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Accession #: D295186474

Document #: SD-WM-RPT-172

Title/Desc:

VAPOR & GAS SAMPLING OF SST 241AX103 USING THE
VAPOR SAMPLING SYSTEM

Pages: 43

STCL 4 (3)

NOV 08 1995

ENGINEERING DATA TRANSMITTAL

Page 1 of 1

1. EDT No 612767

2. To: (Receiving Organization) DISTRIBUTION	3. From: (Originating Organization) SAMPLING AND MOBILE LABS 0M624	4. Related EDT No.: N/A
5. Proj./Prog./Dept./Div.: VAPOR/HTS/SAMPLING AND MOBILE LABS	6. Cog. Engr.: RICKY MAHON 3-7437	7. Purchase Order No.: N/A
8. Originator Remarks: 241-AX-103, SAMPLING USING THE VAPOR SAMPLING SYSTEM		9. Equip./Component No.: N/A
		10. System/Bldg./Facility: M0292/WSCF
11. Receiver Remarks:		12. Major Assm. Dwg. No.: N/A
		13. Permit/Permit Application No.: N/A
		14. Required Response Date: 27 OCTOBER 95

15. DATA TRANSMITTED					(F)	(G)	(H)	(I)
(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	Approval Designator	Reason for Transmittal	Originator Disposition	Receiver Disposition
1	WHC-SD-WM-RPT-172	ALL	0	VAPOR AND GAS SAMPLING OF SINGLE-SHELL TANK 241-AX-103 USING THE VAPOR SAMPLING SYSTEM	Q	2	1	

16. KEY			
Approval Designator (F)	Reason for Transmittal (G)		Disposition (H) & (I)
E, S, O, D or N/A (see WHC-CM-3-5, Sec. 12.7)	1. Approval 2. Release 3. Information	4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)											
(G)	(H)	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M)	Reason	Disp
2	1	Cog. Eng. R.D. MAHON	<i>Ricky Mahon</i>	10/23/95	S3-27	RESOURCE CENTER			R2-12	3	
2	1	Cog. Mgr. J.D. DORIAN	<i>John J. Dorian</i>	10/23/95	S3-27	JAMES L. HUCKABY			K6-80	3	
2	1	QA E.J. STEPHAN	<i>M. C. ...</i>	10/23/95	T6-03	57-07					
3		DAVE BRATZEL			S7-21						
3		JOHN DEICHMAN			T6-03						
3		RAMPUR VISWANATH			S3-90						
3		CENTRAL FILES			A3-88						

18. Signature of ED Originator <i>John S. ...</i> Date: 10/23/95	19. Authorized Representative Date for Receiving Organization	20. Cognizant Manager <i>John J. Dorian</i> Date: 10/23/95	21. DOE APPROVAL (if required) Ctrl. No. <input type="checkbox"/> Approved <input type="checkbox"/> Approved w/comments <input type="checkbox"/> Disapproved w/comments
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RELEASE AUTHORIZATION

Document Number: WHC-SD-WM-RPT-172, REV 0

Document Title: Vapor and Gas Sampling of Single-Shell Tank 241-AX-103 Using the Vapor Sampling System

Release Date: 11/7/95

**This document was reviewed following the
procedures described in WHC-CM-3-4 and is:**

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:


Kara Broz


11/7/95

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SUPPORTING DOCUMENT

1. Total Pages *40*

2. Title

VAPOR AND GAS SAMPLING OF SINGLE-SHELL TANK 241-AX-103 USING THE VAPOR SAMPLING SYSTEM

3. Number

WHC-SD-WM-RPT-172

4. Rev No.

0

5. Key Words

241-AX-103
VSS
SUMMA
TST
SORBENT
TANK

6. Author

Name: G.S. CAPRIO

G.S. Caprio
Signature

Organization/Charge Code 0M624/EL1920

7. Abstract

THIS DOCUMENT PRESENTS SAMPLING DATA RESULTING FROM THE JUNE 21, 1995, SAMPLING OF SST 241-AX-103 USING THE VAPOR SAMPLING SYSTEM.

8. RELEASE STAMP

OFFICIAL RELEASE
BY WHC

3

DATE NOV 08 1995

Sta 4

APPROVALS

Document title: Vapor and Gas Sampling of Single-Shell Tank 241-AX-103
Using the Vapor Sampling System

Approved by: *R.A. Westberg* 10/6/95
R. A. Westberg, Field Scientist
Vapor Sampling Project
Sampling and Mobile Laboratories
Date

Approved by: *Rick Mahon* 17 OCT 95
R. D. Mahon, Project Lead
Vapor Sampling Project
Sampling and Mobile Laboratories
Date

Approved by: *D.L. Edwards* 10-23-95
D. L. Edwards, Technical Lead
Vapor Sampling Project
Sampling and Mobile Laboratories
Date

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LIST OF TERMS

CGI	Combustible Gas Indicator
COC	Chain Of Custody
DOT	U.S. Department of Transportation
GC	Gas Chromatograph
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 _x	Nitric Oxide
H ₂ O	Water Vapor
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
TOC	Total Organic Compound
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-AX-103
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-AX-103. This document presents sampling data resulting from the June 21, 1995 sampling of SST 241-AX-103. Analytical results will be presented in separate reports issued by the laboratories that supplied and analyzed the sampling media.

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-AX-103 on June 21, 1995. Mahon et al. (1994) describes in detail the VSS, its performance, and its operation. The team used the VSS to collect sorbent trap and SUMMA¹ canister headspace samples from SST 241-AX-103. The team then sent these samples to the analytical laboratories for analysis.

The VSS comprises a mobile laboratory, a hot-water-jacketed stainless-steel probe that is inserted 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 vapor mass flow, and monitors sample vapor total organic carbon (TOC) content 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

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

contain vapor-adsorbing media. A known amount of sample vapor is passed through the tube, which traps (by adsorption) virtually all the target analytes. The concentration of analytes in the vapor sampled is calculated from the quantity of analyte found in the sorbent media and the volume of vapor passed through the sorbent trap.

