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Environmental Assessment

Tank 241-C-106 Past-Practice Sluicing Waste Retrieval, Hanford Site, Richland, Washington

U.S. Department of Energy
Richland, Washington

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ENVIRONMENTAL ASSESSMENT

TANK 241-C-106
PAST-PRACTICE SLUICING
WASTE RETRIEVAL

HANFORD SITE, RICHLAND, WASHINGTON

U.S. DEPARTMENT OF ENERGY

February 1995

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Executive Summary

The U.S. Department of Energy (DOE) needs to take action to eliminate safety concerns with storage of the high-heat waste in Tank 241-C-106 (Tank C-106), and demonstrate a tank waste retrieval technology. This Environmental Assessment (EA) was prepared to analyze the potential impacts associated with the proposed action, past-practice sluicing of Tank C-106, an underground single-shell tank (SST). Past-practice sluicing is defined as the mode of waste retrieval used extensively in the past at the Hanford Site on the large underground waste tanks, and involves introducing a high-volume, low-pressure stream of liquid to mobilize sludge waste prior to pumping. This EA describes the proposed action, the affected environment, reasonable alternatives to the proposed action, and provides an analysis of the potential environmental impacts.

It is proposed to retrieve the waste from Tank C-106 because this waste is classified not only as transuranic and high-level, but also as high-heat, which is caused by the radioactive decay of strontium. This waste characteristic has led DOE to place Tank C-106 on the safety "Watchlist." Historically, water has been added to the tank to provide evaporative cooling of the waste and to prevent the sludge from drying out. In the absence of these water additions, the heat load in Tank C-106 might exceed allowable temperature limits with the potential for structural damage to the tank. The tank is currently classified as sound, but there is a concern that should the tank start leaking, continued water additions could result in an increased amount of waste released to the environment.

Specifically, this action would accomplish the following:

- Remove at least 75 percent of the high-heat waste, which would reduce the tank heat load to less than 11.72 kilowatts (kW) (40,000 British thermal units [Btu] per hour). Water additions could then be stopped, and the tank removed from the safety "Watchlist"

- Demonstrate one form of SST retrieval by October 1997 as called for in *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) milestone M-45-03a, "Initiate Sluicing Retrieval of C-106." DOE has committed to resolving the safety concerns of the waste tanks at the Hanford Site in a more expedient timeframe. Consequently, the accelerated schedule calls for an October 1996 date for the waste retrieval demonstration.

Past-practice sluicing would be accomplished by transferring waste from Tank C-106 to the receiver tank, Tank 241-AY-102 (Tank AY-102), an underground double-shell tank (DST). Two transfer lines would connect the tanks. One line would carry the slurry (the sluiced waste) to the DST, and the other would carry the supernatant liquid from the DST, which would be used to mobilize the waste in Tank C-106 to facilitate pumping and waste transfer. The primary equipment necessary for this action would include pumps in each of the tanks; sluicer(s) to remotely aim the sluice streams in Tank C-106; a slurry distributor in the DST; an air ventilation system on Tank C-106; and additional monitoring devices. To provide adequate receiving space in Tank AY-102, its supernatant would be pumped out prior to sluicing. It is proposed that supernatant from Tank 241-AY-101 (Tank AY-101) or other appropriate sluicing fluid would be used as the sluicing agent. This sluicing fluid, which may consist of chemically treated water, would be pumped to Tank AY-102 prior to sluicing. Chemicals may be added, as necessary, to prevent potentially undesirable waste characteristics or to control corrosion.

Several alternatives to the proposed action are discussed briefly in this document. They include:

- Batch Transfer. This alternative would use an accumulation tank of 189,000 liters (50,000 gallons) that would alternately hold the supernatant from Tank AY-102, and the slurry from Tank C-106. The transfers would occur when this accumulation tank was full, and not simultaneously.

- Once Through--No Recycle. This alternative would use a tanker truck to supply the sluicing medium instead of using the supernatant from Tank AY-102.

- Limited Mixer Pump. A tanker truck would provide the sluicing fluid which would utilize sluicers, and a combined mixer and transfer pump, to create a slurry which would be sent to the receiver tank in batches.

- Recirculate Within a SST Via Mixer Pump. Two mixer pumps would use the sluicing fluid, introduced by a tanker truck, to mobilize all the solids in Tank C-106. The tank contents would be transferred to the receiver tank.

- Internal Recirculation. In this alternative, the sluicing fluid from a tanker truck would be routed through a loop in the sluicing system. After the waste has formed a slurry, some of this waste would be sent to the receiver tank, while the rest would be reused as a sluicing fluid.

- Hydraulic Mining. A crane would lower a mining tool into the waste in Tank C-106, and shoot a high-pressure stream of liquid laterally. As the waste is pumped, a cavity forms in the layer of waste desired.

- Center Pivot Dredge. This alternative would retrieve the waste in Tank C-106 by mechanical dredging equipment which would access the tank by a new 1.5-meter (5-foot) opening.

- No-Action. This alternative would involve leaving the high-heat waste in Tank C-106, and continuing to add cooling water periodically.

These alternatives were examined and found to either pose a greater threat to the environment than the proposed action, or failed to meet one of the two requirements of this project. These requirements consist of reducing the heat load in Tank C-106 to below 11.72 kW (40,000 Btu per hour), and being able to start retrieval by October of 1996.

Impacts from the proposed action were found to be small in comparison to Hanford Site operations as a whole. Environmental impacts to the air and water would be within all applicable standards. The proposed action would not lead to a substantial increase in human health effects and would be in compliance with all standards pertaining to public health. No impact is expected to any threatened or endangered plant or animal species, critical or sensitive habitat, or cultural or historical resources.

Impacts from accidents were examined and evaluated. The worst-case scenario, for both onsite and offsite populations, would involve an unfiltered release through a breach in the recirculation duct of the ventilation system using Tank AY-101's supernatant as a sluicing fluid. The likely mechanism for this accident is a vehicular collision, however it is possible that a Design Basis Earthquake (DBE) could lead to similar results. It is assumed that one hour elapses before the leak is detected. This duration can be considered conservative due to the presence of design features which would shut off the sluicing operation, and identify a release, well before one hour. The offsite maximally exposed individual (MEI) has been calculated to receive a dose of 5.2×10^{-4} roentgen equivalent man (rem) Effective Dose Equivalent (EDE), which would represent a probability of 3.0×10^{-7} that the individual would develop a latent cancer fatality (LCF). The onsite MEI was calculated to receive 5.0×10^{-1} rem EDE. This dose would represent a probability of 2.0×10^{-4} that the onsite individual would develop an LCF. The effect to offsite and onsite populations from this scenario would be a calculated 0.0 and 0.02 LCFs, respectively.

Glossary

Acronyms and Initialisms

ALARA	As Low As Reasonably Achievable
Btu	British thermal unit
CAA	*Clean Air Act of 1970*
CPS	Criticality Prevention Specification
CRR	Cultural Resources Review
CY	Calendar Year
DBE	Design Basis Earthquake
DOE	U.S. Department of Energy
DOH	State of Washington Department of Health
DST	double-shell tank
EA	Environmental Assessment
Ecology	State of Washington Department of Ecology
EDE	Effective Dose Equivalent
EPA	U.S. Environmental Protection Agency
HEPA	High-Efficiency Particulate Air
HVAC	heating, ventilation, and air conditioning
kW	kilowatts
LCF	latent cancer fatality
MEI	maximally exposed individual
NRC	Nuclear Regulatory Commission
RCRA	*Resource Conservation and Recovery Act of 1976*
rem	roentgen equivalent man
SST	single-shell tank
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TRU	transuranic
WAC	*Washington Administrative Code*

Definition of Terms

As Low As Reasonably Achievable (ALARA). An approach to radiation protection to control or manage exposures (both individual and collective to the workforce and general public) as low as social, technical, economic, practical, and public policy considerations permit.

Double-shell tank. A reinforced concrete underground vessel with two inner steel liners to provide containment and backup containment of liquid waste; annulus is instrumented to permit detection of leaks from the inner liner.

Definition of Terms (cont.)

Effective Dose Equivalent. A value used for estimating the total risk of potential health effects from radiation exposure. This estimate is the sum of the committed effective dose equivalent from internal deposition of radionuclides in the body and the effective dose equivalent from external radiation received during a year.

High-heat waste. Liquid radioactive waste which has the potential to generate sufficient fission product decay heat to cause self-boiling and self-concentration.

High-level waste. The highly radioactive waste material that results from the processing of spent nuclear fuel, including liquid waste produced directly in reprocessing that contains a combination of transuranic waste and fission products in concentrations requiring permanent isolation.

Latent cancer fatality. The additional cancer fatalities in a population due to exposure to a carcinogen.

Low-level waste. Waste that contains radioactivity and is not classified as high-level waste, transuranic waste, or spent nuclear fuel or byproduct material where the concentration of transuranic radionuclides is less than 100 nCi/g.

Maximally exposed individual. A hypothetical member of the public residing near the Hanford Site who, by virtue of location and living habits, could receive the highest possible radiation dose from radioactive effluents released from the Hanford Site.

Person-rem. A population dose based on the number of persons multiplied by the radiation dose.

rem. Acronym for roentgen equivalent man; a unit of dose equivalent that indicates the potential for impact on human cells.

Single-shell tank. Older style Hanford Site high-level waste underground tank composed of a single carbon steel liner surrounded by concrete.

Sluicing. A method of waste retrieval which utilizes a high-volume, low-pressure stream of liquid to mobilize the waste prior to pumping.

Supernatant. The relatively clear liquid which is located over material deposited by settling or precipitation.

Transuranic waste. Without regard to source or form, radioactive waste that at the end of institutional control periods is contaminated with alpha-emitting transuranic radionuclides with half-lives greater than 20 years and concentrations greater than 100 nCi/g.

Definition of Terms (cont.)

Watch List tanks. These tanks have been identified as Watch List Tanks in accordance with Public Law 101-510, Section 3137, *Safety Measures for Waste Tanks at Hanford Nuclear Reservation, 1990.* These tanks have been identified as the Priority 1 Hanford Site Tank Farm Safety Issues: "Issues/situations that contain most necessary conditions that could lead to worker (onsite) or offsite radiation exposure through an uncontrolled release of fission products, e.g., Tank SY-101."

Metric Conversion Chart

If you know	Multiply by	To get
	Length	
centimeters	0.39	inches
meters	3.28	feet
kilometers	0.62	miles
	Area	
square kilometers	0.39	square miles
square centimeters	0.16	square inch
	Mass (weight)	
grams	0.035	ounces
kilograms	2.20	pounds
milligrams	2.20×10^{-6}	pounds
	Volume	
liters	0.26	gallons
cubic meters	35.3	cubic feet
	Temperature	
Celsius	multiply by 9/5ths, then add 32	Fahrenheit
kilowatts	3412.14	British thermal unit
	Pressure	
kilograms per-square-centimeter	14.22	pounds per-square-inch

Source: *CRC Handbook of Chemistry and Physics*, Robert C. Weast, Ph.D., 70th Ed., 1989-1990, CRC Press, Inc., Boca Raton, Florida.

Scientific Notation Conversion Chart

Multiplier	Equivalent
10^{-1}	0.1
10^{-2}	.01
10^{-3}	.001
10^{-4}	.0001
10^{-5}	.00001
10^{-6}	.000001
10^{-7}	.0000001
10^{-8}	.00000001

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1.0 Purpose and Need for Agency Action

The U.S. Department of Energy (DOE) needs to take action to eliminate safety concerns with the storage of high-heat waste in Tank 241-C-106 (Tank C-106), and demonstrate a tank waste retrieval technology. The action would address the following concerns:

- The heat generation for Tank C-106 is estimated to be 32.24 plus or minus 5.86 kilowatts (kW) (110,000 plus or minus 20,000 British thermal units [Btu] per hour) (WHC 1993a). The heat is produced from the radioactive decay of radionuclides present in the waste, principally strontium-90. This decay heat is currently being removed by evaporative cooling. Approximately 22,700 liters (6,000 gallons) of water are added to the tank each month for this purpose. It is believed that without active cooling, temperatures in the tank would exceed established limits and eventually affect the structural integrity of the tank with a possible breach of containment.

- The continued addition of cooling water to the tank increases the amount of waste that could disperse into the soil column if Tank C-106 starts to leak. Even with the continued additions of cooling water, Tank C-106's integrity could still fail due to the fact that it is storing waste beyond its design life. In addition to the possibility of a tank leak occurring due to the age of the tank, a natural occurrence (i.e., an earthquake) also could lead to a release of the tank's contents to the environment. It is, therefore, advantageous to remove the waste from this tank as soon as possible to protect the environment against an accidental release.

- *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) Milestone M-45-03-T01, "Complete SST Waste Retrieval Demonstration," calls for the completion of a waste retrieval demonstration by 2003. Tank C-106 has been selected by DOE as the demonstration tank for this milestone. The State of Washington Department of Ecology (Ecology) has concurred in this selection and the Tri-Party Agreement names Tank C-106 as the retrieval demonstration tank. Sluicing has been identified as a reference retrieval technology for single-shell tank (SST) waste. While past-practice sluicing has been practiced extensively at the Hanford Site, it is identified as a demonstration technology because it has to be proven effective under the current regulatory framework which is much more stringent than past requirements. Sluicing will be evaluated as a method of waste retrieval for all SSTs. Tri-Party Agreement Milestone M-45-03a, "Initiate Sluicing Retrieval of C-106," also calls for the initiation of sluicing retrieval of Tank C-106 by October of 1997 to resolve the high-heat issue. This project has been identified by DOE as a Secretary of Energy Safety Initiative, and its schedule has been accelerated by one year over the date committed to in the Tri-Party Agreement. This reflects DOE's desire to resolve the safety issues surrounding specific waste tanks at the Hanford Site in a more expedient manner. The new, accelerated date proposed for initiation of the retrieval of the heat-generating waste from Tank C-106 is October 1996. Construction activities required prior to sluicing operations would last approximately two years, while the actual waste retrieval activities would take between six months and one year.

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2.0 Description of the Proposed Action

2.1 Background

The *National Defense Authorization Act for Fiscal Year 1991*, Public Law 101-510, Section 3137, "Safety Measures for Waste Tanks at Hanford Nuclear Reservation," mandates that DOE develop plans to respond to safety issues associated with underground waste storage tanks on the Hanford Site, and report the progress of implementation of these plans to the U.S. Congress. The tanks identified as having safety issues associated with them belong to the safety "Watchlist." The report containing the response plans has been prepared as *Status Report on Resolution of Waste Tank Safety Issues at the Hanford Site* (WHC 1993b), which identifies Tank C-106 as one of the "Priority 1," safety issues at the Hanford Site.

The proposed action would involve sluicing the waste from Tank C-106, a SST, and transferring the waste to Tank 241-AY-102 (Tank AY-102), a double-shell tank (DST), through one of the two proposed double encased (pipe-in-pipe design), bermed lines. Past-practice sluicing involves introducing a high-volume, low-pressure stream of liquid to mobilize sludge waste prior to pumping. Tank C-106 is located in the 200 East Area (Figure 1). Tank C-106 is 23 meters (75 feet) in diameter, and is constructed of reinforced concrete with a carbon-steel liner on the tank bottom and sides. The tank has a 31-centimeter (12-inch) thick dished bottom, and a useable waste depth of approximately 4.8 meters (16 feet) at the sidewall. The dome of the tank is constructed of 38-centimeter (15-inch) thick reinforced concrete. Tank C-106 was constructed between 1943 and 1944, and has the capacity of approximately 1.9 million liters (500,000 gallons). Figure 2 shows the proposed configuration of Tank C-106.

In 1992, the ventilation system failed on the tank, and the practice of adding cooling water was halted for a period of six months while the ventilation system was being repaired. The tank was continuously monitored for waste level decreases that might indicate that there was a loss of confinement in the tank. During this period, the waste level in the tank did not decrease, but actually rose as a result of thermal expansion due to the increased temperature, which supported DOE's classification of the tank as sound.

The waste in Tank C-106 consists of 746,000 liters (197,000 gallons) of sludge. The waste is stratified into two layers. The top layer consists of 655,000 liters (173,000 gallons) of sludge, containing a sufficient amount of strontium to be considered high-heat waste (WHC 1993a). This layer generates approximately 32kW (110,000 Btu per hour). The bottom layer consists of 91,000 liters (24,000 gallons) of low-heat producing hardened material. Approximately 121,000 liters (32,000 gallons) of supernatant exists above the sludge layers, and would be pumped to Tank AY-102 as part of this project, just prior to sluicing operations. In order to resolve the heat issue associated with this tank, sluicing would need to remove approximately 75 percent of the high-heat waste to lower the heat output of the remaining waste to less than 11.72 kW (40,000 Btu per hour). Before the addition of the strontium bearing waste in the 1970s, Tank C-106 did not exhibit a heat problem. There was also an observable hardened layer at the bottom of the tank. After the sluicing operation which introduced the strontium waste was completed, the level of solids in Tank C-106 was observed to increase. At the same time, the waste started generating excess amounts of heat. Figures 3 and 4 show Tank C-106's volume history and heat generation, by layer, respectively.

A core sample taken from Tank C-106 in 1986 showed that stratification of the waste layers persisted. The bottom layer was observed to remain as a hardened layer while the upper layer still remained a soft sludge. It was concluded that since the layers did not commingle, the constituents generating heat remained in this upper soft layer.

In addition to producing significant quantities of heat, the waste in Tank C-106 has greater than 100 nanocuries per gram transuranic (TRU) content (WHC 1994a). This qualifies the sludge as both a high-heat and TRU waste (WHC 1993a). The chemical composition of the sludge also classifies the contents of the tank as a "listed waste" in accordance with *Washington Administrative Code* (WAC) 173-303, "Dangerous Waste Regulations." The heat generation rate for this sludge is estimated to be 32.24 plus or minus 5.86 kW (110,000 plus or minus 20,000 Btu per hour) (Bander 1993).

Tank AY-102, which also is located in the 200 East Area, was built between 1968 and 1970, and has an operational capacity of 3.7 million liters (980,000 gallons). Tank AY-102 is currently near its operational capacity, but would undergo a waste transfer operation prior to sluicing to provide receiving space for Tank C-106's waste. The tank is currently classified as sound (WHC 1993a), and was built with a design life of 50 years. Tank AY-102's waste comes from a variety of sources and is considered TRU and of a noncomplexed organic nature, which poses no criticality issues with the waste from Tank C-106 (WHC 1994a). Tank AY-102 was chosen as the receiver tank because it is a DST, which provides an additional barrier against the release of the waste to the environment; has a newer, larger capacity ventilation system which can dissipate much larger amounts of heat; and has a sufficient amount of space available for waste storage. The transfer of the waste to this DST would eliminate the high-heat problem associated with the waste because Tank AY-102's ventilation system (which serves four DSTs) is capable of handling 1,173 kW (4 million Btu per hour). Tank AY-102 would store the waste until final treatment options become available (currently scheduled for the Year 2009). Figure 2 shows the proposed configuration of Tank AY-102.

2.2 Proposed Action

The proposed action would remove the high-heat solids in Tank C-106 by a closed-loop, continuous sluicing process. Specifically, this would entail introducing a high-volume, low-pressure stream of liquid (supernatant or treated water) to mobilize the sludge waste in Tank C-106 and prepare it for pumping. Up to two remotely aimed "sluicers" would be installed in Tank C-106 at separate locations to ensure full sluicing coverage of the waste. As soon as the sludge is broken up by the sluicers, and a slurry formed, a slurry transfer pump would remove the mixture for transfer to the receiver tank at approximately the same rate that the supernatant is being introduced to Tank C-106. The waste would be transferred to Tank AY-102 through one of two proposed, double encased pipelines, which would be installed to support this waste retrieval project. These pipelines, which would connect the two tanks, would measure approximately 0.4 kilometer (0.25 miles) in length. Figure 5 depicts tank-to-tank sluicing while Figure 6 shows the location of the proposed waste transfer lines. The slurry would be deposited in Tank AY-102 through a slurry distributor (located below the liquid level), which would greatly diminish the flow velocity and allow the heavier, sludge particles in the slurry to settle under the force of gravity. The liquid portion of the slurry would remain on top to be recycled to Tank C-106 as the liquid sluicing agent (supernatant). A sluice pump would simultaneously transfer the supernatant from Tank AY-102 to Tank C-106 through one of the two, newly installed, pipelines to the sluicers where it would be used to mobilize additional sludge in Tank C-106. The pipelines would be partially buried and covered with an earthen berm to limit personnel dose exposure to tank farm workers (Figure 7).

