A tank dome collapse could release a significant amount of waste into the air. Pipeline failures occur every year and are threat to the soil/groundwater and the worker.

Risk to the Groundwater and Columbia River

The long-term risk is related to the past tank waste releases to the soil and future tank leaks to the soil. This risk will not take a long time to start occuring - it is already occuring as past leaks are impacting the groundwater. But once a release occurs it will impact the groundwater for a long time to come since the major risk drivers are the technetium and uranium which are long-lived radionuclides that are fairly mobile in groundwater. Radionuclides from tank waste are moving faster and deeper than previously predicted and some have reached the groundwater. The groundwater beneath the tank farms flows towards the Columbia River as close as 7 miles away. Travel time for fast-moving contaminants is as short as 20 years. As more tank waste is released to the soil, the greater cumulative risk to the groundwater and Columbia River will increase. This highly toxic, highly radioactive tank waste presents a threat to human health and the environment, especially the Columbia River – the economic lifeblood of the region. (3)

Presently all of the single shell tank farms contain a tank suspected of leaking and 10 of the 12 single shell tank farms have impacted groundwater, several at or above federal drinking water standards. Underneath one tank farm, SX, the resultant groundwater concentrations of Technitium-99 are 48 times the drinking water standard. Recent characterization of the soil contamination beneath these tanks reveals that within 50 years the resultant ground water concentrations could be 100's of times the drinking water standards. This type of result can be expected under several of the other tank farms with past releases. This level of significant impact is due to leaking a cumulative 1 million gallons, which is less than 1% of the waste in the tanks.

These groundwater impacts from past releases are just the tip of the iceberg when compared to the potential environmental and economic impacts that could be expected if the tank waste was not retrieved and treated. In other words, the impacts are bad enough from past leaks that account for 1% of the total tank inventory– if you add the impacts from the remaining 99% of the waste it becomes catastrophic. This scenario is spelled out in the Tank Waste Remediation System Environmental Impact Statement no action alternative which examined the result of leaving the waste in the tanks. The no action scenario shows drinking water standards for groundwater would be exceeded by Carbon 14, Iodine129, Technietium-99, Nitrate, and Uranium 238 in 300 years to 500 years. The impacts would continue at less severe levels but contaminates would stay in groundwater for 4000 years. At the maximum the concentrations would be 2 to 3 orders of magnitudes greater than drinking water standards. This would result in a large (nearly 90 square mile) plume extending from the tank farms to the Columbia River and the incidental latent cancer risk would be 1 in 2 for residential farmer and 1 in 10 for the industrial worker. (4)

Other factors that contribute to the urgent need to start addressing risks associated with tank waste are the age of the tanks and the tank design life and the storage capacity of the double shell tanks. Presently all the single shell tanks are 30 years past their design life and in 2018 when the Tri Party Agreement says that all the single shell tanks waste is to be out of the single shell tanks they will be 50 years past their design life. The double shell tanks will reach their design life in 2028, which coincide with the Tri Party Agreement date to have all the tank waste vitrified. Some recent double shell tank integrity assessments have indicated that some of the double shell tanks may fail as early as 2017. Obviously, time is running out for the tanks and for the environment around the tanks. Moving single shell tank waste into double shell tanks is an important mitigative measure, however recent waste volume projections show that in 2006 there will be no more space to move single shell tank waste because the double shell tanks will be full. Further single shell tank waste retrieval will depend on any combinations of tank waste Treatment Complex processing, the building of new double shell tanks, and innovation in creation of more space in the double shell tanks.

Risk to the people of the Pacific Northwest from the tanks is already at a level that demands actions to mitigate the near term risks and long term risk. The existing soil and groundwater contamination from past release is at levels above acceptable limits. If more waste is allowed to impact the environment the associated risk to the Pacific Northwest will skyrocket along with cost to mitigate and our technical ability to remediate.

The answer is simple but costly; the Hanford tank waste must be retrieved and treated. This will require building of a tank waste Treatment Complex and the development of retrieval equipment.

HISTORY OF PAST TREATMENT EFFORTS

In reviewing the past history of the attempts to bring tank waste treatment to Hanford, it becomes apparent that Hanford and the people of the Northwest have always been considered second or third in the nation. Hanford's history for tank waste treatment acquisition can be characterized as a trail of false starts. There have been four distinct attempts to bring treatment capacity starting in 1989.

1989-1993 First Treatment Acquisition Attempt – Hanford Waste Vitrification Plant: High level waste will be vitrified, pretreatment in existing B plant, and low activity waste to be grouted. Construction to begin in July 1991 and hot operations in December 1999. Started failing in first three months due to overarching USDOE budget. Eventually it was decided that B plant was not appropriate location for pretreatment.

1993 Second Treatment Acquisition Attempt – Big Hanford Waste Vitrification Plant: Now both high and low level waste were to be vitrified and a new pretreatment facility needed. The resulting low level vitrified line would be a 200 ton/day facility. High level waste construction was to be started by June 2002 and operational in 2009 and low level vitrified construction was to be started by December 1997 and operational by June 2005. This attempt was killed within months in favor of a new contracting approach of privatization.

