DOE/EA - 0881

ENVIRONMENTAL ASSESSMENT

TANK 241-C-103
ORGANIC VAPOR AND LIQUID CHARACTERIZATION AND SUPPORTING ACTIVITIES

HANFORD SITE, RICHLAND, WASHINGTON

U.S. DEPARTMENT OF ENERGY

August 10, 1993

This page intentionally left blank.

Executive Summary

The action proposed is to sample the vapor space and liquid waste and perform other supporting activities in Tank 241-C-103 located in the 241-C Tank Farm on the Hanford Site. Operations at Tank 241-C-103 are curtailed because of an unreviewed safety question (USQ) concerning flammability issues of the organic waste in the tank. This USQ must be resolved before normal operation and surveillance of the tank can resume. In addition to the USQ, Tank 241-C-103 is thought to be involved in several cases of exposure of individuals to noxious vapors. This safety issue requires the use of supplied air for workers in the vicinity of the tank.

Because of the USQ, the U.S. Department of Energy proposes to characterize the waste in the vapor space and the organic and aqueous layers, to determine the volume of the organic layer. This action is needed to: (1) assess potential risks to workers, the public, and the environment from continued routine tank operations and (2) provide information on the waste material in the tank to facilitate a comprehensive safety analysis of this USQ. The information would be used to determine if a flammable condition within the tank is credible. This information would be used to prevent or mitigate an accident during continued waste storage and future waste characterization.

Alternatives to the proposed activities have been considered in this analysis.

The proposed activities are essentially the same as activities that were evaluated in past safety analyses and safety assessments. Standard operating procedures for sampling this single-shell tank have been reviewed and revised to take into account the potential presence of flammable conditions in the waste.

The potential for significant cumulative environmental impacts, due to the conduct of the proposed activities, has been analyzed. No substantial increase to the overall impact of the Hanford Site operations would be expected from sampling the vapor space and organic and aqueous layers or in performing other listed supporting activities in Tank 241-C-103.

Table of Contents

List of Figures

Appendix

This page intentionally left blank.

1.0 Purpose and Need for Agency Action

The U.S. Department of Energy (DOE) needs to take action to obtain information relative to unreviewed safety questions (USQ) concerning Tank 241-C-103. The DOE proposes to sample the vapor space and organic layer within the tank. The resulting sample analysis would provide the information necessary to evaluate the hazardous effects of potentially toxic gases and the organic vapor/liquid flammability in Tank 241-C-103. The DOE also proposes to conduct other operations needed to ensure safe operating conditions.

Agency action is needed in order to assess the risk to workers and the public from uncontrolled releases of toxic vapors in the tank, and releases of radionuclides caused by combustion of the liquid organic layer. Definitive sampling information is needed to verify that vapor space fuel loading from all sources in the tank is below 25 percent of the lower flammability limit (LFL). During the flammability testing, if the results are less than 25 percent of the LFL, other proposed activities would continue without additional approvals. If the flammability test result is greater than or equal to 25 percent of the LFL, continued activities would require further approval. The value of 25 percent is replacing the 20 percent standard established in the safety review documentation (WHC 1991a) to be consistent with standard industrial practice.

This page intentionally left blank.

2.0 Description of the Proposed Action

Tank 241-C-103, one of the original 530,000-gallon (2,006,262-liter) tanks constructed from 1943 to 1944, was declared an USQ by the Westinghouse Hanford Company on September 21, 1992. The basis for this declaration was the potential for ignition of the vapors from the floating layer of organic material in the tank that was not adequately addressed in the existing Safety Analysis Reports and other documentation that establishes the safety boundary for single-shell tanks (SST). In addition to the USQ, another safety issue involving Tank 241-C-103 is the occasional detection of noxious vapors at or in the vicinity of the tank.

Recent information, developed from an estimate of the tank contents derived from historical records, suggests that the contents may not be flammable. The proposed sampling program is designed to confirm the basis for concluding that the contents are not flammable, thereby permitting removal of the tank from the USQ category.

The noxious vapor safety issue will be addressed by the same sampling program. Vapors that may possibly escape from the tank can be identified and categorized for health impacts such as toxicity, providing an opportunity to impose a more workable health and safety procedure for tank farm workers.

The following sections provide a summary of the operations proposed for Tank 241-C-103, and a description of proposed sampling activities.

2.1 Summary of Proposed Tank 241-C-103 Operations

The proposed operational justifications are detailed in the Appendix. The following is a summary of operations proposed for Tank 241-C-103:

- Tank Operation No. 1. Routine surveillance activities in the vapor space, which are minimally intrusive to the waste, (i.e., liquid-level monitoring, temperature readings from installed temperature monitoring equipment, dome deflection surveys, dry well scans, and repair of monitoring equipment).

- Tank Operation No. 2. Calibration of instrumentation and preventive maintenance activities.

- Tank Operation No. 3. Tank vapor space sampling and monitoring operations.

- Tank Operation No. 4. Tank content sampling operations (supernatant liquid bottle-on-a-string) to retrieve organic and aqueous samples, to determine organic layer thickness and sludge-level in the waste tank.

- Tank Operation No. 5. Activities involving installation, removal and/or replacement of small scale components or pieces of equipment (e.g., sludge weight, liquid-level monitor, still camera or video camera [including its operation], riser flange, riser flange asbestos gasket, pit cover block, failed breather filter, and other tank appurtenances).

- Tank Operation No. 6. Tank breather filter efficiency testing

- Tank Operation No. 7. Installation and/or modification of equipment for above ground facilities (e.g., electrical utilities, instrument air, breather filter assembly, etc.), including activities that would break containment for installation of riser modifications above ground

- Tank Operation No. 8. Installation and operation of a tank farm approved portable exhauster.

- Tank Operation No. 9. Waste additions to the extent that the waste additions comply with the requirements of the safety documentation under the criticality USQ. High-level waste could be added to Tank 241-C-103 from the inadvertent leakage of waste during routine transfers among tanks. Also, small volume water additions that might occur into the tank from flushing instruments, entering pits, decontaminating pits, conducting routine maintenance, pressure testing transfer pipelines, flushing transfer pipelines, disposing of rain water or snow melt intrusions, and from flushing and equipment installation (WHC 1992a).

2.2 Description of Proposed Sampling Activities

Some of the operations described in Section 2.1 are intrusive activities Further description of these proposed intrusive activities and the equipment that would be used to perform them is provided in the following sections (Tables 1 and 2). Safety reviews have been performed.

Table 1.
Sampling Locations for Proposed Action

Location	Description
Downstream of HEPA filter	The sample manifold will be connected to an existing dioctyl phthalate (DOP) port located downstream of the HEPA filter.
Upstream of HEPA filter	The sample manifold will be connected to an existing port located upstream of the HEPA filter.
FIC housing	The sample will be taken at a washdown port on the FIC waste level gauge housing.
In-tank	Tubing will be inserted into the tank vapor space via the installation of a special sampling flange on an existing tank riser.

**Table 2.
Sampling/Laboratory and Field Analysis Equipment**

Sampling equipment	Description of sampling and laboratory equipment
Sorbent tubes	Small pencil-sized stainless steel or glass tubes that require a pump to pull vapors through tightly packed collection media. Sorbent media are designed to adsorb specific analytes.
SUMMA canisters	A 6-liter passivated stainless steel container that is evacuated to a predetermined level. A sample is collected by attaching a SUMMA canister to the sample manifold. The SUMMA canister can be used to collect a grab sample or a time integrated sample, depending on the data quality objectives of the sampling effort.
DAAMS tubes	Similar to sorbent tubes; however, sorbent media are designed only to adsorb phosphorylated organics.
Cryogenic trap GC/MS	Gases from the vapor space are conducted through a heated stainless steel tube. This system then concentrates gas materials in the sampling stream that liquify at ≥-130°F (-90°C). These materials are collected by a cryogenically cooled glass collector filled with glass beads. At the conclusion of sampling, this condensate is recovered by washing the collector with a predetermined amount of methanol solution.
Syringe	A gas tight cylinder and plunger device similar to a hypodermic syringe. A sample is collected by retracting the plunger, which creates a vacuum in the cylinder.

