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DOE/EA-0803

Environmental Assessment

Environmental Assessment for Proposed Pump Mixing Operations to Mitigate Episodic Gas Releases in Tank 241-SY-101, Hanford Site, Richland, Washington

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August 1992

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ENVIRONMENTAL ASSESSMENT FOR PROPOSED PUMP MIXING

OPERATIONS TO MITIGATE EPISODIC GAS RELEASES IN TANK 241-SY-101

HANFORD SITE, RICHLAND, WASHINGTON

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ENVIRONMENTAL ASSESSMENT

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SUMMARY

The U.S. Department of Energy (DOE) is responsible for the management and storage of high-level waste accumulated as a result of the processing of defense reactor irradiated fuels for plutonium recovery at the Hanford Site. These wastes, consisting of liquids and precipitated solids, are stored in underground storage tanks pending final disposition. Located in the 200-West Area of the Hanford Site, Tank 241-SY-101 is a double-shell, high-level waste tank containing about 3785 m^3 (1.0 million gal) of double-shell slurry and complexed concentrate waste. Shortly after the waste was initially pumped into the tank, the waste began to expand because of the generation of gases, which includes hydrogen, nitrous oxide, nitrogen and ammonia. The generation of gas in Tank 241-SY-101 is a Priority 1 waste tank safety issue at the Hanford Site because average peak hydrogen concentrations periodically occur above the lower flammability limit (LFL) after an episodic release. In the unlikely event that an ignition source was present during these periods, a gas ignition event could occur with a significant release of nuclear waste affecting onsite and offsite personnel and contaminating land. Gas generation and subsequent episodic venting is expected to recur until a remediation program is successfully implemented.

The proposed action is to remove a slurry distributor, and to install, operate, and then remove a submerged mixing pump in Tank 241-SY-101. This test is designed to provide data on the efficacy of pump mixing to promote a sustained release of gas from the nonconvecting layer into the tank dome space, and to maintain gas concentrations resulting from episodic releases to below 25% of the LFL of hydrogen in a hydrogen/nitrous oxide atmosphere. The data and information gathered from this test would be used to evaluate the waste response and tank hardware response to the pump mixing operation. Finally, the information acquired would be used to develop design modifications to enhance the effectiveness of pump mixing and to establish if pump mixing is a viable, long-term mitigation concept. If the proposed action is successful, pump mixing would be considered as a long-term mitigation concept to eliminate the potential for a detonation event and for the hydrogen burn accident sequences discussed in the Safety Assessment[1].

The "no action" alternative is the only alternative to the proposed action considered in the Environmental Assessment (EA). No other reasonable alternatives to the proposed action were identified.

The operations associated with the proposed action would be governed by a test plan and test procedure that prescribe the sequence of steps necessary to complete the operation safely and with minimal environmental impact. Each of these operations has been evaluated in a Safety Assessment[1] that addresses the potential safety issues associated with the proposed action. Administrative and engineering controls would be used to mitigate potential hazards associated with the proposed action.

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1.0 INTRODUCTION

1.1 Program Overview

The U.S. Department of Energy (DOE) is responsible for the management and storage of waste accumulated from the processing of defense reactor irradiated fuels for plutonium recovery at the Hanford Site. These wastes include liquids and precipitated solids stored in underground storage tanks pending final disposition.

There are currently 23 Hanford high-level waste tanks on the watch list for potentially generating, storing, and periodically releasing various quantities of hydrogen and other gases. Some tanks release larger amounts of gas than others, but only Tank 241-SY-101 (Tank 101-SY) has been found to release concentrations greater than the lower flammability limit (LFL). A Waste Tank Safety Program Logic has been developed for addressing the safety issues listed in the DOE response to Congress on Public Law 101-510, Section 3137. This Logic lists the hydrogen gas issue as the first item on the priority list and identifies Tank 241-SY-101 for "accelerated evaluation" leading to either a mitigation or remediation resolution.

1.2 Tank 241-SY-101 History

Tank 241-SY-101 is a double-shell, high-level waste tank located in the 200-West Area of the Hanford Site (Figure 1). This tank contains about 3785 m^3 (1.0 million gal) of waste that was concentrated at the 242-S Evaporator and placed in the tank between 1977 and 1980. Initially, 1073.2 m^3 (274,000 gal) of double-shell slurry (which contains high concentrations of hydroxide, nitrate, and aluminate and is the most concentrated material that the evaporators can produce) was pumped into the tank. Subsequent additions of waste to the tank included double-shell slurry and complexed concentrate (an evaporator product similar to, though not as concentrated as, double-shell slurry, and containing significant organic complexant concentrations). Shortly after the waste was initially pumped into the tank, the waste began to expand because of the generation of gases, which includes hydrogen, nitrous oxide, nitrogen, and ammonia. In 1990, this tank was declared to have an Unreviewed Safety Question because of the presence of a potentially explosive/flammable mixture of hydrogen gas and an oxidizer (nitrous oxide) generated within the waste and released into the tank dome space and vented during episodic releases (tank burps). These releases occur over intervals that approximate 100-day cycles[2]. Previous efforts to characterize the tank contents have included gas sampling and analyses, temperature monitoring, displacement level monitoring, sampling to characterize the tank contents, remote video observations, and mechanistic modeling of the observed tank waste behavior.