At the beginning of the sluicing operation, the 120,000 liters (32,000 gallons) of supernatant presently in Tank C-106 would be pumped to the receiver tank (which would be approximately half full at the time of sluicing) to allow improved sluicing efficiency in Tank C-106. The valves on the slurry transfer pump in Tank C-106 then would be set to allow the slurry to recirculate directly to the sluicers. This process would allow the mixture recirculating within Tank C-106 to be monitored for waste consistency. Once the slurry has the desired characteristics (mainly for percentage of solids), the valves on the slurry transfer pump would be switched to allow the slurry to pump through the transfer line to Tank AY-102. At this point, the maximum amount of supernatant pumped from Tank AY-102 would be roughly 19,000 liters (5,000 gallons). The sluice pump would send the supernatant simultaneously from Tank AY-102 to the sluicers, creating a continuous process.

During this process, the sluice pump in Tank AY-102 would deliver 1,324 liters (350 gallons) per minute of supernatant to the sluicing nozzles in Tank C-106, with a pressure of 12.5 kilograms per-square-centimeter (180 pounds per-square-inch), and a temperature between 24 and 29 °C (75 to 85 °F). This pump maintains enough agitation to prevent any solids from settling in the transfer lines. Up to two sluicers (Figure 8) would be installed in Tank C-106, and would use the supernatant from Tank AY-102 to break up the sludge waste. One sluicer would operate in the existing sluice pit, while the other would operate in the existing pump pit, if needed. During most of the waste retrieval operations, only one sluicer would operate at any given time.

An in-tank imaging system would be used to monitor the operation of the sluicers by locating sludge concentrations, and determining the effectiveness of the sluicers. This imaging system would allow for sluicing operations to proceed with a minimal volume of liquid in Tank C-106, which is desirable for safety (tank leakage) considerations and proper positioning of the sluicers for maximum solids removal efficiency. The sluicers would be directed with the aid of this imaging system to cut troughs in the waste during the initial tages of waste removal. These troughs, which would produce channels in the waste leading to the slurry pump, would increase sluicing efficiency (Figure 9).

A new submersible pump would be installed in Tank C-106 to transfer the slurry (i.e., the sluiced waste) to Tank AY-102. To allow for slurry elevation changes, the slurry transfer pump would be manually adjusted to maintain sufficient suction-head pressure. The sluicing operations would start from the center of the tank, and work to the outside, by remotely adjusting the angle of the sluicers. The waste solids located along the tank walls would not be removed until the end of sluicing operations (Figure 9). This would minimize the potential for the sluicing stream to cause a leak by impinging upon a weak point in the tank wall or by opening a pre-existing corrosion induced or sludge-plugged leak site.

The slurry would be pumped into the transfer line and deposited into Tank AY-102. A slurry distributor would evenly spread the Tank C-106 waste solids in Tank AY-102. This would provide a more uniform heat source in Tank AY-102. The distributor also would provide a siphon break for the transfer line back to Tank C-106.

Various techniques exist for determining the amount of sludge the sluicing operation has transferred from Tank C-106. Two of these techniques include direct observation by the in-tank imaging system and the use of process instrumentation. Instrumentation included in the transfer lines would offer a direct measurement of the quantity of waste transferred. In addition to assessing the amount of sludge transferred, the sluicing system proposed for this operation, combined with the level indicator located in Tank AY-102, could be used to determine whether Tank C-106 has developed a leak. A running material balance inventory would be maintained to assure that all liquids (within the accuracies of the Tank AY-102's liquid level instrument and the transfer lines' flow meters) remain accounted for. The presence of flow meters on the transfer lines and material balance controls on Tank AY-102 would detect a leak when approximately 30,000 liters (8,000 gallons) are removed from the sluicing process by means of a leak somewhere in the closed-loop system.

Determination of the end point for the sluicing operation would depend on the results of an in-field evaluation to determine the heat balance of Tank C-106. When the majority (at least 75 percent) of the high-heat waste has been transferred, the evaluation may be considered, although the evaluation may be conducted at other times if other situations arise. If this evaluation confirms that the heat load in the tank is below 11.72 kW (40,000 Btu per hour), the sluicing operation could end; however, additional waste might be sluiced to demonstrate the effectiveness of this waste retrieval technology.

Chemical additions of sodium hydroxide and sodium nitrite (to maintain the waste within the DST operating specifications for corrosion control), would be distributed through an existing riser in Tank AY-102, as needed. In addition, caustic solution (namely sodium hydroxide) would be added, as necessary, to the supernatant prior to and during sluicing to promote waste compatibility.

The project would be designed to incorporate features that would protect workers. The waste transfer lines would be partially buried and bermed for radiation shielding. The proposed new ventilation system for Tank C-106 would be designed to reduce the time workers would spend changing filters. Workers in the 241-C Tank Farm would wear all of the appropriate protective clothing, and may use respiratory equipment (e.g., face masks and bottled 'fresh' air).

Prior to the actual sluicing operations, several actions would be required to prepare the tanks for the insertion of the pumps and/or equipment. Some of the existing equipment in the pump and sluice pits of Tank C-106 must be removed and stored at the Hanford Site for subsequent treatment and disposal. This removal would be accomplished by hoisting the equipment through existing risers into flexible receiver containers. These containers would be lowered into specially constructed crates positioned on a trailer, and sent to the Hanford Central Waste Complex. During the actual sluicing operation, it may be necessary to remove additional equipment if it is determined that this remaining, obsolete equipment impairs sluicing efficiency. The same method of equipment removal described above likely would be utilized for these removals as well. The inside of the pump and sluice pits would require cleaning, and the application of paint or fiber to the surface, to provide a surface that can be more easily decontaminated. Equipment removal and pit decontamination are routine tank farm activities, as previously considered in the preparation of the *Final Environmental Impact Statement: Disposal of Hanford Defense High-Level, Transuranic and Tank Wastes, Hanford Site, Richland, Washington* (HDW-EIS) (DOE 1987), and the *Environmental Assessment: Waste Tank Safety Program, Hanford Site, Richland, Washington* (DOE 1994).

It is proposed that the initial sluicing fluid used to sluice Tank C-106's waste would be Tank 241-AY-101's (Tank AY-101) supernatant or other appropriate fluid. Alternative sluicing agents may consist of supernatant, or fluid, from another waste tank (or waste stream at the Hanford Site) or "buffered" water (water which has been chemically treated for corrosion control). The decision on which fluid to use as the sluicing agent would consider factors such as waste compatibility, cost effectiveness, waste minimization guidelines, and coordination with ongoing tank farm operations. Prior to the transfer of the sluicing fluid into Tank AY-102, the supernatant currently in Tank AY-102 would be sent to the Evaporator Bottoms System or another DST because of potential waste compatibility concerns with the sludge in Tank C-106. This type of transfer is performed frequently at the Hanford Site, and is considered to be a routine action required for proper waste storage and treatment. The removal of Tank AY-102's supernatant, even with the introduction of the new sluicing fluid, would create approximately 1.9 million liters (500,000 gallons) of space in the receiver tank for this transfer and would eliminate the potential for overflow as a result of the proposed sluicing operation.

To minimize releases to the atmosphere from the ventilation system on Tank C-106, the proposed action would install a High-Efficiency Particulate Air (HEPA) filtration system for Tank C-106. Additional filtration elements (which could include mist eliminators and gas filtration units) would be included in this system as required to meet regulatory release requirements, such as Best Available Control Technology for both toxic and radionuclide emissions. These additional elements would be added before sluicing operations commence if ongoing air emission studies demand their inclusion. New exhaust ductwork would be designed and installed to discharge through the new filtration system. The old ventilation system and ductwork would remain in place and operational for Tank 241-C-105 and Tank C-106 major maintenance operations. During these infrequent major maintenance operations, an air flow of approximately 75 cubic meters (2,500 cubic feet) per minute would be discharged through this ventilation system. The new filtration system would discharge a maximum of approximately 9.9 cubic meters (350 cubic feet) per minute during normal operations. Section 5.1 presents a description of emissions from sluicing operations.

A metal filtration unit would be installed upstream from the HEPA filtration units, which would catch the majority of the contaminants before they reach the HEPA filters. This would negate the need to change these HEPA filters during the operational life of this project. This metal filtration unit would be included to meet As Low As Reasonably Achievable (ALARA) requirements, which are designed to minimize worker exposure to radioactive air emissions. Since the metal filtration unit is flushable, little or no solid waste is expected to be generated by the entire air filtration system. At the conclusion of these waste retrieval activities, the disposable part of these filter units would be disposed of properly at the Hanford Site.

To control the temperature and humidity of the Tank C-106 vapor space during sluicing, the proposed action would install a recirculation line in the ventilation system. This recirculation line would consist of a condenser, a dehumidification coil, and a recirculation fan. The proposed action would include a supplemental cooling system, if necessary, to provide a means of removing excess heat from the tank and to preclude steam generation from within the waste. A supplemental cooling system would allow sluicing to proceed safely and more efficiently. This cooling may be accomplished by modifying the piping on the ventilation system to allow the use of the proposed recirculation duct air chiller with the existing tank ventilation system or may involve the addition of cooling liquid (e.g., water), either prior to, or as part of, the sluicing process.

Additional instrumentation would be required in both tanks (Tanks C-106 and AY-102), and in the transfer lines between the tanks. Tank C-106 would receive instrumentation that would monitor tank pressure to ensure confinement. Temperature monitoring would be provided by using a thermocouple tree. Sluicing pump control and status instrumentation also would be provided. A double-wide trailer would be installed outside the 241-C Tank Farm, and would serve to house centralized monitoring and control instrumentation. Additional monitoring devices would be installed in Tank AY-102, as needed. Leak detection would be provided for the new transfer lines and the pump pits, and a seismic switch would be added to reduce the volume of a spill from a rupture of the transfer lines that could be caused by a Design Basis Earthquake (DBE).

Support services in the form of raw water, sanitary water, electrical power, telecommunications, and hoisting hardware, would be provided. The use of existing septic systems or portable facilities for sanitary sewage would be considered for the personnel using the control trailer. A sanitary catch tank, sized for one week of operation, may be provided should it be determined that existing facilities are inadequate. This catch tank would be emptied periodically (weekly) to a properly sited facility for treatment in accordance with approved Hanford Site procedures. Standby power and/or uninterruptable power supplies would be provided, as required.

The project has a maximum design life of two years, although actual sluicing operations should take approximately six months to complete. After the retrieval operation is complete, the used equipment and waste transfer lines would be decontaminated and stored for future treatment and disposal. Other project waste would be disposed of in a properly sited landfill in accordance with all applicable state and federal guidelines.

This project is designed to, at a minimum, remove 75 percent of the high-heat waste, which would lower the heat output of the remaining waste to less than 11.72 kW (40,000 Btu per hour). Sluicing would attempt to remove as much waste as possible beyond this 75 percent to demonstrate a waste retrieval technology. At the end of sluicing operations, however, a 0.3- to 0.6-meter (1- to 2-foot) layer of hardened waste may remain. This hardened layer, if not removed during the sluicing operation, would be removed by a different technology which is under development as part of a separate project, and will be addressed by future *National Environmental Policy Act of 1969* documentation. In the interim period, between the conclusion of the proposed action and the initiation of this future retrieval action, the hardened layer would be monitored and treated (e.g., removing any potential excess heat by utilizing air chillers, and sprinkler systems), if necessary, to prevent this waste from drying out and potentially developing undesirable characteristics. The waste in Tank AY-102 also would be monitored to ensure that the storage of waste is within the tank's operating specifications. Proper measures would be taken, which may include the use of airlift recirculators, to prevent the waste from forming potentially hazardous physical properties.

3.0 Alternatives to the Proposed Action

Sluicing alternatives to the proposed action were identified and described in Appendix F of the *Tank 106-C Sluicing Letter Report* (WHC 1993c). The sluicing alternatives mentioned, including the No-Action Alternative, are listed below. Section 5.3.1 contains a discussion of the impacts from these alternatives.

- Batch Transfer. This option would utilize a 189,000-liter (50,000-gallon) accumulation tank, which would hold both the supernatant from Tank AY-102, and the slurry from Tank C-106, alternately. This supernatant would be used as the sluicer fluid for Tank C-106 waste. When enough solids were pumped to the accumulation tank, the material would be batch transferred to Tank AY-102. The accumulation tank then would be refilled with supernatant from Tank AY-102, and the cycle repeated. While definitive design for this alternative has not been completed, it is anticipated that the accumulation tank would be located within the 241-C Tank Farm boundaries. This alternative has been used at the Hanford Site as a proven technology used to retrieve waste.

- Once Through--No Recycle. This alternative would use a tank truck to supply the sluicing medium to mobilize the solids in Tank C-106, which are then pumped to the receiver tank. With no recycling, the amount of liquid, most likely raw water (chemically adjusted for corrosion control), pumped to the receiver tank would be larger, relative to the amount of liquid pumped from the proposed action. Some of this excess liquid would be pumped from the DST for additional treatment or storage (i.e., sent to an evaporator or another DST with more available space). This alternative, one of several which would use a tank truck, would allow for continuous operation.

- Limited Mixer Pump. This alternative is similar to the Once Through--No Recycle described above in that it would utilize a tank truck to provide the sluicing agent. This alternative, however, would use sluicers and a specially designed combined mixer and transfer pump to mobilize a portion of the solids in Tank C-106 in a bowl-shaped depression (utilizing the remaining solids as an additional barrier to tank leakage). The homogenized slurry then would be transferred to the receiver tank in batches to reduce the amount of extra liquid waste produced. While this alternative is not expected to produce as much additional waste as the Once Through--No Recycle Alternative, it still would require more storage space than the proposed action or the Batch Transfer Alternative.

- Recirculate Within a SST Via Mixer Pump. Again, a tank truck would be used to supply the waste mobilizing agent. However, sluicers would not be used in this option. Instead, two mixer pumps would use the introduced liquid to mobilize all of the solids in Tank C-106 into a homogenous slurry before transfer. This option would have roughly the same waste space requirements as the proposed action; however, there are several drawbacks that make this option unattractive. These drawbacks include higher heat input to the waste due to additional mixing and agitation; increased environmental risk due to possible damage to the tank from the mixing pump outlet spray impinging on the tank walls and a much higher liquid inventory maintained in Tank C-106 during the retrieval operation; the need for an additional 107-centimeter (42-inch) riser; and a longer design and testing period.

- Internal Recirculation. The last alternative examined using a tank truck, internal Recirculation, would use a portion of the slurry (i.e., the already-sluiced waste) as an additional mobilization agent. Some of the slurry would be pumped to the receiver tank, and some would be fed back into the sluicers. This would limit the amount of mobilization agent needed from the tank truck. As with the other alternatives that use a tank truck, the amount of slurry waste would be somewhat greater than that of the proposed action.

- Hydraulic Mining. This alternative would use a variation of a technique used in the mining industry. A crane would lower a mining tool that would penetrate the waste and shoot a high-pressure stream of water laterally. A slurry inlet port would pump the slurry out to the receiver tank, creating a waste cavity in the section of waste desired. More complex than the proposed action, this unproven alternative would have the potential for the greatest waste minimization of any of the alternatives. However, the amount of time required to develop and test the method would be much greater than any of the other alternatives.

- Center Pivot Dredge. Dredging involves utilizing a 1.5-meter (5-foot) opening to allow mechanical dredging equipment to access the tank. This option involves the highest cost and complexity, and yet provides the lowest probability of success because of the technical difficulty of dredging around obstructions (i.e., failed equipment and instrumentation), which extend from the risers. In addition, the amount of time needed to test and develop appears to be prohibitive. The exposure to workers is anticipated to be higher due to the 1.5-meter (5-foot) opening. Concerns on exceeding tank dome weight limits also exist with this option. The potential for worker exposure is greater, and the amount of equipment to be decontaminated and decommissioned is larger.

- No-Action. This alternative would involve leaving the high-heat waste in Tank C-106 and continuing to add cooling water.

Of the sluicing alternatives presented above, only the proposed action and the Batch Transfer Alternative meet the two requirements considered essential to addressing the concerns mentioned in Section 1.0. These requirements consist of reducing the heat load in Tank C-106 to less than 11.72 kW (40,000 Btu per hour), and choosing a sluicing method that would be capable of starting retrieval by October of 1996. The other alternatives were not capable of meeting one or both of these requirements and, therefore, were not examined further. The Batch Transfer Alternative, while it meets the two requirements, would entail more design, procurement and construction costs, and would be less likely to meet the start date.

The No-Action Alternative would result in maintaining Tank C-106 in its present condition. No waste transfer operations would be performed, and the high-heat producing waste would continue to generate excessive thermal loads. In order to maintain the temperature of the tank to levels below the point where the tank structural integrity would not be affected by excessive heat, cooling water would continue to be added. Alternative means of cooling the waste, such as using a sprinkler system, an air chiller (which would introduce cooled air into the tank), or a combination of the two, are currently being examined. These cooling methods are designed to be used as a contingency plan should the tank start to leak. Because Tank C-106 has reached the end of its design life, the possibility of a tank leak is fairly high and will increase over time. The continued addition of cooling water, which would likely proceed under the No-Action Alternative, would increase the total amount of possible contamination which could leak into the soil column. No matter which cooling method is used (either the addition of cooling water or the development and use of an air chiller), the problem of high-heat producing waste would persist, and the Tri-Party Agreement milestone (M-45-03-T01) for the demonstration of a waste retrieval technology would not be met.

Alternatives to the use of Tank AY-102 as the receiver tank were examined at the inception of this project. All DSTs in the 200 East Area were examined as potential receiver tanks. The SSTs were excluded due to fact that most, if not all, of the SSTs are beyond their design life and do not meet double containment requirements. Of the DSTs examined, only the Aging Waste Facility (including two tanks in the AY Tank Farm and two tanks in the AZ Tank Farm) contained a ventilation system capable of handling the additional heat load of Tank C-106's waste. Only the two tanks within the AY Tank Farm were found to have sufficient storage space. Later analyses examined the waste forms from both of the AY tanks for compatibility, and found the best waste compatibility aspects in terms of storage to be with the Tank AY-102. As was mentioned earlier, it has been determined that the supernatant from Tank AY-101 would be used as the initial sluicing agent.

No other reasonable alternatives to past-practice sluicing have been identified.

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4.0 Affected Environment

4.1 Hanford Site

Tanks C-106 and AY-102, are located in the 200 East Area of the approximately 1,450 square kilometer (560 square mile) semi-arid Hanford Site in Southeastern Washington State (Figure 1). The 200 East Area is approximately 10 kilometers (6 miles) west of the Columbia River, the nearest natural watercourse. The nearest population center is the City of Richland, approximately 32 kilometers (20 miles) to the south. The City of Richland has a population of 32,315, while the population within an 80-kilometer (50-mile) radius of the 200 Areas is approximately 380,000. Roughly 2,800 employees are working in the 200 East Area, and an estimated 20 workers would be directly involved with the sluicing operations. The 200 East Area is not located within or adjacent to a wetland, or in a 100- or 500-year floodplain.

The geology of the site where the proposed action would take place is typical of the 200 Areas. The surface is covered with loess and sand dunes of varying thickness, although the tank farms and the majority of the area between them is composed of a disturbed gravel layer. Under the surface layer, in ascending order, are basement rocks of undetermined origin, the Columbia River Basalt Group with intercalated sediments of the Ellensburg Formation, the Ringold Formation, the Plio-Pleistocene unit, and the Hanford Formation. The depth to groundwater in the 200 East Area is 75 meters (246 feet). Groundwater flow is generally in an easterly and southeasterly direction, toward the Columbia River (PNL 1994a).

The Hanford Site has a mild climate with 15 to 18 centimeters (6 to 7 inches) of annual precipitation, and infrequent periods of high winds of up to 128-kilometers (80-miles) per hour. Tornadoes are extremely rare; no destructive tornadoes have occurred in the region surrounding the Hanford Site. The probability of a tornado hitting any given waste management unit on the Hanford Site is estimated at 1 chance in 100,000 during any given year.

The region containing the Hanford Site is categorized as one of low to moderate seismicity. The annual probability (frequency) of a DBE has been determined to be 7.0×10^{-4}. The DBE determines the structural standards which a facility must meet.

