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VAPOR & GAS SAMPLING OF SST 241BX104 USING THE
VAPOR SAMPLING SYSTEM

SEP 25 1995

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LIST OF TERMS

CGI	Combustible Gas Indicator
COC	Chain Of Custody
DOT	U.S. Department of Transportation
GC/FID	Gas Chromatograph/Flame Ionization Detector
GEA	Gamma Energy Analysis
HEPA	High-Efficiency Particulate Air (filter)
NH ₃	Ammonia
NO ₂	Nitrogen Dioxide
NO	Nitric Oxide
H ₂ O	Water Vapor
OGIST	Oregon Graduate Institute of Science and Technology
OPC	Offsite Property Control
ORNL	Oak Ridge National Laboratory
OVM	Organic Vapor Meter
PNL	Pacific Northwest Laboratory
SML	Sampling and Mobile Laboratories
SST	Single-Shell Tank
TCP	Tank Characterization Plan
team	SML Vapor Team
TST	Triple Sorbent Trap
VSS	Vapor Sampling System
WHC	Westinghouse Hanford Company

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VAPOR AND GAS SAMPLING OF SINGLE-SHELL TANK 241-BX-104 USING THE VAPOR SAMPLING SYSTEM

1.0 SCOPE

The Vapor Issue Resolution Program tasked the Sampling and Mobile Laboratories (SML) to collect representative headspace samples from Hanford Site single-shell tank (SST) 241-BX-104. This document presents sampling data resulting from the December 30, 1994, sampling of SST 241-BX-104.

2.0 SAMPLING EQUIPMENT DESCRIPTION

2.1 VAPOR SAMPLING SYSTEM

The SML vapor team (the team) used the vapor sampling system (VSS) to collect representative samples of the air, gases, and vapors from the headspace of SST 241-BX-104 on December 30, 1994. Mahon et al. (1994) describes in detail the VSS, its performance, and its operation. The team used the VSS to collect sorbent traps and SUMMA¹ canister headspace samples from SST 241-BX-104; subsequently, the team sent these samples to analytical laboratories for analysis.

The VSS comprises a mobile laboratory, a hot-water-jacketed stainless steel probe to insert into the tank headspace, and stainless steel transfer tubing that connects the mobile laboratory to the probe. A vacuum pump draws sample vapor from the tank headspace and through all transfer tubing and the sampling manifold. Electrically activated, pneumatically actuated valves direct sample flow within the VSS. Instrumentation housed in the mobile laboratory monitors and controls system temperature, monitors absolute and differential system pressure, meters and controls mass flow, and monitors sample vapor using a gas chromatograph/flame ionization detector (GC/FID).

A key feature of the VSS is its use of heated transfer tubing and a heated sampling manifold. Maintaining the system temperature at an electronically controlled elevated temperature prevents vapor condensation and reduces vapor adsorption on surfaces exposed to sample vapor. Mahon et al. (1994) describes various tests and observations that indicate the VSS sample transfer efficiency is consistently high.

Sorbent trap samples are collected at the sorbent trap station of the sampling manifold. Sorbent traps are pencil-size stainless steel or glass tubes that contain vapor-adsorbing media. A known amount of sample vapor passes through the tube, which traps (by adsorption) virtually all the target analytes. An

¹SUMMA is a registered trademark of Molectrics, Inc., Cleveland, Ohio.

analytical laboratory receives and analyzes the sorbet trap. Using the quantity of analytes found in the sorbent media and the volume of vapor passed through the sorbent trap, the laboratory calculates the analyte concentration.

The sorbent trap station uses highly accurate mass flow controllers to measure and control the flow rate of sample vapor through the sorbent traps. The controllers are located downstream of the sorbent trap station and the in-line driers, which remove water vapor from the vapor before metering the vapor. Westinghouse Hanford Company (WHC) Standards Laboratory determined the errors associated with the mass flow controllers before the SST 241-BX-104 sampling began (see Table 1). Flow rates and the duration of flow are specified by the analytical laboratories that supply and analyze the sorbent traps.

Table 1. Flow Control Calibration.

Flow-indicating Control Valve	Flow (stdcm ³ /min)	Error (%)
1	200	±0.7
3	200	±0.05

The sampling manifold also has a station for sampling vapor with evacuated SUMMA[™] canisters. The SUMMA[™] process passivates active sites on stainless steel canister walls to minimize adsorption of gases and vapors. An analytical laboratory must clean and evacuate SUMMA[™] canisters before use. The canister is filled with sample vapor through a valve, which is then closed to seal the sample inside. SUMMA[™] canisters essentially allow collection and transfer of whole-air samples from location to an analytical laboratory for sample analysis. The standard capacity of each SUMMA[™] canister is 6 liters.

Prior to sampling, GC/FID confirms that the VSS is free of hydrocarbon contamination to the limit of detection. The GC/FID is part of the VSS and can be used during a sampling event to periodically monitor organic vapor concentrations in the vapor being sampled.

3.0 SAMPLING EVENT DESCRIPTION

3.1 SPECIFICATIONS

The Vapor Issue Resolution Program specifies sampling requirements in WHC-SD-WM-TP-296, *Tank 241-BX-104 Tank Characterization Plan* (Carpenter 1994). The Tank Characterization Plan (TCP) also specifies the types and number of samples to be collected, flow rates, and durations. The sample log sheets summarize the key sampling parameters in Appendix A. In addition to the sample log sheets, checksheets for each individual sample help ensure correct sampling procedures. SML retains these documents in the project file. This sample event's project-specific number is S4-089.