2.0 PURPOSE AND NEED FOR ACTION

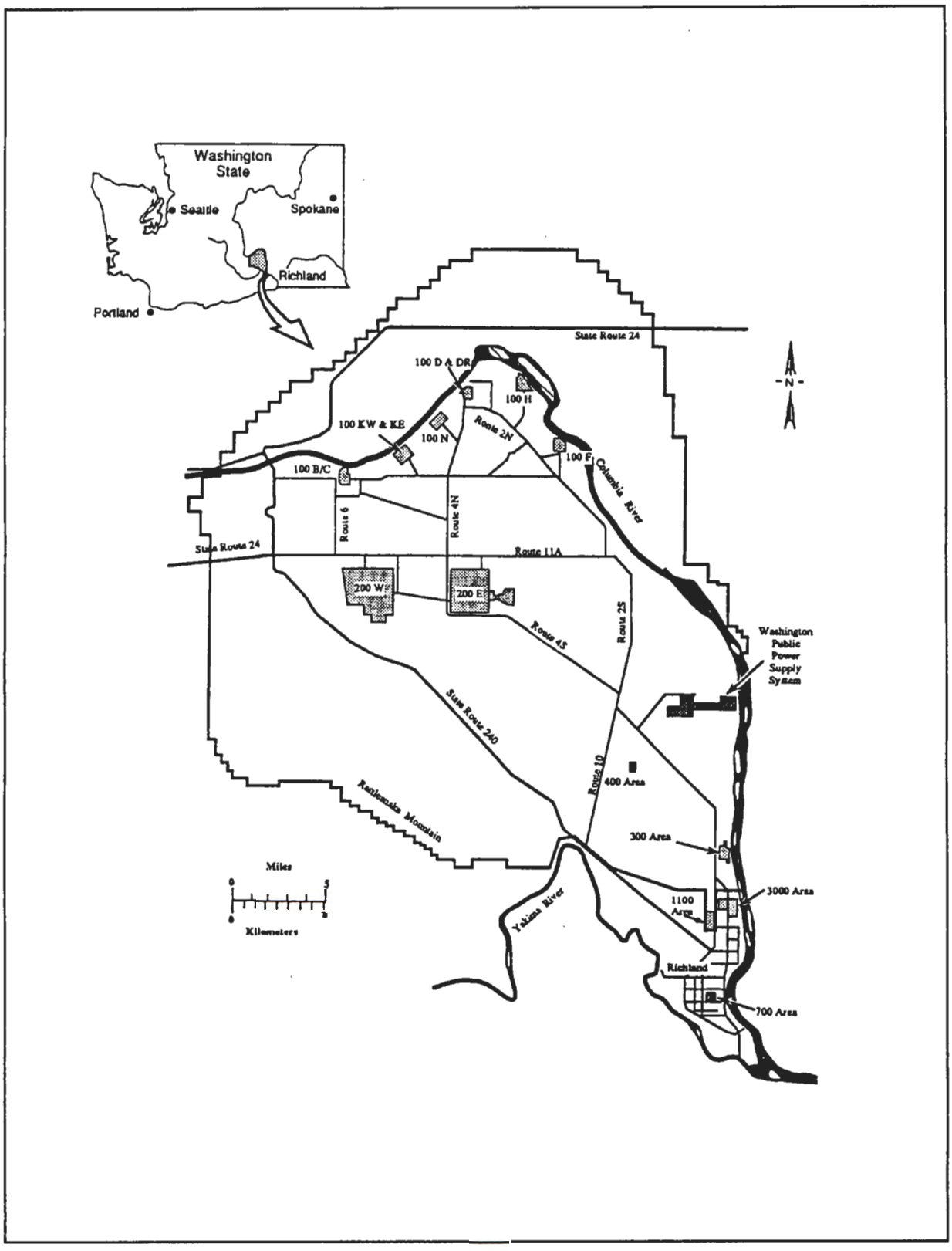

Figure 1. Location of 200 West Area Within the Hanford Site

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Episodic gas releases occurring within Tank 241-SY-101 may result in peak hydrogen concentrations that periodically rise above the lower flammability limit. If coupled with an ignition source, this could potentially lead to conditions that promote a deflagration or detonation event. Although a detonation event is highly unlikely to impossible, it could result in a loss of the tank's structural integrity, resulting in substantial releases of radioactive material to the environment and significant onsite and offsite exposures. Accidents with more limited consequences, but with greater probability of occurrence, are also possible as a result of the conditions that presently exist in Tank 241-SY-101. These accidents may also lead to exposures to onsite and offsite personnel. The DOE needs to take action to reduce these risks.

The purpose of the proposed action is to evaluate the efficacy of pump mixing in promoting the sustained release of gas to the tank dome space and ventilation system, in limiting the amount of gas retained in the nonconvective bottom layer of Tank 241-SY-101, and in reducing the concentrations of hydrogen and nitrous oxide released during episodic events to less than 25% of the LFL. The data and information gathered from this test would be used to assess the waste response and tank hardware response to the pump mixing operation and would be used to develop design modifications to enhance the effectiveness of pump mixing and to establish whether pump mixing is a viable, long-term mitigation concept.

3.0 DESCRIPTION OF PROPOSED ACTION

The proposed action consists of the operations necessary to support removal of the slurry distributor and to install, operate, and remove a mixing pump in Tank 241-SY-101. These operations have been evaluated in a safety assessment[1] and are governed by a test plan[3] and test procedure[4] that prescribe the sequence of steps necessary to complete the operation safely and with minimal environmental impact. The DOE is conducting a separate National Environmental Policy Act (NEPA) review for a proposed action involving installation and operation of equipment to enhance safety in Tank 241-SY-101[5]. Portions of that action are proposed to be accomplished over the same interval of time as the proposed action in this EA. A review of the actions proposed to install and operate equipment to enhance safety[5] indicates that there would be no synergistic interactions between the two proposed actions relevant to environmental concerns (i.e., both actions can be conducted safely and would not, together, result in a significant increase in the risks associated with Tank 241-SY-101).

The proposed action is described below.

3.1 Slurry Distributor Removal

The slurry distributor used to disperse the slurry evenly within the tank during the tank filling operation is presently located in riser 12A, a 107 cm (42 in) diameter riser in

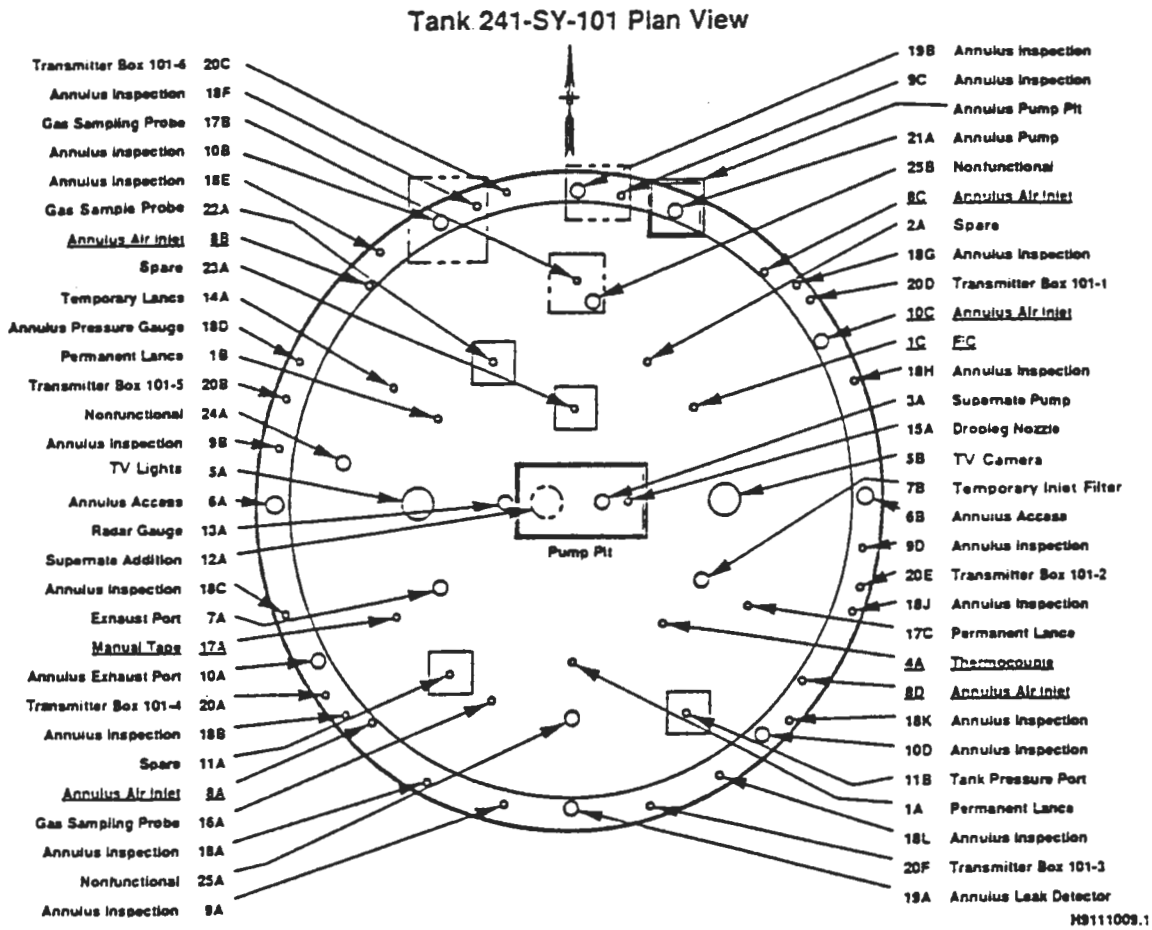

Figure 2. Plan View of Tank 101-SY Showing the Location of Installation Riser 12A and Monitoring Risers 14A and 1B

he central pump pit (Figure 2). The distributor consists of a 5.1 cm (2 in) schedule-80 pipe that tapers to 2.5 cm (1 in) near its outlet, with a nominal length of 2.1 m (81 in) and a weight of 245 kg (540 lbs).

