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VAPOR & GAS SAMPLING OF SST 241S102 USING THE
VAPOR SAMPLING SYSTEM

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SEP 08 1995

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7. Abstract

THIS DOCUMENT PRESENTS SAMPLING DATA RESULTING FROM THE MARCH 14, 1995, SAMPLING OF SST 241-S-102 USING THE VAPOR SAMPLING SYSTEM.

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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
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 Carbon
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-S-102 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-S-102. This document presents sampling data resulting from the March 14, 1995, sampling of SST 241-S-102.

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-S-102 on March 14, 1995. 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-S-102; subsequently, the team sent these samples to 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 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 is passed through the tube, which traps (by adsorption) virtually all the target analytes. The sorbent trap is then sent to an analytical laboratory and

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

analyzed. 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 are located downstream of the sorbent trap station and the in-line driers, which remove water vapor from the vapor before the vapor is metered. Errors associated with the mass flow controllers were determined by the Westinghouse Hanford Company (WHC) Standards Laboratory before the SST 241-S-102 sampling (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 VSS is also equipped with a gas chromatograph (GC). The Hewlett Packard 5890 Series II GC is equipped with a flame-ionization detector (FID), 1 mL sample loop, 10 port injection valve, 2 meter chromatographic column, programmable oven, portable computer, and HP-Chemstation software to control the GC. The GC is plumbed to directly transfer sample from the VSS manifold to the sample loop. After the sample is 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 total organic carbon (TOC). All the 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 a 0.25 μ m phenyl methyl silicone phase. The GC oven is programmed to heat from 50 C to 270 C at a rate 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 TOC. The GC/FID confirms sampling system cleanliness, sampling manifold performance, TOC of ambient air background levels during sampling, and TOC of tank vapor samples. The system is multi-point calibrated and 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 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 where the sample is analyzed. The standard capacity of each SUMMA™ canister is 6 liters.

Prior to sampling, a 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-TP-238, *241-S-102 Tank Characterization Plan* (Homi 1995). The Tank Characterization Plan (TCP) 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 S5-015.

3.2 OPERATIONS AND SAMPLING PERSONNEL

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

- E. A. Johnson, Field Scientist
- R. L. Ragan, Field Scientist
- T. B. Utecht, VSS Technician.

The VSS was set up at SST 241-S-102 on March 13, 1995 and was allowed to warm up overnight. Sampling began shortly after 10:00 a.m. on March 14, 1995, and was completed by 3:30 p.m. the same day.

3.3 INDUSTRIAL HYGIENE FIELD RESULTS

Before hooking up to SST-241-S-102, an industrial hygiene technician field tests 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 3% and a oxygen content of 20.5% using the CGI, and a TOC content of 28.5 ppm using the OVM. The technician also sampled tank vapors for NH₃, 350 ppm, and CO 212 ppm.

3.4 AMBIENT CONDITIONS

The weather the day of the sampling event, March 14, 1995, was cool and cloudy with light rain. Graphs of ambient temperatures and pressures taken at the Hanford Meteorological Station, which is about 2.5 miles due east of 241-S SST farm, are provided in Appendix B.

3.5 SAMPLE COLLECTION

The hot-water-jacketed sampling probe was located in Riser 1 of SST 241-S-102. The probe length, from the sample inlet to the top of the riser flange, was 6.1 meters.

All zones of the VSS were heated to 60 °C during setup of the VSS at SST 241-S-102 on March 13, 1995. The team stabilized the VSS temperature zones by 9:30 a.m. on March 14, 1995, and the system was ready to collect samples. Measured according to the VSS operating procedure, the pressure and temperature of SST 241-S-102 were 988 mbar (741.2 torr) and 24.3 °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.

Approximately 1 hour after heating began, the team purged the sampling manifold with ambient air for 1,095 minutes. The team collected two SUMMA™ canister samples of ambient air, one manually 10 meters upwind of the VSS connection with SST 241-S-102, and one 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 in-tank sampling probe) was performed. Leakage resulted in an increase of 1.4 mbar (1.05 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 less than 12.5 mL/min at a 284 mbar (213.3 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 0.1%, for TST traps sampled at 50 mL/min the dilution was approximately 0.4%, for TST traps sampled at 200 mL/min the dilution was approximately 0.5%, and for sorbent traps the dilution was approximately 0.4%.