3.2 OPERATIONS AND SAMPLING PERSONNEL

E. A. Tampos was the Tank Farm Operations person-in-charge. The other SML vapor team members included:

- E. A. Johnson, Field Scientist
- R. A. Westberg, Field Scientist
- R. L. Ragan, Field Scientist
- N. P. Buechler, Field Technician.

The VSS was set up at SST 241-BX-104 at about 9:00 p.m. on December 29, 1994, and was allowed to warm up overnight. The team began sampling shortly after 11:00 a.m. on December 30, 1994, and completed the sampling by 3:00 p.m. the same day.

3.3 AMBIENT CONDITIONS

The day of the sampling event, December 30, 1994, was cold and cloudy with little wind. Graphs of ambient temperatures and pressures taken at the Hanford Meteorological Station, which is about 4 miles due west of 241-BX SST farm, are provided in Appendix B.

3.4 SAMPLE COLLECTION

The hot-water-jacketed sampling probe was placed in Riser 1 of SST 241-BX-104. The probe length, from the sample inlet to the top of the riser flange, was 8.5 meters. All zones of the VSS were heated to 60 °C during setup of the VSS at SST 241-BX-104 on December 30, 1994. The team stabilized the VSS temperature zones by 11:00 a.m. on December 30, 1994, and the system was ready to collect samples. Measured according to the VSS operating procedure, the pressure and temperature of SST 241-BX-104 were 1007 mbar (755 torr) and 22.8 °C, respectively. The sample log sheets (Appendix A) provide a complete chronology of the sample event including start and end times, flow rates, volumes, and specific sample identifiers.

The team purged the sampling manifold with ambient air overnight and the ambient samples were taken at approximately 10:00 a.m. The team collected two SUMMA™ canister samples of ambient air, one using the VSS sampling manifold and one manually 10 meters upwind of the VSS connection with SST 241-BX-104. The first was collected to establish the cleanliness of the sampling manifold and the second to establish background levels of trace organic vapors.

A leak check of the VSS sampling manifold and transfer tubing (up to its connection to the in-tank sampling probe) was performed. Leakage resulted in an increase of 9.47 mbar (7.1 torr) rise in pressure over the 15 minute test. Given a system volume of not more than 10 L, this pressure rise corresponds to a leak rate of approximately 22.1 mL/min at a 285 mbar (213.9 torr) system pressure. This leak rate was estimated for average SUMMA™, TST, and sorbent sampling pressures. It was found that for the SUMMA™ canisters, dilution by

ambient air was approximately 0.2%, for TST traps sampled at 50 mL/min the dilution was approximately 2%, for TST traps sampled at 200 mL/min the dilution was approximately 1.12%, and for sorbent traps the dilution was approximately 1.0%.

Two analytical laboratories provided sample media. Oak Ridge National Laboratory (ORNL) provided triple sorbent traps (TSTs) for organic vapors; and Pacific Northwest Laboratory (PNL) provided SUMMA™ canisters and sorbent traps for organic vapors, ammonia (NH₃), nitrogen dioxide (NO₂), nitric oxide (NO), and water vapor (H₂O).

3.5 INDUSTRIAL HYGIENE FIELD RESULTS

Prior to connecting to SST 241-BX-104, an industrial hygiene technician field tested tank vapors. The technician purged the vapor probe sample tube for 5 minutes and then field measured vapor stream contents using a combustible gas indicator (CGI) and an organic vapor meter (OVM). The technician verbally reported an LEL of 0.0%, 20.4% O₂, 25 ppm CO, and 22 ppm TOC. The technician also used a Dräger tube to estimate the ammonia content of the tank as 200 ppm.

3.6 FIELD GC/FID RESULTS

The GC was single point calibrated on the day of sampling using a 6.0 ppmC Propane standard by Scott Specialty Gas. The standard is an E.P.A. Protocol Gas that is +/- 2% NIST traceable. Table 2 shows the Field GC/FID results from the sampling of SST 241-BX-104.

Table 2. TOC Results.

Number of Runs	Description	Average TOC Concentration (ppmC)	% Standard Deviation
6	Propane	6.00	0.28
2	Ambient	2.57	0.98
4	Tank Vapor	91.74	20.83

3.7 RADIATION SCREENING

Samples are unconditionally released from the SST farm in accordance with DI-33300-93-004, *Release of Vapor Sampling Equipment* (WHC 1993b). Radiological screening results are used to determine (1) if the samples must be shipped as radioactive or nonradioactive in accordance with U.S. Department of Transportation (DOT) regulations and (2) if the samples meet the laboratory acceptance criteria.

The DOT limits for shipping a nonradioactive sample are 200 pCi/g of beta-gamma activity and 60 pCi/g of alpha activity. Samples exceeding these DOT limits may be shipped as radioactive material, if the samples do not exceed the following laboratory acceptance criteria:

- OGIST: The laboratory has supplied no acceptance criteria for alpha-beta-gamma activity. Notify the laboratory if radioactive levels exceed the DOT limits specified above, or if >50 pCi/g tritium are found.
- ORNL: Beta-gamma activity <450 pCi/g of sample media. Alpha activity <135 pCi/g.
- PNL: Beta-gamma activity <400 pCi/g of sample media. Alpha activity <100 pCi/g of sample media.