Prior to removing the distributor, the pump pit cover blocks would first be removed to permit access to the slurry distributor. Airborne contamination and radiation levels would be surveyed as the cover blocks are removed. The cover blocks, which are expected to be slightly contaminated, would be wrapped in plastic to prevent the spread of contamination and placed in storage for re-use after the pump is removed from the tank.

The slurry distributor would be bonded to riser 12A and the electrical resistance monitored to minimize the potential for sparks during all handling operations. Conductive plastic is attached to the top of the slurry distributor to cover it completely prior to its removal by a lifting crane and its transportation for onsite storage. The internal and external surfaces of the slurry distributor would be triple-rinsed, in compliance with existing procedures for decontamination, prior to its removal. A load path the crane would take while carrying the equipment would be established to minimize the consequences of a drop as the slurry distributor is moved to the truck. The distributor would be transported for onsite storage in accordance with existing tank farm operational procedures.[6]

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3.2 Mixing Pump Installation

The installation of the submersible mixing pump consists of several steps including: (1) the installation of the load distribution frame, (2) the installation of the submerged mixing pump, and (3) the installation of modified cover blocks on the pump pit. These operations would be controlled by the mixing pump installation procedure,[4] which specifies the requirements for safe installation. The mixing pump installation would immediately follow the removal of the slurry distributor and is expected to take approximately 8 hours. The submersible mixing pump would be installed through a 107-cm (42-in) diameter riser (riser 12A) located in the center of the tank (Figure 2) where the slurry distributor and cover blocks were previously located.

The load distribution frame, with the pump system installation containment seal fixture (PSICSF) installed, would be offloaded from the truck and positioned next to the pump pit so that the lifting crane can raise the frame over the pit. The load distribution frame would be raised and the removal cable, attached to the slurry distributor removal containment seal fixture, would be threaded through the load distribution frame and the PSICSF. The load distribution frame would then be installed in a manner consistent with the controlling procedure[4].

The mixer pump would be offloaded from the truck and moved with a boom crane to a position above the riser. A load path would be established to minimize the

consequences of a drop as the pump is moved over the tank. The PSICSF would be opened and the pump lowered into the tank until it is positioned on the guide pins on the load distribution frame. After installation, the flange bolts would be installed and torqued. The submersible pump would be positioned within the tank so that the suction inlet is within the convecting layer and the pump discharge outlet, consisting of two diametrically opposed horizontal nozzles, is within the nonconvecting layer of slurry. The nozzles would be able to be rotated to discharge within a minimum operating arc of 190°, and have a variable nozzle flow velocity. New cover blocks which have sleeves for routing the hydraulic and water lines and electrical cables to the exterior of the pump pit would be installed on the pump pit.

Specific measures would be taken during installation of the mixer pump to mitigate the potential for excessive personnel exposures or releases to the environment of radioactive or other hazardous material.[1,4] These measures incorporate factors related to weather conditions, monitoring requirements, lifting, rigging, and handling.

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3.3 Mixing Pump Test Operation

The test of the efficacy of the mixing pump operation would be initiated after the completion of all prerequsites and immediately following a tank burp (4).. The initial phase is intended to minimize the release of residual gas remaining after a natural tank burp. The operational test phase would evaluate the ability of the pump to maintain particles in suspension and to preclude the accumulation of gas within the nonconvecting bottom layer. The pump system would not be run outside the procedure or envelope contained in the test plan (3). All abort criteria and pump setpoints are also specified in the Test Plan.

Prior to starting the pump, reference baseline data[3] (e.g., tank level, hydrogen concentration, supernatant density, and waste temperature) would be collected at various locations within the tank using the data acquisition and control system. During initial pump startup, one discharge nozzle on the pump would be oriented toward risers 1B and 14A (Figure 2).

Pump operation is described in the Test Plan and would be controlled through an approved hot test procedure. A Management Plan [13] would provide administrative controls for the test. Initial pump operation would be limited to ramped start ups and short, intermittent periods at low flow. Comparison of the expected gas release after each period would be made with the gas release estimated by the numerical codes, prior to restarting the pump.

The test plan would stipulate initial pump operations that would utilize slow startups to relative slow speed and short operating durations. The primary purpose of this phase would be to perform initial testing in a cautious manner to minimize risks associated with a potential release of residual gas. This test can only be initiated after

a gas release event, when the residual gas inventory is reduced. A Data Acquisition and Control System (DACS) is available to measure and record information received from sensing instruments placed within the tank. Information displayed and recorded by the DACS would be monitored by onsite staff whose actions are defined in the approved test procedure and a Management Plan.

Instrumentation for monitoring tank behavior during the mixing pump test is provided at various locations throughout the tank. Of primary importance to determining success of the test is measurement of the waste level and hydrogen concentrations within the tank and vent header. The remaining instrumentation provides information which would be used to control the test, provide abort capabilities, and protect equipment.

Administrative control of the mixing pump test would be accomplished using an approved Test Procedure and a Management Plan. The Management Plan would define authorities and responsibilities for the test. The Test Procedure would delineate how requirements set forth in the Mixing Pump Test Plan and the safety assessment would be implemented.

The results from these preliminary tests would be used to determine the optimum duration the pump would be run. The test is not expected to exceed one year. The factors that would be considered include the overall effectiveness of the pumping on gas releases, and the power requirements and associated heat-up of the waste. Additional NEPA review would be conducted before DOE selects a tank remediation alternative.

3.4 Mixing Pump Removal

The removal of the submersible mixing pump following the completion of the tests would consist of several steps similar to those to be followed during the installation process, but in reverse order. These operations are controlled by a procedure[4] which specifies the requirements for bonding the mixing pump and cover blocks with the waste tank, attaching conductive plastic to each component removed, lifting each component, triple-rinsing each component for decontamination, and disposing of, or storing each component, as appropriate.
The pump pit cover blocks would be removed to permit access to the mixing pump. Airborne contamination and radiation levels would be surveyed as the cover blocks are removed. The bottom surfaces of the cover blocks are expected to be slightly contaminated. The cover blocks would be wrapped in plastic to prevent the spread of contamination.

The mixing pump would be removed from the tank using a boom crane. A spray ring in the tank riser would triple-rinse the external surfaces of the mixer pump with water

prior to its removal from the tank. The spray ring is surrounded by a channel section that forms a splashback shield to confine debris to the pump riser area. Flush lines would be used for decontaminating the internal pump volume and the pump discharge legs. The minimum amount of water required for decontamination was calculated to be approximately 2.3 m^3 (600 gal), which includes the required backflush for all exposed surface areas (including the portion of the pump assembly exposed to the vapor space of the tank). The spray ring delivers 66°C (150°F) demineralized water at a pressure of 20,684 kPa (3000 pounds per square inch) and at 0.6 m^3 (150 gal) per minute. Dose rate levels would be measured as the mixer pump is raised from the pump pit.

The mixer pump would be wrapped in plastic as it is raised from the riser. A load path would be established to minimize the consequences of a drop as the pump is moved over the tank. The mixer pump would then be onloaded and transported for onsite storage or disposal in accordance with existing tank farm operational procedures[6].

Specific measures would be taken during the removal of the mixer pump to minimize the potential for excessive personnel exposures or releases to the environment of radioactive or other hazardous material.[1,4] These measures incorporate factors related to weather conditions, monitoring requirements, lifting, rigging, and handling.