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 FICV-1 through FICV-9 are mounted on top of the sorbent station between the inlet and outlet valves. Controllers FICV-10 and FICV-11 are located downstream of the sorbent trap station and the in-line driers, which remove moisture from the sample vapor before it is metered. Errors associated with the mass flow controllers were determined by the Westinghouse Hanford Company (WHC) Standards Laboratory before the SST 241-AX-103 sampling event (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	Typically used Flow (stdcm ³ /min)	% Change from 647 to Actual	% Change from Datalogger to Actual
1	200	-0.7	-0.85
2	200	0.05	-0.10
3	200	-0.45	-0.60
4	200	0.05	-0.10
5	200	0.55	0.35
6	200	0.25	0.05
7	200	0.4	0.20
8	200	0.25	-1.81
9	50	-0.128	-0.27
10	200	-1.1	-1.20
11	5000	0.332	0.17

The VSS is also equipped with a gas chromatograph (GC). The Hewlett Packard 5890 Series II GC is equipped with a flame-ionization detector (FID), a 1 mL sample loop, a 10 port injection valve, a 2 meter chromatographic column,² a programmable oven, and a portable computer loaded with the HP-Chemstation² software used to control the GC. The GC is plumbed to directly transfer sample from the VSS manifold to the GC sample loop. After the sample is

² HP-Chemstation is a registered trademark of the Hewlett Packard Company, Avondale, Pennsylvania.

transferred into the sample loop and reaches equilibrium, the run is initiated manually. HP-Chemstation™ software activates the 10 port valve to transfer the sample from the sample loop to the column. The sample passes through the column and the FID generates a signal for TOC. All data is then transmitted to the computer where it is stored for further analysis.

The GC is equipped with a HP-5 column which is 2 meters long, 0.25 mm inside diameter, and which contains a 0.25 um phenyl methyl silicone phase. The GC oven is programmed to heat from 50 °C to 270 °C at a rate of approximately 70 °C per minute. Helium is the carrier gas, air and hydrogen the combustion gases, and nitrogen the make-up gas.

The GC/FID is configured to quantitatively estimate concentrations of total organic carbon. The GC/FID confirms sampling system cleanliness, ambient air background TOC concentrations during sampling, and TOC concentration of tank vapor samples. The system is multi-point calibrated at the weather station on a as available basis, the last time being January 1995. The GC/FID has displayed a high degree of stability over a period of months. For further details, see Section 3.6, Field GC/FID Results.

The sampling manifold also has a station for sampling vapor with evacuated SUMMA™ canisters. SUMMA™ canisters are stainless-steel vessels with internal surfaces that have been prepared by the SUMMA™ process, which passivates active sites on the canister walls to minimize adsorption of gases and vapors. An analytical laboratory must clean and evacuate SUMMA™ canisters before use. The evacuated canister is filled with sample vapor through a manually operated valve, which is then closed to seal the sample inside. SUMMA™ canisters essentially allow collection and transfer of whole-air samples from the sample site to an analytical laboratory where the sample is analyzed. The standard capacity of each SUMMA™ canister is 6 liters.

3.0 SAMPLING EVENT DESCRIPTION

3.1 SPECIFICATIONS

The Vapor Issue Resolution Program specifies sampling requirements in WHC-SD-WM-TP-335, Rev. 0D, *Vapor Sampling and Analysis Plan* (Homi 1995). The Sampling and Analysis Plan also specifies the types and number of samples to be collected, flow rates, and durations. These key sampling parameters are summarized on the sample log sheets 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 S5-029.

3.2 OPERATIONS AND SAMPLING PERSONNEL

Dan Bishop was the Tank Farm Operations person-in-charge, while Steve Carter was the PIC in training. The other SML vapor team members included:

- G. S. Caprio, VSS Technician
- R. D. Mahon, VSS Lead Scientist
- T. B. Utecht, VSS Technician
- R. A. Westberg, Field Scientist.

The VSS was set up at SST 241-AX-103 on June 20, 1995 and was allowed to warm up overnight. Sampling began shortly after 8:30 a.m. on June 21, 1995, and was completed by 1:30 p.m. the same day.

3.3 INDUSTRIAL HYGIENE FIELD RESULTS

Before hooking up to SST 241-AX-103, 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 measurements were verbally reported, LEL 0.0%, NH₃ 20 ppm, CO 6 ppm, O₂ 20.6%, and total organic carbon 1.5 ppm.

3.4 AMBIENT CONDITIONS

The weather the day of the sampling event, June 21, 1995 was cloudy and warm with a light breeze from the northwest. Graphs of ambient temperatures and pressures taken at the Hanford Meteorological Station, which is about 6 miles west of AX-Farm, are provided in Appendix B.

3.5 SAMPLE COLLECTION

The hot-water-jacketed sampling probe was located in Riser R9G of SST 241-AX-103. The probe length, from the sample inlet to the top of the riser flange, was 7.9 meters.

All zones of the VSS were heated to 60 °C during setup of the VSS at SST 241-AX-103 on June 20, 1995. The team stabilized the VSS temperature zones by 8:30 a.m. on June 21, 1995, and the system was ready to collect samples. Measured according to the VSS operating procedure, the pressure and temperature of SST 241-AX-103 were 992 mbar (744 torr) and 32.8 °C, respectively. The sample log sheets in Appendix A provide a complete chronology of the sample event including start and end times, flow rates, volumes, and specific sample identifiers.

Approximately 22 hours before the first samples were collected, the team began heating the VSS transfer tubing and sampling manifold. During this warmup period, the team began a purge of all vapor transfer tubing and the sampling manifold with ambient air. Before sampling tank vapors on June 21, 1995, the

team collected two SUMMA™ canister samples of ambient air, one manually 10 meters upwind of the VSS connection with SST 241-AX-103, and the other using the VSS sampling manifold. The former was collected to establish background levels of trace organic vapors, and the latter was collected to establish the cleanliness of the sampling manifold.

A leak check of the VSS sampling manifold and transfer tubing (up to the connection to the sampling probe) was performed before opening the tank probe vapor sampling valve. The system was evacuated to 282 mbar (211.8 torr) and leakage of ambient air into the system was observed by monitoring system pressure for 15 minutes. Leakage resulted in an increase of 2.1 mbar (1.6 torr) in system pressure during the 15 minute test. Given a system volume of not more than 10 L, this pressure increase corresponds to a leak rate of approximately 5.0 mL/min at a 282 mbar (211.8 torr). This leak rate was then estimated for average SUMMA™, triple sorbent trap (TST), and sorbent sampling pressures. It was found that for the SUMMA™ canisters, dilution by ambient air was approximately 0.0%, for TSTs sampled at 50 mL/min the dilution was approximately 0.3%, for TSTs sampled at 200 mL/min the dilution was approximately 0.2%, and for sorbent traps the dilution was approximately 0.2%.

The tank probe vapor sampling valve was opened and the VSS was purged with sample vapor from SST 241-AX-103 for 30 minutes at a total flow rate of 5.46 L/min. This purge was performed to flush ambient air from the system and saturate the system's active adsorption sites. Because the volume of transfer tubing and the sampling manifold upstream of the sampling devices is estimated to be no more than 10 L, this purge provided about 16.4 air turnovers in the system.

Two analytical laboratories provided sample media. Oak Ridge National Laboratory (ORNL) provided TSTs for organic vapors; and Pacific Northwest Laboratory (PNL) provided SUMMA™ canisters, TSTs, and sorbent traps for organic vapors, ammonia (NH₃), nitrogen dioxide (NO₂), and water vapor (H₂O).