To protect the sampling manifold and all sampling devices from radioactive particulates, all sample vapor for the December 30, 1994, SST 241-BX-104 vapor sampling was drawn through a series of four glass-fiber high-efficiency particulate air (HEPA) filters placed upstream of the sampling manifold. These four filters were in place whenever headspace air, gases, and vapors were flowing through the system. When sampling was complete, the filters were removed and assigned unique sample identifiers. All four HEPA filters were submitted to Laboratory 222-S for total alpha, total beta, and gamma energy analysis (GEA). The HEPA filter closest to the sampling manifold was analyzed to determine if the samples met DOT shipping criteria and laboratory acceptance criteria. Table 2 presents SST 241-BX-104 filter sample results. SML scientists use the activity results from Table 3 to calculate pCi/g of sample media. SML maintains this information in the project-specific file.

A water vapor sample was also collected through one of the sorbent station ports and analyzed for tritiated water. Table 3 presents SST 241-BX-104 tritium sample results. The results in Table 3 indicate that the samples collected from SST 241-BX-104 met the laboratory acceptance criteria and the DOT definition of a nonradioactive shipment.

Table 3. Radionuclide Analysis Results.

Filter	Sample Identifier	Activity results ^a (pCi/sample)	Activity ^b (pCi/L of tank gas)
Upstream HEPA (box)	S4089-A35.OU1	Total alpha = 4780 Total beta = 8130 GEA = 0.00375 uCi/Ml (¹⁰⁹ Cd) GEA = 0.000942 uCi/Ml (²⁰⁸ Tl) GEA = 0.00336 uCi/Ml (²¹² Bi) GEA = 0.003 uCi/Ml (²¹² Pb) GEA = 0.00113 uCi/Ml (²³⁷ Np) GEA = 0.000566 uCi/Ml (²⁴³ Am)	= 13.2 = 22.46 = 0.00001 = 0.000003 = 0.000009 = 0.000008 = 0.000003 = 0.000002
Downstream HEPA (box)	S4089-A36.OD1	Total alpha = <0.640 Total beta = 3.34 GEA = ND	= <0.002 = 0.009 = <detectable
Upstream HEPA filter (inside VSS)	S4089-A37.OU2	Total alpha = <0.640 Total beta = 3.34 GEA = ND	= <0.002 = 0.009 = <detectable
Downstream HEPA filter (inside VSS)	S4089-A38.OD2	Total alpha = <0.640 Total beta = 4.82 GEA = ND	= <0.002 = 0.01 = <detectable
Tritium trap	S4089-A03.OT1	Total activity = <50.0	= <50.0 ^c

NOTES:

The samples are nonradioactive. These results were evaluated against laboratory acceptance criteria and DOT limits.

^aAll less than (<) values represent the minimum detection limits at Laboratory 222-S.

^bNumbers based on an approximation of the total volume of tank vapor through the HEPA filters. Appendix A and the sample checksheets were used to estimate a total flow through the VSS of 362 Liters.

^cNumber is calculated using a total volume of 1 L passing through the tritium trap.

4.0 SAMPLE CHAIN OF CUSTODY: RECEIPT, STORAGE, AND SHIPMENT

All sorbent trains, sorbent tubes, and SUMMA™ canisters received by SML are stored in a custody locker maintained by SML. Sorbent trains and tubes were maintained at 4 ± 2 °C in a refrigeration unit. SUMMA™ canisters were stored in the same locked storage area, but were not refrigerated.

TSTs are supplied by ORNL. ORNL initiates the chain-of-custody (COC) forms. The sample media is placed in 40-mL volatile organic analysis vials. Evidence tape is applied to the vials, which are then placed in a shipping container along with the relinquished COC forms and shipped to SML. TSTs are shipped to SML in a cooler containing "blue" ice.

The sample media was received, inventoried against the COC forms, and SML signed the "received by" block on the COC form. The TSTs were maintained at 4 ± 2 °C before and after the sampling event in a refrigeration unit.

The TSTs were shipped to back ORNL after the sampling event using offsite property control (OPC W95-0-0117-56). Table 4 lists the sample identifiers, sample types, and COC form numbers for all ORNL samples. The samples were delivered for transport on January 9, 1994, and shipped by Federal Express for next-day delivery.

PNL supplied COC forms for the sorbent train and SUMMA™ canister sampling devices. SML picked up sampling devices from PNL and took them to a custody locker using a government vehicle.

Using a government truck, SML took the PNL sorbent traps and SUMMA™ canisters directly to PNL and delivered them to J. A. Edwards on January 5, 1995. Table 5 lists the sample identifiers, sample types, and COC form numbers for all PNL samples. The sorbent trains were maintained at 4 ± 2 °C before and after the sampling event in a refrigeration unit.

From the time that samples are received by SML until they are shipped back to the analytical laboratory, SML maintains COC in accordance with LO-090-443/A0 *Chain-of-Custody for RCRA and CERCLA Protocol Samples* (WHC 1992). Final COCs from this sampling event are in Appendix C.

Table 4. Oak Ridge National Laboratory Samples.

Sample Identifier	Sample Type	COC Number
S4089-A10.565	TST	006749
S4089-A11.563	TST	006749
S4089-A12.561	TST	006749
S4089-A13.483	TST field blank	006749
S4089-A14.560	TST	006749
S4089-A15.559	TST	006749
S4089-A16.558	TST	006749
S4089-A17.557	TST	006749
S4089-A18.554	TST	006749
S4089-A19.562	TST	006749
S4089-A20.727	TST field blank	006749
S4089-A21.523	TST	006749
S4089-A22.556	TST	006749
S4089-A23.788	TST	006749
S4089-A24.564	TST trip blank	006749
S4089-A25.270	TST trip blank	006749

Table 5. Pacific Northwest Laboratory Samples.