Field Analysis Equipment	Description of Field Equipment
Field GC/MS	This technique uses a pump to pull vapor directly into the field GC/MS. This option basically bypasses the need to collect the sample by other means (i.e., sorbent tubes, SUMMA canisters).

2.2.1 Description of Measuring Thickness of Organic Layer

The thickness of the organic layer would be determined by measurement of the relative electrical conductivity of the organic layer versus the aqueous layer. This would be accomplished by slowly lowering a probe into the liquid waste. The probe would be a 2-foot (61.0-centimeter) long by 1-inch (2.54-centimeter) diameter copper pipe with a central copper rod insulated from the pipe by epoxy plastic. The lower end of the probe would be convex to ensure that no organic matter could be entrained in the probe as it passed through the organic layer into the aqueous layer. A two conductor insulated copper wire, fastened to the outer pipe and inner rod at the top of the probe, would support the probe as it was lowered into the tank. At grade, above the tank riser, a volt-ohm meter, operating on a 9-volt battery (smoke detector type), would be connected to the conductor support wire. The probe would be lowered manually into the tank with the meter on the megohm scale. A steel tape, attached to the conductor support wire, would measure the distance the probe was lowered into the tank. The electrical resistance measured would be the resistance across the 0.4-inch (1-centimeter) gap between the pipe and inner rod. The probe would be calibrated in the laboratory using an organic mixture of 70 volume percent tributyl-phosphate, 30 volume percent normal paraffin-hydrocarbons (NPH), and an aqueous layer, which would simulate the tank's aqueous layer. In air, the probe resistance would be several hundred megohms. When the lower end of the probe entered the organic layer, the resistance is expected to decrease to several megohms. When the lower end of the probe enters the aqueous layer, the probe resistance would be expected to shift to about 1,100 ohms. When these resistance changes are observed, the steel tape measurement would be recorded and the probe depth determined. Accuracy of the measurement, based on laboratory results, would be expected to be plus or minus 0.4 inches (1 centimeter). After the depth readings are obtained, the probe would be retrieved manually. When the probe gets near the top of the riser, it will be washed down with a small amount of water and removed from the riser. A Health Physics Technician would measure the radioactive contamination and determine if the probe could be reused or if the probe would require disposal as mixed waste.

2.2.2 Vapor Space (Aerosol + Vapor) Flammability Sampling

An evaluation of the flammability of Tank 241-C-103 vapor space would be performed before more intrusive characterization sampling. The evaluation would be based on sampling of the vapor space using sorbent tubes. Before installation of the heated sample tube assembly, the sorbent tubes would be lowered into the tank vapor space, and a metered amount of vapor space gases would be drawn through each sorbent tube by way of an electrically grounded wire-wrapped Teflon[1] tube. The suction used to draw the vapor sample into the sorbent tube would be provided by an intrinsically safe vacuum pump (located outside of the tank). The chosen sorbent tubes, and this particular sampling approach, would allow collection of volatile organic vapors and any aerosol in the vapor space. Specific analyses of interest would be the straight-chain alkane series from decane to n-pentadecane and tributyl-phosphate. In accordance with the *Program Plan for the Resolution of Tank Vapor Issues* (WHC 1992d), the key flammable constituents in the vapor space are expected to be NPH, and the total amount of flammable substances in the vapor space would be conservatively estimated at 1.5 times the amount of NPH.

2.2.3 Description of Tank Vapor Space Gas Sampling

Gas sampling would be performed in two phases. Phase I, the Qualitative Phase, would involve sampling downstream and upstream of the tank's High-Efficiency Particulate Air (HEPA) filter, and/or at the liquid level equipment housing washdown port, with SUMMA Canisters. This sampling would not require grounding of the sampling apparatus because the activity would not be intrusive into the tank. Although not required for safety

[1] Teflon - trademark of E.I. Dupont de Nemour & Company

purposes, flammability readings would be obtained at the sample location with an intrinsically safe, hot-wire type, combustibility gas meter for determining flammable constituents other than NPH.

The hot-wire gas meter is safe because:

- gases would be burned by catalytic action (not an open flame)
- gases would be drawn in through a sintered filter that acts as a flame arrestor in the event that a flame was created in the detection chamber.

The HEPA filter combustible gas data would be used to determine statistical variations of flammable gases, other than NPH. Concentrations of NPH cannot be effectively determined by a hot-wire type combustibility meter (Estey 1992) because the NPH would condense on the unheated meter inlet tube.

At Phase II of vapor space gas sampling, the Quantitative Phase, gases for quantitative analyses would be collected from a three-tube, water heated, sampling assembly (Figures 2 and 3). The in-tank water heated tubes would be intrinsically safe. External to the tank, the sampling manifold would be heated electrically in an oven enclosure. Interconnecting lines would be heated by electrical heat tape. In previous sampling, it was suspected that NPH vapors and small particle aerosols[2] might be condensing on the relatively cool portions of the sample tubes in the riser, and above ground during sample withdrawal. The heated tubes would ensure that vapors and aerosols would not be lost by condensation. These samples could be drawn into SUMMA canisters or sorbent tubes, or fed directly into a field laboratory gas chromatograph (GC) or GC/mass spectrometer (GC/MS). The SUMMA canisters and sorbent tubes have no energy sources, and would be intrinsically safe. The GC/MS has an energy source, but that source would be isolated from a direct pathway to the tank vapor space. Vapors/aerosols must be confirmed to be less than 25 percent of the LFL; adequate safety measures would be provided. Future sampling could include other methods (e.g., ion traps) if the methods were validated.

2.2.4 Description of Dip Sampling

A 100-milliliter glass sample bottle with a rubber stopper would be placed in a 2-inch (5.08-centimeter) steel pipe sleeve and would be attached to a stainless steel wire and lowered manually into the supernatant waste. The weight of the pipe sleeve would submerge the bottle. The wire would be looped through the top of the rubber stopper and tied to the neck of the bottle. After lowering the bottle to the proper level, a quick jerk would remove the rubber stopper and the bottle would fill with liquid supernate. After the bottle was filled, the bottle would be pulled manually to the surface by a worker wearing protective gloves. A Health Physics Technician would monitor the sample line and the sample bottle for

[2] Aerosols: A term that refers to a collection of suspended solid or liquid particles in a gas. Fogs, smogs, clouds, smoke, and fumes are all aerosols.

radioactive contamination as it is retrieved. Before removing the bottle from the top of the riser, the bottle would be sealed manually with a screw-on cap. The sample bottle would be lowered 1 foot (0.3 meter) into the riser and washed down with warm water. After shaking off excess surface water, the sample bottle would be removed from the riser, checked by the Health Physics Technician, placed in a plastic bag, and placed in a protective container (sample pig). The sample pig would be checked for radioactive contamination dose rates by the Health Physics Technician and placed in a shipping container for transport to an analytical laboratory.

3.0 Alternatives to the Proposed Action

Sampling of the gaseous materials in the tank vapor space was evaluated in the *Engineering Evaluation of Alternatives for Tank 241-C-103 Vapor Phase Characterization* (WHC 1993a). Apart from the proposed methods of sampling the tank vapor space gas and liquid waste, no other viable method of sampling was evaluated. This decision was based on past tank farm practices, and the success and efficiency of those methods of sampling.

No-Action: Under this alternative, tank operation would continue under existing conditions with no validated tank vapor space or waste sampling and analysis to evaluate the tank waste and the impact on worker safety. The USQ would remain unreviewed indefinitely. The lack of this information could increase the risk of chemical and radiation exposure to workers, the public, and the environment, in the event that a fire caused by accidental ignition of the organic vapors, and pressurization of the tank contents breeches the tank containment. This alternative also would delay the scheduled characterization of organic waste in Tank 241-C-103. Therefore, this alternative is not considered a reasonable alternative.

Intrusive operations with high energy input to the waste (e.g., rotary-mode core sampling, SST retrieval activities, organic mitigation activities) or operations that may affect the flammability potential of the organic layer (e.g., push-mode core sampling, auger sampling, removal and installation of a transfer pump [including jet pump assemblies], a salt well screen, a thermocouple tree, or similar large scale pieces of equipment), must be evaluated by means of Safety Assessments (SA), Letters of Applicability, or equivalent documentation, and approved by DOE prior to performing the operation.