3.6 FIELD GC/FID RESULTS

The GC was single point calibrated on the day of sampling using 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 displays the Field GC/FID results from the sampling of SST 241-AX-103.

Table 2. TOC Results.

Number of Runs	Description	Average TOC Concentration (ppmC)	% Standard Deviation
3	Propane	6.00	1.38
4	Ambient	2.90	0.72
4	Tank Vapor	3.20	1.28

3.7 RADIATION SCREENING

Samples are unconditionally released from the SST farm in accordance with 1995-33300-RSP-03, *Release of Vapor Sampling Equipment* (WHC 1995c). 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 2,000 combined pCi/g of beta-gamma activity and alpha activity. Samples exceeding these DOT limits may be shipped as radioactive material if the samples do not exceed the following laboratory acceptance criteria:

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 sampling devices from radioactive particulates, all sample vapor for the June 21, 1995, SST 241-AX-103 vapor sampling event 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 any time tank 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. Moisture from the tank vapors was collected in a silica gel trap through one of the sorbent station ports and analyzed for tritiated water. SST 241-AX-103 filter and silica gel analysis results are shown in Table 3. SML scientists use the activity results in Table 3 to calculate pCi/g of sample media. SML maintains this information in the project-specific file. The results in Table 3 indicate that the samples collected from SST 241-AX-103 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 filter (box)	S5029-A51.OU1	Total Alpha = 747 Total Beta = 920 GEA = 152 (²⁰⁸ Tl) GEA = 446 (²¹² Pb)	= 2.2 = 2.7 = 0.5 = 1.3
Downstream HEPA filter (box)	S5029-A52.OD1	Total Alpha = <0.534 Total Beta = 2.39 GEA = <detectable	= <0.001 = 0.009 = <detectable
Upstream HEPA filter (VSS)	S5029-A53.OU2	Total Alpha = 0.645 Total Beta = 3.1 GEA = <detectable	= 0.002 = 0.009 = <detectable
Downstream HEPA filter (VSS)	S5029-A54.OD2	Total Alpha = 0.717 Total Beta = <2.33 GEA = 27 (¹³⁷ Cs)	= 0.002 = <0.007 = 0.08
Tritium trap	S5029-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 336 L.

^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 kept in a custody locked storage area 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 and 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 TSTs were received, inventoried against the COC forms, and the "received by" block on the COC form was signed by SML. They were maintained at 4 ± 2 °C before and after the sampling event in the storage area refrigeration unit.

The TSTs were shipped back to ORNL after the sampling event using offsite property control (OPC W95-0-0435-17). Table 4 lists the sample identifiers, sample types, and COC form numbers for all ORNL samples. The samples were delivered to shipping on June 29, 1995 with instructions to ship by Federal Express, next-day delivery.

Table 4. Oak Ridge National Laboratory Samples.

Sample Identifier	Sample Type	COC Number
S5029-A7.805	TST	006767
S5029-A8.653	TST	006767
S5029-A9.849	TST	006767
S5029-A10.999	TST field blank	006767
S5029-A11.988	TST	006767
S5029-A12.989	TST	006767
S5029-A13.990	TST	006767
S5029-A14.991	TST	006767
S5029-A15.992	TST	006767
S5029-A16.993	TST	006767
S5029-A17.987	TST field blank	006767
S5029-A18.994	TST	006767
S5029-A19.995	TST	006767
S5029-A20.996	TST	006767
S5029-A21.997	TST trip blank	006767
S5029-A22.998	TST trip blank	006767

PNL supplied sorbent chain traps, TSTs, and SUMMA™ canisters, including COC forms. These sampling devices were picked up from PNL by SML and transported in a government vehicle to a custody locked storage area. The sorbent trains were maintained at 4 ± 2 °C before and after the sampling event in storage area refrigeration unit.

After sampling, the PNL sorbent tubes and SUMMA™ canisters were transported by government vehicle directly to PNL and delivered to J. A. Edwards on June 26, 1995. Table 5 lists the sample identifiers, sample types, and COC form numbers for all PNL samples.

Table 5. Pacific Northwest Laboratory Samples.

Sample Identifier	Sample Type	COC Number
S5029-A01.265	Ambient upwind SUMMA™	008894
S5029-A02.266	Ambient SUMMA™ (VSS)	008894
S5029-A04.267	SUMMA™	008894
S5029-A05.268	SUMMA™	008894
S5029-A06.269	SUMMA™	008894
S5029-A23.U09	NH ₃ /NO _x /H ₂ O sorbent	008895
S5029-A24.U10	NH ₃ /NO _x /H ₂ O sorbent	008895
S5029-A25.U11	NH ₃ /NO _x /H ₂ O sorbent	008895
S5029-A26.U12	NH ₃ /NO _x /H ₂ O sorbent	008895
S5029-A27.U13	NH ₃ /NO _x /H ₂ O sorbent	008895
S5029-A28.U14	NH ₃ /NO _x /H ₂ O sorbent	008895
S5029-A29.U15	NH ₃ /NO _x /H ₂ O trip blank	008895
S5029-A30.U16	NH ₃ /NO _x /H ₂ O trip blank	008895
S5029-A31.U17	NH ₃ /NO _x /H ₂ O trip blank	008895
S5029-A32.U24	NH ₃ /NO _x /H ₂ O field blank	008895
S5029-A33.U25	NH ₃ /NO _x /H ₂ O field blank	008895
S5029-A34.U26	NH ₃ /NO _x /H ₂ O field blank	008895
S5029-A35.064	PNL TST	008905
S5029-A36.065	PNL TST	008905
S5029-A37.066	PNL TST	008905
S5029-A38.067	PNL TST field blank	008905
S5029-A39.068	PNL TST	008905
S5029-A40.069	PNL TST	008905
S5029-A41.070	PNL TST	008905
S5029-A42.071	PNL TST	008905
S5029-A43.072	PNL TST	008905
S5029-A44.073	PNL TST	008905
S5029-A45.074	PNL TST field blank	008905
S5029-A46.075	PNL TST	008905
S5029-A47.076	PNL TST	008905
S5029-A48.077	PNL TST	008905
S5029-A49.078	PNL TST trip blank	008905
S5029-A50.079	PNL TST trip blank	008905

From the time that samples are received by SML until they are shipped back to the analytical laboratory, all COCs are maintained by SML in accordance with WHC-IP-1127-1.3, *Chain-of-Custody/Special Analysis Request for RCRA and CERCLA Protocol Samples* (WHC 1995a). Copies of the completed COC forms for this sampling event are included in Appendix C.