Additional information regarding the Hanford Site can be found in characterization documents (PNL 1994a and PNL 1994b).

4.2 Cultural and Biological Resources

The Hanford Site is known to be rich in cultural resources, and contains many well-preserved archaeological sites dating back to both prehistoric and historical periods.

Over 10,000 years of human activity have left extensive archaeological deposits along the Columbia River shoreline and at well-watered inland sites. By virtue of their inclusion in the controlled Hanford Site, archaeological deposits have been spared some of the severe disturbances that have befallen unprotected sites in the area.

The proposed activities, past-practice sluicing and waste transfer operations, would not occur in a known environmentally sensitive area. The tank farms affected by the sluicing and waste transfer actions have been reviewed, and have not been found to contain any cultural resources. Appendix A contains the Cultural Resources Review (CRR) for the impacted area and states that, "due to the highly disturbed nature of the area, no cultural resources are expected." If the work being proposed uncovered any items of significance (e.g., bones and artifacts), work would be halted until proper mitigation measures are taken. Additional information regarding the Hanford Site's cultural and biological resources can be found in characterization documents (PNL 1994a).

No plants or animals on the federal list of "Endangered and Threatened Wildlife and Plants" (50 Code of Federal Regulations 17) are found in the immediate vicinity of the proposed action. Consequently, there is no need for formal consultation with the U.S. Fish and Wildlife Service. In addition, none of the several species of plants and animals, which are under consideration for formal listing by either the Federal Government or the State of Washington, would be adversely impacted by the proposed waste retrieval activities. In fact, there are relatively few species of either plants or animals found in the proximity of the proposed action due to the highly disturbed nature of the area. Appendix B contains the Ecological Survey for the impacted area, and states that no state or federal threatened, endangered, or candidate species would be adversely impacted.

5.0 Environmental Impacts

This section presents information on those potential environmental impacts that have been identified as a result of the proposed activities for past-practice sluicing of waste from Tank C-106 to Tank AY-102. Also, environmental impacts are presented for reasonably foreseeable accident scenarios, impacts from the reasonable alternatives to the proposed action, and cumulative impacts.

5.1 Analysis of Past-Practice Sluicing of Tank 241-C-106

It is expected that proper controls on the tank ventilation systems would operate in accordance with *Clean Air Act of 1970* (CAA) requirements for gaseous and particulate discharges to the atmosphere. The tank ventilation system would maintain a negative pressure inside of Tank C-106. This would keep the gaseous and particulate contents inside the tank in the event of planned or unforeseen openings of the tank risers. The HEPA filtration units would be employed at the Tank C-106 exhaust stack, which would satisfy ALARA principles, and meet state and federal regulatory requirements. These requirements would limit emissions from both tanks, Tanks C-106 and AY-102. Emissions from Tank C-106 as a result of sluicing operations, which are expected to be slightly higher than current levels, would represent only a small fraction of total Hanford Site tank farm emissions. In 1992, the average dose to the offsite maximally exposed individual (MEI), based on measured emissions, from the combined filtration stack which services Tanks C-106 and 241-C-105, was 6.23×10^{-7} millirems (DOE-RL 1993). The average dose to the offsite MEI from the operation of the AY and AZ Tank Farms for 1992 was 4.4×10^{-5} millirems (DOE-RL 1993). Since the four tanks which comprise the AY and AZ Tank Farms all release through a common ventilation stack, individual release data from Tank AY-102 is not available. This number is not expected to increase either during or after the waste transfer operation. The proposed action would not result in a greater impact from emissions to either on- or offsite populations than the status quo.

Most of the liquid necessary for the sluicing operations would be obtained from, and returned to, Tank AY-102. The overall amount of liquid in Tank C-106 would not increase substantially during sluicing operations because the amount of material being sluiced is approximately equal to the amount of supernatant added. During the initial stage of retrieval operations, the total amount of waste in Tank C-106 would be increased by roughly 19,000 liters (5,000 gallons) of supernatant from Tank AY-102. Additional liquid, which would consist primarily of clean water, might be required for sluicing-line cleanout, but would not be a significant increase in total volume used, and would be within the receiving tank's storage capacity.

Sanitary services for the support trailer would consist of either a buried catch tank designed to collect sanitary waste, which would need to be emptied weekly for the duration of the project, or portable facilities. The waste from the catch tank would be pumped to a trailer truck and sent to a properly sited facility for treatment in accordance with approved

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Hanford Site procedures. A permit for this catch tank would be required from the State of Washington Department of Health (DOH) if this option is chosen.

The sluicing and slurry transfer lines would comply with *Resource Conservation and Recovery Act of 1976* (RCRA) requirements, and include full pipe-in-pipe containment with leak detection capability. The sluicing line valve box would be designed to have a drain system capable of handling a worst-case spill scenario. This drain system also would serve to prevent releases to the environment. Initially, sluicers would direct the diluted supernatant toward the center of the tank. As the retrieval operation proceeds, the sluicers would be directed outward. This would minimize the time that the tank liner is directly exposed to the sluice stream, and minimize the potential for a sluicing-induced tank leak.

During normal sluicing operations, no releases of tank contents would be expected. During jumper change operations (which is defined as the replacement of the hoses which connect the transfer lines to the various pumps, and sluicers), small residual amounts of radioactive material would be available for release. Leaks within the pump and sluice pits would be detected by special instrumentation which might include conductivity probes. Pit drains would return leaked wastes to either Tank C-106 or Tank AY-102 for compatible waste storage. Leaks resulting in measurable accumulation of solution on the floor of the pits would be detected, and the waste returned to the tank. For smaller leaks, detection would be accomplished by visual inspections or engineered features. The pits would maintain slightly negative pressures, maintained by the tank ventilation system, to prevent release of any airborne radioactivity from the pit to the atmosphere during retrieval activities. Administrative controls, such as lock and tag procedures, would require that all pit covers be in place before any transfer. The transfer pumps would be locked and tagged-out while the pit covers are off. The removal of the pump lock and tag requires that the pit covers be in place. Only after the lock and tagout requirements are met, would the pumps be allowed to operate. Spray and washdown systems would be incorporated into the design to reduce any contamination in the pits before they are opened for any maintenance activities.

Leaks in the primary piping system of the transfer lines would be controlled by the secondary containment system (the outer encasement pipe). This secondary containment system would be designed to collect released waste at a common point for detection and removal. Leaks from the DST would be controlled by the secondary containment shell, which is designed to collect and transmit released waste to a common point for detection and transfer. Inspection for potential leaks and waste transfer would be possible through a number of risers located on the DST.

There would be some radiological exposure to workers involved in the proposed activities. However, the anticipated exposure would be no greater than other routine tank farm activities. Average occupational external exposure to workers in the Hanford Site tank farms (as measured by individual dosimetry records) is approximately 14 millirem per year per worker (WHC 1994b), which is substantially less than the maximum allowable exposure of 5,000 millirem per year as set by DOE guidelines. For comparison purposes, the national average dose to the public from natural sources is 300 millirem per year (PNL 1994b).

Some additional exposure might occur to workers involved in decontamination of excess equipment at the conclusion of sluicing operations. Decontamination is considered a routine action at the Hanford Site. Engineering controls would be in place prior to decontamination activities to prevent any excess radiological exposure. Further, the workers are trained and would be attired in appropriate protective gear. Therefore, workers would not be expected to receive more than the allowable 5,000 millirem per year set by DOE guidelines. Also, decontamination activities could lead to exposure of hazardous chemicals used in the decontamination process. Proper training, equipment, and procedures would prevent adverse human health effects from the handling of these hazardous chemicals.

Workers involved with the sluicing operation would use proper respiratory equipment as required, (which may include masks and bottled 'fresh' air) while in the 241-C Tank Farm for the duration of the project, to avoid the possibility of inhalation of toxic vapors, which may emanate from other tanks (notably Tank 241-C-103). Tank C-106 is not expected to produce toxic vapors in detectable quantities and no threat to worker safety is predicted. Toxic air pollutants from routine operations would be within acceptable source impact levels at the Hanford Site boundary, and would pose no threat to the public.

Based on a dose-to-risk conversion factor of 4.0×10^{-4} (onsite) latent cancer fatality (LCF) per person-rem (56 *Federal Register* [FR] 23363), the average tank farm worker with the previously mentioned dose rate of 14 millirem per year would have an estimated annual probability of an LCF induced by the radiation of 5.6×10^{-6}. The estimated probability of the worker dying from cancer induced by such radiation doses over the worker's projected exposure period (2 years) is approximately 1.1×10^{-5} (or 1 chance in 100,000). Further, assuming that annually 20 tank farm workers are directly involved with operations associated with the proposed actions, and those workers are exposed to the average annual dose rate for tank farm operations (i.e., 14 millirem), a total of 2.2×10^{-4} LCFs over the two year projected exposure period would be expected.

No public exposure above that currently experienced from Hanford Site operations would be anticipated as a result of these actions. As reported in the *Hanford Site Environmental Report 1993* (PNL 1994b), the potential dose to the hypothetical offsite MEI during Calendar Year (CY) 1993 from Hanford Site operations was 3.0×10^{-2} millirem. The potential dose to the 380,000 persons which constitute the affected population (defined as the number of people living within 80 kilometers [50 miles] of the source) from 1993 operations, was 0.4 person-rem. The 1993 average dose to the population was 1.0×10^{-3} millirem per person. The current DOE radiation limit for an individual member of the public is 100 millirem per year.

The proposed action would result in the generation of solid waste during the life of the project. Such waste would be surveyed and disposed of in the Hanford Site Solid Waste Landfill if uncontaminated, or another applicable, permitted location if found to be contaminated with hazardous or radioactive constituents. Transportation of hazardous and/or radioactive waste is considered a routine activity at the Hanford Site. Proper administrative controls and operating procedures would minimize the impact of transporting this waste. At the completion of activities, noncontaminated equipment would be excessed where applicable, while contaminated materials and components would be packaged and stored in an onsite permitted facility as is the current practice.

Trenching would be required for the installation of the transfer lines, power and instrumentation control cable lines, and for the tie-down operations required to install a double-wide trailer (two single, modular trailers combined into one facility). This facility would be located between the 241-C and the 241-AY Tank Farms. An Excavation Permit would be required for the trenching required for the power and instrumentation control cable lines, the buried waste transfer lines, and the tie-down operations needed for the double-wide trailer. Appendix A of this document is the CRR for this project, which states that no cultural resources are expected to be disturbed.

The area where the work is to be performed (i.e., the 241-C and 241-AY Tank Farms) is a developed, highly disturbed area, and is currently under vegetation management. The pipelines would be partially buried and covered with an earthen berm for shielding. Neither the pipelines nor the support facility would have a negative impact on plant or animal species of concern. The work would not disturb any sensitive or critical habitat. There are no animal species of special concern that are known to use the area exclusively. The 200 East Area is not located in a floodplain, and the tank farms are not located on land that could be considered wetlands. Appendix B consists of the Ecological Survey, which states that no adverse impacts are expected to any plant or animal species of concern because the proposed action takes place in such a highly disturbed location.

The proposed action likely would result in a minor release of particulates from construction activities needed to prepare the tanks for sluicing. These particulates, which consist chiefly of dust, would be mitigated by proper dust controls whenever necessary. Thermal discharges to the environment would be generated by equipment and vehicle exhaust, but can be considered minor when compared to sitewide thermal releases. Noise levels would rise in the vicinity of the 241-C and 241-AY Tank Farms during the sluicing operations, but would return to present levels when the project is finished. The equipment to be used (e.g., steel and other metals for piping and enclosures that are necessary for sluicing operations) represents a long-term commitment of nonrenewable resources. A Hanford Site Radiation Work Permit would be required for work within the tank farms.

Protective clothing requirements would be prescribed in the Hanford Site Radiation Work Permit and would be selected based upon the contamination level in the work area, the anticipated work activity, worker health considerations, and regard for any nonradiological hazards that may be present. The *Tank Farm Health and Safety Plan* (WHC 1994c) lists controls and procedures which are in place to protect tank farm workers. This document specifies clothing requirements (including respiratory equipment), monitoring procedures, tank farm access restrictions, and standard operating controls. In addition, workers would have completed all proper procedural and safety training prior to commencement of sluicing activities. This would result in having trained personnel present during all phases of the project, especially during the duration that the pumps are operating.

Construction activities would not generate any substantial risk to the existing operating facilities in the 200 East Area located near the waste transfer site. Routine construction hazards would exist both before and during the retrieval operations. Field and construction operations would be conducted to ensure a safe working environment in accordance with both federal and state standards. The project would be designed to minimize the amount of hazardous and nonhazardous waste generated.

There would be no substantial effect to the work force at the Hanford Site, from either construction activities or during the actual sluicing operations. The 50 construction workers needed for work on the tank farms prior to sluicing would be taken from the existing local work force. As there would be no need for additional employees to be hired, there would be little effect on the local economy.

Neither the use of Tank AY-102 as the receiver tank nor the two preliminary supernatant transfers (from Tank AY-102 to the evaporator or another DST and from Tank AY-101 to Tank AY-102, if that is the sluicing agent chosen) would cause an adverse impact to the overall waste management strategy at the Hanford Site. The supernatant from Tank AY-102 would be sent to an evaporator for volumetric reduction before its subsequent storage in another DST. Such transfers at the Hanford Site occur routinely and are part of normal waste tank storage activities as described in the HDW-EIS (DOE 1987). For each of these routine transfers, a specific procedure, work plan, and/or work procedure would be written in accordance with approved DOE contractor procedures. Finally, these transfers would be evaluated to ensure that the DST storage criteria fall within an acceptable range for waste storage (i.e., temperature, chemical compatibility, organic material, and liquid level). No additional impact to human health or the environment would occur as a result of these transfers. Capabilities of DSTs other than Tank AY-102, either in existence or proposed, would exist to handle planned waste transfers in the future.

5.2 Analysis of Accidents

Table 1 displays the accident scenarios relevant to the proposed action. In addition, this section analyzes the issue of waste compatibility. For each accident scenario in the table, the probability of the accident occurring and the accident's potential impacts are provided. The consequences are conservatively presented assuming that Tank AY-101's supernatant is used as the sluicing agent. If another sluicing fluid is chosen that has a lower source term than Tank AY-101's supernatant, these doses likely would be lower. The probability for many of the accident scenarios is dependent on the probability of a DBE occurring at the Hanford Site. In fact, the worst case scenario for this sluicing operation would consist of a combination of the three accident scenarios discussed individually in this section. These scenarios consist of a DBE leading to an unfiltered release through a breach in the recirculation duct (which is not the only mechanism for this accident), a break in the waste transfer lines, and the rupture of Tank C-106. The presence of a DBE does not necessarily mean that all, or even some, of these accidents would happen, only that the mechanism exists which might lead to their occurrence. These accident scenarios were addressed in the *Preliminary Safety Evaluation for 241-C-106 Waste Retrieval* (WHC 1994a), an engineering study on leaks from Tank C-106 as a result of hydraulic retrieval (WHC 1993d), and a waste compatibility study (1994d). The range of reasonably foreseeable accident scenarios associated with the proposed action, which could result in a release of radioactive materials to the environment, are discussed in detail following the table.

Table 1.
Reasonably Foreseeable Accident Scenarios.

Accident Scenario	Accident Consequences	Annual Probability	Reference Documentation
(1) Waste leak from jumper or connector	Offsite MEI dose of 1.6×10^{-4} rem EDE. Onsite dose of 1.5×10^{-1} rem EDE.	2.6×10^{-2}	WHC 1994a
(2) Waste transfer line leak	Offsite MEI dose of 1.0×10^{-4} rem EDE. Onsite dose of 1.9×10^{-1} rem EDE.	7.0×10^{-4}*	WHC 1994a
(3) Tank rupture due to DBE	Potentially large scale environmental contamination of soil and groundwater.	7.0×10^{-4}*	N/A (see text)
(4) Tank C-106 leak from sluicing	Release of substantial amounts of liquid waste to the environment (soil and possibly groundwater).	Undetermined (see text)	WHC 1993d
(5) Recirculation line breach	Offsite MEI dose of 5.2×10^{-4} rem EDE. Onsite dose of 5.0×10^{-1} rem EDE.	Undetermined**	WHC 1994a

* The probability shown for these scenarios is the occurrence of a DBE, however, the presence of a DBE does not necessarily mean the accident would occur. The worst case scenario involves a DBE triggering these two accidents as well as rupturing the HVAC recirculation duct. While it is not accurate to add the human health effects from each scenario, the consequences would be fairly similar to those discussed for the breach of the recirculation duct.

** In the absence of safety features, the most common mechanism for this accident is human error (e.g., vehicular collision). It is also possible that a DBE might result in a breach.

Accidents occurring during sluicing operations involving environmental releases of the tank waste to the atmosphere or soil column would result in the greatest impacts. An atmospheric accident would involve either a spray leak in a valve pit, an unfiltered release through a breach in the recirculation duct of the heating, ventilation, and air conditioning (HVAC) system leading to a radioactive release, or a transfer line break. A soil column accident would involve a breach of containment in the tank, leading to a spill of the liquid component of Tank C-106, which is not held up in either the sludge or hardened waste.

Many of the accident scenarios assume that releases occur for a prolonged duration. During the sluicing phase of the project, when the pumps are running and the waste is being retrieved, trained personnel would be present. The presence of these workers would minimize the duration of a release and restrict access to the release site. Additional precautions would be taken to protect on and offsite personnel in the event of an accident (such as stopping the pumps immediately, stabilizing and containing the release and evacuating onsite personnel as needed). Table 2 presents the accident scenarios, consequences, assumptions used, and administrative and design features in place which could lower the consequences of these accidents further.

Table 2.
Accident Assumptions and Consequence Reduction Features.

Accident Scenarios	Consequences	Assumptions/Criteria	Means of Reducing Consequences
(1) Waste leak from jumper or connector	1.6×10^{4} rem EDE offsite	External leak in valve pit	All valves provided with welded connections and double stem seals with leak detection devices in pits. Coverblocks sealed to the greatest extent possible.
	1.5×10^{1} rem EDE onsite	2-hour release	Interlock controls would shut down system when leak detection devices identify a leak. Visual monitors used to detect leaks in pump pits.
		12-hour exposure	Leak would be identified and personnel evacuated before 12 hours.
		Exposed worker(s) not wearing protective clothing	Workers within the 241-C Tank Farm will be wearing protective clothing at all times and possibly respiratory equipment.
(2) Waste transfer line leak	1.0×10^{4} rem EDE offsite	The DBE occurs during the period the pumps are operating and the transfer lines are full	Trained workers would always be present during sluicing operations and would be able to shut down the system after a DBE and evaluate the integrity of the lines. Seismic switch would shut off sluicing operation.
	1.9×10^{1} rem EDE onsite	Line break occurs at the low point of the line and 10 percent of the waste pools above ground	This point of the line would be buried 3 feet below grade, which would reduce the amount that could pool above ground.
		Exposed worker(s) not wearing protective clothing	Workers in the 241-C Tank Farm (the hypothesized location for this accident) would be wearing protective clothing and respiratory equipment as required.
		Pool forms and remains unmitigated to calculate dose	After the release is detected, the area around the release would be controlled for personnel access and the spill stabilized to prevent airborne releases.
(3) Tank rupture due to a DBE	Potential large-scale release to the environment	DBE occurs during the early stage of sluicing, however, this accident could occur regardless of this project and is not specific to this project	A release would be possible whether sluicing is conducted or not. Sluicing would remove the waste from Tank C-106 and eliminate the potential of a release from continued storage.
(4) Tank leak from sluicing	150,000 liters (40,000 gallons) released	Sluicers cause leak or open existing plugged leak	Sluicers installed with controls to prevent them from hitting the tank walls.
		Leak occurs early during sluicing	Sluicing would start from the center of the tank and leave the area around the tank walls until the end of the operation.
		Leak detection devices fail	Flow meters and a running material balance would be able to detect a leak when approximately 30,000 liters (8,000 gallons) are removed from the closed system.
(5) Recirculation line breach	5.2×10^{4} rem EDE offsite	Assumed that the accident occurs during sluicing operation	The probability of the accident (either vehicle collision or DBE) occurring during actual operations (estimated 6 months) is remote.
	5.0×10^{1} rem EDE onsite	Release not detected for one hour	A collision would result in the stoppage of sluicing operations and seismic switches would shut off sluicing operation (and the ventilation system) after the DBE.
		Onsite populations exposed to plume which exists after one hour release	An accident would lead to evacuation of onsite workers not wearing protective clothing.
		Onsite workers not wearing protective clothing	Since the HVAC system is within the 241-C Tank Farm, all workers would be wearing protective clothing and respiratory equipment as needed.