The operations involved in the proposed activities do not involve high energy input to the tank and its systems, and are believed to be capable of being conducted safely.

No other reasonable alternatives were identified for obtaining sample data from the tank.

This page intentionally left blank.

4.0 Affected Environment

Tank 241-C-103 is located in the 200 East Area (Figure 1) of the approximately 560 square mile (1,450 square kilometer) semiarid Hanford Site, located in Southeastern Washington State. The 200 East Area is approximately 10 miles (16 kilometers) west of the Columbia River, the nearest natural watercourse. The nearest population center is the City of Richland, about 20 miles (32 kilometers) away. The 200 East Area is not located in a wetland or in a 100- or 500-year floodplain. No plants or mammals on the federal list of Endangered and Threatened Wildlife and Plant are found in the immediate vicinity of Tank 241-C-103, nor would plant or animal species, that are known to occur on the Hanford Site, be affected by the characterization activities in Tank 241-C-103. There are, however, several species of both plants and animals that are under consideration for formal listing by the Federal Government and Washington State. The proposed action would not be expected to impact the climate, flora and fauna, air quality, geology, hydrology and/or water quality, land use, or the population in any substantially different manner than described in the DOE/EIS 0113, *Final Environmental Impact Statement, Disposal of Hanford Defense High-Level, Transuranic and Tank Wastes* (DOE 1987).

The Hanford Site has a mild climate with 6 to 7 inches (15 to 18 centimeters) of annual precipitation and infrequent periods of high winds up to 80 miles (128 kilometers) 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 10 chances in 1 million during any given year.

The 241-C Tank Farm has been surveyed for cultural resources and found not to contain any cultural resources. Additional information regarding the Hanford Site can be found in the Hanford Site NEPA characterization report (PNL 1992).

This page intentionally left blank.

5.0 Environmental Impacts

This section presents information on the potential environmental impacts that have been identified.

5.1 Proposed Action: Impacts from Routine Operations

The following are impacts from the consequences of proposed tank operation Nos. 1 through 9. Because current radiological dose information from Tank 241-C-103 for routine tank operations is not available, measured radiological data from other tanks in the 241-C Tank Farm would be assumed to be the bounding condition, including the requirement for use of supplied air related to the incidence of noxious vapors, until accurate radiological tank doses could be obtained during the proposed activities of this Environmental Assessment (EA).

5.1.1 Airborne Releases

Airborne release data at ground level for Tank 241-C-103 is not available. During Tank 241-C-103 characterization activities, appropriate respiratory protection (including supplied air for protection from noxious vapors) and protective clothing would be used by personnel performing the work. These personnel would be trained for specific characterization activities, and would be knowledgeable of As Low As Reasonably Achievable (ALARA) considerations and job specific requirements. Field representatives from the contractor's Industrial Health, Safety, and Fire Protection and Health Physics groups would closely monitor the work to ensure that the required protective devices were used correctly and that personnel were protected appropriately. The resultant impacts to workers would be inconsequential. Impacts to other personnel onsite and to persons offsite will be even less.

5.1.2 Liquid Releases

It is recognized that small spills of radioactive liquids could occur during routine equipment removal and flushing activities. Workers in the immediate area would be protected with anticontamination clothing, and supplied self-contained fresh air. Any spills would be cleaned up immediately using established tank farm practices. Based on this, there is little likelihood that any negative health effects to the workers or the public would occur. A specific waste disposal area would be available for use, and the volume of liquid waste generated by these activities would be well within the volume limits of the available space.

5.1.3 Solid Wastes

The major solid items generated for storage and/or disposal would be the equipment used to determine sampling and organic layer thickness. These items exposed to the tank environs weigh only a few pounds, and would contain a small amount of residual radioactive liquid. In addition to this equipment, there would be miscellaneous solid radioactive waste consisting of tools, rags, plastic, clothing, and materials from spill cleanup. None of this waste is expected to contribute significantly to the volume of waste generated annually on the Hanford Site (estimated to be approximately 213,000 cubic feet [approximately 6,032 cubic meters] in 1991). The disposal of this waste would not have any substantial impacts or health effects to workers, public, or the environment.

5.2 Proposed Action: Impacts from Accidents

A range of reasonably foreseeable accident scenarios associated with the proposed action, which could result in a release of radioactive materials and/or toxic gases and material to the environment, were considered in the safety documentation. The SAs for the accident scenarios considered in this activity have been performed previously for other similar tasks. Each assessment has developed an annual probability of occurrence and the likely consequences of the accident. This information is summarized with reference to the source of the SA in Table 3. Descriptions and summary analyses of the scenarios are as follows:

(a) Noxious or toxic gas release: Gases in sufficient concentration to be noxious or toxic, might be released during the opening of a riser, or after damage to a riser, because of pressure in the tank that exceeds atmospheric pressure, due to patterns of vapor flow in the tank and the riser that create an out flow, or because of flow patterns on the outside that aspirate vapor from the tank. An annual probability of occurrence for this accident scenario has been estimated to be less than 1.0×10^{-6}. Any upset condition in the tank contents may also create a release of toxic gases (e.g., ammonia, tributyl-phosphate, NPH, hydrogen-cyanide, hydrazine, and nitrogen-dioxide). Analysis of the bounding toxic gas in the tank (tributyl-phosphate) indicates that the plume centerline concentration for the worst case release would exceed the threshold limit value for a distance of 14 feet (4 meters). The control limit of supplied fresh air for workers located within 28 feet (8.5 meters) of an open riser, is conservative.

(b) Lightning: A lightning strike on or near the tank when a riser is open, could ignite organic vapors and cause a spread of radioactive material outside the tank caused by pressurized ejection of the contents. While the consequences of such an accident could potentially be large, the risk is small, because the expected frequency of such an accident is less than 1.0×10^{-6}. An analysis of the risk involved from a lightning strike to each square kilometer of the Hanford Site has been incorporated into storm warning procedures in standard tank farms operations procedure. The procedure prohibits tank farm work if any lightning activity is reported within 50 miles (80.5 kilometers) of the site, by the Pacific

Northwest Laboratory meteorological station. By following this procedure, the likelihood of a lightning strike causing the ignition of vapors is reduced from 3.7×10^{-3}/year to 4.2×10^{-9}/year.

(c) Vapor space/liquid organic burn: The consequences of a vapor space fire, and subsequent liquid organic layer burn as a result of the proposed action would be no greater than those projected in *DOE/EIS-0013 Disposal of Hanford High-Level, Transuranic and Tank Wastes* (DOE 1987) for a ferrocyanide tank explosion. The 1987 EIS projected that such an explosion would result in a short-term radiation dose of 200 millirem to the maximally exposed member of the public, and an offsite collective dose commitment of 7,000 person rem. Such an explosion would be expected to result in 4 offsite latent cancer fatalities, the contamination of a substantial area of land, and large doses to workers. A 1990 General Accounting Office (GAO) study estimated the consequences of the Ferrocyanide tank explosion could be 10 to 100 times greater than those projected in the 1887 EIS. The GAO study did not reach a conclusion regarding the probability of a tank explosion. The probability of the ferrocyanide tank explosion was estimated at less than one in ten million (WHC 1991). The probability of a vapor space fire and liquid organic layer burn is estimated to be less than that of a ferrocyanide tank explosion. Therefore, even if the severs consequences of a ferrocyanide tank explosion projected by the GAO are assumed, the risks posed to the environment and human health by this potential accident are small.

(d) Radiation exposure: This accident scenario involves radiation exposure to a worker from accidently drawing waste into a gas sample tube, and failure of a Health Physics Technician to correctly monitor the sample tube as it is withdrawn from the tank. The annual probability of occurrence is 2.5×10^{-6}. No personal adverse consequences would result from this accident for the following reasons:

- Personnel working close to the riser in which sampling is being performed would be wearing protective clothing and respiratory protection
- The HEPA filtered greenhouse would prevent radionuclide release to the environment
- The small liquid spill 0.21 pint (100 milliliter) would be amenable to standard cleanup procedures.