5.0 QUALITY ASSURANCE AND CONTROLS

5.1 VAPOR SAMPLING SYSTEM CLEANING

Immediately before sampling of SST 241-AX-103, the VSS manifold and vapor sample transfer tubing was heated to 60 °C and ambient air was purged through the system for 22 hours. Also, 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 significant level of contaminants was detected. A second ambient air GC/FID run confirmed that the VSS manifold and transfer tubing was free of organic remnant residue down to ambient levels. A SUMMA™ canister ambient air sample was then collected to confirm by laboratory analysis that the VSS sampling manifold was free of trace organic contaminants (or to determine which contaminants were present and at what concentration), as discussed in Section 3.5. For further details, refer to Appendix E of WHC-IP-1127-4.10 (WHC 1995b) and the project-specific file located with SML.

In compliance with LO-080-405/A0, *Vapor Space Probe Cleaning Procedure* (WHC 1993) the team cleaned the hot-water-jacketed probe before it was installed in SST 241-AX-103. 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 then heated to 90 °C, and dry air is passed through the probe to evaporate the solvents. Before the probes are released, the team ensures by a hand-held organic vapor meter that the total organic concentration in the sample line is below 1 ppmv.

5.2 INSTRUMENT CALIBRATION

Instruments located in the VSS are calibrated on an annual basis at the WHC Standards Laboratory. VSS instrumentation calibration data, maintained in files by SML, are summarized in Table 6. According to the calibration schedule shown in Table 6, all instrumentation was within its calibration period during the SST 241-AX-103 sampling event.

Table 6. Calibration Data.

Element	Calibration Date	Expiration Date	WHC Standards Laboratory Code
FICV-1	5/08/95	5/08/96	518-28-03-012
FICV-2	5/08/95	5/08/96	518-28-03-008
FICV-3	5/08/95	5/08/96	518-28-03-004
FICV-4	5/08/95	5/08/96	518-28-03-006
FICV-5	5/08/95	5/08/96	518-28-03-011
FICV-6	5/08/95	5/08/96	518-28-03-009
FICV-7	5/08/95	5/08/96	518-28-03-014
FICV-8	5/08/95	5/08/96	518-28-03-013
FICV-9	5/08/95	5/08/96	518-28-03-007
FICV-10	5/08/95	5/08/96	518-28-03-010
FICV-11	5/08/95	5/08/96	518-28-03-005
PE-1	5/04/95	5/04/96	518-80-02-005
PE-2	5/04/95	5/04/96	518-80-02-006
PE-3	5/04/95	5/04/96	518-80-02-008
PE-4	5/04/95	5/04/96	518-80-02-007
PD-1	5/04/95	5/04/96	518-80-02-004
PD-2	5/04/95	5/04/96	518-80-02-003
Temperature Control System	3/30/95	3/30/96	804-67-74-009

5.3 BLANK SAMPLES

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

Field blanks are sampling devices similar to trip blanks. They are prepared and handled in the same manner as the sampling media, but no tank vapors are drawn through them.

Spiked blanks are prepared as regular sampling media but also contain a known amount of special analyte. Tank vapors are drawn through these blanks and

they are handled and analyzed just like any other sample. 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 or in the transfer tubing or sampling manifold of the VSS immediately before sampling operations.

Tables 4 and 5 also list sample blanks used during the sampling of SST 241-AX-103.

6.0 ANOMALIES

All samples were collected in accordance with the Tank Characterization Plan (TCP) and WHC-IP-1127-4.10, *Collection of Parallel Sorbent Tube and SUMMA Canister Samples Using the Vapor Sampling System* (1995b). One glass TST (sample number S5029-A46.070) was broken while removing it from the sampling manifold. The manifold was carefully cleaned until no visible remnants of TST packing material was evident.

7.0 REFERENCES

- 49 CFR 100-177, 1992, "Transportation," *Code of Federal Regulations*, as amended.
- Homi, C. S., 1995, *Vapor Sampling and Analysis Plan*, WHC-SD-WM-TP-335, Rev. 0D, Westinghouse Hanford Company, Richland, Washington.
- Mahon, R. D., C. M. Jones, and M. S. Story, 1994 (draft), *Evaluation of the Capabilities and Use of the Vapor Sampling System for Tank Headspace Sampling and Characterization*, SD-WM-RPT-094, Westinghouse Hanford Company, Richland, Washington.
- WHC, 1995a, *Chain-of-Custody/Special Analysis Request for RCRA and CERCLA Protocol Samples*, Procedure WHC-IP-1127-1.3, Rev. 1, Westinghouse Hanford Company, Richland, Washington.
- WHC, 1995b, *Collection of SUMMA Canisters and Sorbent Tube Samples Using the Vapor Sampling System*, Procedure WHC-IP-1127-4.10, Westinghouse Hanford Company, Richland, Washington.
- WHC, 1995c, *Release of Vapor Sampling Equipment*, Procedure 1995-33300-RSP-03, Westinghouse Hanford Company, Richland, Washington.
- WHC, 1993, *Vapor Space Probe Cleaning Procedure*, Procedure LO-080-405/A0, Westinghouse Hanford Company, Richland, Washington.

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APPENDIX A
SAMPLE LOG SHEETS

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Waste Tank
241-AX-103

Date: 6/21/95

VSS Personnel: Westberg, Caprio, Mahon, Utecht

Trailer Personnel: Utecht

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

Ensure HEPA filters are installed

Ensure connection to sample probe

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

Tank Temperature 32.8 C

GC Standard Runs

GC Ambient Air Runs through port 10

WHC Sample ID	PNL	ORNL	Port	Description	Desired		Actual		Actual Total	Actual Total Flow	Actual Total Time (min.)	Actual Total Liters
					Flow Rate SCCM	Duration (min.)	Flow Rate SCCM	Start Time				
Purge with ambient air for 30 min.												
S5029-A01. 265	265			Overnight	5500	30	165000	5500	6/20-10:11	6/21-8:32	1341	7.376
GC Run #1 Ambient air/Cleanliness check												
S5029-A02. 266	266	15		AMBIENT #2		1		8:54	9:00	9:01	1	
GC RUN#2 Ambient air												
LEAK CHECK(APPENDIX A) Leak Rate: <u>6.4 torr/hr</u>												
Purge with tank air for 30 min												
					5500	30	165000	5500	9:12	9:27	30	165.00
Measure tank pressure												
									10:11			
S5029-A03. 0T1	T-2065 (222-S)	8		Tritium Trap	200	5	1000	200.00	10:14	10:19	5	1.00
GCRUN #3 (Tank run #1)												
S5029-A04. 267	267	11		SUMMA #3		1			10:27	10:28	1	6.00
S5029-A05. 268	268	13		SUMMA #4		1			10:31	10:32	1	6.00
S5029-A06. 269	269	15		SUMMA #5		1			10:35	10:36	1	6.00
GCRUN #4 (Tank run #2)												
									10:38			