Sample Identifier	Sample Type	COC Number
S4089-A01.005	Ambient upwind SUMMA™	008090
S4089-A02.007	Ambient SUMMA™ (VSS)	008090
S4089-A04.045	SUMMA™	008090
S4089-A05.046	SUMMA™	008090
S4089-A06.047	SUMMA™	008090
S4089-A07.077	SUMMA™	008090
S4089-A08.078	SUMMA™	008090
S4089-A09.079	SUMMA™	008090

5.0 QUALITY ASSURANCE AND CONTROLS

5.1 VAPOR SAMPLING SYSTEM CLEANING

Immediately prior to sampling of SST 241-BX-104, the VSS manifold was heated to 50 °C and ambient air was purged through the system for approximately 12.5 hours. Throughout this purge, all pertinent system valves were actuated to release any contaminants that may have collected in the VSS valves themselves. After this purge, an ambient air sample was drawn through the VSS manifold and a GC/FID run was initiated. No contaminants were detected by the FID. A second sample confirmed the VSS was free of organic remnants down to ambient levels. Thus, the system was ready to sample SST 241-BX-104. For further details, refer to Appendix C of LO-080-450/A0 (WHC 1993c) and the project-specific file located with SML.

In compliance with the *Vapor Space Probe Cleaning Procedure* (WHC 1993c), the team cleaned the hot-water-jacketed probe before installing it in SST 241-BX-104. This procedure requires a solvent rinse of all internal probe surfaces with acetone and methanol to clear the sample line of possible contamination remaining from the construction process. The probes are heated to 90 °C, and dry air passes through the probe to evaporate the solvents. Before the team releases the probes they use a hand-held organic vapor meter to ensure that the total organic concentration in the sample line is below 1 ppmv.

SUMMA™ canister ambient air samples were also collected to confirm that the VSS sampling manifold was free of trace organic contaminants (or to determine what contaminants were present). One SUMMA™ canister was filled with ambient air using the VSS sampling manifold, a second was filled with ambient air upwind of SST 241-BX-104. The canisters were shipped to PNL for analysis.

5.2 INSTRUMENT CALIBRATION

Instruments located in the VSS are calibrated on an annual basis at the WHC Standards Laboratory. Table 6 summarizes VSS instrumentation calibration data, which are maintained in files by SML. According to the calibration schedule shown in Table 6, all instrumentation was within its calibration period during the SST 241-BX-104 sampling event.

Table 6. Calibration Data.

System	Calibration Date	Expiration Date	WHC Standards Laboratory Code
Temperature Control System	04/21/94	04/21/95	804-67-74-009
Mass Flow System	12/08/94	12/08/95	804-28-03-001
Pressure System	12/07/94	12/07/95	804-67-89-001

5.3 BLANK SAMPLES

Trip blanks are samples that accompany the sample media from the point of generation through sample analysis. Analysis of trip blanks is used to assess cross-contamination of the sample media during transport and storage. Trip blanks are transported to the field with the sample collection media but remain unopened throughout the sampling event.

Field blanks are samples that are used to determine if cross-contamination may have occurred during sample handling. Sorbent tube field blanks are collected by transporting the field blank to the field with the other sample media, uncapping the media and connecting it to the VSS sorbent connections, removing the field blank from the connections, and recapping the ends of the sorbent tubes.

Spiked blanks are samples that are spiked with a known amount of analyte before shipment. These blanks are handled and analyzed with the other samples. Analysis of the spiked blanks is used to evaluate potential sample loss during shipment or storage.

Ambient blanks are samples of ambient air collected at the sampling location. Analysis of ambient blanks is used to assess contamination that may be present in the atmosphere surrounding the sampling system or in the system itself prior to sampling.

Field blanks are sampling devices prepared and handled in the same manner as the samples, but no tank gases are drawn through them.

Table 7 lists the blank samples collected during the sampling of SST 241-BX-104.

Table 7. Blank Samples.

Sample Identifier	Blank Type	Sample Media
S4089-A01.005	Ambient	SUMMA™
S4089-A02.007	Ambient (VSS)	SUMMA™
S4089-A13.483	Field	TST
S4089-A20.727	Trip	TST
S4089-A24.564	Trip	TST
S4089-A25.270	Trip	TST
S4089-A32.V42	Trip	NO ₃ /NO _x /H ₂ O
S4089-A33.V43	Trip	NO ₃ /NO _x /H ₂ O
S4089-A34.V44	Trip	NO ₃ /NO _x /H ₂ O

6.0 ANOMALIES

All samples were collected in accordance with the TCP and LO-080-450/A0, *Collection of SUMMA Canisters and Sorbent Tube Samples Using the Vapor Sampling System* (WHC 1993a). No anomalies to the TCP or the operating procedure were noted during the sampling of SST 241-BX-104. Further details are available in the project-specific file maintained by SML.

7.0 REFERENCES

49 CFR 100-177, 1992, "Transportation," *Code of Federal Regulations*, as amended.

Carpenter, B. C., 1994, *Tank Characterization Plan for Vapor and Gas Sampling Tank 241-BX-104 Using the Vapor Sampling System*, WHC-SD-WM-296, Westinghouse Hanford Company, Richland, Washington.