Table 3.
Accident Scenarios

Accident scenario	Potential accidents	Anticipated Consequences	Annual probability	Conclusions	Referenced safety documentation
Toxic gas release.	Worker exposure.	Worker doses within DOE limits. No adverse public health consequences.	1.0×10^{6}	Worker protection is adequate.	WHC 1992c
Lightning.	Ignites flammable gases if present.	Organic material would be ignited. Radiation released to the workers and/or public.	4.2×10^{7}	Incredible sequence of events.	WHC 1991b
Vapor space burn.	Gases in tank vapor space burn.	Radiation released to the workers and/or public.	1.0×10^{9}	This scenario would require a spark of sufficient energy and a volume of gases present.	WHC 1991a
Liquid organic burn.	Burn ignites liquid organic layer.	Radiation released to the workers and/or public.	1.0×10^{10}	This scenario would require a vapor space fire to ignite a liquid organic layer.	WHC 1991a
Radiation exposure.	Waste drawn into sample tube from the tank vapor space	Waste accidently drawn into the sample tube exposing workers to radiation dose.	2.5×10^{6}	Proposed action within onsite guidelines.	WHC 1991a
Dip-sample bottle breaks outside of tank.	Contaminated liquid spill outside of tank.	Contamination of passively ventilated greenhouse.	1.0×10^{3}	1. Workers would wear appropriate protective clothing and be on supplied air. 2. Greenhouse cleanup would be according to approved tank farm procedure.	WHC 1991b

(e) Dip-sample bottle break outside of tank: This accident scenario involves dropping the dip-tube sample bottle outside of the tank, within the contamination greenhouse, with bottle breakage. The SA calculated an annual probability of 1.0×10^{-5} of spilling the sample contents and resulting in an environmental impact. The annual effective dose equivalent (EDE) for that accident was 0.29 rem and an organ dose equivalent of 5.0 rem was calculated for the worker obtaining the sample (maximally exposed worker). If realized, these doses would be below the normal operational limits specified in DOE Order 5480.11, which identify EDE annual occupational limit of 5 rem and an organ dose equivalent annual occupational limit of 50 rem. Other personnel in the tank farm area would be expected to receive much smaller doses due to dispersion, evacuation, and the fact that not all of the release would be respirable. No adverse public health consequences would be expected to result from this accident, because the expected doses to offsite individuals would be small.

A powered, negative pressure[3] ventilation system would not be required in order to perform the characterization activities in Tank 241-C-103. Work procedures would be approved, and the existing tank passive system would be adequate to keep radioactive releases below DOE guidelines (DOE Order 5480.11) and within all applicable requirements.

No release of radioactive materials would be expected during sampling of the Tank 241-C-103 vapor space because all of the sampling activities would be performed within a secondary containment structure. Appropriate standard provisions for respiratory protection of the involved personnel would be incorporated into the work package for sampling.

The design of the sampling equipment, and the techniques used, would minimize the influences of extraneous tank environmental conditions that could affect the sample and cause analytical results that would not accurately show the conditions in the tank.

5.3 Cumulative Impacts

Potential impacts of organic waste characterization in Tank 241-C-103 would not contribute substantially to the overall impacts of the 241-C Tank Farm continued operation. Therefore, the cumulative effects in the 200 East Area would not be changed significantly with respect to the overall Hanford Site operations.

Radioactive materials and nonradioactive chemicals are handled daily 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 ALARA, DOE, and contractor guidelines (3 rem/year).
Tank 241-C-103 would not have a significant cumulative affect on day-to-day operations on the Hanford Site with respect to worker exposure. The incremental impact from handling

[3] Negative Pressure: Below atmospheric pressure.

radioactive or nonradioactive materials that might result from the proposed action would be small, and when added to the impacts from existing day-to-day operations on the Hanford Site, the total impact would remain small.

Waste generated by the proposed activity is not expected to be a significant quantity compared to annual Hanford Site waste generation. For example, small quantities of low-concentration hazardous waste (e.g., solvents, cleaning agents, etc.) 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. Radioactive waste, radioactively contaminated equipment, and mixed waste would be appropriately packaged and stored and/or disposed of at existing treatment storage, and/or disposal units on the Hanford Site. The solid waste generated by the proposed activities is expected to contribute an insignificant fraction to the total Hanford Site annual waste volume (e.g., the recorded total volume of waste received in the 200 Areas for storage in calendar year 1991 was approximately 213,000 cubic feet [approximately 6,032 cubic meters]).

6.0 Permits and Regulatory Requirements

The Hanford Site is owned by the U.S. Government and is managed by the RL. It is the policy of the 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 Washington State agencies, primarily the State of Washington Department of Ecology (Ecology).

The Single-Shell Tank System is being operated under interim status as a treatment and storage unit under Washington Administrative Code (WAC) 173-303. A dangerous waste closure/postclosure plan will be submitted to Ecology for closure of the Single-Shell Tank System (*Hanford Federal Facility Agreement and Consent Order* Milestone M-9-02 [Ecology 1992]).

The proposed action would comply with the provisions of the Wyden Amendment (Public Law No. 14-510) to prohibit additions of high-level radioactive waste to identified tanks unless the DOE determines that no safer alternative exists, or that the tank does not pose a serious potential for release of high-level radioactive waste. Water is not a high-level waste and, as such, is not regulated by Public Law 101-510.

Notification and approval from the Washington State Department of Health would be required if there were potential increases in radioactive air emissions. In this case, potential is defined as more likely than not to occur during normal operations or reasonably expected upsets.

There are no permits specifically required for completion of this proposed action.

This page intentionally left blank.

7.0 Agencies Consulted

No outside agencies were consulted in the preparation of this Environmental Assessment.

This page intentionally left blank.

8.0 References

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

DOE Order 5480.11, *Radiation Protection for Occupational Workers.*

Duffy, 1991, *Secretarial Determination Concerning Prohibition of Transfers to High-Level Waste Tanks Identified in Response to the Wyden Amendment*, October 8, 1991, EM-35, U.S. Department of Energy.

Ecology et al., 1992, *Hanford Federal Facility Agreement and Consent Order* 2 volumes, as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

Estey, S. D., 1992, *Flammable Issue Resolution for 241-C-103*, Internal Memo 7K-92-446 To M. H. Shannon, Westinghouse Hanford Company, Richland, Washington, October 12, 1992.

NFPA, 1986, *Standard on Explosion Protection Systems*, Article 69, National Fire Protection Association, Inc., Quincy, Massachusetts.

PNL, 1983, *Safety of Organic Solvents in Waste Tanks*, (letter to W. V. Baumgartner from H. H. Van Tuyl, August 30), Pacific Northwest Laboratories, Richland, Washington.

PNL, 1992, *Hanford Site National Environmental Policy Act (NEPA) Characterization*, PNL-6415, Rev 5, 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.

WHC, 1991a, *Safety Assessment for Gas Sampling all Ferrocyanide Tanks*, WHC-SD-WM-SAD-009, Rev. 2A, Westinghouse Hanford Company, Richland, Washington.

WHC, 1991b, *Safety Assessment for Push-Mode Sampling in Ferrocyanide Tanks Without Saltcake Crusts*, WHC-SD-WM-SAD-013, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

WHC, 1992a, *Justification for Continued Operation of Hanford High-Level Waste Tanks Resulting from the Criticality USQ, 492-CRITSAF*, WHC-SD-WM-JCO-001, Westinghouse Hanford Company, Richland, Washington.

WHC, 1992b, *Floating Organic Layer Determined to be an Unreviewed Safety Question in Tank C-103*, Occurrence Report Number: RL-WHC-TANKFARM-1992-0069, Westinghouse Hanford Company, Richland, Washington.

WHC, 1992c, *Safety Assessment for Thermocouple Tree System Installation and Operation in Nonleaking Ferrocyanide Tanks*, WHC-SD-WM-SAD-014, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

WHC, 1992d, *Program Plan for the Resolution of Tank Vapor Issues*, WHC-EP-0562, Westinghouse Hanford Company, Richland, Washington.