Waste Tank
241-AX-103

WHC Sample ID	PNL ORNL Sample ID	Port Valve #	Description	Desired		Actual		Desired		Actual		Desired		Actual	
				Flow Rate SCCM	Duration (min.)	Flow Rate SCCM	Flow Rate SCCM	Total Flow SCCM	Flow Rate SCCM	Start Time	End Time	Total Time (min.)	Total Flow SCCM	Flow Rate SCCM	Total Time (min.)
S5029-A07.805	TST#805	1	TST #1	50	4	50.00	10:55	200	50.00	10:55	10:59	4	200	50.00	0.20
S5029-A35.064	PNL TST#064	2	PNL TST #1	50	4	50.00	10:55	200	50.00	10:55	10:59	4	200	50.00	0.20
S5029-A08.653	TST#653	3	TST #2	50	4	50.00	10:55	200	50.00	10:55	10:59	4	200	50.00	0.20
S5029-A36.065	PNL TST#065	4	PNL TST #2	50	4	50.00	10:55	200	50.00	10:55	10:59	4	200	50.00	0.20
S5029-A09.849	TST#849	5	TST #3	50	4	50.00	10:55	200	50.00	10:55	10:59	4	200	50.00	0.20
S5029-A37.066	PNL TST#066	6	PNL TST #3	50	4	50.00	10:55	200	50.00	10:55	10:59	4	200	50.00	0.20
S5029-A11.988	TST#988	7	TST #4	50	4	50.00	10:55	200	50.00	10:55	10:59	4	200	50.00	0.20
S5029-A39.068	PNL TST#068	8	PNL TST #4	50	4	50.00	10:55	200	50.00	10:55	10:59	4	200	50.00	0.20
S5029-A12.989	TST#989	1	TST #5	200	5	200.00	11:16	1000	200.00	11:16	11:21	5	1000	200.00	1.00
S5029-A40.069	PNL TST#069	2	PNL TST #5	200	5	200.00	11:16	1000	200.00	11:16	11:21	5	1000	200.00	1.00
S5029-A13.990	TST#990	3	TST #6	200	5	200.00	11:16	1000	200.00	11:16	11:21	5	1000	200.00	1.00
S5029-A41.070	PNL TST#070	4	PNL TST #6	200	5	200.00	11:16	1000	200.00	11:16	11:21	5	1000	200.00	1.00
S5029-A14.991	TST#991	5	TST #7	200	5	200.00	11:16	1000	200.00	11:16	11:21	5	1000	200.00	1.00
S5029-A42.071	PNL TST#071	6	PNL TST#7	200	5	200.00	11:16	1000	200.00	11:16	11:21	5	1000	200.00	1.00
S5029-A15.992	TST#992	7	TST #8	200	5	196.60	11:16	1000	196.60	11:16	11:21	5	1000	196.60	0.98
S5029-A43.072	PNL TST#072	8	PNL TST #8	200	5	194.40	11:16	1000	194.40	11:16	11:21	5	1000	194.40	0.97

Waste Tank
241-AX-103

WHC Sample ID	PNL ORNL Sample ID	Port Valve #	Description	Desired		Actual		Desired Total Flow SCCM	Actual		Actual Total Flow Liters	
				Flow Rate SCCM	Duration (min.)	Flow Rate SCCM	Start Time		End Time	Time (min.)		
S5029-A16.993	TST#993	1	TST # 9	200	20	200.00	11:58	4000	200.00	12:18	20	4.00
S5029-A44.073	PNL TST#073	2	PNL TST # 9	200	20	200.00	11:58	4000	200.00	12:18	20	4.00
S5029-A18.994	TST#994	3	TST # 10	200	20	200.00	11:58	4000	200.00	12:18	20	4.00
S5029-A46.075	PNL TST#075	4	PNL TST # 10	200	20	200.00	11:58	4000	200.00	12:18	20	4.00
S5029-A19.995	TST#995	5	TST # 11	200	20	200.00	11:58	4000	200.00	12:18	20	4.00
S5029-A47.076	PNL TST#076	6	PNL TST # 11	200	20	200.00	11:58	4000	200.00	12:18	20	4.00
S5029-A20.996	TST#996	7	TST # 12	200	20	195.70	11:58	4000	195.70	12:18	20	3.91
S5029-A48.077	PNL TST#077	8	TST # 12	200	20	198.00	11:58	4000	198.00	12:18	20	3.96
S5029-A10.999	TST#999		TST FIELD BLANK #1				12:24			12:25		
S5029-A17.987	TST#987		TST FIELD BLANK #2				12:24			12:25		
S5029-A38.067	PNL TST#067		PNL TST FIELD BLANK #1				12:28			12:29		
S5029-A45.074	PNL TST#074		PNL TST FIELD BLANK #2				12:28			12:29		
GCRUN#5	(Tank run #3)						12:37					
S5029-A23.U09	U09	1	NH3/NOx/H2O #1	200	15	200.00	12:49	3000	200.00	13:04	15	3.00
S5029-A24.U10	U10	2	NH3/NOx/H2O #2	200	15	200.00	12:49	3000	200.00	13:04	15	3.00
S5029-A25.U11	U11	3	NH3/NOx/H2O #3	200	15	200.00	12:49	3000	200.00	13:04	15	3.00
S5029-A26.U12	U12	4	NH3/NOx/H2O #4	200	15	200.00	12:49	3000	200.00	13:04	15	3.00
S5029-A27.U13	U13	5	NH3/NOx/H2O #5	200	15	200.00	12:49	3000	200.00	13:04	15	3.00
S5029-A28.U14	U14	6	NH3/NOx/H2O #6	200	15	200.00	12:49	3000	200.00	13:04	15	3.00
S5029-A32.U24	U24		NH3/NOx/H2O FIELD BLANK #1				13:02			13:03		
S5029-A33.U25	U25		NH3/NOx/H2O FIELD BLANK #2				13:05			13:06		
S5029-A34.U26	U26		NH3/NOx/H2O FIELD BLANK #3				13:05			13:06		
GCRUN#6	(Tank run # 4)						13:07					

TOTAL TANK GAS USED DURING SAMPLING RUNS

78.43

Waste Tank
241-AX-103

WHC Sample ID	PNL	ORNL	Sample ID	Port	Description	Desired Flow Rate	Desired Duration (min.)	Desired Total Flow	Actual Flow Rate	Actual Start Time	Actual End Time	Actual Total Time (min.)	Actual Total Flow
				Valve #		SCCM		SCCM	SCCM				Liters