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WHC, 1993b, *Release of Vapor Sampling Equipment*, Procedure DI-33300-93-004, Westinghouse Hanford Company, Richland, Washington.

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APPENDIX A
SAMPLE LOG SHEETS

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Waste Tank
241-BX-104

Set up VSS (Section A)(Temperature set point = 60C)

Date: 30 Dec., 1994

Ensure HEPA filters are installed

VSS Personnel: E. Johnson R. Ragan

Ensure connection to sample probe

R. Westberg

System status check sheet. (Verify zones are to temp)

Trailer Personnel: N. Buechler,

Tank Temperature 22.8 °C

PNL				Desired	Desired	Desired	Actual	Actual	Actual	Actual	Actual
OGI/ORNL		Port	Description	Flow	Duration	Total	Flow	Start	End	Total	Total
WHC Sample ID	Sample ID	Valve #		Rate	(min.)	Flow	Rate	Time	Time	Time	Flow
Group # 1						SCCM	SCCM	12/29/94	12/30/94	(min.)	Liters
Purge with ambient air for 30 min.				5450	30	163500	5460	20:50	09:15	12hrs/25min	4,067
S4089- 01 005	005		AMBIENT #1 (PNL)		1			09:35	09:36	1	
GC Run #1 Ambient air/Cleanliness check								09:40			
S4089- A02. 007	007	15	AMBIENT #2 (PNL)		1			09:45	09:46	1	
GC Run #2 Standards Runs								09:48			
Leak check (Appendix A)		Leak Rate:		28.0 Torr/Hr.							
Purge with tank air for 30 min.				5450	30	163500	5460	10:20	10:50	30	163.80
Measure tank pressure			PE-1	754.6 Torr							
S4089- A03 0T1	T1735(222S	8	Tritium Trap	200	5	1000	200.40	10:55	11:00	5.0	1.00
GC Run # 3 (Tank run #1)								11:05			
S4089- A04. 045	045	11	SUMMA #3 (OGI)		1			11:12	11:13	1	6.00
S4089- A05. 046	046	13	SUMMA #4 (OGI)		1			11:16	11:17	1	6.00
S4089- A06. 047	047	15	SUMMA # 5 (OGI)		1			11:20	11:21	1	6.00
S4089- A07. 077	077	12	SUMMA #6 (PNL)		1			11:24	11:25	1	6.00
S4089- A08. 078	078	14	SUMMA #7 (PNL)		1			11:28	11:29	1	6.00
S4089- A09. 079	079	16	SUMMA #8 (PNL)		1			11:32	11:33	1	6.00
GC Run # 4 (Tank run # 2)								11:40			

Waste Tank
241-BX-104

PNL				Desired	Desired	Desired	Actual	Actual	Actual	Actual	Actual
OGI/ORNL				Flow	Duration	Total	Flow	Start	End	Total	Total
WHC Sample ID	Sample ID	Valve #	Description	Rate	(min.)	Flow	Rate	Time	Time	Time	Flow
S4089- 10 565	TST#565	9	TST #1	50	4	200	50.10	11:58	12:02	4.0	0.20
S4089- 11 563	TST#563	10	TST #2	50	4	200	50.10	11:58	12:02	4.0	0.20
S4089- 12 561	TST#561	8	TST #3	50	4	200	50.10	12:08	12:12	4.0	0.20
S4089- 14 560	TST#560	10	TST #4	50	4	200	50.10	12:08	12:12	4.0	0.20
S4089- 13 483	TST#483		TST FIELD BLANK #1					12:14			
S4089- 15 559	TST#559	9	TST # 5	200	5	1000	200.35	12:18	12:23	5.0	1.00
S4089- 16 558	TST#558	10	TST # 6	200	5	1000	200.35	12:18	12:23	5.0	1.00
S4089- 17 557	TST#557	8	TST # 7	200	5	1000	200.30	12:30	12:35	5.0	1.00
S4089- 18 554	TST#554	10	TST # 8	200	5	1000	200.30	12:30	12:35	5.0	1.00
S4089- 19 562	TST#562	9	TST # 9	200	20	4000	200.40	12:42	13:02	20.0	4.01
S4089- 21 523	TST#523	10	TST # 10	200	20	4000	200.40	12:42	13:02	20.0	4.01
S4089- A20. 727	TST#727		TST FIELD BLANK #2					12:46			
S4089- A22. 556	TST#556	8	TST # 11	200	20	4000	200.77	13:14	13:34:18*	20.3	4.08
S4089- A23. 788	TST#788	10	TST # 12	200	20	4000	200.40	13:08	13:28	20.0	4.01
GC Run # 5 (Tank run #3)								13:50			
S4089- A26. V36	V36	9	NH3/NOx/H2O #1	200	15	3000	200.40	13:53	14:08	15.0	3.01
S4089- A27. V37	V37	10	NH3/NOx/H2O #2	200	15	3000	200.40	13:53	14:08	15.0	3.01
S4089- A28. V38	V38	8	NH3/NOx/H2O #3	200	15	3000	200.40	14:14	14:29	15.0	3.01
S4089- A29. V39	V39	10	NH3/NOx/H2O #4	200	15	3000	200.40	14:14	14:29	15.0	3.01
S4089- A30. V40	V40	9	NH3/NOx/H2O #5	200	15	3000	200.40	14:35	14:50	15.0	3.01
S4089- A31. V41	V41	10	NH3/NOx/H2O #6	200	15	3000	200.40	14:35	14:50	15.0	3.01
GC Run # 6 (Tank run # 4)								14:56			