WHC, 1992e, *An Engineering Assessment of the Aerosol and Vapor Flammability in 241-C-103*, WHC-SD-WM-ER-101, Rev. 0, Westinghouse Hanford Company, Richland, Washington

WHC, 1993a, *Engineering Evaluation of Alternatives for Tank 241-C-103 Vapor Phase Characterization*, WHC-SD-WM-ES-232, Westinghouse Hanford Company, Richland, Washington.

Figures

This page intentionally left blank.

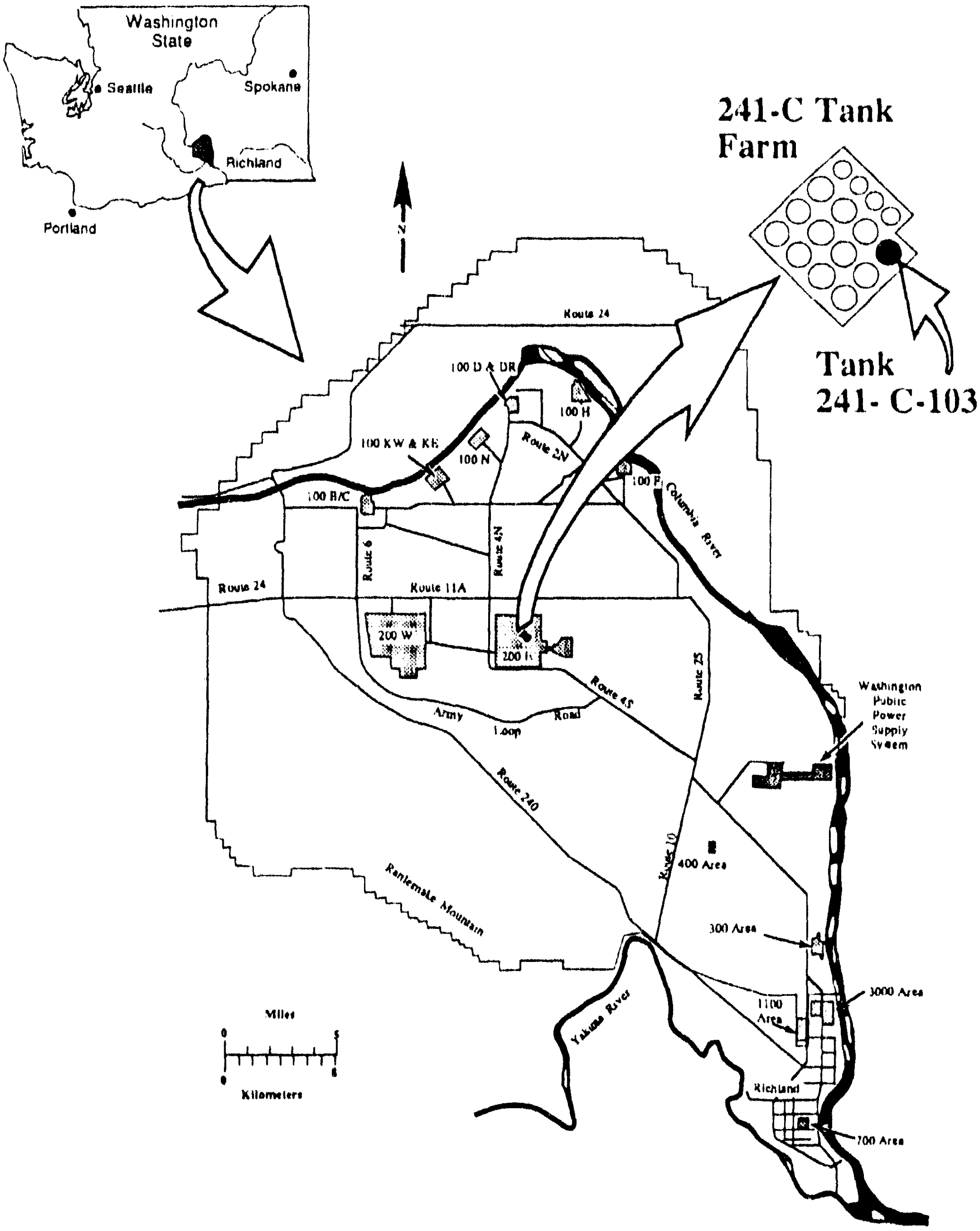

Figure 1. Hanford Site Showing Location of Tank 241-C-103.

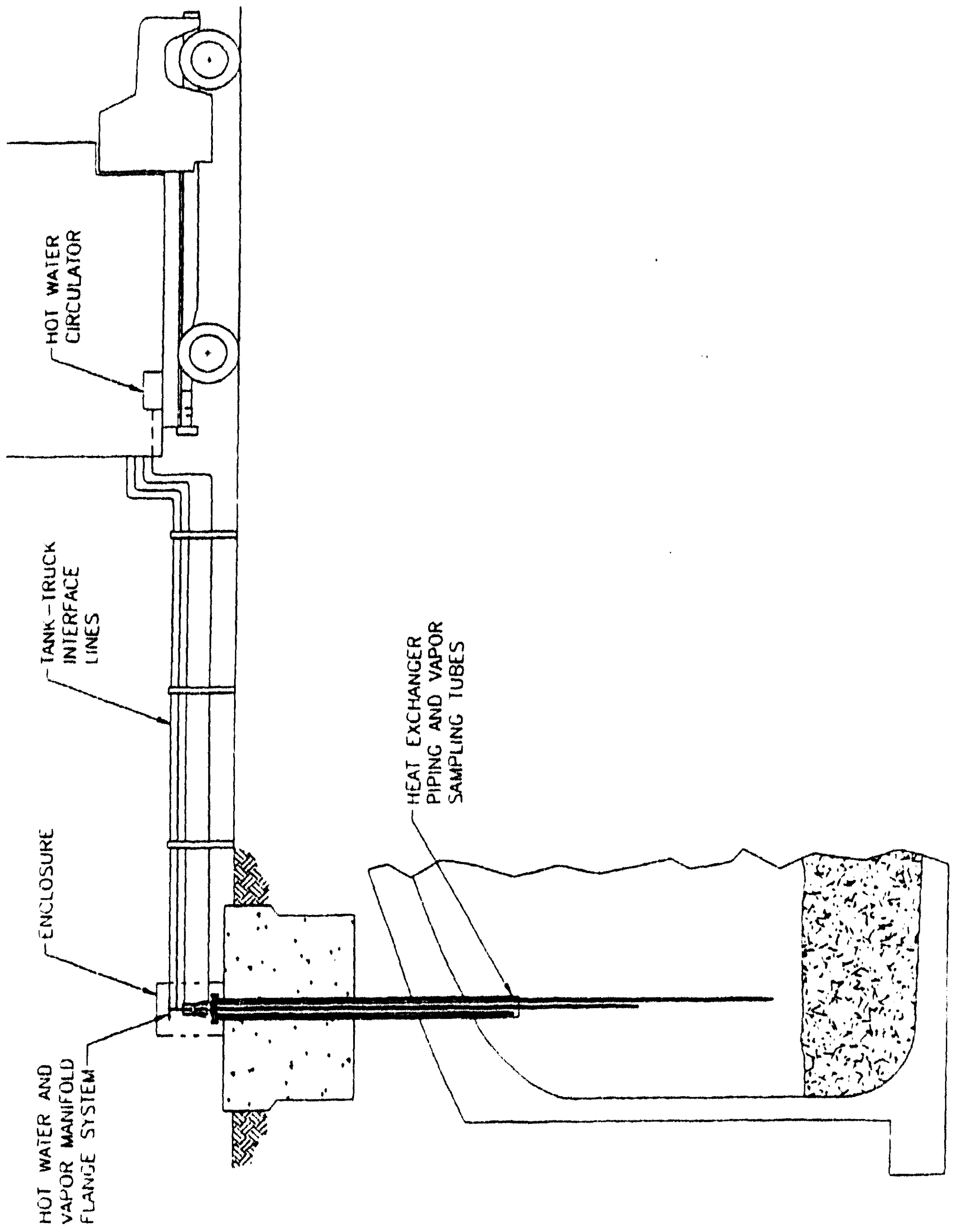

Figure 2. Tank Mounted Truck Vapor Sampling Assembly.