For the accident scenarios, the offsite population is defined as the 115,000 people located within 80 kilometers (50 miles) of the release point in a southwesterly direction. The uninvolved workers (numbered at 1,630) are defined as personnel in the area greater than 100 meters (328 feet) to the south of the release point. Onsite health effects in terms of LCFs are presented for the uninvolved worker only. The risk to the directly involved worker (those workers directly involved with the proposed action, which may or may not be within the 100 meters [328 feet]) is highly dependant upon the worker's specific location, meteorological conditions, and nature of the accident. All of these circumstances could either increase or mitigate the severity of the consequences. Therefore, no quantification of risk to the directly involved worker is available; however, it is assumed that the directly involved worker could receive a substantially higher dose given the proper conditions.

Accident consequences are evaluated in terms of human health effects from radiological exposure. Nonradiological hazards, during normal sluicing operations, would be controlled by strict adherence to the contractor guidelines dealing with industrial safety (WHC-CM-4-3). Potential nonradiological hazards encountered during postulated accidental releases would be controlled by adherence to emergency procedures to be written prior to the initiation of the sluicing operation. These emergency procedures would be based upon analyses to be performed as part of future safety documentation. The Preliminary Safety Evaluation (WHC 1994a) examined the chemical constituents in Tank C-106, and indicate that toxic chemicals would not be available for release from the various accident scenarios in large quantities.

Waste Leak From Jumper or Connector. The first scenario considered was a waste leak from a jumper or a connector in a pump pit. Equipment in a pump pit would include valves that were provided with welded connections and double stem seals. Although the system would have been leak tested before operation, it is postulated for this scenario that an external leak could develop in the valve pit. Leakage, in the form of a spray in a valve pit, may result in an atomizing (spray) leak and release of waste material from improperly sealed openings in the pit covers which allow monitoring equipment to access the pump pit. From such a leak at 12.7 kilograms per-square-centimeter (180 pounds per-square-inch) and for a duration of two hours, an aerosol capacity of 10 milligrams per cubic meter (1.0×10^{-3} pounds per cubic feet) of transportable, respirable liquid aerosol equivalent to 3.0×10^{2} liters (2.1×10^{2} gallons) would be generated (WHC 1994a).

The mitigating feature of administrative controls (i.e., lock and tag procedures), which would ensure that the pit covers are always in place during waste transfer operations would reduce the consequences of a spray leak to the atmosphere to much lower levels than might occur in the absence of pit covers in the pump pits (WHC 1994a). With pit covers in place, the dose to the offsite MEI is calculated to be 1.6×10^{-4} rem Effective Dose Equivalent (EDE), which is within the "low" category of radiological dose consequences (WHC-CM-4-46). Uninvolved workers could be exposed to 1.5×10^{-1} rem EDE, also in the "low" category. Additional administrative controls which would include sealing the pit cover openings and edges could lower these numbers substantially. While there is no accurate method for calculating the dose received to the directly involved worker, it is conceivable that the dose could be somewhat greater. All doses in this section are considered to be a

50-year committed dose. With pit covers in place the chance of either the offsite or onsite MEI developing an LCF, which is calculated by multiplying the dose with the conversion factors of 4.0×10^{-4} (onsite) and 5.0×10^{-4} (offsite) (56 FR 23363), could be considered nonexistent (8.0×10^{-8} and 6.0×10^{-5} respectively). Even assuming that the directly involved worker receives a dose several orders of magnitude greater than that of the uninvolved worker (which can be considered extremely conservative), it is not likely that any adverse health effects would occur.

Waste Transfer Line Leak. This scenario assumes that both transfer lines (and both pipes comprising double containment) fail and the waste leaks at a rate of 1,324 liters (350 gallons) per minute from each line. It is further assumed that seismic switches located on the transfer lines would be activated and would shut down the pumps immediately. A duration of 10 seconds is used to estimate the time required for the pumps to stop completely and cease adding fluid to the transfer lines. Based upon this 10 second duration, an estimated 10,500 liters (2,800 gallons) could be released to the soil column. Due to the fact that the release is below grade and covered by an earthen berm, only a small amount of this total spill volume would pool above ground and affect human health. The majority of the waste would migrate downward and laterally from point of origin. Only a small percentage of the waste that pools on the surface would be in a condition to be considered as a possible source term which might impact human health. The mechanism for this accident has been determined to be a DBE, which has an annual probability of occurring (frequency) of 7.0×10^{-4}.

For the accident scenario dealing with a leak in the transfer line, the dose to the offsite MEI has been calculated to be 1.0×10^{-4} rem EDE, which is within the "low" criteria range for offsite populations. The onsite MEI has been calculated to receive a dose of 1.9×10^{-1} rem EDE, which also is within the "low" criteria range for uninvolved workers (WHC-CM-4-46). Based on the above numbers, the accident scenario dealing with a waste transfer line leak would result in a probability of 5.0×10^{-8} that the offsite MEI would develop an LCF and a probability of 7.6×10^{-4} for the onsite uninvolved worker. The total number of LCFs for the affected offsite population, determined to be the 115,000 persons residing within 80 kilometers (50 miles) southeast of the release site, has been determined to be 5.3×10^{-5}. This number was calculated by multiplying the offsite probability by a conversion factor of 2,500 (which can be calculated by dividing the collective dose to the affected offsite population by the dose to the offsite MEI) (Leach 1993). The uninvolved worker population (1,630) was calculated to have approximately 0.2 LCFs. This number was calculated by multiplying the volume of waste available on the surface as the source term, 1.0 liters (0.27 gallons), by the conversion factor of 0.16 LCFs per liter (0.6 LCFs per gallon). Given the proper conditions (i.e., the directly involved worker is in the immediate vicinity of the spill and the wind carries contamination toward that worker), the possibility exists for the directly involved worker to experience an adverse health effect, which might include genetic effects or even the occurrence of a fatal cancer.

Based upon the 10-second spill duration, and the soil characteristics of the area, it can be assumed that less than 28.3 cubic meters (1,000 cubic feet) of soil around the ruptured pipe would be contaminated and would need to be cleaned up. Radiation cleanup workers would wear proper clothing and respiratory protection when performing the remediation for this accident scenario. It is further assumed that five radiation cleanup workers would be employed for a period of one week. The absence of these seismic switches in the transfer lines could increase the amount of waste released into the environment by several orders of magnitude. The higher cost of eventual cleanup of a two hour spill duration, and the increased exposure likely to the cleanup workers, further justifies the presence of these switches.

For CY 1992, the average dose to radiation cleanup workers was 8 millirem per year (WHC 1993e). This number yields a collective dose to the five workers involved in the cleanup of the 10-second release scenario for a period of 1 week of 7.7×10^{-4} person-rem. The number of LCFs expected from this dose is 3.0×10^{-7}. In other words, an individual worker has less than one chance in one million of contracting an LCF as a result of cleanup activities.

The contaminated soil would be transported to existing onsite disposal or storage facilities. After the contaminated spill area is cleaned up, the spill area would be properly posted. Overall site remediation at and around the spill area would be included as a part of a Hanford Site operable unit cleanup.

Tank Rupture Due to a DBE. Another soil column accident would be the result of a seismic event which ruptures the tank. This accident scenario would be possible at any time and regardless of this specific waste transfer operation. Subsequently, a detailed discussion of this accident is not presented. The annual probability (frequency) of a DBE at the Hanford Site is 7.0×10^{-4} per year. While human health effects would probably not be a factor, the accident could involve the contamination of a large volume of soil depending upon when the accident occurs during the sluicing operation, which would require a significant cleanup operation. The total amount of waste in all forms in Tank C-106 is not expected to be greater than 750,000 liters (200,000 gallons) at any time, however, only that portion of the waste in a liquid form would contribute to the amount of waste released.

An accident of this magnitude could result in long-term health effects to the public if the contamination reached the groundwater and the groundwater was accessible to the public. However, the chance of contamination reaching the groundwater is remote since the most conservative release from Tank C-106 is estimated to be less than 662,000 liters (175,000 gallons), and the majority of radionuclides would be trapped in the top portion of the soil column. Cleanup of a leak of more than 375,000 liters (100,000 gallons) would likely be performed with the eventual cleanup of the tank farms and would be completed well before the waste reaches the groundwater. As has been mentioned, this scenario is possible for normal waste storage activities and is not exclusive to this action. In fact, this waste retrieval operation would reduce the risk of a DBE induced leak from Tank C-106 by removing the waste and storing it in a DST.

<u>Tank Leak From Sluicing</u>. Sluicing operations have the possibility of releasing liquid waste from the tank to the soil column. The probability of this happening is undetermined because of the lack of information concerning the condition of Tank C-106's bottom and sides. The most probable occurrence would involve the sluicers opening a plugged leak in the tank wall. The leak source term during sluicing would be any free-standing liquid present in the tank during the sluicing operation, the drainable interstitial liquid above the level of the leak point, and the sluicing stream as it impacts the tank wall. Based on historical leak rates of other SSTs, the actual leaked volume is expected to be on the order of a few cubic meters (several thousand gallons). However, the most conservative estimate has a release of up to 150,000 liters (40,000 gallons) (WHC 1993d). This estimate assumes that the leak occurs early in the sluicing operation, that leak detection devices and controls fail, sluicing operations proceed without these leak detection devices, the leak(s) occur at the bottom of the tank, and the remaining sludge does not plug these leaks. The size of any leaks would be limited by: (1) the ability to detect leaks, (2) administrative controls on liquid inventories, (3) the tendency of solids in the sludge to plug any leaks, and (4) the free liquid in the Tank C-106, is limited, and could be pumped out in a short time. The presence of flow meters on the transfer lines and material balance controls on Tank AY-102 would detect a leak when approximately 30,000 liters (8,000 gallons) are removed from the sluicing process by means of a leak somewhere in the closed-loop system.

Any postulated waste leak, upon reaching the soil, would be driven downward by the moisture recharge, rainfall and runoff, from the tank dome. Travel time for the first of the radioactive constituents in the waste to reach the aquifer is calculated to be about 60 years (WHC 1993d) (though most of the constituents would be held up in the top portion of the soil column and would take significantly longer to reach the aquifer), provided the amount leaked was small compared to the rate of recharge, and no preventative measures were taken to halt the migration. It has been shown that surface barriers are effective in limiting the migration of any tank leaks. Any contaminated soil could be recovered or treated after sluicing, if required, as part of the overall site closure activities under the Tri-Party Agreement milestone M-45-06. No immediate human health effects are anticipated from this accident; however, if left unchecked, the release would have the potential to contaminate a relatively small section of groundwater.

<u>Recirculation Line Breach</u>. It has been postulated that a mechanical accident (e.g., a vehicular collision) or a DBE (with a probability [frequency] of 7.0×10^{-4} per year) could result in a breach in the recirculation line of the ventilation system, leading to a release of radioactive air emissions. A DBE would pose a threat to normal tank waste storage activities; however, in this scenario, the DBE would damage the recirculation line installed by this project. Therefore, this DBE accident is specific to this project, and is evaluated in this section. For this scenario it is assumed that the recirculation duct has been breached and unfiltered ventilation flow passes through the stack, and that the failure is not detected for one hour (it should be emphasized that this duration is extremely conservative since engineered features would be designed to shut off HVAC system when a break occurs to any of its piping). Based on a vapor space capacity of 100 milligrams per cubic meter (1.3×10^{-2} pounds per cubic feet), approximately 0.146 liters (0.04 gallons) are released, leading to an

offsite dose calculation of 5.2×10^{-4} rem EDE to the MEI, which is within the "low" category, and an onsite dose of 5.0×10^{-1} rem EDE, which is within the "high" category (WHC 1994a). These numbers represent a probability of 2.6×10^{-7} that the offsite individual would develop an LCF, and 2.0×10^{-4} for the onsite population. Using the conversion factor mentioned in the transfer line leak scenario, an anticipated 2.0×10^{-4} LCFs would occur to the entire affected offsite population (identified as the 115,000 persons residing to the southeast) (Leach 1993). Based upon 0.146 liters (0.04 gallons) release volume, and the onsite population conversion factor of 0.16 LCFs per liter (0.6 LCFs per gallon), no LCFs to the uninvolved workers would be expected (the actual number being 0.02 LCFs for the uninvolved worker population of 1,630). It is not likely that any adverse health effects would occur to the directly involved workers.

This scenario is considered the worst case accident when examined separately. It is possible that a DBE could trigger not only a recirculation duct break, but also a rupture of the waste transfer lines and a breach of tank confinement in Tank C-106. If this were to occur, the health consequences to on- and offsite populations would be close to, but somewhat higher than, the health effects presented for this scenario. In addition, the potential for large scale soil contamination, and possibly groundwater contamination, would exist. As noted earlier, however, the impacts from a DBE-initiated leak are not specific to this proposed action, but could occur for normal waste storage operations.

5.3 Waste Compatibility

The transfer of waste from Tank C-106 to Tank AY-102 raises the issue of waste compatibility. The *Chemical Compatibility of Tank Waste in 241-C-106, 241-AY-101 and 241-AY-102* (WHC 1994d) evaluated waste compatibility (WHC 1994a), and stated that using Tank AY-102 would not result in potentially dangerous situations. This document verifies that no chemical compatibility safety issue currently understood or perceived to exist would be adversely impacted by the proposed waste transfer operation. Additionally, the waste in Tank AY-102, after sluicing, would not be in a condition that precludes future treatment options.

Specifically, the compatibility safety issues addressed in this waste compatibility evaluation are criticality, energetics, corrosivity, and flammable gas accumulation. It was determined that criticality was not an issue based on analytical data. A criticality is defined as a self-sustaining or divergent neutron chain-reaction that has the potential to release large amounts of energy. Plutonium concentrations were determined to be so minimal as to be impossible to support a criticality prior to, or as a result of, waste transfers. Transfer of the fissile material contents, namely plutonium, from Tank C-106 to the receiving tank fully complies with, and does not exceed current criticality safety evaluation report limits. A waste characterization report (WHC 1988) provided analysis of a core sample from Tank C-106. The plutonium concentration is given as 7.1×10^{-2} grams per liter (9.0×10^{-3} ounces per gallon), a value less than 8 percent of the Criticality Prevention Specification (CPS) limit. The transfer of this waste to Tank AY-102 would satisfy limits provided by the applicable CPS. Further analysis of this criticality issue, which supports the above conclusion, is addressed in the *Criticality Safety of Single Shell Waste Storage Tanks* (WHC 1994e).

The analytical data also indicated that there is minimal organic carbon contained in the wastes of Tanks C-106, AY-102, and AY-101. Furthermore, if the organic carbon is conservatively assumed to be entirely in the form of Sodium Acetate, then there is still greater than twice the needed water to suppress the limiting exothermic reaction that might be postulated. This provides assurance that no propagating exothermic reaction is sustainable before, during, or after combining these wastes as described in the proposed action. Further, the concentrations of hydroxide, nitrate and nitrite, as well as the average temperature (all parameters affecting corrosion of the tank walls) would continue to be well within acceptable limits.

Finally, the existing and resultant specific gravities of the wastes would not result in exceeding specifications for placing the tank(s) on the flammable gas "Watchlist." The specific gravity provides an indication of the capability for retention of flammable gases (e.g., hydrogen) within the waste. While the waste compatibility evaluation indicates that hydrogen buildup would not be a problem, further safety analysis will evaluate this issue. It is possible that the initial sluicing fluid to be used may be supplemented with a caustic solution (sodium hydroxide) to ensure that flammable gas generation is not a problem. It is proposed to utilize the existing airlift recirculators in Tank AY-102 to agitate the waste after the sluicing operation is completed, if needed. This agitation would result in the constant release of potentially flammable gases, and the prevention of a surface layer in the waste that could trap these gases. If the possibility arises for hydrogen accumulation, hydrogen monitoring equipment may be installed. In addition, the introduction of the initial sluicing fluid to Tank C-106 would maintain a large margin of safety, and would not result in compromise of chemical compatibility between the sluicing fluid and the waste in Tank C-106 (WHC 1994a).

Certain accidents that were not analyzed in this Environmental Assessment have been analyzed by other tank farm facilities. These accidents include tank dome failure due to exceeded weight limits, tank bottom penetration by dropped equipment, and riser damage due to excavation and/or construction activities. These accidents were found to have a smaller risk, where risk equals the product of probability and consequence, than the analyzed accidents. In other words, either the probability of the event occurring was outside the realm of reasonableness or the consequences were not considered substantial enough to warrant discussion.

5.4 Analysis of Alternatives

5.4.1 Analysis of Alternative Waste Retrieval Methods

While all of the alternatives presented in Section 3.0 were designed to retrieve the waste in Tank C-106, they often involved additional environmental impacts. Several of these alternatives had greater impacts than the proposed action, while others posed less of a threat to the environment, but involved substantially more design or construction costs which likely would mean failure to meet the October 1996 targeted start time.

The Once Through--No Recycle, Limited Mixer Pump, and Internal Recirculation Alternative would utilize a tanker truck to provide the sluicing medium to mobilize the solids in Tank C-106. Since none of the slurry deposited in the receiver tank would be recycled, the space requirements for Tank C-106's waste would be greater than the proposed action or the Batch Transfer Alternative. This additional waste would add to the total amount of waste which would eventually have to be treated, and does not support the waste minimization policy practiced at the Hanford Site.

Two of the alternatives, the Recirculate Within a SST Via Mixer Pump, and the Center Pivot Dredge Alternatives, both pose greater environmental risks than the proposed action. The Recirculate Within a SST Via Mixer Pump Alternative would introduce potentially more heat than the proposed action from the increased mixing and agitation of Tank C-106's waste. This alternative also would increase the environmental risk, relative to the proposed action, due to possible damage to the tank from the mixing pump outlet spray impinging on the tank walls, and maintain a much higher liquid inventory in the tank. In addition, this alternative would involve installing a new riser to the tank, and would require a longer design and testing period. The Center Pivot Dredge Alternative raises issues on worker safety due to the need for the construction of a 1.5-meter (5-foot) opening necessary to allow the dredging equipment access to the waste. This would lead to the possibility of a higher exposure to workers both during the creation of this opening and during operation of the dredging equipment. There also are concerns on exceeding tank dome weight limits with this alternative. Other negative factors include a high cost to implement; greatest design complexity compared to alternatives; and the amount of equipment to be decontaminated and decommissioned is larger than the other alternative.

The Hydraulic Mining Alternative would have the potential for the greatest waste minimization of the alternatives, but would be much more complex than the proposed actions. As this is an unproven technology, unlike the proposed action which has been used extensively in the past at the Hanford Site, the time required to develop and test this method would probably lead to failure in meeting the accelerated or Tri-Party Agreement timeframe. While the waste minimization aspects make this alternative attractive, the time required to design and implement this alternative makes this method unacceptable.

The Batch Transfer Alternative would utilize a temporary receiver tank which would require additional ventilation systems, and more waste transfer line jumpers, which would increase the probability of a waste leak from a failed jumper. The temporary receiver tank would be an additional source term that would have the possibility for release in the event of an accident. Due to this alternative's increased complexity created by the additional engineering requirements of the accumulation tank, an agitation system, and the additional pumps required to pump waste from the accumulation tank to Tank AY-102 and supernatant from the accumulation tank to Tank C-106, it is estimated to extend the project duration by 2 to 3 years and would mean the probable failure of the October 1996 start date. Further, this waste retrieval operation is estimated to entail a higher cost (as much as $10 million) than the proposed action, and may require more detailed and extensive environmental permitting due to the construction of the new accumulation tank.

5.4.2 Analysis of the No-Action Alternative

Under this alternative, the high-heat waste would remain in Tank C-106 and continue to generate sufficient heat to require active cooling. The primary cooling method would be the continued addition of cooling water, however, alternative means might be available, such as an air chiller or a combination of an air chiller and a sprinkler system. Regardless of the method used to cool the waste, the threat of a structural failure of the tank would remain, and increase over time. The probability of the DBE, which could lead to a breach in tank confinement, would continue to exist. The waste would continue to be stored in a tank which is considered past its design life and more susceptible to release than if it were stored in the newer DST.