TOTAL TANK GAS USED DURING SAMPLING RUNS

75.95

* Removed Prior to Sample Completion -
Reinstalled and Sampled For 20 min.
Data logger output shows total
sampling time 20 min-18 sec.
Total Volume 4080 SCCM

788 Tank Gases May have
Been Diluted with Ambient Air.

Waste Tank
241-BX-104

WHC Sample ID	PNL OG/ORNL	Port Sample ID Valve #	Description	Desired		Desired		Actual		Actual		Actual	
				Flow	Rate	Duration (min.)	Total Flow	Flow	Rate	Start Time	End Time	Total Time	Total Flow
S4089- A35. 0U1		T1736(222S)	Upstream HEPA(box)								15:20		
S4089- A36. 0D1		T1737(222S)	Downstream HEPA(box)								15:20		
S4089- A37. 0U2		T1738(222S)	Upstream HEPA (VSS)								15:20		
S4089- A38. 0D2		T1739(222S)	Downstream HEPA (VSS)								15:20		

Trip Blanks (DO NOT EXPOSE)

S4089- A24. 564	TST#564		TST TRIP #1										
S4089- A25. 270	TST#270		TST TRIP #1										
S4089- A32. V42	V42		NH3/NOx/H2O TRIP #1										
S4089- A33. V43	V43		NH3/NOx/H2O TRIP #2										
S4089- A34. V44	V44		NH3/NOx/H2O TRIP #3										

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**VSS SAMPLING RADIOLOGICAL SCREENING RESULTS
BX-104**

HEPA BOX UPSTREAM FILTER	Liters	pCi / filter		pCi / liter		HEPA BOX DOWNSTREAM FILTE	Liters	pCi / filter		pCi / liter
TOTAL VOLUME.	362.15					TOTAL VOLUME	362.15			
BETA		8,130		22.45		BETA		3.34		0.00922281
ALPHA		4,780		13.20		ALPHA		< 0.640		<Detectable
GEA - Am-243		0.0006		0.00		GEA - Am-243		ND		<Detectable
- Bi-212		0.003		0.00		- Bi-212		ND		<Detectable
- Np-237		0.0001		0.00		- Np-237		ND		<Detectable
- Pb-212		0.000		0.00		- Pb-212		ND		<Detectable
- Th-229		ND		ND		- Th-229		ND		<Detectable
- TL-208		0.000		0.00		- TI-208		ND		<Detectable
-Cd-109		0.004		0.00						
VSS UPSTREAM FILTER	Liters	pCi / filter		pCi / liter		VSS DOWNSTREAM FILTER	Liters	pCi / filter		pCi / liter
TOTAL VOLUME	362.15					TOTAL VOLUME	362.15			
BETA		3.34		0.01		BETA		4.82		0.01330956
ALPHA		< 0.640		< Detectable		ALPHA		< 0.640		< Detectable
GEA - Am-243		ND		< Detectable		GEA - Am-243		ND		< Detectable
- Bi-212		ND		< Detectable		- Bi-212		ND		< Detectable
- Np-237		ND		< Detectable		- Np-237		ND		< Detectable
- Pb-212		ND		< Detectable		- Pb-212		ND		< Detectable
- Th-229		ND		< Detectable		- Th-229		ND		< Detectable
- TL-208		ND		< Detectable		- TI-208		ND		< Detectable
TRITIUM TRAP		pCi / filter		pCi / liter						
TOTAL VOLUME	1.0									
TOTAL ACTIVITY		< 50.0		< 50.0						
SAMPLE EXPOSURE ANALYSIS, USING VSS DOWNSTREAM FILTER ANALYSIS AS POSSIBLE EXPOSURE LEVEL										
= BETA 0.0133 pCi/Liter, ALPHA < 0.640 pCi/Liter, GEA not detected										
SORBENT SAMPLING						TST'S				
TOTAL VOLUME PER SAMPLE	3.00	Liters				TOTAL VOLUME PER SAMPLE	Liters	Beta per sample		
BETA PER SAMPLE	0.04	pCi				TST 565, 563, 561, 560.	0.2	0.003	pCi	
INDIVIDUAL SORBENTS						TST 559, 558, 557, 554.	1	0.013	pCi	
NH3 (0.75 gram)	0.05	pCi per gram				TST 562, 523, 556, 788.	4.01	0.053	pCi	
NO2 (0.60 gram)	0.07	pCi per gram								
H2O (0.45 gram)	0.09	pCi per gram								
SUMMA SAMPLING										
TOTAL VOLUME PER CANISTER	6	Liters								
BETA PER SAMPLE	0.08	pCi								

APPENDIX B
AMBIENT CONDITIONS

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WEATHER DURING VSS SAMPLING OF 241-BX-104

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APPENDIX C
CHAIN-OF CUSTODY FORMS

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Westinghouse
Hanford Company

CHAIN OF CUSTODY

ORNL-006749

Custody Form Initiator Amy Dindal

Company Contact Roger Jenkins

Project Designation/Sampling Locations 241-BX-104 (VSS)

Ice Chest No.

Bill of Lading/Airbill No.

Method of Shipment Federal Express

Shipped to Rick Mahon

Possible Sample Hazards/Remarks NONE

Telephone (615) 576-8594

Collection Date 12/30/94

Field Logbook No. WHC-N-647-4

Offsite Property No.