4.0 ALTERNATIVE TO PROPOSED ACTION

The "no action" alternative is the only identified reasonable alternative to the proposed action considered. The evaluation of the no action alternative in the context of this EA analyzes conditions in Tank 241-SY-101 as they presently exist. The no action alternative would not provide the information needed to evaluate the effectiveness of pump mixing in promoting the gradual release of gas from the nonconvecting bottom layer or in reducing the concentration of gas released during an episodic gas release event.

5.0 DESCRIPTION OF AFFECTED ENVIRONMENT

The DOE Hanford Site lies within the semi-arid Pasco Basin of the Columbia Plateau in southeastern Washington State. The Hanford Site occupies an area of about 1450 km^2 (560 $miles^2$) of essentially flat to gently rolling treeless desert, although some trees are found along the Columbia River. There are two mountains located on the site: (1) Rattlesnake Mountain which is a treeless anticline on the southwestern edge of the site, at an elevation of 1,066 m (3,500 ft) above sea level; and (2) Gable Mountain, a small ridge north of the 200 East Area, 339 m (1,112 ft) high. A detailed and comprehensive description of the Hanford Site is presented in documents developed by DOE, ERDA, and Pacific Northwest Laboratory (PNL).[7,8,9]

The 241-SY Tank Farm is located in the 200 West Area of the Hanford Site about 48

km (30 miles) northwest of the city of Richland, Washington and 8 km (5 miles) from the Columbia River.

The Hanford Site has a mild climate with 15 to 18 cm (6 to 7 in) of annual precipitation and occasional high winds up to 129 km (80 miles) per hour. The annual probability of a tornado hitting any given location on the site is estimated at 10 chances in 1 million. The Hanford Site has low to moderate seismicity.

No species of plant or animal that is federally registered as rare, threatened, or endangered is known to depend on the habitats unique to the Hanford Site. The proposed action would not take place on a floodplain or wetland and would take place at an existing facility in a previously disturbed area. No impacts to critical habitat or environmentally sensitive areas such as archaeological, historical, or native American religious sites are anticipated.

6.0 ENVIRONMENTAL IMPACTS OF PROPOSED ACTION AND ALTERNATIVE

6.1 Proposed Action: Impacts From Routine Operations

6.1.1 Airborne Releases

Environmental monitoring data indicate small quantities of radioactive releases occur annually through the SY Tank Farm ventilation system stack. The releases amount to about 3.6×10^{-7} curies (Ci) of gross beta annually, according to published data for 1990.[10] Assuming this release is comprised primarily of Sr 90, and assuming that the other dose-contributing isotopes are present in amounts corresponding to their ratios in the tank wastes, the total release is 5.2×10^{-6} Ci/yr. This results in a dose of 5.4×10^{-5} mrem/yr to a worker assigned to the 242-S evaporator, 300 m west of the 5 m stack. Doses for other nearby occupied facilities such as U-plant (780 m NE) are even less and the dose to the nearest offsite person (13.8 km WNW) is 8.2×10^{-7} mrem/yr, including the ingestion pathways. These dose estimates were performed with the U.S. Environmental Protection Agency (EPA) CAP88 Code.[11]

The anticipated pump duty cycle when it is installed in the tank is 4 hrs/day, 7 days/week, or 1460 hrs/yr (17%). Since the pump operation is not expected to affect the total amount of flammable gas released over time, but rather to eliminate the periodic burps and make releases more uniform, the effect on the ventilation system operation should be minor. However, it is possible that the pump stirring action could enhance the formation of vapor and the production of aerosols in the tank dome space. Making a conservative assumption that such processes are increased by a factor of 10 during the hours of pump operation results in an increase of the annual radiologic release rate and dose by a factor of about 2.5. As shown in Table 1 (column 4), the resulting doses would be small. Also shown in the Table are the average occupational doses currently received by workers in the tank farm

facilities. The last column gives the maximum dose, limited by site administrative procedures, that a worker directly involved in the pump installation and removal operations would receive. In practice, as indicated by the much lower values for actual exposure experienced in column 3, the worker doses tend to be much lower than the limits. The health risks associated with these occupational exposures, while not zero, would be extremely small.

No onsite or offsite health effects from the release of toxic gases during routine operations would be expected.

The maximum offsite incremental airborne dose for a year of testing is 2.1×10^{-6} mrem for the nearest offsite person located at a distance of 13.8 km. This, along with the other routine releases from the Hanford Site, is well within the 10 mrem/yr limit specified by DOE Orders for dose to the public by the air pathway.

6.1.2 Liquid Releases

Continuous cooling water is supplied to the SY Tank Farm ventilation system moisture condenser. The water is discharged to a cooling pond where the heat is dissipated and the water is recycled. In addition there is steam condensate from the steam heater in the ventilation system, which is recycled to the boiler via the steam condensate line. There is no radioactivity in these liquids, and the proposed action would not alter the quantities of water for these uses.

Prior to inserting the pump, the existing slurry distributor pipe would be removed, rinsed with water, and stored for use at a later time. The rinse water, which removes loosely adhered

Table 1. Routine Annual Releases

Worker Location	Distance (km)	Average Occupational Dose for Tank Farms[1] (mrem/yr)	Incremental Airborne Dose from Test[2] (mrem/yr)	Incremental Pump Removal/Insertion Dose (mrem/yr)
241 SY Farm	0.1	14	3.2×10^{-4}	3000 maximum
242-S Evaporator	0.3	14	1.4×10^{-4}	0
U-Plant	0.78	14	3.3×10^{-5}	0

1 Average external exposure from tank farm worker film badge record.
2 Calculated average dose from inhalation of radionuclides; the worker doses by this pathway, if any, are normally below detection limits.

salts and sludge, would be directed back into the tank riser or disposed of following existing regulations and procedures. A similar procedure would be followed for rinsing

the mixing pump when it is removed at the end of the test period (nominally one to two years). It is estimated that a minimum of approximately 2.3 m^3 (600 gal) of water would be used to rinse the pump; the quantity of water required for rinsing the slurry distributor would be less.

Accidental spills of radioactive liquids were analyzed in the Safety Assessment[1] for the slurry distributor removal and pump installation and removal. Table 2 summarizes these results.
Because of the non-volatile form of the radionuclides, they typically do not constitute an airborne hazard to workers outside the immediate area of the spill. Workers in the immediate area are protected with anti-contamination clothing and breathing filters and would clean up a spill immediately using established tank farm practices.

6.1.3 Solid Wastes

The major solid items generated for storage and/or disposal are the slurry distributor pipe and the pump pit cover blocks. The pipe weighs 245 kg (540 lb), and may contain a small amount of residual radioactive liquid. The cover blocks weigh 20,000 kg (44,000 lb) and may contain a small amount of radioactive contaminant on their lower surfaces. The pump weighs 7727 kg (17,000 lb) and may also contain a small amount of residual radioactive liquid. In addition to this equipment, there would be miscellaneous solid radioactive wastes consisting of tools, rags, plastic, clothing, and material from potential spill cleanups that would require disposal in accordance with existing tank farm procedures[6]. None of these wastes are expected to contribute significantly to the volume of waste generated annually at the Hanford Site (estimated to be 17,943 m^3 in 1988).