Using the same conservative assumptions which were presented in the accident scenario dealing with a tank leak created by sluicing operations (i.e., leak detection devices and controls fail, the leaks occur at the bottom of the tank, and the remaining sludge does not plug the leak sites), the possibility exists for a large leak to develop. If Tank C-106's waste is not retrieved and remains in the tank for an extended duration, the likelihood of the tank failing, and a leak occurring, becomes greater. The presence of leaks in other SSTs at the Hanford Site indicate that it is only a matter of time before these tanks lose their integrity.

Tank C-106 would continue to remain on the safety "Watchlist," and continue to pose a risk to the environment. In addition, the Tri-Party Agreement milestones for the retrieval of Tank C-106's waste, and demonstration of a waste retrieval technology, would not be met.

5.5 Cumulative Impacts

The potential impacts from the proposed action are not expected to contribute substantially to the cumulative impacts of tank farm operations. In fact, because the high-heat waste would be removed from Tank C-106, which is at the end of its design life, it is expected that there would be a decrease in the overall risk to the environment.

Radioactive materials and nonradioactive chemicals are handled routinely on a daily basis throughout the Hanford Site. Standard Operating Procedures, and administrative controls, would provide sufficient personnel protection such that exposure to radiological and chemical materials would be kept below DOE guidelines, and within the policy of ALARA. The sluicing and waste transfer operations would not have a substantial cumulative effect on day-to-day operations on the Hanford Site with respect to worker exposure. The incremental impact from handling radioactive or nonradioactive materials that would result from the proposed action would be very small, and when added to the impacts from existing day-to-day operations on the Hanford Site and surrounding community, the total impact would remain small.

While sluicing operations would release some radionuclides, the proposed action is not expected to substantially increase the amount of radioactivity released from total Hanford Site operations. DOE limits the dose received to an individual worker to 5,000 millirem per year. In 1992, the offsite MEI was exposed to 3.7×10^{-3} millirem EDE from total air emissions (DOE-RL 1993), well below allowable limits (10 millirem to the public from airborne sources) set by state and federal regulations (WAC 246-247). The potential dose to the hypothetical offsite MEI during CY 1993 from Hanford Site operations were 3.0×10^{-2} millirem (PNL 1994b). The potential dose to the population within 80 kilometers (50 miles), established at 380,000 persons, from 1993 operations was 0.4 person-rem. The 1993 average dose to the population was 1.0×10^{-3} millirem per person.

Waste generation resulting from the proposed activity is not expected to be a substantial quantity compared to annual Hanford Site waste generation. For example, small quantities of low-concentration hazardous waste (e.g., solvents, cleaning agents) could be generated as a result of performing the proposed activities. These materials would be managed and disposed of in accordance with applicable federal and state regulations. Liquid waste generated from decontamination of equipment and the transfer lines is expected to be less than 26,000 liters (7,000 gallons), which could be easily stored in Tank AY-102. This project could potentially result in the creation of approximately 2,000,000 liters (500,000 gallons) of additional liquid waste if an uncontaminated fluid is used as the sluicing agent. While this would represent an increase in the amount of waste to be stored and treated at the Hanford Site, it is within current tank farm capabilities and in accordance with current waste management strategies (i.e., it could be sent to the evaporator for volumetric reduction). Radioactive waste, radioactively contaminated equipment, and mixed waste would be appropriately packaged, stored, and/or disposed of at existing treatment, storage, and/or disposal units on the Hanford Site. It is estimated that this project would produce an average of 62 cubic meters (2,200 cubic feet) of low-level and low-level mixed waste per year. This waste would be sent to either the Hanford Central Waste Storage Facility or the low-level burial grounds. This number represents only a minor amount of waste received at these facilities in the course of a year and would not substantially impact their operation or design life. The recorded total volume of waste received in the 200 Areas for storage in CY 1991 was approximately 6,028 cubic meters (213,000 cubic feet) (PNL 1992).

5.6 Environmental Justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires that Federal agencies identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of their programs and activities on minority and low-income populations. DOE is in the process of developing official guidance on the implementation of the Executive Order. However, the analysis in this EA indicates that there would be minimal impacts to both the offsite population and potential workforce during the proposed action, under both routine and accident conditions. Therefore, it is not expected that there would be any disproportionate impacts to any minority or low-income portion of the community.

6.0 Permits and Regulatory Requirements

It is the policy of DOE to carry out its operations in compliance with all applicable federal and state laws and regulations, Presidential Executive Orders, and DOE orders. Environmental regulatory authority over the Hanford Site is vested both in federal agencies, primarily the U.S. Environmental Protection Agency (EPA), and in State of Washington agencies, primarily Ecology.

The SSTs are being operated under interim status as treatment and storage units under WAC 173-303. A dangerous waste closure/postclosure plan would be submitted to Ecology for closure of the SSTs (Ecology et al. 1993). Specific requirements under RCRA include revisions to the Part A permits for both the SST and DST Systems, and revisions to the Part B permit for the DST System (WHC 1993f).

Notification and approval from the DOH would be required because of the potential increase in radionuclide air emissions. Additionally, a National Emissions Standards for Hazardous Air Pollutants Permit is required by the EPA (40 CFR 61), and an approval for Toxic Air Pollutants is required by Ecology. All of these approvals would be obtained before the start of construction for this activity. Phase I and Phase II CAA Permit Applications would have to be prepared and submitted to Ecology, the DOH, and the EPA. Phase I applications deal with non-HVAC systems, while Phase II applications deal specifically with HVAC systems.

The project would not be subject to the "National Primary and Secondary Ambient Air Quality Standards" (40 CFR 50), the federal new source review program, or emission limitations in an air quality control region. The project would conform to the State Implementation Plan for air quality.

A permit would be required from the DOH for the installation of the sanitary catch tank to be buried at the control trailer if this option is chosen.

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7.0 Organizations Consulted

Prior to approval of this document, a draft version was sent to Ecology, the Yakama Indian Nation, the Confederated Tribes of the Umatilla Indian Reservation, the Nez Perce Tribe, and the Wanapum. Comments were received from the Yakama Indian Nation and were considered in the preparation of this document. Appendix C contains the Yakama Indian Nation's comments and the DOE responses.

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8.0 References

40 CFR 50, 1992, "National Primary and Secondary Ambient Air Quality Standards, *Code of Federal Regulations*, as amended.

40 CFR 61, 1992, "National Emission Standards for Hazardous Air Pollutants," *Code of Federal Regulations*, as amended.

50 CFR 17, 1992, "Endangered and Threatened Wildlife and Plants," *Code of Federal Regulations*, as amended.

56 FR 23363, 1991, "Nuclear Regulatory Commission, Preamble to Standards for Protection Against Radiation," *Federal Register*, May 21.

Bander, T. J., 1993, "Total Heat Source in Tank C-106," (Internal Memo TJB-93-048, T. J. Bander to J. P. Harris, January 25), Westinghouse Hanford Company, Richland, Washington.

Clean Air Act, 1970, as amended, 42 U.S.C. 7401 et seq.

DOE, 1987, *Final Environmental Impact Statement: Disposal of Hanford Defense High-Level, Transuranic and Tank Wastes, Hanford Site, Richland, Washington*, 5 vols, DOE/EIS-0113, U.S. Department of Energy, Washington, D.C.

DOE, 1994, *Environmental Assessment: Waste Tank Safety Program, Hanford Site, Richland, Washington*, DOE/EA-0915, U.S. Department of Energy, Washington, D.C.

DOE-RL, 1993, *Radionuclide Air Emissions Report for the Hanford Site, Calendar Year 1992*, DOE/RL-93-36, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Ecology, EPA, and DOE, 1993, *Hanford Federal Facility Agreement and Consent Order*, as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

Leach, C. E., Stahl, S. M., 1993, *Hanford Site Tank Farm Facilities Interim Safety Basis,"* WHC-SD-WM-ISB-001, Westinghouse Hanford Company, Richland, Washington.

National Environmental Policy Act of 1969, as amended, 42 U.S.C. 4321 et seq.

PNL, 1994a, *Hanford Site National Environmental Policy Act (NEPA) Characterization*, PNL-6415, Rev. 6, Pacific Northwest Laboratory, Richland, Washington.

PNL, 1994b, *Hanford Site Environmental Report 1992*, PNL-8682, Pacific Northwest Laboratory, Richland, Washington.

Public Law 101-510, "Safety Measures for Waste Tanks at Hanford Nuclear Reservation," Section 3137 of *National Defense Authorization Act for Fiscal Year 1991*, 42 U.S.C 7274, et seq., November 5, 1990.

Resource Conservation and Recovery Act of 1976, as amended, 42 U.S.C. 6901 et seq.

WAC 173-303, 1990, "Dangerous Waste Regulations," *Washington Administrative Code*, as amended.

WAC 246-247, 1994, "Radiation Protection - Air Emissions," *Washington Administrative Code*, as amended.

WHC, 1988, *Data Transmittal Package for 241-C-106 Waste Tank Characterization*, WHC-SD-RE-TI-205, Westinghouse Hanford Company, Richland, Washington

WHC, 1993a, *Project W-320, Tank 241-C-106 Sluicing, Functional Design Criteria*, WHC-SD-W320-FDC-001, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

WHC, 1993b, *Status Report on Resolution of Waste Tank Safety Issues at the Hanford Site*, WHC-EP-0600, Westinghouse Hanford Company, Richland, Washington.

WHC, 1993c, *Tank 106-C Sluicing Letter Report*, WHC-SD-WM-ES-234, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

WHC, 1993d, *Engineering Study of Tank Leaks Related to Hydraulic Retrieval of Sludge From Tank 241-C-106*, WHC-SD-WM-ES-218, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

WHC, 1993e, *Westinghouse Hanford Company Health and Safety Performance Report, Fourth Quarter 1992*, WHC-SP-0564-28, Westinghouse Hanford Company, Richland, Washington.

WHC, 1993f, *Work Plan-Permitting Support for Tank 241-C-106 Waste Retrieval*, WHC-SD-W320-WP-001, Westinghouse Hanford Company, Richland, Washington.

WHC, 1994a, *Preliminary Safety Evaluation for 241-C-106 Waste Retrieval*, WHC-SD-WM-PSE-010, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

WHC, 1994b, *Westinghouse Hanford Company Health and Safety Performance Report. Fourth Quarter Calendar Year 1993*, WHC-SP-0564-32, Westinghouse Hanford Company, Richland, Washington.

WHC, 1994c, *Tank Farm Health and Safety Plan*, WHC-SD-HSP-002, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

WHC, 1994d, *Chemical Compatibility of Tank Waste in 241-C-106, 241-AY-101 and 241-AY-102*, WHC-SD-WM-ES-290, Rev. 2, Westinghouse Hanford Company, Richland, Washington

WHC, 1994e, *CSER 94-001: Criticality Safety of Single Shell Waste Storage Tanks*, WHC-SD-SQA-CSA-20363, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

WHC-CM-4-3, *Industrial Safety Manual*, Westinghouse Hanford Company, Richland, Washington.

WHC-CM-4-46, *Nonreactor Facility Safety Analysis Manual*, Westinghouse Hanford Company, Richland, Washington.

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Figures

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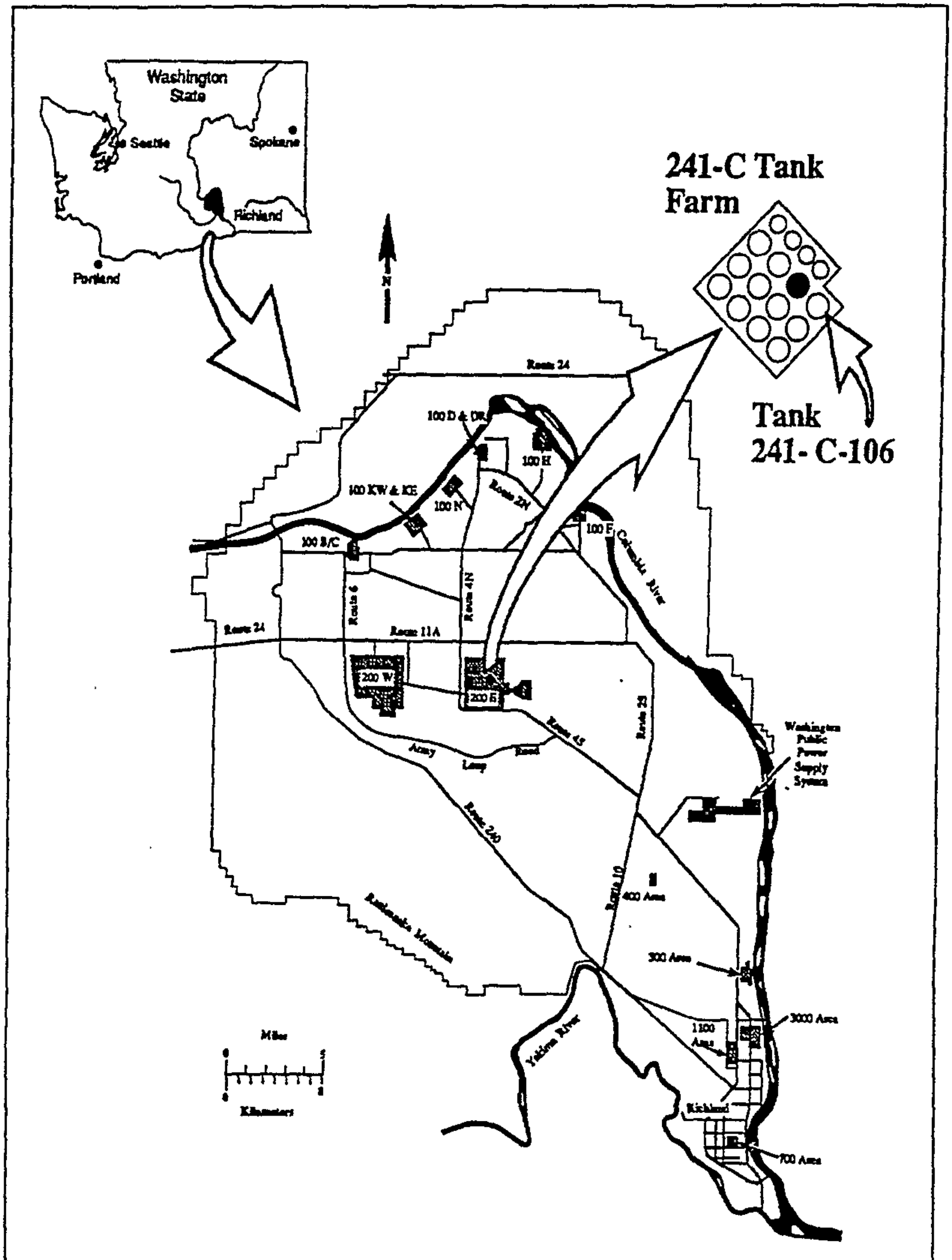


Figure 1.
Hanford Site Showing Tank 241-C-106 Location.

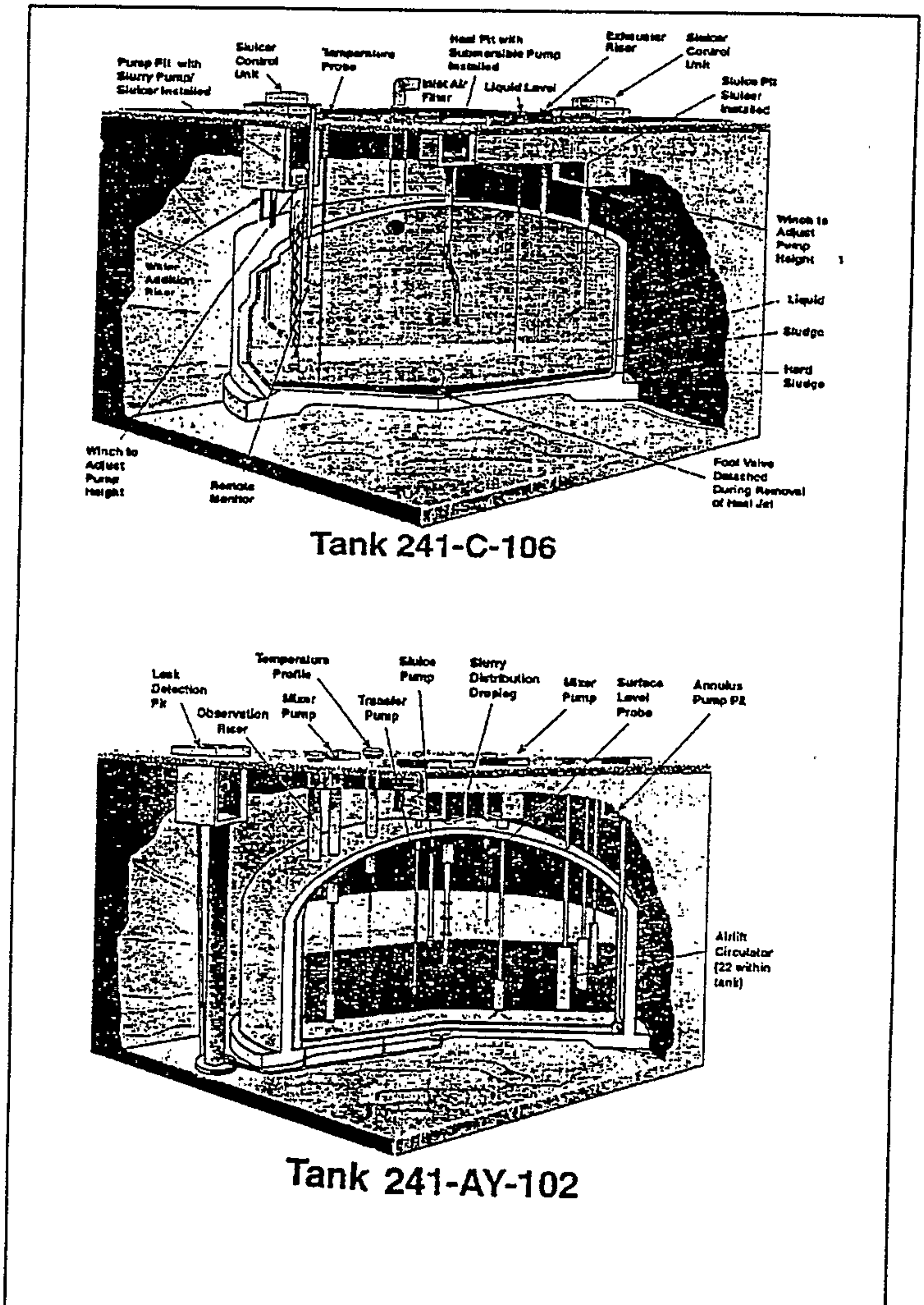
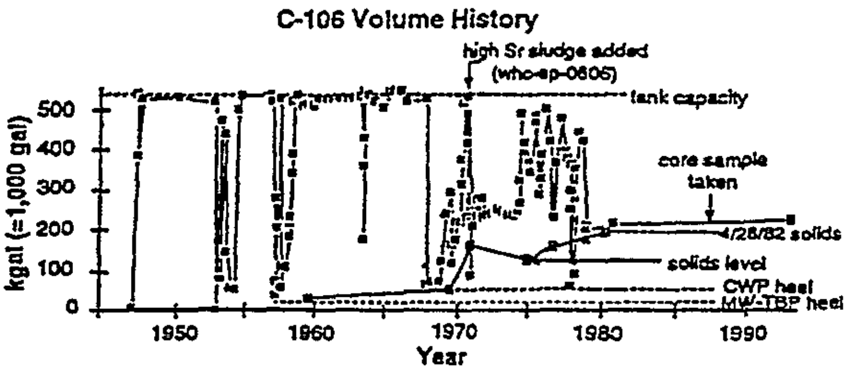
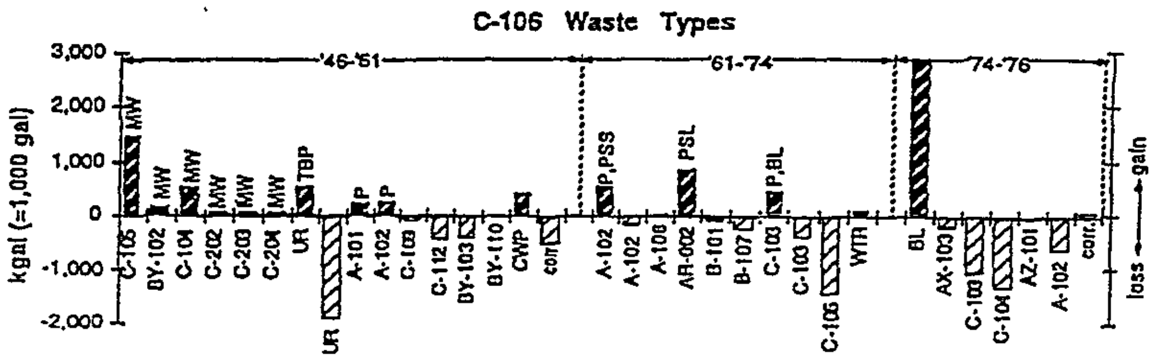


Figure 2.
Tank 241-C-106 and Tank 241-AY-102 Configuration.