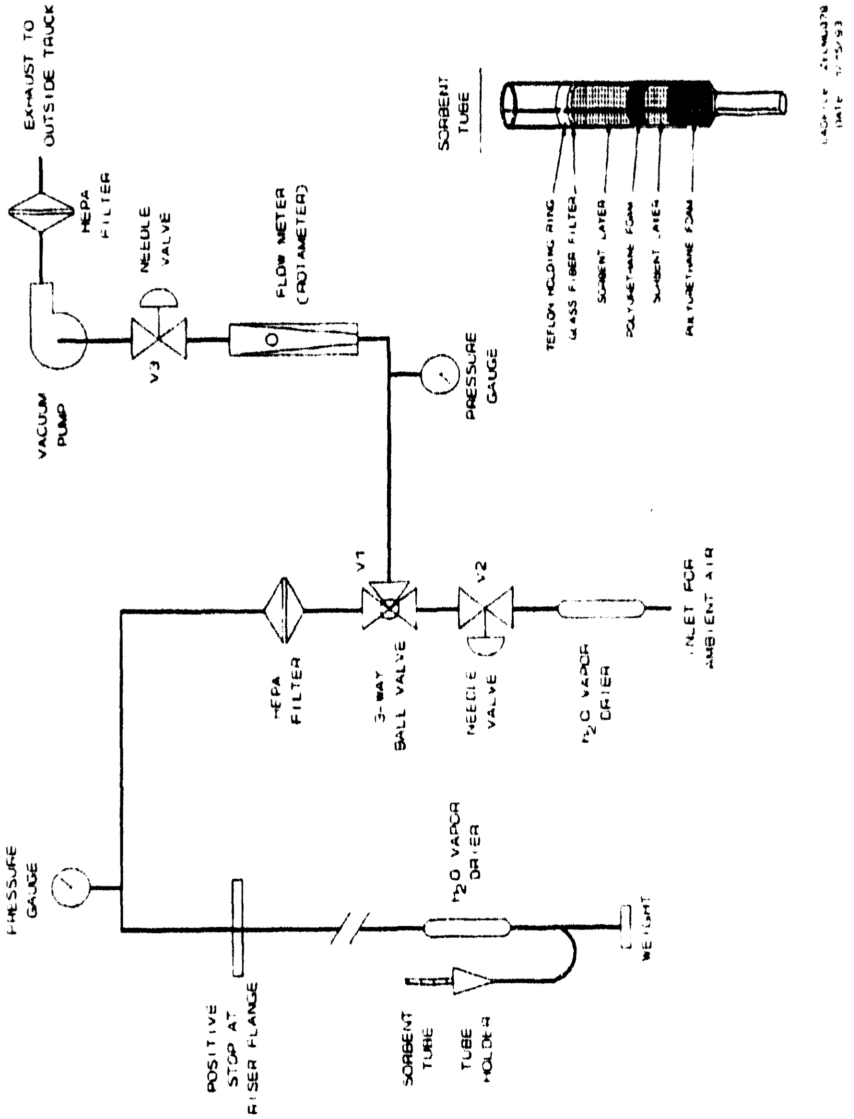

Figure 3. Normal Paraffin Hydrogen Test Instrumentation.

This page intentionally left blank.

Appendix

JUSTIFICATION FOR ALLOWED TANK 241-C-103 OPERATIONS

This page intentionally left blank.

TANK ORGANIC CHARACTERIZATION ACTIVITIES WITH MINIMAL ENVIRONMENTAL IMPACTS

This appendix discusses Tank 241-C-103 operations that would not affect the flammability of fuel as vapors and aerosols in the tank vapor space and, therefore, would not initiate or worsen an event related to the separable organic layer. Only surveillance, instrument calibration, preventative maintenance, and initial tank vapor space sampling activities would be authorized until the vapor space of the tank was shown to be at less than 25 percent of the lower flammability limit (LFL) for the mixture of gases, vapors, and aerosols present. Approval of this Environmental Assessment would authorize Tank 241-C-103 Operation Nos. 1, 2, and 3 to continue uninterrupted. Continuation of all other activities covered by this EA would be contingent upon successful completion of initial sampling of the tank vapor space as set forth in Tank 241-C-103 Operation No. 3.

Tank 241-C-103 Operations No. 1. Routine surveillance activities in the vapor space, which are minimally intrusive to the waste, (i.e., liquid-level monitoring, temperature readings from installed temperature monitoring equipment, dome deflection surveys, dry well scans, and repair of monitoring equipment).

Justification for Operation No. 1. Most of these activities would be nonintrusive to the tank and ventilation system, and would not affect the organic liquid in the tank. These minimally intrusive operations are not energy intensive activities that could increase the waste temperature to the level necessary to form a flammable organic vapor and aerosol layer above the waste surface. For the vapor and aerosol to be flammable, the temperature of the waste would have to be raised to more than 63°F (35°C), which would correspond to the 170°F (77°C) flash point for unused normal paraffin-hydrocarbon (NPH) as determined by Pacific Northwest Laboratory (PNL 1983). The actual waste temperature at which a flammable condition could occur would depend on the quantity of tributyl-phosphate in the solvent, and the partial pressure of NPH vapors above the solvent mixture.

The surveillance activities would not produce an aerosol because they affect only a small area of the organic surface, and do not vigorously agitate the waste.

However, additional precautions would be taken to further reduce the risk associated with these activities. Tank operating specifications would require the use of (1) spark-resistant tools, and (2) sampling to ensure flammable concentrations are less than 25 percent of LFL (vapors plus aerosol) when working in the primary ventilation space or in the tank exhaust ventilation system (WHC 1992b). Preventative measures also would be taken to ensure that objects were not dropped into the tank.

Because the fuel concentration would be confirmed to be significantly below the LFL before beginning activities that are intrusive to the tank vapor space or its ventilation system, electrically grounding objects being inserted into, or connected to objects in the tank and bonding would not be necessary. Tank 241-C-103 operations would not raise the waste temperature or otherwise cause the condition of the tank to change with respect to flammability. Furthermore, the expected relative high humidity and ionizing radiation in the vapor space would be expected to dissipate static buildup and prevent electrical discharge.

Tank 241-C-103 Operation No. 2. Instrument calibration and preventative maintenance activities would be performed.

Justification for Operation No. 2. These activities would be nonintrusive to the tank and the exhaust ventilation system, and would have no affect on the organic layer in the tank. If an intrusive operation became necessary for these activities, tank operating specifications would establish the controls that apply. These specification would include determining that flammable constituents in the primary ventilation space were less than 25 percent of the LFL for vapor plus aerosol (WHC 1992b).

Tank 241-C-103 Operation No. 3. The tank vapor space sampling and monitoring operations would be performed.

Justification for Operation No. 3. Vapor space sampling and monitoring would be nonintrusive to the organic layer and would not alter the flammability potential in the tank. However, these operations would be continued routinely only after the following initial sampling and analysis of the samples had been performed to ensure a safe envelope of operation:

- A comprehensive safety review would be prepared to identify the safety hazards that might be encountered during the initial sampling activities, and to establish the appropriate controls that would be followed to ensure safety of the sampling operations

- Initial sampling would be done step-wise, beginning with sampling just inside the tank riser opening. Analysis of the samples and evaluation of results would be completed before continuing initial sampling

- If results from the previous samples indicated that fuel loading was less than 25 percent of the LFL for vapors, sorbent tube tank vapor space samples would be taken for collective vapors plus aerosols approximately 2 feet (approximately 0.6 meters) above the tank waste. Analysis of the samples would be completed before continuing sampling where electrical bonding was not required, and energy sources were in intimate contact with the vacuum removed gas stream

- If results from the previous samples indicated that fuel loading was less than 25 percent of the LFL for vapors plus aerosol, the heat traced sampling equipment would be installed, and samples would be taken and analyzed as required to determine the flammable conditions of the tank.

To ensure minimal risk, tank operating specifications would implement restrictions and requirements designed to conduct operations (including initial vapor space sampling) in the tank vapor space exhaust ventilation system (WHC 1992b)[4]. The riser opening or pit vapor space would be sampled to verify that flammable constituents were less than 25 percent of LFL for vapors plus aerosols before performing work in the vapor space of the tank. Also, spark-resistant tools would be used, physical restraints would be applied to objects to prevent them from falling into the tank, and a hazardous work permit or job safety analysis would be completed before beginning work.