S5029-A51.0U1	T-2066	(222S)			Upstream HEPA(box)								
S5029-A52.0D1	T-2067	(222S)			Downstream HEPA(box)								
S5029 A53.0U2	T-2068	(222S)			Upstream HEPA(VSS)								
S5029-A54.0D2	T-2069	(222S)			Downstream HEPA (VSS)								

Trip Blanks (DO NOT EXPOSE)

S5029-A21.997	TST#997				TST TRIP #1								
S5029-A22.998	TST#998				TST TRIP #2								
S5029-A29.U15	U15				NH3/NOx/H2O TRIP #1								
S5029-A30.U16	U16				NH3/NOx/H2O TRIP #2								
S5029-A31.U17	U17				NH3/NOx/H2O TRIP #3								
S5029-A49.078	PNL TST#078				PNL TST TRIP #1								
S5029-A50.079	PNL TST#079				PNL TST TRIP #2								

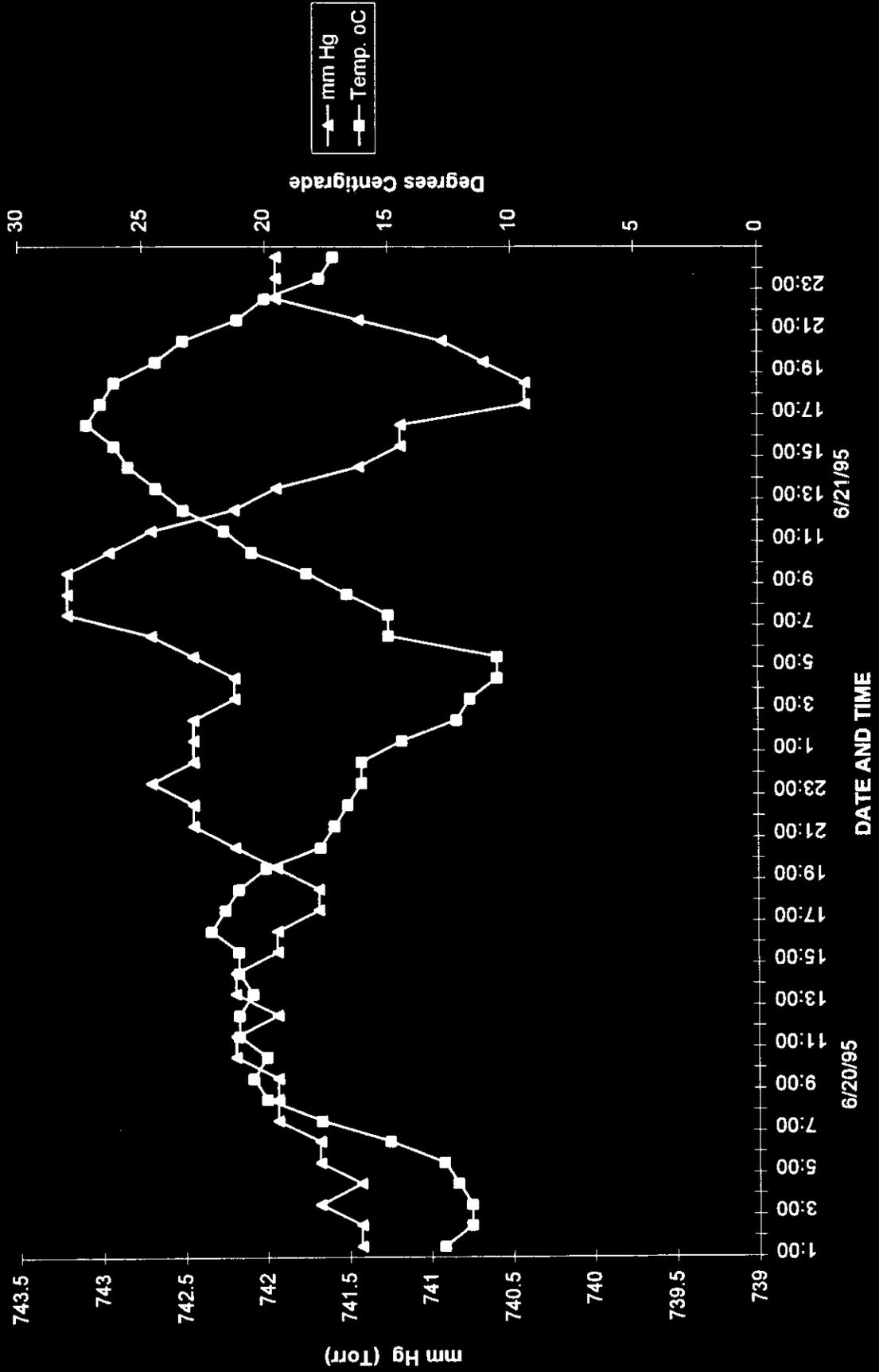
AX-103
TOTAL TANK VAPOR USED

	NUMBER OF EVENTS	TIME IN MINUTES	VOLUME IN SCCM	TOTAL VOLUME, LITERS
LEAK CHECKS	1	0	5600	5.60
TANK PURGE PUMP DOWNS	3	1	5600	16.80
TANK PURGE TIME (From Spreadsheet)	1	30	5450	165.00
GC PURGES	4	2	5000	40.00
SUMMA PURGES	3	2	5000	30.00
ALL SAMPLES COLLECTED				78.43
TOTAL FOR TANK SAMPLING RUN				335.83

APPENDIX B
AMBIENT CONDITIONS

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WEATHER DURING VSS SAMPLING OF 241-AX-103



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APPENDIX C
CHAIN-OF-CUSTODY FORMS

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CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Westinghouse Hanford Company

Page 1 of 1

Collector: **T.B. Cuffelt**
 Project Designation: **241-Ax**
 Telephone No.: **373-7437**
 Company Contact: **R.D. McLeod**
 SAF No.: **SS029**
 Method of Shipment: **Govt Vehicle # 930**
 Is Chain No.: **N/A**
 Field Logbook No.: **WHC-N-647 no**
 Bill of Lading/AF BR No.: **N/A**
 Shipped To: **222-S LABS**
 Office Property No.: **N/A**

Preservative	Type of Container	No. of Containers(s)	Volume
NONE	Petri Dish	(5)	47ml

Special Handling and/or Storage: **NONE**

SAMPLE ANALYSIS

Sample No.	Matrix*	Date Sampled	Time Sampled
SS029-0T1	Silica Gel	6-21-55	T-2065
SS029-0A1	Hepa		T-2066
SS029-0D1	Hepa		T-2067
SS029-0A2	Hepa		T-2068
SS029-0D2	Hepa		T-2069

CHAIN OF POSSESSION

Received By	Date/Time	Received By	Date/Time
T.B. Cuffelt	6:25 0880	SP Dubois	6:25-0890