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Table 2. Summary of Accident Analyses Results[1]

Radiological Doses EDE (rem) and Ammonia Exposures for Accident Sequences During Slurry Distributor Removal									
		Radiological (rem)		Toxicological (ppm)				Radiological (person-rem)	
Accident Sequence	Frequency (1/yr)	SY Farm	Max Offsite	SY Farm	242-S Evap	U-Plant	Hwy 240	Onsite	Offsite
Window Burp, no burn, ventilation operable	3.70E-03	–	–	247.00	68.00	17.50	1.40		
Window Burp, no burn, ventilation not operable	3.70E-07	–	–	374.00	88.60	18.30	1.30		
Window Burp, burn, ventilation operable	3.70E-06	3.862	0.0013	247.00	68.00	17.50	1.40		
Window Burp, burn, ventilation not operable	3.70E-10	2.664	0.0009	374.00	88.60	18.30	1.30		
Spill During Removal	3.00E-03	0.0061	0.0000017	–	–	–	–		
Contamination from Dropped Distributor	3.00E-04	0.5	0.00014	–	–	–	–		
Unfiltered Release from Open Riser	7.70E-04	0.13	0.0000352	–	–	–	–		

Radiological Doses EDE (rem) and Ammonia Exposures for Accident Sequences During Pump Installation									
		Radiological (rem)		Toxicological (ppm)				Radiological (person-rem)	
Accident Sequence	Frequency (1/yr)	SY Farm	Max Offsite	SY Farm	242-S Evap	U-Plant	Hwy 240	Onsite	Offsite
Window Burp, no burn, ventilation operable	4.70E-03	–	–	247.00	68.00	17.50	1.40		
Window Burp, no burn, ventilation not operable	4.70E-07	–	–	374.00	88.60	18.30	1.30		
Window Burp, burn, ventilation operable	4.70E-06	3.862	0.0013	247.00	68.00	17.50	1.40		
Window Burp, burn, ventilation not operable	4.70E-10	2.664	0.0009	374.00	88.60	18.30	1.30		
Window Burp, no burn, ventilation not operable, riser partially open	4.70E-07	–	–	301.00	75.70	17.20	1.29		
Window Burp, burn, ventilation not operable, riser partially open	4.70E-10	2.518	0.0008	301.00	75.70	17.20	1.29		
Spill During Removal (Failure to Install)	3.00E-03	0.72	0.0002	–	–	–	–		
Contamination from Dropped Pump (Failure to Install)	3.00E-04	0.5	0.00014	–	–	–	–		
Unfiltered Release from Open Riser	7.70E-04	0.13	0.0000352	–	–	–	–		

Table 2. Summary of Accident Analyses Results[1] (continued)

Radiological Doses EDE (rem) and Ammonia Exposures for Accident Sequences During Pump Operation									
		Radiological (rem)		Toxicological (ppm)				Radiological (person-rem)	
Accident Sequence	Frequency (1/yr)	SY Farm	Max Offsite	SY Farm	242-S Evap	U-Plant	Hwy 240	Onsite	Offsite
Maximum Expected Burp, no burn, ventilation operable	3.70+00	–	–	294.00	1.0800	36.40	3.01		
Maximum Expected Burp, no burn, ventilation not operable	3.70E-04	–	–	243.00	95.20	33.60	2.80		
Maximum Expected Burp, burn, ventilation operable	3.70E-03	6.154	0.002	294.00	108.00	36.40	3.01		
Maximum Expected Burp, burn, ventilation not operable	3.70E-07	6.94	0.002	243.00	95.20	33.60	2.80		
Maximum Allowable Burp, no burn, ventilation operable	1.00E+00	–	–	422.00	156.00	53.10	4.40		
Maximum Allowable Burp, no burn, ventilation not operable	1.00E-04	–	–	430.00	157.00	53.00	4.39		
Maximum Allowable Burp, burn, ventilation operable	1.00E-03	7.052	0.002	422.00	156.00	53.10	4.40		
Maximum Allowable Burp, burn, ventilation not operable	1.00E-07	6.319	0.003	430.00	157.00	53.00	4.39		44.5
Radiological Doses EDE (rem) and Ammonia Exposures for Accident Sequences During Pump Removal									
		Radiological (rem)		Toxicological (ppm)				Radiological (person-rem)	
Accident Sequence	Frequency (1/yr)	SY Farm	Max Offsite	SY Farm	242-S Evap	U-Plant	Hwy 240	Onsite	Offsite
Window Burp, no burn, ventilation operable	4.70E-03	–	–	247.00	68.00	17.50	1.40		
Window Burp, no burn, ventilation not operable	4.70E-07	–	–	374.00	88.60	18.30	1.30		
Window Burp, burn, ventilation operable	4.70E-06	3.862	0.0013	247.00	68.00	17.50	1.40		
Window Burp, burn, ventilation not operable	4.70E-10	2.664	0.0009	374.00	88.60	18.30	1.30		
Window Burp, no burn, ventilation not operable, riser partially open	4.70E-07	–	–	301.00	75.70	17.20	1.29		
Window Burp, burn, ventilation not operable, riser partially open	4.70E-10	2.754	0.0009	301.00	75.70	17.20	1.29		
Spill During Removal	3.00E-03	0.72	0.0002	–	–	–	–		
Contamination from Dropped Pump	3.00E-04	0.5	0.00014	–	–	–	–		
Unfiltered Release from Open Riser	7.70E-04	0.13	0.0000352	–	–	–	–		0.7

The slurry distributor pipe and the pump pit cover blocks would be stored on the Hanford Site for re-use at a later time. The pump and all associated materials generated would be placed in a steel disposal box and sent to the Hanford Site low level solid waste burial ground for disposal.

6.2 Proposed Action: Impacts from Accidents

6.2.1 Summary of Safety Assessment Accident Analysis

A wide range of accidents were considered and analyzed in the Safety Assessment[1]. Chapter 4 of the safety assessment describes each of the accident sequences developed, which are based on the different phases of the proposed action (i.e., slurry distributor removal, pump installation, operation, and removal). The accident scenarios involving hydrogen releases and burns were evaluated as a function of the volume of gas released. Chapter 5 of the Safety Assessment presents estimated consequences for the accident sequences that result in radionuclide or toxic gas releases, except for the highly unlikely gas detonation event. A summary of these results is presented in Table 2. The consequences of a gas detonation would be significantly greater than those for the scenarios presented in Table 2, although the consequences have not been quantified (see Section 6.2.2). The radiological consequences values reported in Table 2 are individual Effective Dose Equivalent (EDE), in rem, and population doses in person-rem. The toxic gases values reported are parts per million (ppm) of ammonia, and the frequency values are estimated annual probabilities of the given sequence occurring. The locations of the receptors (e.g., SY Farm, 242-S Evaporator, etc.) relative to Tank 241-SY-101 are given in Table 3.

Table 3. Distance of Receptors from Tank 241-SY-101

Location	Distance (km)
241-SY Tank Farm Area	0.10
242-S Evaporator	0.30 W
U-Plant	0.78 NE
Highway 240	3.9 SE
Maximum Offsite	13.8 WNW

The maximum expected (95th percentile) acute doses to individuals at various locations presented in Table 2 were computed using the A1-Risk code.[12] The offsite population doses were based on the population surrounding the site out to 80 km (50 miles).

Estimated offsite latent cancer fatalities from the radiological releases (see last column of Table 2) vary with the accident sequence from a minimum of 1.5×10^{-5} to a

maximum of 3.4×10^{-2} for population doses of 0.03 and 68 person-rem, respectively. A dose to latent cancer conversion factor of 5 percent per Sievert (5×10^{-4}/rem) was used[14].

Since the maximum ammonia exposures are only slightly above the health threatening level for ammonia (i.e., 500 ppm) and the exposures would be short (several minutes), there would be no onsite or offsite health effects from the exposures for the various accident sequences.