AR-002 PSL (Purex sludge) was sluiced from A and AX Farms and washed in AR-002. Some solids came back to C-106 unexpectedly from a Sr sludge that did not settle properly (see WHC-EP-0606).

BL	B-Plant low level waste. Waste from B-Plant cesium/strontium recovery campaign.
CWP	Cladding Waste-Purex
MW	Metal Waste from BiPO4. 90% of FP, all of U, 1% of Pu (see 1C, 2C).
P	Purex HLW, 1956-72. Sometimes assumed to be 50% OWW. Used NPH/TBP to extract both Pu and U. Np also 1963-72.
PSL	Purex sludge sluiced during recovery of Sr.
TBP	Tri-Butyl Phosphate-waste from solvent based Uranium Recovery operation in '50's.
UR	Uranium Recovery operation in 222-U, 1952-57. Created TBP (primary waste) and FeCN (scavanging wastes).

Figure 3. Tank 241-C-106 Volume History.

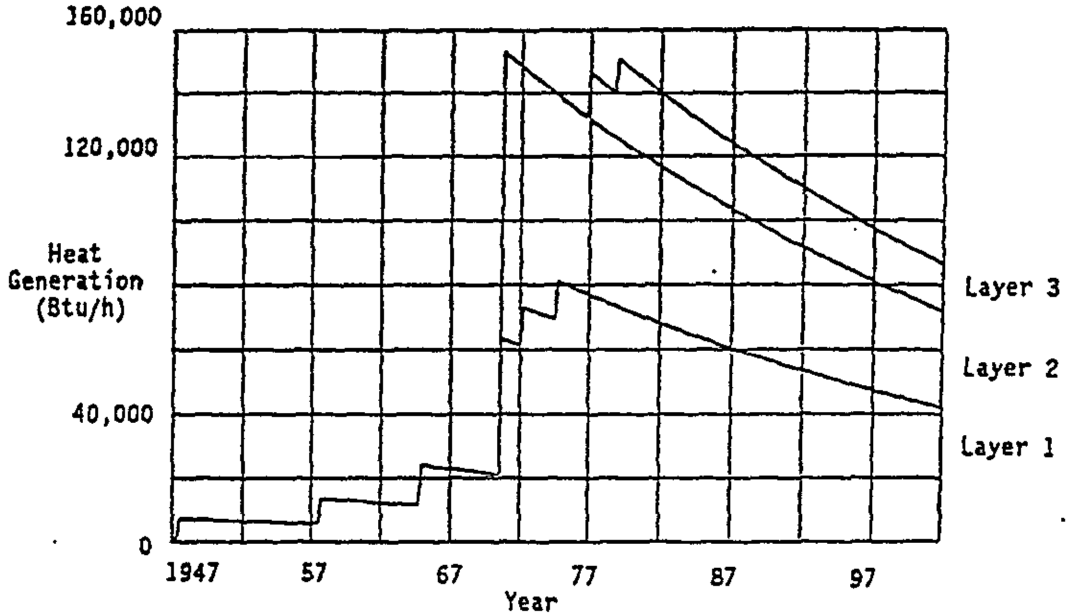


Figure 4. Tank 241-C-106 Heat Generation by Layer.

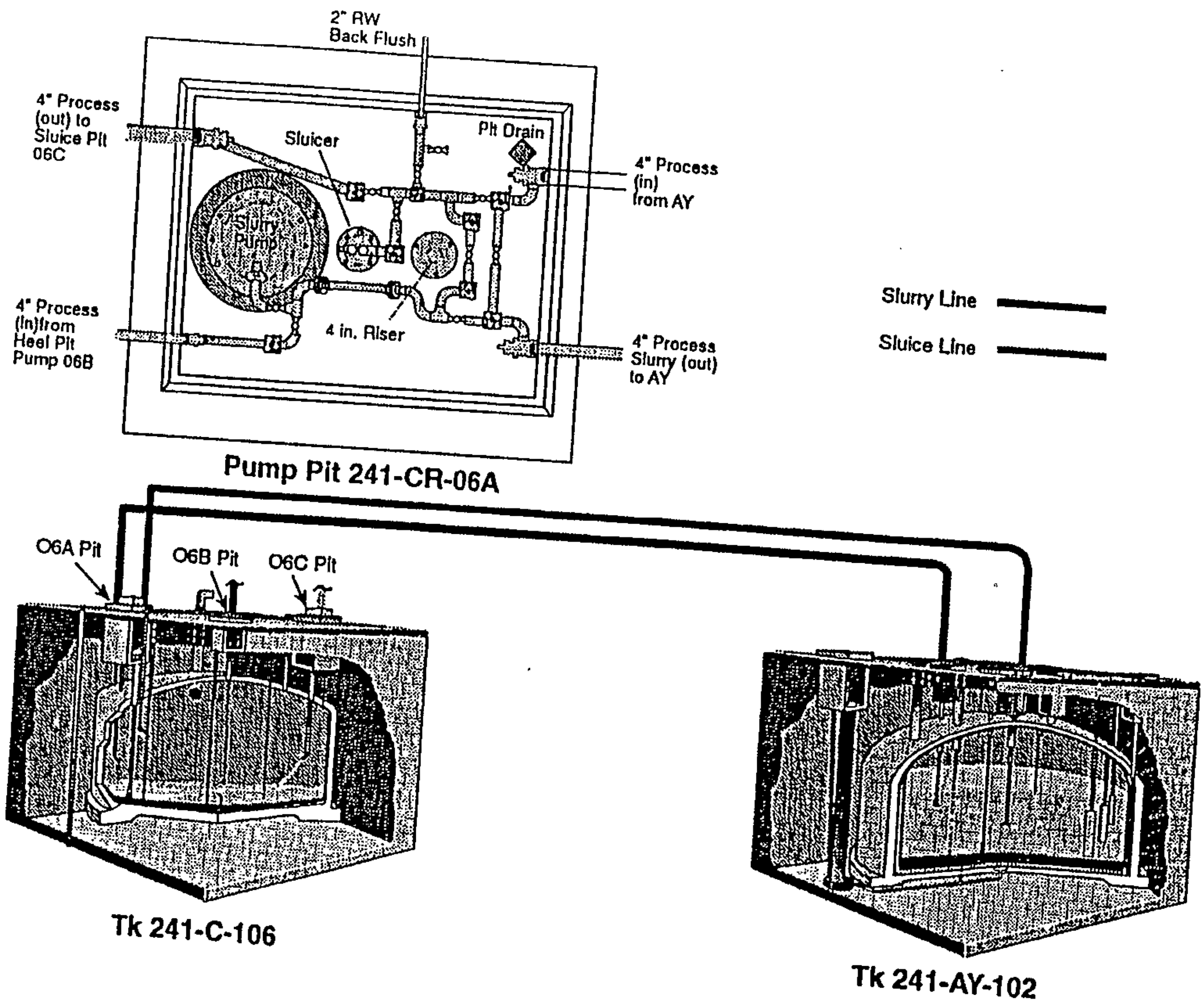


Figure 5. Tank-To-Tank Sluicing.

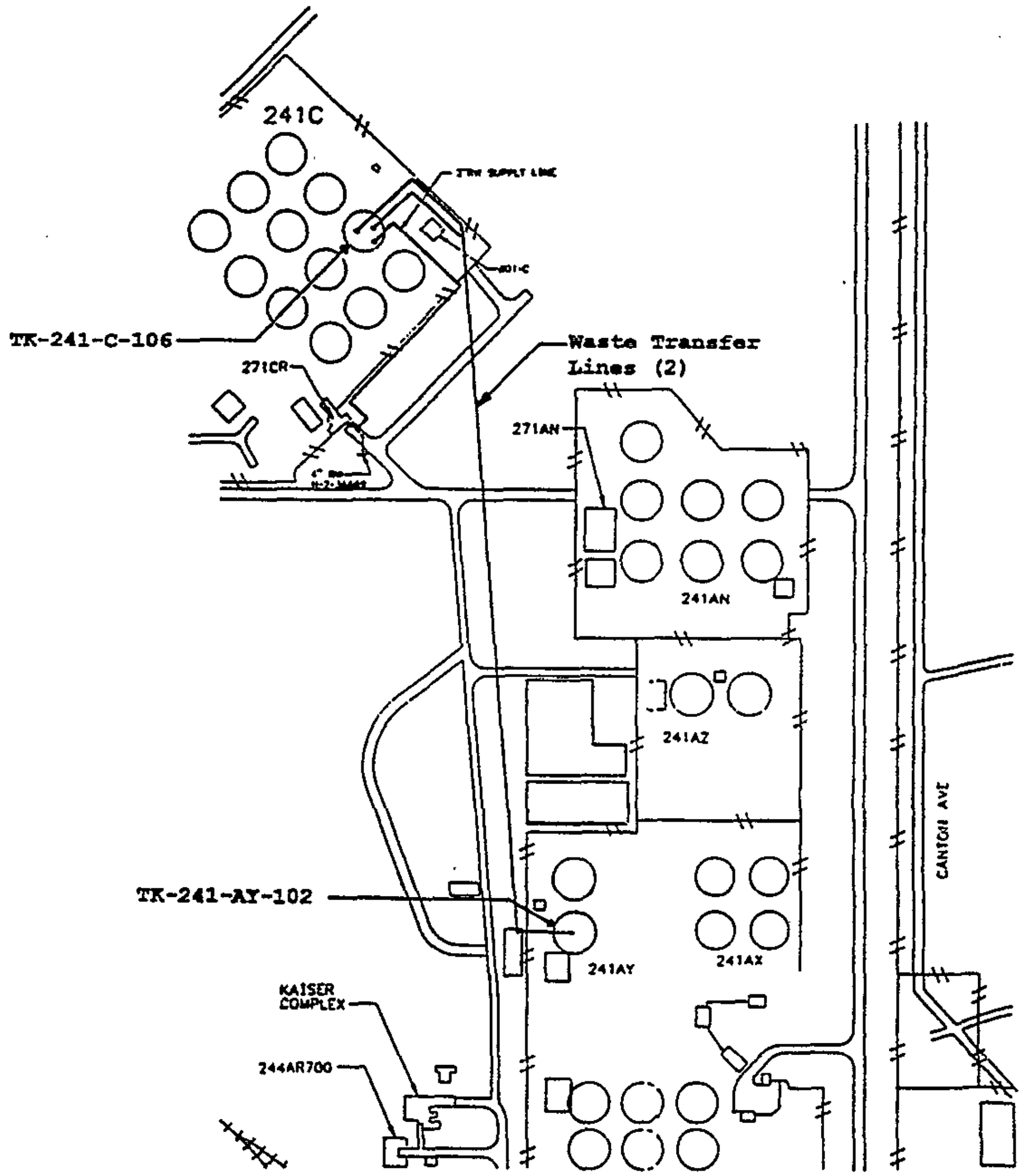


Figure 6.
Proposed Location of Waste Transfer Lines.

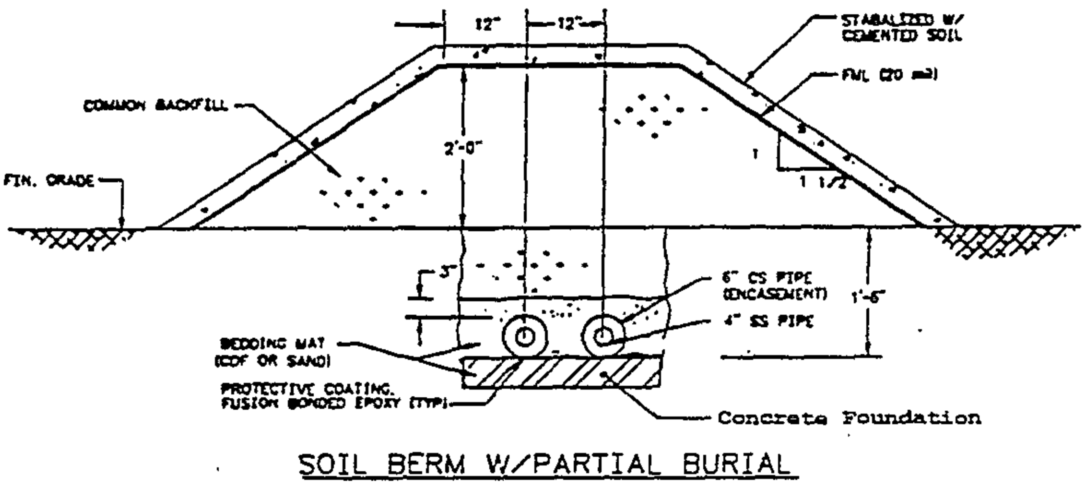


Figure 7.
Proposed Pipeline Configuration.

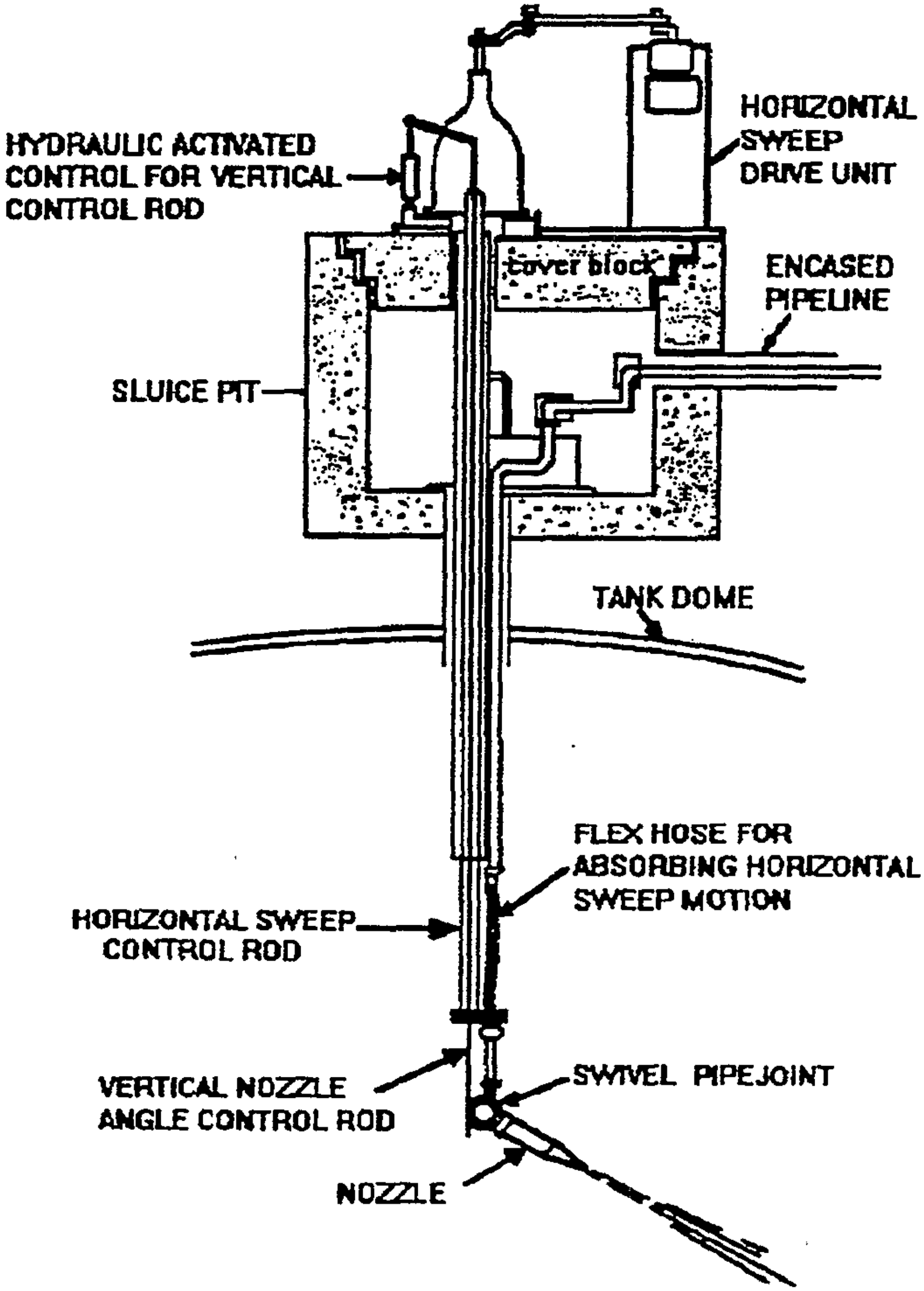


Figure 8.
Typical Sluicer Configuration.

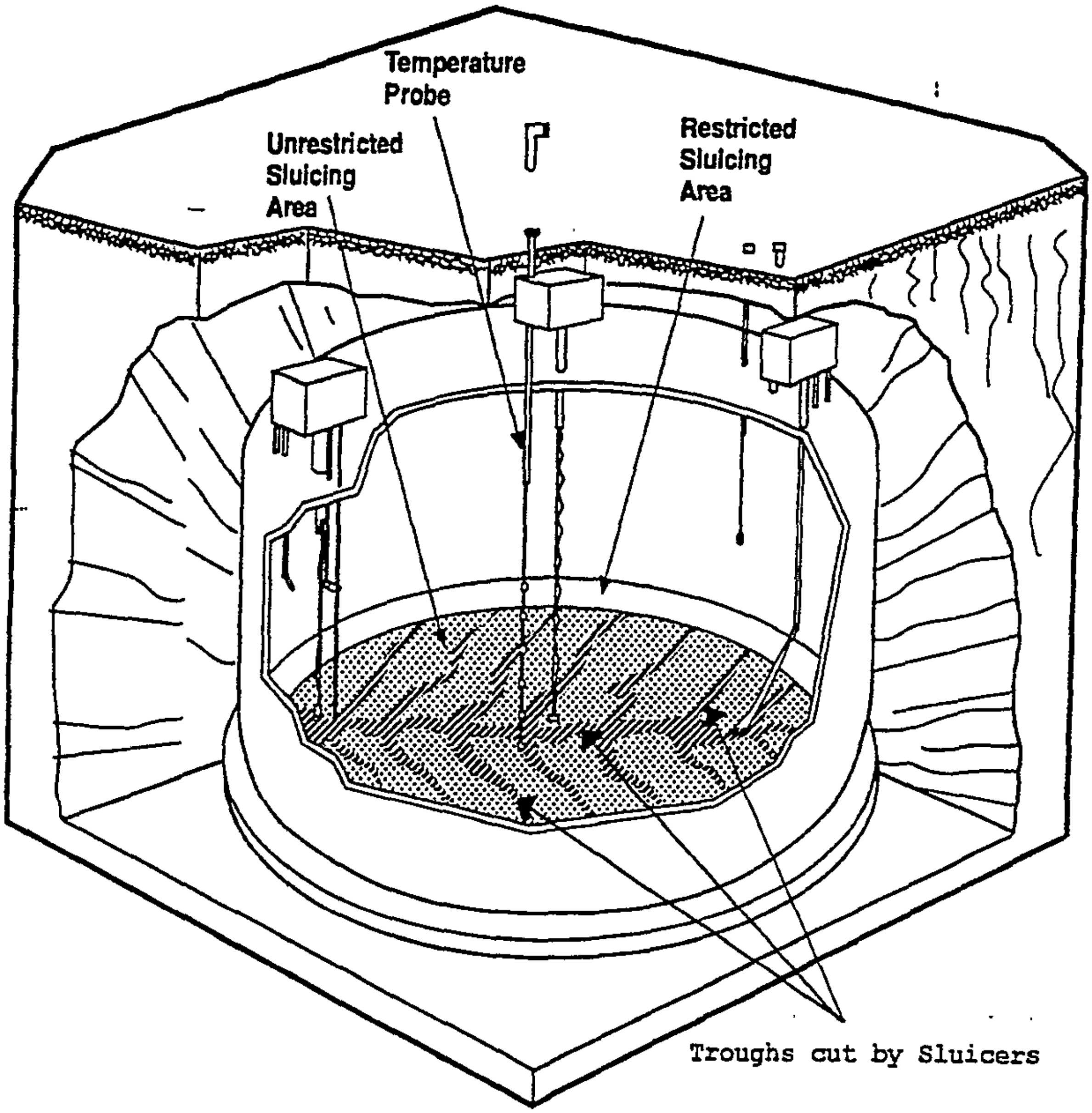


Figure 9.
Tank 241-C-106 Sluicing Features.