Tank 241-C-103 Operation No. 4. Tank content sampling operations (supernatant liquid bottle-on-a-string) to retrieve organic and aqueous samples, and determine organic layer thickness and sludge-level in the waste tank

Justification for Operation No. 4. These activities would not cause the temperature of the waste to increase and, therefore, would not increase the concentration of flammable vapors in the vapor space. An inconsequential amount of energy would be involved in lowering either a glass jar held in its sample bottle holder, a conductivity or buoyancy measuring device, or a sludge-level device through the layer of organic waste. The sampling and monitoring would not significantly agitate the waste layer and, therefore, would not contribute to the tank vapor space aerosol loading.

Tank operating specifications require that vapor space samples be taken to ensure flammable constituents are less than 25 percent of the LFL (vapors plus aerosols) and that spark-resistant tools are used unless exempted by tank farm operations and waste tank safety assurance (WHC 1992b). Physical restraints would be used to prevent dropping objects into the tank. A hazardous work permit or job safety analysis would be completed before beginning sampling operations. Electrically grounded objects inserted into the tank and bonding would not be required for the same reasons presented in the justification for Tank 241-C-103 Operation No. 1.

Tank 241-C-103 Operation No. 5. Activities involving installation, removal, and/or replacement of small-scale components or pieces of equipment such as a sludge weights, liquid-level monitors, still camera or video cameras (including its operation), riser flanges, riser flange asbestos gaskets, pit cover blocks, failed breather filters, and other tank

[4] The headspace is defined at the void volume of the ellipsoidal tank dome region (excluding the risers) plus the void volume of the cylindrical tank region above the waste surface.

appurtenances would be performed. The addition of water for flushing and equipment installation purposes would be a routine operation (Tank 241-C-103 Operation No. 9).

Justification for Operation No. 5. These activities would have negligible impact on the flammability potential of the organic layer. Tank vapor space or exhaust ventilation system intrusive work would have minimal affect on the organic layer because no contact would be made with the waste. Equipment installation, removal, and/or replacement activities included in this Tank 241-C-103 operation would affect a small area of the organic surface; therefore, very little energy would be imparted to the organic waste as the equipment components traverse through the organic layer. The aqueous layer below the organic layer is comprised of about 91 weight percent water and would not offer any frictional resistance to raise the waste temperature. On the contrary, the deep aqueous pool would serve as a large heat sink for dissipating any concentrated energy source introduced during the operations.

The following tank operating specifications would provide controls that would enable operations to be minimally intrusive to the tank vapor space and the waste to proceed (WHC 1992b):

- use of spark-resistant tools, sampling the vapor space to ensure flammable constituents would be less than 25 percent of LFL (vapor plus aerosol)
- use of physical restraints to prevent dropping objects into the tank
- use of either a hazardous work permit or job safety analysis.

Installation or removal of any equipment would require written approval to ensure compliance with all appropriate tank operating specifications and safety requirements. The procedures and/or work plans for conducting Tank 241-C-103 operations would be reviewed by Safety and Health or Radiation Protection personnel to determine specific radiation protection requirements. Electrically grounding objects inserted into the tank and bonding would not be required for the same reasons presented in the justification for Tank 241-C-103 Operation No. 1.

Electrical equipment planned for installation in the tank (such as photographic equipment) would be designed in accordance with the electrical classification assigned the tank at the time based on National Fire Protection Association 69, National Electrical Code (NFPA 1983).

Tank 241-C-103 Operation No. 6. Breather filter efficiency testing would be performed.

Justification for Operation No. 6. This testing would affect only the exhaust ventilation system. Therefore, the intrinsic properties of the separable organic would not change as a result of performing the testing. Before beginning work in the exhaust system, the concentration of vapors in the exhaust housing would be measured to ensure that flammable vapors were less than 25 percent of the LFL (WHC 1992b). Spark-resistant tools would also be used.

Tank 241-C-103 Operation No. 7. Installation and/or modification of equipment for aboveground facilities (e.g., electrical utilities, instrument air, breather filter assembly, etc.) including activities that would break containment for installation of riser modifications above ground would be performed.

Justification for Operation No. 7. Above-ground facility modifications that were nonintrusive to the tank vapor space, would have no affect on the organic layer, and would be performed safely after considering common industrial safety hazards associated with the work. Any modifications to the exhaust ventilation system or tank risers, although containment would be broken, would not affect the condition of the organic layer in the tank.

This Tank 241-C-103 operation would be controlled by the specification limits and precautionary measures (WHC 1992b). The controls would require the use of spark-resistant tools where practicable, sampling at the riser opening to verify that the flammable constituent concentration were less than 25 percent of the LFL (vapors and aerosols), and written approval to perform spark-producing activities (such as grinding, drilling, and welding) on as well as in the tank or the ventilation system. Written approval would also be required for the installation and removal of equipment. Precautions would also be taken to prevent objects from falling into the tank, and to ensure work hazards were identified and controlled by completing a hazardous work permit or job safety analysis before beginning any installation or modification work.

Tank 241-C-103 Operation No. 8. A tank farm approved portable exhauster would be installed and operated.

Justification for Operation No. 8. Installation of the exhauster would be covered by Tank 241-C-103 Operation No. 7. Operation of the exhauster would affect the organic layer by increasing the evaporation rate of the volatile organic constituents and the water. This operation would have the overall effect of diluting the tank vapor space flammable constituent concentration, which would enhance the safety margin.

At exhauster startup, the probable condition of the tank vapor space would be that the vapor and aerosol fuel loading was substantially below the 2.2×10^{-2} ounces per pint (46.9 milligrams per liter) of the LFL. The influx of cool unsaturated air would eventually promote dilution of the fuel load as the system establishes a new equilibrium. Therefore, operation of an exhauster would increase the safety margin of the tank with respect to its flammable condition.

Because this operation would involve working in the primary ventilation space, the operating specification limit of the flammable constituents in the tank vapor space being less than 25 percent of the LFL (vapors plus aerosol) before beginning the operation would apply (WHC 1992b). Additionally, all applicable federal, state, and local environmental (protection and permitting) regulations would be satisfied before beginning operation of a forced ventilation system.

Tank 241-C-103 Operation No. 9. Waste additions would be allowed only to the extent that the waste additions complied with the requirements of the justification for continued operation (JCO) under the criticality unreviewed safety question (WHC 1992e). High-level waste could be added to Tank 241-C-103 from the inadvertent leakage of waste during routine transfers among tanks. Also, small volume water additions into the tank to flush instruments, enter pits, decontaminate pits, conduct routine maintenance, pressure test transfer pipelines, flush transfer pipelines, dispose of rain water or snow melt intrusions, and for flushing and equipment installation purposes, would be allowed as routine operations. Waste additions would be allowed only to the extent that they would comply with the requirements of the JCO under the criticality unreviewed safety question (WHC 1992a).

Justification for Operation No. 9. The provisions of the Wyden Amendment prohibit additions of high-level radioactive waste to identified tanks unless the U.S. Secretary of Energy determines that no safer alternative exists or that the tank does not pose a serious potential for release of high-level radioactive waste. Water is not a high-level waste and, as such, is not regulated by Public Law 101-510 (DOE-RL 1990). However, to remove any question concerning the legality of making routine water additions, the Secretarial determination made on October 4, 1991, authorizes both leakage into watchlist tanks during routine waste transfers and the use of water for purposes described for tank operations (Duffy 1991).

The addition of flush water or the inadvertent addition of transfers to Tank 241-C-103 would not pose any new safety questions or decrease the safety margin associated with storage of waste in the tank. The waste in Tank 241-C-103 under the organic layer is an aqueous phase. Dilution of this phase with water or any solutions likely to be inadvertently pumped from other tanks in the 241-C Tank Farm would not increase either the potential for sparking or the concentration of volatile organic compounds in the vapor space.

Because additions of waste containing fissile materials or other liquids might affect nuclear reactivity, all liquid additions would be made according to the requirements of the criticality safety justification for continued operation (WHC 1992a).