Sample Identification

S4089-A10.565	TST# 565	ORNL Triple Sorbent Trap
S4089-A11.563	TST# 563	ORNL Triple Sorbent Trap
S4089-A12.561	TST# 561	ORNL Triple Sorbent Trap
S4089-A14.560	TST# 560	ORNL Triple Sorbent Trap
S4089-A15.559	TST# 559	ORNL Triple Sorbent Trap
S4089-A16.558	TST# 558	ORNL Triple Sorbent Trap
S4089-A17.557	TST# 557	ORNL Triple Sorbent Trap
S4089-A18.554	TST# 554	ORNL Triple Sorbent Trap
S4089-A19.562	TST# 562	ORNL Triple Sorbent Trap
S4089-A21.523	TST# 523	ORNL Triple Sorbent Trap
S4089-A22.556	TST# 556	ORNL Triple Sorbent Trap
S4089-A23.788	TST# 788	ORNL Triple Sorbent Trap
S4089-A24.564	TST# 564	ORNL Trip Blank
S4089-A25.270	TST# 270	ORNL Trip Blank
S4089-A13.483	TST# 483	ORNL Field Blank
S4089-A20.727	TST# 727	ORNL Field Blank

(See Spreadsheet Comments)

[] Field Transfer of Custody

Chain of Possession

(Sign and Print Names)

Relinquished By	Date	Time	Received By	Date	Time
AB Dindal	12/18/94	10:45am	Shannon L. Spencer	12-9-94	1410
Shannon L. Spencer	1-9-95	0930	TEBULL + TERLICKA	1-9-95	0630
TEBULL + TERLICKA	1-9-95	1100			

Temperture (°C)	Min	Max
When shipped (ORNL)	4	24
When received (WHC)	-4/	3
When shipped (WHC)	2.1	4
When received (ORNL)		

Westinghouse Hanford Company	CHAIN OF CUSTODY	008540																																				
Custody Form Initiator <u>Neil Brechler</u>																																						
Company Contact <u>RD Mahon</u>	Telephone <u>373-1101</u>																																					
Project Designation/Sampling Locations <u>BX 104</u>	Collection Date <u>12/30/94</u>																																					
Ice Chest No. <u>SML-543</u>	Field Logbook No. _____																																					
Bill of Lading/Airbill No. <u>N/A</u>	Offsite Property No. <u>N/A</u>																																					
Method of Shipment <u>Hand delivered in Government vehicle 4556</u>																																						
Shipped to <u>222-S Lab</u>																																						
Possible Sample Hazards/Remarks _____																																						
Sample Identification																																						
<u>54089-0T1 T-1735</u>	<div style="position: relative; height: 100px;"> X 12-30-94 12-30-94 </div>																																					
<u>54089-041 T-1736</u>																																						
<u>54089-001 T-1737</u>																																						
<u>54089-042 T-1738</u>																																						
<u>54089-002 T-1739</u>																																						
<u>12-30-94 12-30-94</u>																																						
☐ Field Transfer of Custody <table border="1" style="width:100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th colspan="4" style="text-align: center;">CHAIN OF POSSESSION</th> <th colspan="2" style="text-align: center;">(Sign and Print Name)</th> </tr> <tr> <th style="width:25%;">Relinquished By</th> <th style="width:15%;">Date</th> <th style="width:15%;">Time</th> <th style="width:25%;">Received By</th> <th style="width:15%;">Date</th> <th style="width:15%;">Time</th> </tr> </thead> <tbody> <tr> <td><u>NP Brechler NP Brechler</u></td> <td><u>12-30-94</u></td> <td><u>1600</u></td> <td><u>XB Hulce</u></td> <td><u>12/30/94</u></td> <td><u>1600</u></td> </tr> <tr> <td><u>XB Hulce</u></td> <td><u>12/30/94</u></td> <td><u>1630</u></td> <td><u>[Signature]</u></td> <td><u>12-30-94</u></td> <td><u>1630</u></td> </tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>			CHAIN OF POSSESSION				(Sign and Print Name)		Relinquished By	Date	Time	Received By	Date	Time	<u>NP Brechler NP Brechler</u>	<u>12-30-94</u>	<u>1600</u>	<u>XB Hulce</u>	<u>12/30/94</u>	<u>1600</u>	<u>XB Hulce</u>	<u>12/30/94</u>	<u>1630</u>	<u>[Signature]</u>	<u>12-30-94</u>	<u>1630</u>												
CHAIN OF POSSESSION				(Sign and Print Name)																																		
Relinquished By	Date	Time	Received By	Date	Time																																	
<u>NP Brechler NP Brechler</u>	<u>12-30-94</u>	<u>1600</u>	<u>XB Hulce</u>	<u>12/30/94</u>	<u>1600</u>																																	
<u>XB Hulce</u>	<u>12/30/94</u>	<u>1630</u>	<u>[Signature]</u>	<u>12-30-94</u>	<u>1630</u>																																	
Final Sample Disposition																																						
Disposal Method:	Disposed by:	Date/Time:																																				
Comments:																																						

**Westinghouse
Hanford Company****CHAIN OF CUSTODY****WHC 008090**

Custody Form Initiator J. A. Edwards-PNL

Telephone (509) 373-0141
Page 85-3009 / FAX 376-0418

Company Contact R. D. Mahon-WHC

Telephone (509) 373-1101
Page 85-9656 / FAX 373-3193Project Designation/Sampling Locations 200 East Tank Farm
241-BX-104 Tank Vapor Sample SAF S4089
(VSS Truck)Collection date 12 - 30 - 94
Preparation date 12 - 22 - 94

Ice Chest No.