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Appendix A
Cultural Resources Review
(HCRL #93-200-111)

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Battelle
Pacific Northwest Laboratories
Battelle Boulevard
P.O. Box 999
Richland, Washington 99352
Telephone (509)
372-1791

August 9, 1993

No Known Cultural Resources

Mr. Warren Rued
Westinghouse Hanford Company
Restoration and Remediation
P. O. Box 1970/H6-26
Richland, WA 99352

CULTURAL RESOURCES REVIEW OF PROJECT W-320, TANK 241-C-106 SLUICING. HCRC #93-200-111.

Dear Warren:

In response to your request received August 4, 1993, staff of the Hanford Cultural Resources Laboratory (HCRL) conducted a cultural resources review of the subject project, located in the 200 Area of the Hanford Site. According to the information that you supplied, the project entails sluicing Tank 241-C-106 to remove solid waste and transferring the waste to Tank 241-AY-102. The sluicing and transfer will require two transfer pipes to be installed above ground between the two tanks, except where the pipes meet existing roadways when the depth of burial will not exceed six ft, and the installation of a double-wide trailer.

Our literature and records review shows that project is located in an area that has been highly disturbed by previous construction. It is very unlikely that any intact cultural materials would exist in such disturbed ground. Survey and monitoring by an archaeologist are not necessary.

It is the finding of the HCRL staff that there are no known cultural resources or historic properties within the project area. The workers, however, must be directed to watch for cultural materials (e.g., bones, artifacts) during excavations. If any are encountered, work in the vicinity of the discovery must stop until an HCRL archaeologist has been notified, assessed the significance of the find, and, if necessary, arranged for mitigation of the impacts to the find. This is a Class III case, defined as a project that involves new construction in a disturbed, low-sensitivity area. Please notify us if changes to the project location or dimensions are anticipated.

A copy of this letter has been sent to Charles Pasternak, DOE, Richland Operations Office, as official documentation. If you have any questions, please call Beth Crist, ASci Corporation, at 372-1791. Please use the HCRC# above for any future correspondence concerning this project.

Very truly yours,

M. K. Wright

M. K. Wright
Scientist
Cultural Resources Project

cc: C. R. Pasternak, RL (2)
File/LB

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Appendix B

Ecological Survey (#93-200-40)

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Westinghouse Hanford Company | **Internal Memo**

From: Environmental Technology and Assessment | 25320-93-126
Phone: 376-9956 H4-14
Date: August 16, 1993
Subject: **SURVEY NUMBER 93-200-40**

To:	W. J. Rued	H6-26
cc:	L. L. Cadwell	P7-54
	K. A. Gano	X0-21
	A. R. Johnson	H6-30
	D. S. Landeen	H4-14
	M. R. Sackschewsky	H4-14
	J. C. Sonnichsen	H4-14
	S. W. Seiler	B4-64
	R. S. Weeks	H6-26
	S. Weiss	H6-02
	DSL File/LB	

This letter is in response to the request for a biological assessment in support of the transfer line between 241-C tank farm and the 241-AY tank farm as part of Project W-320, "Past Practice Sluicing of Tank 241-C-106." Although no biological surveys have been conducted in the near vicinity during 1993, no adverse impacts to any plant or animal species of concern are expected to occur because the proposed routing of the transfer line is adjacent to established roadways and through highly disturbed areas. Most of this area is currently under vegetation management.

M. R. Sackschewsky
Biological Sciences Team
Senior Scientist

mjm

CONCURRENCE:

J. C. Sonnichsen Jr., Manager
Environmental Technology
and Assessment

Date: 8/16/93

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Appendix C

Yakama Indian Nation's Comments and DOE Responses

NOTE: Finalization of the EA may have resulted in changes to the specific pages/paragraphs referred to in the DOE response letter to the Yakama Indian Nation.

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Confederated Tribes and Bands
of the Yakima Indian Nation

Established by the
Treaty of June 9, 1855

February 24, 1994

COMMITMENT CONTROL PHONE 6-6537
CONTROL NO. 940890.2E
ASSIGNED TO: TWP
DISTRIBUTION: MGK TWR EAP CCC PSL

Mr. John Wagoner, Manager
Richland Operations Office
Department of Energy
P.O. Box 550 A7-50
Richland, WA 99352

Subject: ENVIRONMENTAL ASSESSMENT FOR TANK 241-C-106 PAST-PRACTICE SLUICING WASTE RETRIEVAL; COMMENTS ON--

Dear Mr. Wagoner:

Department of Energy Richland Operations letter 94-PRJ-006 from Mr. Dunigan of your staff requested comments on the subject environmental assessment (EA).

We support the action to expedite the remediation of Tank C-106; however, we are concerned with the potential environmental impacts associated with the evolution and recommend that thorough engineering evaluations be accomplished and reported by means of the subject EA.

We consider that, in general, EA's should be used more consistently as a project controlling document to assure comprehensive engineering evaluations for projects are accomplished and potential impacts properly identified and quantified.

This type of information is necessary to rationally reach conclusions about the conceptual design of a project and impact mitigation measures. It is consistent with Mr. Grumbly's recent initiative to improve the front-end planning as a means of reducing project costs.

Comments concerning the subject EA for Tank C-106 reflecting this consideration are contained in the Attachment to this letter.

Sincerely,

Russell Jim

Russell Jim, Manager
Environmental Restoration/Waste Management Program
Yakama Indian Nation
P. O. Box 151
Toppenish, WA 98948

ATTACHMENT: **Comments on Environmental Assessment Tank 241-C-106 Past-Practice Sluicing Waste Retrieval DOE/EA/XXXX**
(see next page for distribution)

RECEIVED
MAR 02 1994
DOE-RL/CCC

RL Commitment Control
MAR 01 1994
Richland Operations Office
H.B

Acn# 9496826

Post Office Box 151, Fort Road, Toppenish, WA 98948 (509) 865-5121
194-PRJ-007

cc: K. Clarke, DOE/RL
M. Riveland, WA Ecol. .
G. Emison, U.S. EPA Reg. 10
T. Grumbly, DOE/EM
Washington Gov. M. Lowry
U. S. Congressman J. Inslee
U. S. Senator P. Murray

2

ATTACHMENT: Comments on Environmental Assessment Tank 241-C-106 Past-Practice Sluicing Waste Retrieval DOE/EA/XXXX

Comments prepared by J.R. Brodeur, P.E.

General Comment:

USE OF EA'S TO IDENTIFY ENGINEERING SCOPE AND ENVIRONMENTAL ISSUES-

We consider that Environmental Assessments (EAs), including the subject EA, provide a primary means of identifying issues and concerns about technical aspects of a project. However, the subject (EA) does not adequately address engineering concerns associated with potential environmental impacts of the subject project.

Our concerns reflect a potential for significant environmental impacts, such as leaks or spills resulting from the sluicing operation, and we consider these concerns should be addressed and resolved. Resolution of some of those concerns may be the responsibility of the various engineering functions of the project and may not necessarily be resolved in the EA; but the EA should provide the formal vehicle to commit to addressing the concerns and should respectively identify or reference the appropriate engineering documents that are planned or completed.

It appears that there is inadequate preliminary engineering assessment of the subject sluicing project to comprehensively scope technical issues and establish conceptual designs. We note that Mr. Grumbly, in connection with the recent stand down, identified the need to perform more comprehensive engineering at the initial stages of major projects such as this one. We agree that comprehensive engineering in the initial stages of various DOE projects has been a root cause of cost over-runs and inefficient operations. In it's current form, the EA falls short of providing a true assessment of the impacts to the environment. Furthermore, it appears to be based on a collection of disorganized, uncoordinated documents that use inconsistent design and operational criteria. The EA should be revised to correct the deficiencies identified below.

SPECIFIC COMMENTS:

1. LEAK EVALUATION, OVER-FILLING TANK-AY-102--Page 2-1, 3rd par.--This paragraph states that C-106 contains 173,000 gal. of top layer sludge of which at least 75% is to be removed (129,750 gal.) to AY-102 in the sluicing operation. However, according to WHC-EP-0182-64 (TF Surveillance and Waste Status), Tank AY-102 only has 131,000 gal. of space available. This leaves only a 1250 gal. difference. Additionally, both the EA and the functional design criteria (FDC) (WHC-SD-W320-FDC-001 Rev.1) indicate that the transfer lines will be flushed after completion of the sluicing operation.

3

We assumed from the description of operations in the EA that pumping of liquid from C-106 will be accomplished at the same rate at which sluicing liquid is pumped into C-106 (350 gpm). Therefore, after pumping 75% of the liquid from C-106 there would only be a maximum of 3.5 minutes before the pump must be turned off to assure AY-102 is not filled beyond its capacity.

This will require careful monitoring with adequate instrumentation and operational controls to prevent spills and overfilling tank AY-102. In this regard monitoring criteria should be specified in the EA, and the EA should assess the environmental impact of leak or spill considering the capabilities of the instrumentation.

In summary, our concern is that tank AY-102 may be filled beyond design capacity, resulting in an environmental impact due to a release from the first shell of the double shell tank. We consider that additional engineering is required to address and prevent this scenario.

The EA should consider the realistic impact of overfilling AY-102, and such a risk should be minimized by adequate process design, instrumentation and automatic pump controls.

2. OPERATIONAL CONTROLS TO PREVENT LEAKS/SPILLS--
The EA is not clear about the amount of liquid that will be in Tank C-106 at any time during the sluicing operation. The functional design criteria (FDC), described in WHC-SD-W320-FDC-001, provide an upper limit of liquid in the tank at 79 inches (217,000 gal). However, this document a) does not indicate how the amount of liquid in the C-106 will be minimized; b) does not state what criteria will be used to decide when pumping from C-106 will occur; or c) does not indicate, if there will be any additional controls to minimize the liquid. Also, there is no explanation of the sequence of events relative to the pumping and sluicing operations in the EA, in the FDC, or in the procedural report (WHC-SD-WM-ES-234).

The following additional questions should be resolved by the engineering documents justifying the subject operation: a) Will the existing liquid in the tank be pumped prior to introduction of the sluicing liquid? b) Will the sluicing liquid be pumped from C-106 during the sluicing operation? c) Will there be a significant fluctuation in the liquid level? Appropriate operational limits should be specified in the procedures.

The EA should provide a clear statement as to the maximum volume of liquid to be placed in tank C-106 at any time, and it should clearly indicate the sequence of the pumping and sluicing operations. These process design data should be used as input parameters in the tank leak engineering study (WHC-SD-WM-ES-218). Currently, that study assesses tank volume criteria that are inconsistent with the FDC.

4

A primary concern is that leaving a large amount of liquid in C-106 during the sluicing operations could promote a leak from the tank and result in an environmental impact. The EA should consider such an impact and assess this impact. (The significant cooling anticipated by the removal of the sludge will cause thermal contraction of the tank that could lead to tank failure.)

3a. LEAK DETECTION CAPABILITY--
As suggested by the comments above, questions remain about the current ability to detect leaks and the resulting environmental impacts from undetected leaks. The tank leak engineering assessment (WHC-SD-WM-ES-218) postulates a low volume leak, even though, as a result of poor precision leak detection instrumentation, a high volume leak may go undetected.

Therefore, an engineering assessment of the Hanford single shell waste tank leak detection systems to be used in the sluicing operations should be completed and those data should be used to provide input to the tank leak engineering study. This, in turn should be referenced and used in the EA. Engineering evaluations of the leak detection systems that exist should be made public as background information.

The EA should provide a credible assessment of the maximum leak volume to compare with our estimate of 200,000 gal. (See comment 3b below) that could be released in the sluicing operation, and an evaluation should be made of various sluicing methods so as to minimize the chances of a leak from C-106.

3b. TANK INTEGRITY WITH SLUICING--Section 5, pp 5-7 & 5-8--
We have a major concern about the current integrity of Tank C-106; about the possibility that the sluicing operation will induce further leaks from the tank; about the inadequacy of the leak detection instrumentation; and about the inadequacy of the EA in assessing the impacts resulting from a leak.

The question about the current integrity of the tank has not been addressed in the EA. However, documents describing studies about possible tank leaks in the C-farm, specifically addressing possible leaks from C-106, have not been reviewed or referenced in the EA. Studies about the integrity of C-106 have not been completed (see recommendations section of WHC-SD-EN-TI-185). Specifically, there is contamination in the unsaturated zone on the north-west and east sides of this tank that is of unknown origin. Some of that contamination is deep in the unsaturated zone and is probably not from downward migration of surface contamination. Additional studies are required to identify the sources of that contamination. Such studies, together with a comprehensive assessment of the origin of the unsaturated zone contamination and the tank integrity should be completed. This study should include a review and analysis of all historical tank leak detection data.

5

We consider that the sluicing operation should not proceed without knowing if the tank is currently sound, if it has leaked in the past, if the operation will induce another leak, or if the sluicing operation could be performed with a minimal amount of free liquid in the tank to mitigate such a potential leak.

To evaluate the worst case scenario, the EA should assess the impacts resulting from a large leak (over 200,000 gal). In any case, adequate tank integrity characterization should be performed and sluicing operational controls should be put into place to minimize the possibility of a large leak.

4. LEAK DETECTION FOR TRANSFER LINES AND PUMP PITS--Page 2-3-- The last sentence states "Leak detection would be provided for the new transfer lines and pump pits." Since leak detection is critical to prevention of spills, considering the spill history at C farm, more detail concerning this issue is warranted in the EA. A more rigorous assessment of the possibility of a spill is needed. Such an assessment should identify the instrumentation required to assess a spill and evaluate the probability of a spill. This was not accomplished in the referenced Hazard Classification (WHC-SD-WM-HC-007). As a result, the real hazard associated with a spill is not determined, and the potential environmental impacts were not assessed.

5. FACILITY DECONTAMINATION AND WASTE DISPOSITION--Pg 2-4, Par. 2- This paragraph discusses decontamination of the transfer lines and equipment. This decontamination process will generate both liquid and solid waste. Estimates of the nature of this decontamination waste and its environmental impact should be provided, as well as, a description of how the decontamination waste will be handled, including facilities needed to accomplish the decontamination and plans for disposal.

6. INCORRECT TRANSFER LINE FLOW RATES--Section 5, p 5-6, par. 1-- The transfer line leak scenario appears to incorrectly use a transfer line flow rate of 105 gpm, which is inconsistent with the sluicing pump output which would pump liquid from AY-102 at a rate of 350 gpm (pg. 2-2, par 3). The scenario should be re-evaluated to include the highest possible flow rate. Additionally, the probability that has been "determined" may not be correct. The EA should incorporate the probability calculations or a proper scientific reference.

7. WORKER PROTECTION FROM TANK C-103 TOXIC VAPORS--
There is nothing in the environmental assessment which addresses the problem of worker protection from organic vapors arising from Tank C-103. The assessment of a vapor release from C-103 during the sluicing operations is critical to the health and safety of the workers. Measures appropriate to mitigate the impact on workers from such releases should be identified.

6

8. RECOVERY FROM A LEAK FROM TANK C-106--Page 5-7, par 2.-- This paragraph implies that a surface barrier will be constructed over C-106 if a leak occurs. Further, it alludes to an action of recovering or treating any contaminated soils. These statements do not constitute an assessment of the impact of a release on the groundwater or unsaturated zone environment and remediation associated with these natural resources. As noted above, a proper and comprehensive assessment of these potential impacts, together with possible remediation, should be completed in the EA.

7

Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

JAN 1 7 1995

94-TWP-104

Mr. Russell Jim, Manager
Confederated Tribes and
Bands of the Yakama Nation
P.O. Box 151
Toppenish, WA 98948

Dear Mr. Jim:

RESPONSES TO COMMENTS ON THE ENVIRONMENTAL ASSESSMENT (EA) FOR TANK 241-C-106 PAST-PRACTICE SLUICING WASTE RETRIEVAL

The Department of Energy, Richland Operations Office (RL), appreciates your efforts in reviewing and commenting on the EA for Tank 241-C-106 Past-Practice Sluicing Waste Retrieval. Enclosed are RL's responses to your comments on this EA and one copy of the revised Preliminary Safety Evaluation for 241-C-106 Waste Retrieval, Project W-320, which includes the revised Chemical Compatibility of Tank Wastes in Tanks 241-C-106, 241-AY-101, and 241-AY-102 Report as an attachment. The EA is being revised to incorporate changes in response to your comments. We will send you a copy when it is finished.

If you or your staff wish to receive further information about this activity, please contact Mr. S. D. Bradley, of the Tank Waste Projects Division, on (509) 376-7333. If you desire further information about the National Environmental Policy Act (NEPA) process, please contact me on (509) 376-6667.

Sincerely,

Paul F. X. Dunigan, Jr.
Paul F. X. Dunigan, Jr.
NEPA Compliance Officer

PJR:SDB

Enclosures

cc w/o encls:
M. D. McKinney, PNL
H. R. Cook, YIN
R. Tulee, YIN
W. Reed, WRC

Department of Energy Richland Operations Office

Subject: Responses to the Yakama Indian Nation Comments on the Environmental Assessment (EA) for Tank 241-C-106 Past-Practice Slucing Waste Retrieval, letter dated February 24, 1994.

1. According to WHC-EP-0182-64 (TF Surveillance and Waste Status), Tank AY-102 only has 131,000 gallons of space available. This leaves only 1,250 gallons difference between space available and the 129,750 gallons of waste needed to be sluiced. Additionally, the transfer lines will be flushed which will produce more liquid waste. Towards the end of the sluicing operation (after 75% of the waste has already been transferred) there will only be 3.5 minutes before the pumps must be shut off to prevent Tank AY-102 from being filled to capacity (based upon the 1,250 gallons of space mentioned above). The EA should specify the monitoring criteria which would prevent tank overfilling and the environmental impact from a spill or leak given the instrumentation capabilities.

Disposition of Comment 1: Section 2.2 has been expanded to include a discussion on the preliminary activities needed to Tank AY-102 to prepare it for sluicing operations. The 2nd paragraph (on page 2-5) explains that the supernatant currently in Tank AY-102 would be pumped out and sent to the Evaporator Bottoms System or another double shell tank (DST). Either Tank AY-101's supernatant or treated water would be pumped into Tank AY-102 to provide the initial sluicing agent. This would be done because both AY-101's supernatant and treated water have better compatibility characteristics with waste in Tank C-106 than the supernatant in Tank AY-102. The paragraph states, "...The removal of Tank AY-102's supernatant, even with the introduction of Tank AY-101's supernatant, would allow for sufficient space requirements for the receiver tank and would eliminate the potential for overflow as a result of the proposed sluicing operation ".

2a. The EA does not indicate how the amount of liquid in C-106 will be minimized, what criteria will be used to decide when pumping from C-106 will occur, what additional controls (if any) will be installed to minimize the liquid. An explanation is needed in the EA on the sequence of events relative to pumping and sluicing.

Disposition of Comment 2a: The EA describes the process that would be involved in sluicing in Section 2.2 (which has been modified). The description emphasizes that the process would be a closed loop and would not introduce additional liquid to Tank C-106.

A paragraph has been added (page 2-3) which explains that at the start of sluicing, the slurry transfer pump in C-106 would be configured to run the slurry internally through the sluicers. This closed loop would be monitored to ensure that the proper consistency is reached before the slurry is transported to AY-102. This section (Section 2.2) has been modified to provide a more detailed description of the overall sluicing process, and indicates that this is a continuous, simultaneous process (where the volume being pumped out is roughly the same as the volume of supernatant added).

2b. The following questions should be resolved by engineering documents justifying sluicing: a) will the existing liquid in the tank be pumped prior to the introduction of the sluicing liquid? b) will the sluicing liquid be pumped from C-106 during the sluicing operation? c) will there be significant fluctuation in the liquid level? Appropriate operational limits should be specified in the procedures.