1993-April 2000 Third Treatment Acquisition Attempt – Privatization originally started as a competition between two pilot plants. This idea of small pilot plants was quickly dropped due to the intense requirements of building a facility to handle high-level waste. It turns out that when all the safety requirements are built in, a facility design-life will last 30 years. Hot start for low activity waste was scheduled to be 2002. Initially two companies awarded contract, then down selected to one contractor. In July 1998, estimated cost of the facility was $6.9 billion and hot operations would begin in 2007. The point of privatization was to push risk to the contractor and to put off paying for construction of the facility in lieu of the private company borrowing money. In February 2000, the Congressional Budget Office ruled that it would not score all the budget obligation now and budget authority later. The Congressional Budget Office scored more Budget Obligation up front – which then makes Congress ask why pay for all this interest on borrowed money if we will need the Budget Obligation up front? At this point, if not earlier, USDOE could have considered alternative financing and contract methods. April 2000, BNFL cost estimates escalate to $15.2 billion. May 2000, USDOE announces will terminate BNFL and will develop a request for new proposal for waste treatment contract.

May 2000 to Present Fourth Treatment Acquisition Attempt – Contract mechanism of Privatization is dropped and a government-owned contractor-operated request for proposal is implemented in August 2000. This proposal would delay start of construction one year to mid-2002, hot start would be in 2007 and full operations would be delayed by 13 months (2009 to 2011). In October 2000, USDOE and Ecology agreed to modify the Consent Decree to require

USDOE to award a treatment complex by January 2001. In December 2000 USDOE awards a construction contract Bechtel/ Washington Group

In summary, a series of lack of commitment on the Federal level, competing USDOE projects for funding, misjudgments on types and sizes of facilities to deal with Hanford waste have led to: a decade of delay; a series of false starts, a series of broken promises to the Pacific Northwest, increased risk from the waste stored in the tanks, and no real progress on a final solution for Hanford tank waste.

WASHINGTON STATE APPROACH TO INSURE SUCCESSFUL REMEDIATION OF TANK WASTE

The overall objective of the State of Washington in regard to the Hanford Tank Waste is remediate the tank waste in a manner that is protective of human health and the environment. The tank waste must be stored safely, interim actions must be taken to protect against more immediate threats, the tank waste must be retrieve/treated and disposed of in manner that is protective. The State recognizes that this is a long, expensive process and we are willing to work with the USDOE in a manner that promotes the protection of human health and environment over the meeting the specific letter of applicable regulation. The Tri Party Agreement and our Consent Decree recognize the long road ahead and serve as maps to the future.

Washington State Goals for Hanford Tank Waste

Specific goals of Washington State in regard to Hanford tank waste are discussed below in order of increasing importance. These goals are aimed at significant risk reduction.

- Compliant Double Shell Tank System: A safe up-to-date double shell tank system is required to safely store, and feed waste to the Treatment Complex for the next 30 years plus. Required are tank system integrity assessments that predict the life span of the tanks and to allow for safe management practices.

- Retrieval of Tank Waste: Having reliable retrieval systems to feed waste to the Treatment Complex is important. Of greater importance is the ability to retrieve tank waste from the old failing single shell tanks into the newer safer double shell tanks. Moving waste from the single shell tanks to double shell tanks is a significant act to reducing the risk. This risk mitigative measure is tied to available space in double shell tanks and processing rate of the Treatment Complex. Deciding how to close the tanks and what measures need to be taken to mitigate past leaks will be part of the retrieval decisions.

- Interim Stabilization of Single Shell Tanks: Removing the pumpable liquids from the single shell tanks is the most important near term mitigative measure to minimize the impacts of potential future leaks. Although this is important interim mitigative measure it is only a partial solution and final retrieval is a necessity.

- Treatment of Tank Waste: Construction a Treatment Complex and starting processing would result in the greatest risk reduction from the impacts of tank waste. Treating at least 10% of the tank waste by 2018 will result in better management of 20% of the waste in that 10% will be in glass and 10% of waste will be moved out of single shell tanks to double shell tanks. The treatment of the remaining 90% of the waste will complete the risk reduction.

Washington State Approach to Seeking Forward Progress on Hanford Tank Waste

In order to provide protection to the Pacific Northwest from Hanford Tanks, which the State considers one of the most important environmental cleanup actions in the nation, a tank waste Treatment Complex must be built and operating soon. This action is the most important step in protecting the people of the Pacific Northwest from the Hanford Site. Any further false starts in beginning treatment for tank waste is unacceptable and cannot be tolerated by this region.

Washington States approach based on bringing treatment for tank waste to Hanford in the near future.

We have involved public officials in the all levels of government, and we are committed to the mission.

We are striving to educate the regional public on the urgent need to gain tank waste treatment capacity soon and that continued support will be needed from the public to insist that Congress maintains funding.

We will continue to work with Congress to insure that appropriate funding is available when it is needed.

We are insisting that the USDOE personnel that have the authority to insure that a Treatment Complex be built and operating soon are held accountable for delays. We will hold people accountable to meet critical path schedules and to make meaningful recovery efforts if the schedule shows delays.

CONCLUSIONS

When you juxtapose the great risk that the tank waste represents; against the age and design life of the tanks; and against the seven years it will take to built a Treatment Complex and the 30 years or more it will take to retrieve and treat the tank waste, it becomes apparent that the only sound approach is to start now with the contracts and technology at hand. Improvements can be made along the way if needed.

The issue is that the Hanford tanks are an egregious case of non-compliant dangerous waste storage. We'd never let private industry or local governments continue such actions for ten years while failing to solve the problem. So we are looking for all legal means at our disposal to hold USDOE accountable as the party responsible and to bring them into compliance with the law that applies to everyone else.

Throughout the last decade, the State of Washington has been patient waiting for its turn for tank waste treatment. We are home to 60% of the nations high level radioactive mixed waste but we are the only site with no significant treatment. The age of the tanks, and the way the waste travels in the environment dictates that we can be patient no longer. For our economic and environmental survival we must succeed this time in bringing tank waste treatment to Hanford.

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