6.2.2 Maximum Foreseeable Accident Consequences

The maximum foreseeable accident sequence is a gas detonation event which is highly unlikely to impossible. Information available in the literature indicates that the pressures from a detonation would exceed, by a factor of two or more, the pressures that have been found to be structurally limiting in Tank 241-SY-101 for a maximum allowable burp with a burn. This means that a detonation, should it occur, would be expected to cause tank failure and result in consequences more severe than those given in Table 2.

The 1987 Environmental Impact Statement[7] (EIS) "Disposal Hanford High-Level Transuranic and Tank Wastes," (DOE/EIS-0113) projected that the maximum forseeable accident associated with high-level waste management operations would be an explosion of a ferrocyanide-containing high-level waste tank. The 1987 EIS projected that such an explosion would result in a short-term radiation dose to the maximally exposed member of the public to 200 millirem, and an offsite collective dose committment of 7,000 person-rem. Such an explosion would be expecxted to result in four offsite latent cancer fatalities, the contamination of a substantial area of land, and significant doses to workers. However, a 1990 General Accounting Office (GAO) study estimated that the consequences of this event would be 10 to 100 times greater than those projected in the 1987 EIS. Although the GAO study did not reach a conclusion regarding the probability of a tank explosion, an independent DOE review determined that the probability of such an explosion is low.

The situation is similar with respect to an explosive detonation of flammable gas in Tank 241-101-SY. The similarities are that: (1) as described in the safety assessment there is a very low likelihood of occurrence, and (2) the consequences, although they have a significant uncertainty band, are likely to be similar to those estimated for the upper-bound accident in the 1987 EIS and the 1990 GAO study in that the consequences would be catastrophic and would involve significant doses to workers.

The proposed action has the potential to slightly increase the probability of such a gas detonation occurring because the pump could generate a larger gas release. Although DOE cannot quantify the probability of a larger gas release, the probability of a detonation of such a release remains highly unlikely. The relative probability of a

detonation, between the proposed action and the no action alternative, depends on the likelihood of the pump test succeeding in limiting the hydrogen concentration in the tank dome space to below the LFL during the pump test. DOE designed the proposed pump mixing test with the expectation that it would be successful in limiting flammable gas concentrations, but this likelihood cannot be quantified in absolute terms at this time. Failure of the pump in limiting hydrogen concentrations to below the LFL would not necessarily result in an increased probability of a detonation.

6.3 No-Action Alternative: Impacts from Routine Operations

6.3.1 Airborne Releases

As discussed above, a small increase in releases from the ventilation stack may occur due to the pump mixing action in the liquid waste. The no-action alternative would not result in this small increase in releases.

6.3.2 Liquid Releases

The cooling water and steam condensate flow quantities for the no-action alternative are identical to those discussed above for the proposed alternative.

The risk of possible liquid spills during slurry distributor removal and pump installation/removal would be eliminated for the no-action alternative.

6.3.3 Solid Wastes

The solid wastes generated as a result of the proposed action (see Section 6.1.3) would not be generated in the no-action alternative.

6.4 No-Action Alternative: Impacts from Accidents

6.4.1 Summary of Safety Assessment Accident Analyses

Table 2 summarizes the accident sequences and consequences quantified in the Safety Assessment.[1] The "window burp", "maximum expected burp", and detonation accident sequences may occur as part of the "no action" alternative (i.e., conditions that presently exist). In the no action alternative, Tank 241-SY-101 would continue to generate hydrogen, and episodic gas releases exceeding the LFL are likely to occur unmitigated, until the controlling processes and mechanisms are abated. These episodic releases could lead to a detonation or deflagration resulting in a release of radioactive material. The "no action" alternative would not provide the information needed to evaluate the effectiveness of pump mixing in promoting the gradual release of gas from the nonconvecting bottom layer or in reducing the concentration of gas released during an episodic event.

The possibility of a detonation in Tank 241-SY-101 has been examined and found to be highly unlikely to impossible. For this case, the relative risk associated with the proposed action and no action alternative cases is dependent on the probability that the mixing pump is effective in limiting the hydrogen concentration in the tank dome space to below the LFL. Based on observations and studies of the episodic gas releases for the past two years and engineering judgement, DOE believes that the pump test would be successful. DOE also believes that the potential of the proposed action to slightly increase the probability of a gas detonation and therefore the overall risk will be more than offset by the decrease in overall risk due to the decrease in probability of a gas detonation if the testing is successful in reducing the hydrogen concentration in the dome space to below the LFL during the period of the test.

7.0 PERMITS AND REGULATORY REQUIREMENTS

The Hanford Site is owned by the U.S. Government and is managed by the DOE. It is the policy of the DOE to carry out its operations in compliance with all applicable federal laws and regulations, 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 EPA, and in Washington State agencies, primarily the Washington State Department of Ecology (Ecology).

The hazardous waste management facilities at the Hanford Site are operated under the auspices of an interim status RCRA Part A application submitted to EPA on November 18, 1980 and a RCRA Part B application submitted November 6, 1985 to both EPA Region 10 and Ecology for the storage, treatment, and disposal of hazardous wastes at Hanford. Supplemented and revised RCRA permit applications have been submitted either to Ecology, to the EPA, or to both, as appropriate. No additional permits are required to complete the proposed action.

8.0 REFERENCES

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FINDING OF NO SIGNIFICANT IMPACT FOR PROPOSED PUMP MIXING OPERATIONS TO MITIGATE EPISODIC GAS RELEASES IN TANK 241-SY-101 HANFORD SITE, RICHLAND, WASHINGTON

AGENCY: U.S. Department of Energy

ACTION: Finding of No Significant Impact (FONSI)

SUMMARY: The U.S. Department of Energy (DOE) has prepared an Environmental Assessment (EA), DOE/EA-0803, to assess the environmental impacts associated with the removal of a slurry distributor and the installation, operation, and removal of a mixing pump in Tank 241-SY-101, located in the 200 West Area of the Hanford Site, Richland, Washington. Tank 241-SY-101 has been found to have episodic releases of hydrogen and nitrous oxide at concentrations greater than the lower flammability limit (LFL), and in 1990 this tank was declared to have an Unreviewed Safety Question. DOE needs to take action to reduce the risks associated with potential ignition of flammable gases in Tank 241-SY-101. The purpose of the proposed action is to evaluate the efficacy of pump mixing in promoting the sustained release of gas to the tank dome space, in limiting the amount of gas retained in the nonconvective bottom layer of the tank, and in reducing the concentrations of hydrogen and nitrous oxide released during episodic events to less than 25% of the LFL.

Based on the analysis in the EA, which evaluated the potential environmental impacts of the proposed action and the no action alternative, 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 (NEPA) of 1969 (42 U.S.C. 4321 et seq). Therefore, the preparation of an environmental impact statement is not required, and the DOE is issuing this FONSI.

COPIES OF THE EA AND FURTHER INFORMATION REGARDING THE PROPOSED ACTION ARE AVAILABLE FROM:

Mr. R. E. Gerton, Manager
Tank Farm Project Office
U.S. Department of Energy
Richland Field Office
Richland, Washington 99352 (509) 376-1366

FOR FURTHER INFORMATION ON DOE NEPA PROCEDURES CONTACT:

Carol M. Borgstrom, Director
Office of NEPA Oversight
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20685
(202) 586-4600 or (800) 472-2756

BACKGROUND: The U.S. Department of Energy (DOE) is responsible for the management and storage of waste accumulated from the processing of defense reactor irradiated fuels for plutonium recovery at the Hanford Site. These wastes, consisting of liquids and precipitated solids, are stored in underground storage tanks pending final disposition.