Disposition of Comment 2b: As has been mentioned, the 1st full paragraph of Page 2-3 states that the liquid currently in C-106 would be pumped out to improve sluicing efficiency prior to the actual sluicing. The revised Section 2.2 describes the process used in this project which mentions that the supernatant would be used to sluice the sludge and form a slurry. This slurry would be pumped through the transfer lines into Tank AY-102. The heavier particles would settle out under gravity while the relatively clear liquid would remain on top to be used as the supernatant (and thereby forming a continuous operation). The greatest liquid level would be at the start of operations. The slurry pump would remove the slurry at roughly the same rate as the supernatant is added, keeping the liquid level fairly constant (approximately 5,000 gallons). The overall waste volume would steadily decrease throughout the project.

3a1. Questions remain about the current ability to detect leaks. An engineering assessment of the SST waste leak detection capability should be completed and included in the tank leak engineering study, which should, in turn, be referenced in the EA.

Disposition of Comment 3a1: The EA was modified to include a discussion on the ability to detect leaks during sluicing. Both Section 2.2 (3rd paragraph on page 2-4) and Section 5-2 (first paragraph on page 5-11) mention that the presence of flow meters on the transfer lines and mass balance controls on the receiver tank would detect a leak when approximately 8,000 gallons were lost.

3a2. The EA should provide a credible assessment of a leak of 200,000 gallons.

Disposition of Comment 3a2: Due to the presence of the above controls, a leak of 200,000 gallons from sluicing is unrealistic and overly conservative (see response to Comment 3b3).

3b1. Concerns exist with the integrity of Tank C-106. Additional studies are needed to identify the source for the current soil contamination in and around C-Farm.

Disposition of Comment 3b1: A paragraph was added on page 2-1 explaining why C-106 has been characterized as sound. In 1992, the ventilation system failed and the tank was monitored for a period of roughly six months. During this time, with no additional cooling water added, the level of waste within C-106 remained constant.

3b2. Sluicing should not be allowed until information is available on if the tank is currently sound, if it has leaked in the past, if it is possible to sluice with a minimal amount of free liquid in the tank to mitigate a potential leak.

Disposition of Comment 3b2: The tank will be sluiced with a maximum of 5,000 gallons of supernatant added to the sludge at any time. The maximum amount of waste that could be released under these conditions would be the 5,000 gallons and any interstitial liquid in the waste.

3b3. To evaluate a worst case scenario, the EA should examine a leak of over 200,000 gallons. In any case, adequate tank integrity characterization should be performed and operation controls should be put into place to minimize the possibility of a large leak.

Disposition of Comment 3b3: As has been mentioned, leak detection devices would identify a leak when approximately 8,000 gallons of liquid is unaccounted for in the sluicing process. The EA further mentions that a conservative estimate of a leak is 40,000 gallons (and would be determined by the amount of free liquid in the tank, the detection devices, and the ability of the waste to plug the leak site). It is unrealistic to address a leak of 200,000 gallons from routine sluicing operations, when the total waste volume in C-106 would be less than this amount. The sluicing process, by working from the center outward, is designed to minimize the amount of waste that could leak to the environment. By the time the sluicers are applied to waste near the tank walls, the amount of waste would be greatly reduced.

4. More detail is warranted in the EA on leak detection of the transfer lines and pump pits. A more rigorous assessment is needed to determine the probability of a spill and the instrumentation required to assess the spill.

Disposition of Comment 4: The pump pits would return any leaked waste back into their respective tanks. The transfer lines would collect waste from a break in the primary pipe and carry it to a common point for leak detection. There is a discussion of these points on Page 5-2 (3rd and 4th paragraphs). Please see attached two sheets on design requirements.

The probability of a spill from the transfer lines has been determined to be 7.0×10^{-4}, the frequency of a Design Basis Earthquake at the Hanford Site.

5. A more thorough discusssion of the decontamination process is needed, including the nature of the decontamination waste and its environmental impact.

Disposition of Comment 5: Decontamination of equipment and materials used in this project would produce roughly 7,000 gallons of additional liquid waste which would be sent to AY-102 and would still be well within the operating capabilities of that tank. The equipment would be excessed where practical or disposed of as waste. The volume of liquid waste generated from this action is mentioned on Page 5-16.

6. The transfer line leak scenario should use the pump flow rate of 350 gpm to be consistent with the description of the proposed action. The probability of this accident should be reexamined.

Disposition of Comment 6: Section 5.2 of the EA was revised to address comment contents.

7. Measures appropriate to mitigate the impact on workers from organic vapors which might arise from Tank C-103 should be identified.

Disposition of Comment 7: Section 5.1 page 5-3, 2nd paragraph of the EA was revised to state that proper respiratory equipment will be used as appropriate.

8. Statements in the EA on potential surface barriers should a leak occur and future recovery and treatment of contaminated soils, do not reflect an assessment of the impact of a release on the groundwater or unsaturated zone and remediation associated with these resources.

Disposition of comment 8: Wording was added to the EA to reflect that the accident scenario of a tank rupture from a DBE (which has the possibility of the most severe waste release to the soil) is not exclusive to the proposed action. This accident could occur during normal tank storage activities and, therefore, should not be a factor in determining the environmental significance of this project. Existing wording in the EA explain that a postulated leak would take a minimum of 60 years to reach the groundwater (and only the most mobile portion of the leak). The EA also explains that contaminated soil from such a spill would likely be remediated as part of the overall site closure of the tank farms under the TPA Milestone (M-45-06).

TANK 241-C-106
PAST-PRACTICE SLUICING
WASTE RETRIEVAL

HANFORD SITE, RICHLAND, WASHINGTON

U.S. DEPARTMENT OF ENERGY

FINDING OF NO SIGNIFICANT IMPACT

FEBRUARY 1995

AGENCY: U.S. Department of Energy

ACTION: Finding of No Significant Impact

SUMMARY: The U.S. Department of Energy (DOE) has prepared an Environmental Assessment (EA), DOE/EA 0933, to assess environmental impacts associated with past-practice sluicing as a means of waste retrieval for Tank 241-C-106 (Tank C-106), and activities necessary to support this work at the Hanford Site, Richland, Washington. Tank C-106 is an underground single-shell tank (SST) located in the 241-C Tank Farm in the 200 East Area of the Hanford Site. Alternatives considered in the review process included: the No Action alternative; the preferred alternative to remove heat-producing sludge from Tank C-106 by sluicing using a high-volume, low-pressure stream of liquid to mobilize sludge waste for transfer through two transfer lines to a receiver tank, Tank 241-AY-102 (Tank AY-102), an underground double-shell tank (DST) also located in the 200 East Area; and a batch-transfer alternative that would use an accumulation tank connected to the transfer es to hold in turn the supernate from Tank AY-102 that would be used to sluice the waste in Tank C-106, then the sluiced solids from Tank C-106 to be sent to Tank AY-102.

Based on the analysis in the EA, and considering preapproval comments from the Yakama Indian Nation, DOE has determined that the proposed action is not a major federal action significantly affecting the quality of the human environment within the meaning of the *National Environmental Policy Act of 1969* (NEPA), 42 U.S.C. 4321, et seq. Therefore, the preparation of an Environmental Impact Statement (EIS) is not required.

ADDRESSES AND FURTHER INFORMATION

Single copies of the EA and further information about the proposed action are available from:

Leif Erickson, Director
Tank Waste Disposal Division
U.S. Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352
(509) 376-6406

For further information regarding the DOE NEPA process, contact:

'arol M. Borgstrom, Director
Office of NEPA Oversight
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20585
(202) 586-4600 or (800) 472-2756

PURPOSE AND NEED: DOE needs to take action to eliminate safety concerns with the storage of high-heat waste in Tank C-106, and demonstrate a tank retrieval technology.

BACKGROUND: In November 1990, Public Law 101-510, Section 3137, "Safety Measures for Waste Tanks at Hanford Nuclear Reservation" was enacted, which mandated that the DOE develop plans for response to safety issues associated with the waste storage tanks at the Hanford Site, and to report the progress of implementation of those plans to the U.S. Congress. In the resulting "Status Report on Resolution of Waste Tank Safety Issues at the Hanford Site," Tank C-106 is identified as a high-heat tank and one of the "Priority 1" ··fety issues at the Hanford Site.

Tank C-106, which was built during 1943 and 1944, measures 23 meters (75 feet) in diameter. It contains 655,000 liters (173,000 gallons) of sludge containing a sufficient amount of strontium to be considered high-heat waste. It is estimated that this sludge generates 32.24 plus or minus 5.86 kW (110,000 plus or minus 20,000 Btu per hour). This decay heat is being currently removed by the addition of approximately 22,700 liters (6,000 gallons) of water per month which provides evaporative cooling. It is believed that without active cooling, temperatures in the tank could exceed established limits and eventually affect the structural integrity of the tank resulting in a possible breach of containment. Also, the continued additions of cooling water would increase the amount of material available to be released to the soil column if a loss of containment occurs due to the age of the tank.

In addition, sluicing the waste from Tank C-106 would demonstrate a form of tank waste retrieval as called for in *Hanford Federal Facility Agreement and Consent Order* -Party Agreement) Milestone M-45-03-T1 "Complete SST Waste Retrieval Demonstration." While the sluicing operations would need to retrieve approximately 75 percent of the high-heat sludge to lower the heat output below 11.72 kW (40,000 Btu per hour) (the level at which active cooling is no longer required), the proposed action would attempt to retrieve as much waste as possible beyond this 75 percent to demonstrate waste retrieval efficiency.

PROPOSED ACTION: The waste retrieval operation would involve introducing a high-volume, low-pressure stream of liquid to mobilize the sludge waste in Tank C-106 and prepare it for pumping. One or two remotely-aimed "sluicers" would be installed in Tank C-106 at separate locations to ensure full sluicing coverage of the waste. The mobilized waste would be retrieved from Tank C-106 with a submersible pump that would transfer the waste to Tank AY-102 through one of the two newly installed, double-encased pipelines. The waste would be deposited in the receiver tank where the majority of the heavier solid waste particles would settle to the bottom while the liquid portion would remain on top as supernate to be recycled to Tank C-106 as the liquid sluicing agent. A sluice pump would be installed in Tank AY-102 to provide this sluicing agent. The two pipelines, one carrying the sluiced waste to Tank AY-102 and one carrying the supernatant back to ınk C-106, would be partially buried and covered by an earthen berm to reduce radiation dose to tank farm workers.

One of the sluicers in Tank C-106 would operate in the existing sluice pit, while the other would operate in the existing pump pit, if needed. Valves would direct the supernate liquid to one of the sluicers depending upon the area of the tank being sluiced. If it is determined that portions of the waste cannot be mobilized by the one sluicer, the valves would direct the supernatant into the second sluicer. Only one sluicer would operate at any one time.

A new submersible pump would be installed in Tank C-106 to transfer the slurry (i.e., the sluiced waste) to Tank AY-102. To allow for slurry elevation changes, the slurry transfer pump would be manually adjusted to maintain sufficient suction-head pressure. The sluicing operations would start from the center of the tank and work to the outside by remotely adjusting the angle of the sluicers. This is designed to minimize the time that the tank liner lirectly exposed to the sluice stream, and minimize the potential for a sluicing-induced tank leak.

The slurry would be pumped into the transfer line and deposited into Tank AY-102. A slurry distributor would evenly spread the Tank C-106 waste solids in Tank AY-102. This provides a more uniform heat source in Tank AY-102. The distributor also would provide a siphon break to the transfer line back to Tank C-106.

Prior to the sluicing operations, several actions would be required to prepare the tanks for the insertion of the pumps and equipment. Some of the existing equipment in the pump and sluice pits of Tank C-106 must be removed and stored at the Hanford Site for subsequent treatment and disposal. These pits would then require cleaning and the application of paint or fiber coating to the inside surface, which would provide a surface that can be more easily decontaminated. Before the waste from Tank C-106 can be transferred, the supernatant from Tank AY-102 would be pumped out to allow for sufficient space for the waste transfer. After the supernatant from Tank AY-102 is pumped out, supernatant from Tank AY-101 or other appropriate sluicing fluid (which may consist of treated water), would be pumped into Tank AY-102 to be used as the initial sluicing agent.

new High-Efficiency Particulate Air (HEPA) filtration system would be added to Tank C-106 to minimize releases to the atmosphere. To control the temperature and humidity of the Tank C-106 vapor space during sluicing, the proposed action would install a recirculating air system. Additional methods of cooling the tank may be used, as necessary which may consist of either connecting an air chiller to the recirculation duct or by introducing cooled fluid prior to, or during, the sluicing operation. Additional instrumentation would be required in both tanks and in the transfer lines between the tanks. A double-wide trailer would be installed outside the 241-C Tank Farm, and would serve to house centralized monitoring and control instrumentation. Finally, support services, in the form of raw water, sanitary water, electrical power, telecommunications, and hoisting hardware, would be provided.

ALTERNATIVES CONSIDERED: The EA discussed a variety of sluicing alternatives as well as the No Action Alternative. Of the sluicing alternatives, all but one, the Batch 'nsfer Alternative, failed to meet the two essential requirements necessary for this project; tne ability to remove enough of the waste so that the heat production in Tank C-106 is less than 11.72 kW (40,000 Btu) per hour, and that the sluicing method start retrieval by October 1996. The other alternatives discussed in the EA either resulted in the generation of greater quantities of liquids requiring tank farm storage or rely upon technologies unproven in a waste tank environment.

Batch-Transfer Alternative. Of the alternatives described in the EA, the only option that could conceivably meet the two requirements was the Batch-Transfer Alternative. This alternative would utilize an accumulation tank which would hold both the supernatant from Tank AY-102 and the slurry from Tank C-106 at various times. The accumulation tank would first be filled with supernate from Tank AY-102, which would be used to sluice the waste in Tank C-106. The solids from Tank C-106 would then be transferred to this accumulation tank and the material batch transferred to the receiver tank. The accumulation tank then would be refilled with supernate from Tank AY-102 and the cycle repeated. While this alternative appears to meet the requirements, it would involve more design, procurement and construction costs, and would be less likely to meet the start date.

ɔ-Action Alternative. This alternative would result in maintaining Tank C-106 in its present condition. No waste transfer operations will be performed, and the high-heat producing waste will continue to generate excessive thermal loads. Water additions to provide evaporative cooling will continue, which increase the amount of liquid available for release to the soil column in the event that the tank starts to leak. This alternative will not resolve the safety issue associated with Tank C-106 and will necessitate missing a Tri-Party Agreement milestone.

ENVIRONMENTAL IMPACTS: Routine conduct of the proposed activity would not result in any significant increase in tank farm emissions. Before beginning the proposed activity, appropriate procedures and administrative controls would be in place to maintain exposure to workers and other onsite personnel to within requirements established by DOE Orders and as low as reasonably achievable principles. The exposure received by onsite personnel is not expected to be greater than doses currently received from routine Hanford Site operations. ential radiological doses to the public from routine operations would be extremely small and are not expected to result in any health effects. The risks to workers from chemical exposures, noxious vapors, burns, and other common industrial hazards are expected to be low, and would be minimized by training and the use of appropriate personal protective equipment.

The Tank C-106 ventilation system would keep emissions within applicable regulatory requirements for gaseous and particulate discharges. The tank ventilation system would maintain a slight negative pressure inside Tank C-106 in the event of planned or unforeseen openings of the tank risers.

Most of the liquid necessary for the sluicing operations, after the initial supernatant transfers, would be obtained from and returned to Tank AY-102. Since the amount of slurry is approximately equal to the amount of supernate used to sluice the waste, the overall amount of liquid in Tank C-106 at any one time is not expected to increase substantially. Additional liquid might be required for sluicing line clean-out, but would not be a significant increase in total volume used, and would be within the receiving tank's storage capacity.

The proposed action would result in the generation of solid waste during the life of the project. Such waste would be surveyed and disposed of in the Hanford Site Solid Waste Landfill if uncontaminated, or another applicable, permitted location if found to be contaminated with hazardous or radioactive constituents. At the completion of activities, noncontaminated equipment would be excessed where applicable, while contaminated materials and components would be packaged and stored in a permitted facility as is the current practice at the Hanford Site.

The 200 East Area, and the project location specifically, is a developed, highly disturbed area, and is currently under a vegetation management program which eradicates vegetation. No sensitive or critical plant or animal habitat would be affected. There are no animal species of special concern which are known to use the area exclusively.

The proposed action would not release any particulate matter, thermal releases, or gaseous discharges in significant amounts. Noise levels would rise only slightly for the duration of the project with the majority of the impact during the early construction phase.

Leaks in the pump and sluice pits would be detected and controlled by special instrumentation during normal sluicing operations. Pit drains would return leaked wastes to one of the two tanks involved for compatible storage. Leaks in the primary piping system of the transfer lines would be controlled by the secondary containment system (the outer pipe). This secondary containment system would be designed to collect released waste at a common point for detection and removal.

Socioeconomic Impacts

Existing Hanford workers will perform the preparations and sluicing. Therefore no socioeconomic impacts are expected from this action.

Cumulative Impacts

The proposed action is not expected to contribute substantially to the overall cumulative impacts from operations on the Hanford Site. Standard Operating Procedures will provide fficient personnel protection such that exposure to radiological and chemical materials will be kept below DOE and contractor guidelines. Routine sluicing operations are not expected to significantly increase the amount of radioactivity released from total Hanford operations. In 1993, the maximally exposed offsite individual was exposed to 3.7×10^{-3} millirem EDE from total air emissions, well below allowable limits set by state and federal regulations. The wastes generated from the activities would not add substantially to waste generation rates at the Hanford Site and would be stored or disposed in existing facilities.

Environmental Justice

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires that Federal agencies identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of their programs and activities on minority and low-income populations. This posed action would occur within the Hanford Site Boundary. Since no socioeconomic impacts or health effects are expected, it is not expected that there would be any disproportionate adverse effects to low-income or minority populations in the surrounding community.

Impacts From Postulated Accidents

In addition to environmental impacts that were postulated from routine operations, the EA discussed a range of reasonably foreseeable accident scenarios that could lead to environmental impacts.

An unfiltered release through a breach in the recirculation duct of the ventilation system using the supernatant from Tank AY-102 as a source term was the accident scenario resulting in the highest dose to both onsite and offsite populations. The resulting 50-year committed dose from this potential accident was found to be 5.0×10^{-1} roentgen equivalent man (rem) Effective Dose Equivalent (EDE) for the onsite maximally exposed individual (MEI) and 5.2×10^{-4} rem EDE to the offsite MEI. The likely mechanism for this accident is a vehicular accident, which has a remote probability of occurring if proper administrative controls are in place; however, it is possible that a Design Basis Earthquake (DBE) could lead to similar results. It is not expected that there would be any latent cancer fatalities to either onsite or offsite populations from this accident.

Other accidents analyzed in the EA consisted of a waste transfer line break, a breach in tank confinement as a result of a DBE, a leak developing in the tank as a result of the sluicing operation, and a spray leak from a jumper or connector. It should be noted that a DBE has the potential to initiate three of the accident scenarios; a breach in the recirculation duct, a rupture of the tank, and a break in the transfer lines. However, the impacts from the three accident scenarios, in terms of human health effects, would not be substantially greater than those described for the recirculation line breach except for a potentially greater amount of soil contamination. In addition, the EA examined the possibility of hazardous conditions existing in the receiver tank after sluicing. It was determined that no waste compatibility issues would result from the proposed action. It is not likely that the accidents which were analyzed would produce any cancer fatalities.

Other accidents that were not analyzed, such as tank dome failure due to exceeded weight limits, tank bottom penetration by dropped equipment, riser damage due to excavation and construction activities, have been analyzed by other tank farm facilities. Finally, the EA addressed the possibility of a sudden release of steam from a submerged waste layer which could overpressurize the tank and lead to a failure of the ventilation system. These accidents were found to have smaller risk, where risk equals the product of probability and consequence, than the accidents described in detail in the EA.

DETERMINATION: Based on the analysis in the EA, and after considering the preapproval review comments of the Yakama Indian Nation, I conclude that the proposed Past Practice Sluicing of Tank C-106 at the Hanford Site, Richland, Washington does not constitute a major federal action significantly affecting the quality of the human environment within the meaning of NEPA. Therefore, an EIS for the proposed action is not required.

Issued at Richland, Washington, this 17th day of February 1995.

John D. Wagoner
Manager
Richland Operations Office