Received By: _____ Date/Time: _____
 Received By: _____ Date/Time: _____
 Received By: _____ Date/Time: _____

SPECIAL INSTRUCTIONS: **Please fax info to Tim Cuffelt at 373-7076. Thanks**
X = Silica Gel Hepa-filter

Received By: _____ Date/Time: _____
 Disposed By: _____ Date/Time: _____
 Disposal Method: _____
 Original - Sample Yellow - Sampler

ORNL	CHAIN OF CUSTODY (Rev 1)	# 006767
-------------	---------------------------------	-----------------

Custody Form Initiator Amy Dindal	Sampling Location 241-AX-103 (VSS)
ORNL Contact Roger Jenkins	Telephone (615) 576-8594
Method of Shipment Federal Express	Shipped to Rick Mahon

Sample Identification

WHC Identifier	TST #	Trap Type	Received at WHC (✓)	Received at ORNL (✓)
S5029-A7.805	805	SAMPLE	/	✓
S5029-A8.653	653	SAMPLE	/	✓
S5029-A9.849	849	SAMPLE	/	✓
S5029-A11.988	988	SAMPLE	/	✓
S5029-A12.980	989	SAMPLE	/	✓
S5029-A13.990	990	SAMPLE	/	✓
S5029-A14.991	991	SAMPLE	/	✓
S5029-A15.992	992	SAMPLE	/	✓
S5029-A16.993	993	SAMPLE	/	✓
S5029-A18.994	994	SAMPLE	/	✓
S5029-A19.995	995	SAMPLE	/	✓
S5029-A20.996	996	SAMPLE	/	✓
S5029-A21.997	997	TRIP BLANK	/	✓
S5029-A22.998	998	TRIP BLANK	/	✓
S5029-A10.999	999	FIELD BLANK	/	✓
S5029-A17.987	987	FIELD BLANK	/	✓

COMMENTS: Sample Date: 6-25-95 Logbook No: WHC-N-647-10

1. Refrigerator failed from 1100 5 MAY 95 to 0800 8 MAY. Temperature recorder shows that 72 degrees Fahrenheit was reached and held for most of this time. Amy Dindal was contacted and informed. Amy directed that sample media is still good and can be used to sample. 11 MAY 95 RM

Field Transfer of Custody Chain of Possession (Sign and Print Names)

Relinquished By	Date	Time	Received By	Date	Time
A B Dindal / A B Dindal	4/27/95	758	T. B. Utkin / T. B. Utkin	4-28-95	1400
T. B. Utkin / T. B. Utkin	4/28/95	1300	A B Dindal / A B Dindal	6/30/95	1511
	6-25-95				

Cooler Temperature Status

Temperature (°C)	Min	Max
When Shipped from ORNL	-1°	3°
When Received at WHC	-3°	5°
When Shipped from WHC	3°	5°
When Received at ORNL	-10°	7°

**Battelle
Pacific Northwest Lab**

CHAIN OF CUSTODY

WHC 008894

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) 373-7437
Page 85-9656 / FAX 373-7076

Project Designation/Sampling Locations 200 West Tank Farm
241-AX-103 Tank Vapor Sample SAF S5-029
(VSS Truck)

Collection date 06 - 21 - 95
Preparation date 06 - 14 - 95

Ice Chest No.

Field Logbook No. WHC-~~H~~-647-10

Bill of Lading/Airbill No. N/A

Offsite Property No. N/A

Method of Shipment Government Truck

Shipped to PNL

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification

S5-029 - A01 . 265 -	Ambient Air SUMMA #1 Upwind of AX-103
S5-029 - A02 . 266 -	Ambient Air SUMMA #2 Through Port 15
S5-029 - A04 . 267	SUMMA #3 Port 11
S5-029 - A05 . 268	SUMMA #4 Port 13
S5-029 - A06 . 269	SUMMA #5 Port 15

[] Field Transfer of Custody		[] Chain of Possession		(Sign and Print Names)	
Relinquished By	Date	Time	Received By	Date	Time
J A Edwards <i>J A Edwards</i>	06-14-95	1050	Tim Utecht <i>T Utecht</i>	06-14-95	1050
Tim Utecht / <i>T Utecht</i>	6-26-95	1030	J A Edwards / <i>J A Edwards</i>	06-26-95	1030

Final Sample Disposition

Comments:

- | PNL (only) Checklist | Pick-up / Delivery | Comments: |
|------------------------------------|-------------------------------|-----------|
| 0 Media labeled and checked? | <i>Q</i> / IN | |
| 0 Letter of instruction? | <i>Q</i> / IN | |
| 0 Media in good condition? | <i>Q</i> / IN / <i>Q</i> / IN | |
| 0 COC info/signatures complete? | <i>Q</i> / IN / <i>Q</i> / IN | |
| 0 Rad release stickers on samples? | <i>Q</i> / IN / <i>Q</i> / IN | |
| 0 Activity report from 222S? | <i>Q</i> / IN / <i>Q</i> / IN | |
| 0 COC copy for LRB, RIDS filed? | <i>Q</i> / IN / <i>Q</i> / IN | |

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

(Revised 10/17/94 PNL)

**Battelle
Pacific Northwest Lab**

CHAIN OF CUSTODY

WHC # 008895

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) 373-7497
Page 85-9656 / FAX 373-7076

Project Designation/Sampling Locations 200 West Tank Farm
241-AX-103 Tank Vapor Sample SAF S5-029
(VSS Truck)

Collection date 06 - ²¹ 7^{PM} 95 *6-21-95*
Preparation date 04 - 27 - 95

Ice Chest No.

Field Logbook No. WHC- *N* - *697-10*

Bill of Lading/Airbill No. N/A

Offsite Property No. N/A

Method of Shipment Government Truck

Shipped to PNL

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification

S5-029 - A23 . U09 -	NH ₃ /NO _x /H ₂ O (Sorbent Trap # 1)	Line # 9
S5-029 - A24 . U10 -	NH ₃ /NO _x /H ₂ O (Sorbent Trap # 2)	Line # 10
S5-029 - A25 . U11 -	NH ₃ /NO _x /H ₂ O (Sorbent Trap # 3)	Line # 8
S5-029 - A26 . U12 -	NH ₃ /NO _x /H ₂ O (Sorbent Trap # 4)	Line # 10
S5-029 - A27 . U13 -	NH ₃ /NO _x /H ₂ O (Sorbent Trap # 5)	Line # 9
S5-029 - A28 . U14 -	NH ₃ /NO _x /H ₂ O (Sorbent Trap # 6)	Line # 10
S5-029 - A29 . U15	NH ₃ /NO _x /H ₂ O (Trap Trip Blank # 1)	
S5-029 - A30 . U16	NH ₃ /NO _x /H ₂ O (Trap Trip Blank # 2)	
S5-029 - A31 . U17	NH ₃ /NO _x /H ₂ O (Trap Trip Blank # 3)	
S5-029 - A32 . U24 -	NH ₃ /NO _x /H ₂ O (Trap Field Blank # 1)	Line # 8
S5-029 - A33 . U25 -	NH ₃ /NO _x /H ₂ O (Trap Field Blank # 2)	Line # 9
S5-029 - A34 . U26 -	NH ₃ /NO _x /H ₂ O (Trap Field Blank # 3)	Line # 10