There are currently 23 Hanford high-level waste tanks on the watch list for potentially generating, storing, and periodically releasing various quantities

of hydrogen and other gases. Some tanks release larger amounts of gas than others, but only Tank 241-SY-101 has been found to release concentrations greater than the LFL. A Waste Tank Safety Program Logic has been developed for addressing the safety issues listed in the DOE response to Congress under Public Law 101-510, Section 3137. This Logic lists the hydrogen gas issue as the first item on the priority list and identifies Tank 241-SY-101 for "accelerated evaluation" leading to either a mitigation or remediation resolution.

Tank 241-SY-101 is a double-shell, high-level waste tank located in the 200-West Area of the Hanford Site. This tank contains about 3785 m^3 (1.0 million gal) of waste that was concentrated at the 242-S Evaporator and placed in the tank between 1977 and 1980. Initially, 1070 m^3 (274,000 gal) of double-shell slurry (which contains high concentrations of hydroxide, nitrate, and aluminate, and is the most concentrated material that the evaporators can produce) were pumped into the tank. Subsequent additions of waste to the tank included double-shell slurry and complexed concentrate (an evaporator product similar to, though not as concentrated as, double-shell slurry, and containing significant organic complexant concentrations). Shortly after the waste was initially pumped into the tank, the waste began to expand because of the generation of gases, including hydrogen, nitrous oxide, nitrogen, and ammonia. In 1990, this tank was declared to have an Unreviewed Safety Question because of the presence of a potentially explosive/flammable mixture of hydrogen gas and an oxidizer (nitrous oxide) generated within the waste and released into the tank dome space and vented during episodic releases (tank burps). These releases occur over intervals that approximate 100-day cycles. Previous

efforts to characterize the tank contents have included gas sampling and analyses, temperature monitoring, displacement level monitoring, sampling to characterize the tank contents, remote video observations, and mechanistic modeling of the observed tank waste behavior.

Episodic gas releases occurring within Tank 241-SY-101 may result in peak hydrogen concentrations that periodically rise above the LFL and may, when coupled with an ignition source, potentially lead to conditions that promote a detonation event. Although a detonation event is highly unlikely, it could result in a loss of the tank's structural integrity, causing substantial releases of radioactive material to the environment and significant onsite and offsite exposures. Accidents with more limited consequences, but with greater probability of occurrence, are also possible as a result of the conditions that presently exist in Tank 241-SY-101. These accidents may also lead to exposures to onsite and offsite personnel. DOE needs to take action to reduce these risks.

The purpose of the proposed action is to evaluate the efficacy of pump mixing in promoting the sustained release of gas to the tank dome space, in limiting the amount of gas retained in the nonconvective bottom layer of Tank 241-SY-101, and in reducing the concentrations of hydrogen and nitrous oxide released during episodic events to less than 25% of the LFL. In addition, the data and information gathered from this demonstration would be used to evaluate the waste response and tank hardware response to the pump mixing operation. Finally, the information acquired during this test would be used to develop design modifications to enhance the effectiveness of pump

mixing and to establish if pump mixing is a viable, long-term mitigation concept. Additional NEPA review will be conducted before DOE selects a tank remediation alternative.

PROPOSED ACTION: The proposed action consists of the operations necessary to support removal of the slurry distributor and to install, operate, and remove a mixing pump in Tank 241-SY-101. These operations have been evaluated in a Safety Assessment (SA) and are governed by a test plan and test procedures that prescribe the sequence of steps necessary to complete the operation safely and with minimal environmental impact. DOE has prepared an EA (DOE/EA-0802, August 1992) and issued a FONSI for a separate proposed action involving installation and operation of equipment to enhance safety in Tank 241-SY-101. Portions of that action are proposed to be accomplished over the same interval of time as this proposed action. A review of the proposed action to install and operate equipment to enhance safety indicates that there would be no synergistic interactions between the two proposed actions relevant to environmental concerns (i.e., both actions can be conducted safely and would not, together, result in a significant increase in the risks associated with Tank 241-SY-101).

The slurry distributor used to disperse the slurry evenly within the tank during the filling operation is presently located in riser 12A in the central pump pit. The pump pit cover blocks would be removed first to permit access to the slurry distributor. Conductive plastic would be attached to the top of the slurry distributor to cover it completely prior to its removal by a lifting crane and its transportation for onsite storage.

The installation of the submersible mixing pump would consist of several steps including: (1) the installation of the load distribution frame, (2) the installation of the submerged mixing pump, and (3) the installation of modified cover blocks on the pump pit. The submersible mixing pump would be installed through a 42-inch diameter riser (riser 12A) located in the center of the tank where the slurry distributor and cover blocks were previously located. These operations would be controlled by the mixing pump operation procedure, which specifies the requirements for safe installation.

The operation of the mixing pump is expected to mix the tank contents and induce flow within the waste tank fluid. This test would be conducted in two phases: (1) an initial operation and residual gas release phase, and (2) a long-term operational test phase. Data would be collected on the pump speed, waste velocity, instrument probe strain, tank level, and hydrogen concentration data. The results from the initial tests would be used to determine the optimum duration the pump would be run. The test is not expected to exceed approximately one year, after which the pump would be removed by a process similar to the reverse of the installation process.

ALTERNATIVES CONSIDERED: The "no action" alternative is the only identified reasonable alternative to the proposed action. The consideration of the no action alternative in the EA includes analysis of conditions in Tank 241-SY-101 as they presently exist. The no action alternative would not provide the information needed to evaluate the effectiveness of pump mixing in promoting the gradual release of gas from the nonconvecting bottom layer, or

in reducing the concentration of gas released during an episodic gas release event.

ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION AND NO ACTION ALTERNATIVES:

Proposed Action: Impacts From Routine Operations

AIRBORNE RELEASES

Environmental monitoring data indicate that, currently, the 241-SY Tank Farm ventilation system stack releases about 3.6×10^{-7} curies (Ci) of gross beta radioactivity annually, according to published data for 1990. Assuming this release is comprised primarily of Sr 90, and assuming that the other dose-contributing isotopes are present in amounts corresponding to their ratios in the tank wastes, the total release is 5.2×10^{-6} Ci/yr. This results in a dose of 5.4×10^{-5} mrem/yr to a worker assigned to the 242-S evaporator, 300 m west of the 5 m stack. Doses to workers at other nearby occupied facilities such as U-plant (780 m NE) are even less, and the dose to a hypothetical maximally exposed offsite individual (13.8 km WNW) is 8.2×10^{-7} mrem/yr, including the ingestion pathways.

The anticipated pump duty cycle when it is installed in the tank would be 4 hrs/day, 7 days/week, or 1460 hrs/yr (17%). The effect on the ventilation system operation should be minor because the pump operation is not expected to affect the total amount of flammable gas released over time, but rather to eliminate the periodic burps and make releases more uniform. However, it is

possible that the pump stirring action could enhance the formation of vapor and the production of aerosols in the tank dome space. Making a conservative assumption that such processes are increased by a factor of 10 during the hours of pump operation results in an increase of the annual radiological release rate and dose by a factor of about 2.5. The resulting doses would therefore be very small. This dose, combined with the doses from other routine releases from the Hanford Site, is well within the 10 mrem/yr limit for dose to the public by the air pathway. The maximum dose that workers directly involved in the pump installation and removal operations would receive would be controlled administratively to less than 3 rem per year; the EA concludes that the actual doses to such workers would be much lower. The health risks associated with these occupational and offsite exposures, while not zero, would be extremely small.

No onsite or offsite health effects from the release of toxic gases during routine operations are expected.

LIQUID RELEASES

No radioactive liquids requiring disposal would be generated by the ventilation system moisture condenser as a result of the planned pump installation/removal process or as a result of the no action alternative.