Field Logbook No. WHC-~~N-447-4~~

Bill of Lading/Airbill No. N/A

Offsite Property No. N/A

Method of Shipment Government Truck

Shipped to PNL

Sample Job # S 4089

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification

S4089 - A01 . 005 ~	Ambient Air SUMMA #1 Upwind BX-104 (PNL)
S4089 - A02 . 007 ~	Ambient Air SUMMA #2 Through Port 15 (PNL)
S4089 - A04 . 045 ~	SUMMA #3 Port 11 (OGI)
S4089 - A05 . 046 ~	SUMMA #4 Port 13 (OGI)
S4089 - A06 . 047 ~	SUMMA #5 Port 15 (OGI)
S4089 - A07 . 077 ~	SUMMA #6 Port 12 (PNL)
S4089 - A08 . 078 ~	SUMMA #7 Port 14 (PNL)
S4089 - A09 . 079 ~	SUMMA #8 Port 16 (PNL)

[] Field Transfer of Custody			[] Chain of Possession (Sign and Print Names)		
Relinquished By	Date	Time	Received By	Date	Time
J. A. Edwards	12-27-94	1350	T. B. Utecht / T. B. Utecht	12-27-94	1350
T. B. Utecht / T. B. Utecht	1-5-95	1120	A. Edwards / A. Edwards	1-5-95	1120

Final Sample Disposition

Comments:

	<u>PNL (only) Checklist</u>	<u>Pick-up / Delivery</u>	<u>Comments:</u>
0	Media labeled and checked?	(Y) N	
0	Letter of instruction?	(Y) N	
0	Media in good condition?	(Y) N / (Y) N	
0	COC info/signatures complete?	(Y) N / (Y) N	
0	Sorbents shipped on ice?	Y/N / (Y) N	
0	Rad release stickers on samples?	/ (Y) N	
0	Activity report from 222S?	/ (Y) N	
0	COC copy for LRB, RIDS filed?	/ (Y) N	
0	COC copy for sorbent follow-on?	/ (Y) N/A	
	POC (16)	POC (16)	

Westinghouse
Hanford Company

CHAIN OF CUSTODY

WHC 008091

Custody Form Initiator J. A. Edwards-PNL

Telephone (509) 373-0141

Page 85-3009 / FAX 376-0418

Company Contact R. D. Mahon-WHC

Telephone (509) 373-1101

Page 85-9656 / FAX 373-3193

Project Designation/Sampling Locations 200 East Tank Farm
241-BX-104 Tank Vapor Sample SAF S4089
(VSS Truck)

Collection date 12 - 30 - 94

Preparation date 12 - 09 - 94

Ice Chest No.

Field Logbook No. WHC-~~N~~-~~4424~~

Bill of Lading/Airbill No. N/A

Offsite Property No. N/A

Method of Shipment Government Truck

Shipped to PNL

Sample Job # 5-4087

Possible Sample Hazard/Remarks Unknown at time of sampling

Sample Identification

S4089 - A26 . V36'	NH ₃ /NO _x /H ₂ O (Trap # 1) Line # 9
S4089 - A27 . V37'	NH ₃ /NO _x /H ₂ O (Trap # 2) Line #10
S4089 - A28 . V38'	NH ₃ /NO _x /H ₂ O (Trap # 3) Line # 8
S4089 - A29 . V39'	NH ₃ /NO _x /H ₂ O (Trap # 4) Line #10
S4089 - A30 . V40'	NH ₃ /NO _x /H ₂ O (Trap # 5) Line # 9
S4089 - A31 . V41'	NH ₃ /NO _x /H ₂ O (Trap # 6) Line #10
S4089 - A32 . V42'	NH ₃ /NO _x /H ₂ O a-b-c (Trap Trip Blank# 1)
S4089 - A33 . V43'	NH ₃ /NO _x /H ₂ O a-b-c (Trap Trip Blank# 2)
S4089 - A34 . V44'	NH ₃ /NO _x /H ₂ O a-b-c (Trap Trip Blank# 3)

[] Field Transfer of Custody		[] Chain of Possession		(Sign and Print Names)	
Relinquished By	Date	Time	Received By	Date	Time
G W Dennis <i>[Signature]</i>	12-12-94	1200	J. A. Edwards <i>[Signature]</i>	12-12-94	1200
J. A. Edwards <i>[Signature]</i>	12-12-94	1330	<i>[Signature]</i>	12-12-94	1330
<i>[Signature]</i>	1-5-95	1120	<i>[Signature]</i>	1-5-95	1120

Final Sample Disposition

Comments:

	PNL (only) Checklist	Pick-up / Delivery	Comments:
0	Media labeled and checked?	☒ Y / ☒ N	
0	Letter of instruction?	☒ Y / ☒ N	
0	Media in good condition?	☒ Y / ☒ N	
0	COC info/signatures complete?	☒ Y / ☒ N	
0	Sorbents shipped on ice?	☒ Y / ☒ N	
0	Rad release stickers on samples?	☒ Y / ☒ N	
0	Activity report from 222S?	☒ Y / ☒ N	
0	COC copy for LRB, RIDS filed?	☒ Y / ☒ N	
0	COC copy for sorbent follow-on?	☒ Y / ☒ N/A	

POC *[Signature]*POC *[Signature]*

(Revised 10/17/94 PNL)