Field Transfer of Custody

Chain of Possession

(Sign and Print Names)

Relinquished By	Date	Time	Received By	Date	Time
G W Dennis <i>G.W. Dennis</i>	06-12-95	1335	J A Edwards <i>J.A. Edwards</i>	06-12-95	1335
J A Edwards <i>J.A. Edwards</i>	06-14-95	1040	Tim Utecht <i>T. R. Utecht</i>	06-14-95	1040
Tim Utecht <i>T. R. Utecht</i>	6-26-95	1030	J A EDWARDS <i>J.A. Edwards</i>	6-26-95	1030

Final Sample Disposition

Comments:

PNL (only) Checklist	Pick-up / Delivery	Comments:
Media labeled and checked?	<input checked="" type="checkbox"/> Y / <input type="checkbox"/> N	
Letter of instruction?	<input checked="" type="checkbox"/> Y / <input type="checkbox"/> N	
Media in good condition?	<input checked="" type="checkbox"/> Y / <input type="checkbox"/> N	
COC info/signatures complete?	<input checked="" type="checkbox"/> Y / <input type="checkbox"/> N	
Sorbents shipped on ice? (<5°C)	<input checked="" type="checkbox"/> Y / <input type="checkbox"/> N	
Rad release stickers on samples?	<input checked="" type="checkbox"/> Y / <input type="checkbox"/> N	
Activity report from 222S?	<input checked="" type="checkbox"/> Y / <input type="checkbox"/> N	
COC copy for LRB, RIDS filed?	<input checked="" type="checkbox"/> Y / <input type="checkbox"/> N	
COC copy for sorbent follow-on?	<input checked="" type="checkbox"/> Y / <input type="checkbox"/> N/A	
	POC <input checked="" type="checkbox"/> (1)	POC <input checked="" type="checkbox"/> (2)

(Revised 10/17/94 PNL)

Battelle Pacific Northwest Laboratory

CHAIN OF CUSTODY

WHC 008905

Custody Form Initiator J. A. Edwards - PNL

Telephone (509) 373-0141
Page 85-3009 / P8-08 / FAX 376-0418

Company Contact R. D. Mahon - WHC

Telephone (509) 373-7437
Page 85-9656 / S3-27 / FAX 373-7076

Project Designation/Sampling Locations 200 West Tank Farm
241-AX-103 Tank Vapor Sample SAF S5-029
(VSS Truck)

Collection date 06 - 21 - 95
Preparation date 06 - 09 - 95

Ice Chest No.

Field Logbook No. WHC-N-647-10

Erco Hi/Lo thermometer No. PNL-T-002

Bill of Lading/Airbill No. N/A

Offsite Property No. N/A

Method of Shipment Government Truck

Shipped to WHC

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification

S5-029 - A35 . 064	Collect PNL Triple Sorbent Trap (TST) Sample # 1	Line # <u>2</u>
S5-029 - A36 . 065	PNL TST Sample # 2	Line # <u>3</u>
S5-029 - A37 . 066	PNL TST Sample # 3	Line # <u>4</u>
S5-029 - A38 . 067	Open, close & store PNL TST Field Blank # 1	In VSS truck
S5-029 - A39 . 068	PNL TST Sample # 4	Line # <u>8</u>
S5-029 - A40 . 069	PNL TST Sample # 5	Line # <u>2</u>
S5-029 - A41 . 070	PNL TST Sample # 6	Line # <u>4</u>
S5-029 - A42 . 071	PNL TST Sample # 7	Line # <u>6</u>
S5-029 - A43 . 072	PNL TST Sample # 8	Line # <u>8</u>
S5-029 - A44 . 073	PNL TST Sample # 9	Line # <u>2</u>
S5-029 - A45 . 074	Open, close & store PNL TST Field Blank # 2	In VSS truck
S5-029 - A46 . 075	PNL TST Sample # 10	Line # <u>4</u>
S5-029 - A47 . 076	PNL TST Sample # 11	Line # <u>6</u>
S5-029 - A48 . 077	PNL TST Sample # 12	Line # <u>8</u>
S5-029 - A49 . 078	Store PNL TST Trip Blank # 1	None
S5-029 - A50 . 079	Store PNL TST Trip Blank # 2	None

[] Field Transfer of Custody		[] Chain of Possession		(Sign and Print Names)	
Relinquished By	Date	Time	Received By	Date	Time
J A Edwards <i>J Edwards</i>	06-14-95	1040	Tim Utecht <i>T Utecht</i>	06-14-95	1040
<i>Tim Utecht</i>	06-21-95	1030	<i>J Edwards</i>	06-21-95	1030

Final Sample Disposition

Comments:

PNL (only) Checklist	Pick-up / Delivery	Comments:
Media labeled and checked?	<input checked="" type="checkbox"/> Y / <input checked="" type="checkbox"/> N	
Letter of instruction?	<input checked="" type="checkbox"/> Y / <input checked="" type="checkbox"/> N	
Media in good condition?	<input checked="" type="checkbox"/> Y / <input checked="" type="checkbox"/> N	
COC info/signatures complete?	<input checked="" type="checkbox"/> Y / <input checked="" type="checkbox"/> N	
Sorbents shipped on ice? (<5°C)	<input checked="" type="checkbox"/> Y / <input checked="" type="checkbox"/> N	
Hi/Lo thermometer - reset @ 5°C	<input checked="" type="checkbox"/> Y / <input checked="" type="checkbox"/> N	
Hi/Lo thermometer - <i>Keep upright</i>	<input checked="" type="checkbox"/> Y / <input checked="" type="checkbox"/> N	
Rad release stickers on samples?	<input checked="" type="checkbox"/> Y / <input checked="" type="checkbox"/> N	
Activity report from 222S?	<input checked="" type="checkbox"/> Y / <input checked="" type="checkbox"/> N	
COC copy for LRB, RIDS filed?	<input checked="" type="checkbox"/> Y / <input checked="" type="checkbox"/> N	
	POC <input checked="" type="checkbox"/>	

Hi 6 °C / Lo 6 °C (at delivery from PNL to WHC)
Hi 17 °C / Lo 5 °C (upon return to PNL from WHC)

(Revised 05/10/95 PNL)