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Solid Wastes

The major solid wastes that would be generated for storage and/or disposal are the slurry distributor pipe, the pump, and the pump pit cover blocks. The pipe weighs 245 kg (540 lb) and it would contain a small amount of residual radioactive liquid. The cover blocks weigh 20,000 kg (44,000 lb) and may contain a small amount of radioactive contaminant on their lower surfaces. The pump weighs 7727 kg (17,000 lb) and may also contain a small amount of residual radioactive liquid. In addition to this equipment, there would be miscellaneous solid radioactive wastes consisting of tools, rags, plastic, clothing, and material from potential spill cleanups that would require disposal in accordance with existing tank farm procedures.

The slurry distributor pipe and the pump pit cover blocks would be stored on the Hanford Site for reuse at a later time. The pump and all associated materials generated would be placed in a steel disposal box and sent to the Hanford Site low level solid waste burial ground for disposal.

Proposed Action: Impacts From Potential Accidents

Non-detonation Scenarios

A wide range of reasonably foreseeable accidents that would not result in a gas detonation were considered and analyzed in the EA and Safety Assessment (SA). The consequences of a gas detonation were considered in the EA but not quantified in the SA, and would be significantly greater than the consequences

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for the other scenarios considered in the EA and Safety Assessment. A gas detonation would be the maximum reasonably foreseeable accident, and is discussed separately below.

The non-detonation accident sequences analyzed included potential material spills, equipment drops, unfiltered releases from open risers, and a range of potential ignition scenarios that would not result in a detonation. Based on a conversion factor of 5×10^{-4} latent cancer fatalities (LCFs) per person-rem, the estimated offsite LCFs that could result from radiological releases associated with the non-detonation accident scenarios vary with the accident sequence from 1.5×10^{-5} (for a spill during removal, with estimated annual probability of occurrence of 5×10^{-3}) to 3.4×10^{-2} (for a gas ignition, with estimated annual probability of occurrence of 10^{-7}), corresponding to population doses of 0.03 and 68 person-rem, respectively. The corresponding exposures to individual tank farm workers would range from about 6 millirem for the spill-during-removal scenario (largest probability of occurrence) to about 12.5 rems for the ignition scenario. The respective probabilities of inducing a LCF associated with these individual exposures are 3×10^{-6} and 6×10^{-3}.

As indicated, the accident sequence with highest probability of occurrence would be a small accidental spill of radioactive liquids during equipment removal and flushing activities. However, because of the non-volatile form of the radionuclides, such a spill would not constitute an airborne hazard to workers outside the immediate area of the spill. Workers in the immediate area would be protected with anti-contamination clothing and breathing

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filters, and would immediately clean up any spill using established tank farm practices.

No onsite or offsite health effects are expected to result from exposure to toxic gases during any of these accident sequences because the maximum exposures to the species of greatest concern, ammonia, would be only slightly above the health threatening level (i.e., 500 ppm) and the exposures would be short (several minutes).

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Maximum Reasonably Foreseeable Accident Consequences

The maximum reasonably foreseeable accident sequence is the highly unlikely gas detonation event with an estimated probability of occurrence of less than 10^{-6}/yr under current conditions. The gas detonation accident sequence discussed below could occur independently of the proposed action. The proposed action has the potential to slightly increase the likelihood that the gas detonation accident sequence would occur because the pump could generate a larger gas release than would be expected for the no action alternative. Although DOE cannot quantify the probability of a larger gas release, the probability of a detonation of such a release would remain highly unlikely. The relative probability of a detonation, between the proposed action and the no action alternative, depends on the likelihood of the pump test succeeding in limiting the hydrogen concentration in the tank dome space to below the LFL during the pump test. DOE conceived and designed the proposed pump mixing test with the expectation that it would be successful in limiting flammable gas concentrations, but this likelihood cannot be quantified in absolute terms

at this time. Failure of the pump to limit hydrogen concentrations to below the LFL would not necessarily result in an increased probability of a detonation.

The EA indicates that the pressures resulting from a detonation could exceed, by a factor of two or more, the pressures that have been found to be structurally limiting in Tank 241-SY-101. This means that a detonation, should it occur, could be expected to cause tank failure and result in consequences more severe than those discussed above for the non-detonation scenarios.

The 1987 Environmental Impact Statement (EIS), "Disposal of Hanford High-Level, Transuranic and Tank Wastes," (DOE/EIS-0113) projected that the maximum reasonably foreseeable accident associated with high-level waste management operations would be an explosion of a ferrocyanide-containing high-level waste tank. The risks associated with an explosive detonation of flammable gas in Tank 241-SY-101 are similar to those estimated for the maximum reasonably foreseeable accident in the 1987 EIS in that there is a very low likelihood of occurrence, and, although there is uncertainty regarding the consequences, the consequences would be catastrophic.

The 1987 EIS projected that a high-level waste tank explosion would result in a short-term radiation dose to the maximally exposed member of the public of 200 millirem, and an offsite collective dose commitment of 7,000 person-rem. Such an explosion would be expected to result in 4 offsite LCFs, the contamination of a substantial area of land, and significant doses to workers.

However, a 1990 General Accounting Office (GAO) study estimated that the consequences of this event could be 10 to 100 times greater than those projected in the 1987 EIS. Although the GAO study did not reach a conclusion regarding the probability of a tank explosion, an independent DOE expert review panel judged the probability of such an explosion to be low.

No-Action Alternative: Impacts from Routine Operations

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Airborne Releases

The proposed action may result in a small increase in releases from the ventilation stack due to the pump mixing action in the liquid waste. Under the no-action alternative, no such small increases in releases would occur.

Liquid Releases

The cooling water and steam condensate flow quantities for the no-action alternative are identical to those discussed above for the proposed alternative.

Solid Wastes

The solid wastes generated as a result of the proposed action would not be generated in the no-action alternative.

No-Action Alternative: Impacts from Potential Accidents

Under the no action alternative, the risks associated with possible liquid spills and unfiltered gas releases from an open riser during slurry distributor removal and pump installation/removal would be avoided.

Under the no action alternative, Tank 241-SY-101 would continue to generate hydrogen, and episodic gas releases exceeding the LFL are likely to occur, unmitigated, at the current rate of three to four times per year until the controlling processes and mechanisms are abated. These episodic releases could lead to a detonation or deflagration resulting in a release of radioactive material. The no action alternative would not provide the information needed to evaluate the effectiveness of pump mixing in promoting the gradual release of gas from the nonconvecting bottom layer or in reducing the concentration of gas released during an episodic event.

The slightly increased probability of a detonation event would be avoided under the no action alternative, although a detonation would remain highly unlikely for both the proposed action and the no action alternatives. The detonation risk associated with the proposed action relative to the risk from the no action alternative depends on the probability that the mixing pump would be effective in limiting the hydrogen gas concentration in the tank dome space to below the LFL. Based on observations and studies of the episodic gas releases for the past two years and engineering judgement, DOE expects that the pump would be successful in reducing the detonation risk during the test. DOE also believes that the potential of the proposed action to slightly

increase the probability of a gas detonation, and therefore increase the overall risk, would be more than offset by the decrease in overall risk from successfully reducing the hydrogen concentration in the dome space to below the LFL during the period of the test.

DETERMINATION: Based on the analysis in the EA, the proposed action to install, operate, and remove a submerged mixing pump in Tank 241-SY-101 does not constitute a major Federal action significantly affecting the quality of the human environment within the meaning of NEPA. Therefore an environmental impact statement for the proposed action is not required.

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Issued at Washington D.C., this 18th day of Sept. 1992.

Paul L. Ziemer, Ph.D.
Assistant Secretary
Environment, Safety and Health

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