For tank farm operations not affecting flammability in the vapor space of the tank, and not covered previously, a concise justification for the proposed operation would be submitted to the U.S. Department of Energy, Richland Operations Office (RL). This justification would be reviewed, approved, and attached to the work authorization before conducting work.

The RL review and approval would verify independently that vapor space flammability would not be adversely impacted by an activity not anticipated during the preparation of Tank 241-C-103 Operation Nos. 1 through 9.

This page intentionally left blank.

Finding of No Significant Impact
for
Tank 241-C-103 Organic Vapor and Liquid Characterization and Supporting Activities at the Hanford Site, Richland, Washington

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-0881, to assess the environmental impacts associated with organic vapor and liquid characterization for Tank 241-C-103 and activities needed to support this work at the Hanford Site, Richland, Washington.

Tank 241-C-103 is a single-shelled tank located in the 241-C tank farm in the 200 Area on the Hanford Site. Operations at the tank have been curtailed due to unresolved concerns about potential flammability and noxious or toxic vapors that might be associated with a layer of organic waste in the tank. DOE proposes to sample the vapor space and the floating organic layer in the tank to gain information needed to resolve the safety questions associated with the presence of organic wastes in the tank so that normal operation of the tank can be resumed.

Based on the analysis in the EA, DOE has determined that the proposed action would not constitute 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, an environmental impact statement (EIS) is not required.

Addresses and Further Information:

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

Mr. R. E. Gerton, Director
Tank Waste Storage Division
U. S. Department of Energy
Richland Operations Office
Richland, Washington 99352
Phone: (509) 376-9106

For further information regarding the DOE NEPA process, contact:

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

Proposed Action: DOE needs to take action to obtain information relative to unreviewed safety questions concerning Tank 241-C-103. The information is required to assess the risk to workers and the public from uncontrolled release of noxious or toxic vapors, and releases of radionuclides that could potentially be caused by combustion of the liquid organic layer in the tank. DOE also needs to take action to ensure safe tank operating conditions.

The proposed action would involve sampling the vapor space and organic layer in Tank 241-C-103 and measuring the thickness of the organic layer to gain information needed to address the flammability and/or noxious or toxic vapor issues that might be associated with the organic material in the tank. DOE also proposes to conduct other activities to support the sampling task and to ensure safe operating conditions, including: routine tank vapor space surveillance activities; instrument calibration; preventive maintenance;

installation and removal of small scale components; breather filter testing; installation and removal of equipment for above ground facilities; installation and operation of a portable exhauster; small volume waste additions to the tank; and other activities that would not alter vapor space flammability.

All sampling activities would take place inside a HEPA filtered greenhouse. The vapor space sampling would begin by using a vacuum pump to draw tank vapors through tubes filled with compounds designed to absorb the organic materials. Further sampling would be contingent on finding that the tank's fuel loading is less than 25 percent of the lower flammability limit for the mixture of gases, vapors, and aerosols present. Vapor space sampling would continue by collecting vapor from points upstream and downstream of the tank's high efficiency particulate air (HEPA) filter using partially evacuated canisters. Finally, vapor samples would be collected through a heated sampling tube and analyzed.

The organic layer would be sampled by manually lowering a weighted and stoppered glass bottle into the organic layer and removing the stopper, allowing the bottle to fill with liquid. The bottle would be pulled to the surface by a worker wearing protective gloves, sealed with a screw on cap, and washed down with warm water inside the tank riser. The sample would then be checked for radioactivity, placed in a plastic bag and a protective container, and transported to an analytical laboratory for analysis.

The depth of the organic layer would be determined by lowering an electrode containing probe attached to a measuring tape through the air and the organic layer and into the liquid layer below. The thickness of the organic layer would be indicated by the change in electrical resistance when the probe contacts the organic layer and later enters the liquid below the organic layer. The resistance would be measured with a battery powered ohm meter. The probe would be washed down with warm water inside the tank riser before being retrieved and monitored for radioactivity to determine whether it could be reused or must be disposed of as waste.

Alternatives: No reasonable alternatives for obtaining needed information regarding safety issues and ensuring safe operating conditions for Tank 241-C-103 were identified. Intrusive methods that would involve a high energy input into the waste or methods that might affect or increase the flammability of the organic layer were rejected due to the potential for ignition.

Under the No Action alternative DOE would be unable to obtain the information needed to review safety questions and could not adequately investigate mitigation measures to minimize the risks associated with a tank fire or worker exposure to noxious or toxic vapors. Routine tank operations would be suspended indefinitely.

Environmental Impacts:

Routine Operations. Workers involved in sampling activities would wear protective clothing and breathe supplied air, and would be protected from vapor releases and small spills. Noxious or toxic vapors would be diluted below danger levels within the 28 foot radius where workers would be required to use supplied air, and individuals outside that radius would not be adversely affected by noxious or toxic releases. Any minor radioactive spills would be filtered and dispersed by the HEPA filtered greenhouse. Resulting radiation doses to workers and the public outside the greenhouse would be extremely small. No health effects are expected to result from the conduct of the routine operations examined here.

Wastes generated by the proposed action could include sampling equipment that was introduced into the tank and possibly tools, rags, clothing, and other items used for cleanup. This waste would be disposed of at existing disposal sites.

The proposed action would not affect endangered or threatened species or cultural or historic resources.

Potential Accidents. The EA analyzed a range of reasonably foreseeable accidents, including a noxious or toxic gas release, a dip-sample bottle break outside the tank, radiation exposure from a gas sampling tube, a lightning strike that ignites organic vapors in the tank, and a vapor space fire and subsequent burn of the liquid organic layer in the tank. The accident with the highest probability of occurrence (probability of about 1 in 100,000) is the dip-sample bottle break, which would increase worker exposure to radiation, but would not be expected to result in any adverse health effects.

The noxious or toxic gas release (estimated probability of occurrence of 1 in 1,000,000) and radiation exposure from gas sampling tubes (estimated probability of occurrence of 2.5 in 1,000,000) would not result in any adverse health effects to workers due to the use of protective clothing and supplied air in the vicinity of the sampling, and would have no impact on the public.

The remaining two accident scenarios involving ignition of flammable materials in the tank each have an estimated probability of less than 1 in 10 million. DOE does not have sufficient information to quantify the consequences of these accidents since one purpose of the proposed action is to obtain the needed information. However, the consequences of these accidents would be no greater than those projected for a ferrocyanide tank explosion in the 1987 Environmental Impact Statement, Disposal of Hanford High-Level, Transuranic and Tank Wastes, (DOE/EIS-0013). The 1987 EIS projected that such an explosion would result in a short-term radiation dose of 200 millirem to the maximally exposed member of the public, and an offsite collective dose commitment of 7,000 person-rem. Such an explosion would be expected to result in 4 offsite latent cancer fatalities, the contamination of a substantial area of land, and large doses to workers. A 1990 General Accounting Office study estimated that the consequences of the ferrocyanide tank explosion could be 10 to 100 times greater than those projected in the 1987 EIS. The GAO study did not reach a conclusion regarding the probability of a tank explosion. In view of the extremely low probability of occurrence for these accidents, even if the severe consequences of a ferrocyanide tank explosion projected by the GAO are assumed, the risks posed to the environment and human health by this potential accident are small.

Cumulative Impacts. Potential impacts of the waste characterization activities in Tank 241-C-103 would not contribute substantially to the cumulative impacts at the Hanford Site. The proposed action would not increase radioactive and chemical emissions and would not have a significant cumulative effect on workers or the general public. The wastes generated by the activities would not add substantially to waste generation at Hanford.

Determination: The proposed sampling of the vapor space and organic layer in Tank 241-C-103 and measuring of the thickness of the organic layer does not constitute a major Federal action significantly affecting the quality of the human environment within the meaning of the NEPA. This finding is based on information and analyses in the EA. Therefore, an environmental impact statement is not required for this proposed action.

Issued at Washington, D.C. this 10th day of August, 1993.

Peter N. Brush
Acting Assistant Secretary
Environment, Safety and Health

DATE FILMED

11 / 26 / 93

END