The VSS was purged with sample vapor from SST 241-S-102 for 30 minutes at a total flow rate of 5.45 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 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).

3.6 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 241-S-102.

Table 2. TOC Results.

Number of Runs	Description	Average TOC Concentration (ppmC)	% Standard Deviation
4	Propane	6.00	1.61
4	Ambient	2.88	2.14
4	Tank Vapor	28.96	0.31

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 2000 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:

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 March 14, 1995, SST 241-S-102 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 headspace vapor, 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. SST 241-S-102 filter sample results are shown in Table 3. SML scientists use the activity results from the following table 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. SST 241-S-102 tritium sample results are shown in Table 3. The results in Table 3 indicate that the samples collected from SST 241-S-102 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)	S5015-A32.OU1	Total Alpha = 16.6 Total Beta = 990 GEA = 1300 (¹³⁷ Cs)	= 0.04 = 2.96 = 3.89
Downstream HEPA filter (box)	S5015-A33.OD1	Total Alpha = 0.514 Total Beta = 1.74 GEA = <detectable	= 0.002 = 0.005 = <detectable
Upstream HEPA filter (VSS)	S5015-A34.OU2	Total Alpha = 0.323 Total Beta = 1.58 GEA = <detectable	= 0.0009 = 0.005 = <detectable
Downstream HEPA filter (VSS)	S5015-A35.OD2	Total Alpha = 34.7 Total Beta = 1.24 GEA = <detectable	= 0.10 = 0.004 = <detectable
Tritium trap	S5015-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 334 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 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 the "received by" block on the COC form was signed by SML. The TSTs were maintained at 4 ± 2 °C before and after the sampling event in a refrigeration unit.

The TSTs were shipped back to ORNL after the sampling event using offsite property control (OPC W95-0-0304-21). Table 4 lists the sample identifiers, sample types, and COC form numbers for all ORNL samples. The samples were delivered for transport on March 29, 1995, and shipped by Federal Express for next-day delivery.

Table 4. Oak Ridge National Laboratory Samples.

Sample Identifier	Sample Type	COC Number
S5015-A7.572	TST	006758
S5015-A8.530	TST	006758
S5015-A9.531	TST	006758
S5015-A10.520	TST field blank	006758
S5015-A11.532	TST	006758
S5015-A12.533	TST	006758
S5015-A13.518	TST	006758
S5015-A14.506	TST	006758
S5015-A15.513	TST	006758
S5015-A16.514	TST	006758
S5015-A17.543	TST field blank	006758
S5015-A18.515	TST	006758
S5015-A19.516	TST	006758
S5015-A20.517	TST	006758
S5015-A21.511	TST trip blank	006758
S5015-A22.519	TST trip blank	006758

Sorbent trains and SUMMA[™] canister sampling devices were supplied with COC forms by PNL. Sampling devices were picked up from PNL by SML and transported in a government vehicle to a custody locker.

After sampling, the PNL sorbent traps were transported by government vehicle directly to PNL and delivered to J. A. Edwards on March 17, 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.

Table 5. Pacific Northwest Laboratory Samples.

Sample Identifier	Sample Type	COC Number
S5015-A01.049	Ambient upwind SUMMA [™]	008108
S5015-A02.050	Ambient SUMMA [™] (VSS)	008108
S5015-A04.056	SUMMA [™]	008108
S5015-A05.065	SUMMA [™]	008108
S5015-A06.066	SUMMA [™]	008108
S5015-A29.18U	NH ₃ /NO _x /NO/H ₂ O sorbent	008109
S5015-A30.19U	NH ₃ /NO _x /NO/H ₂ O sorbent	008109
S5015-A31.20U	NH ₃ /NO _x /NO/H ₂ O sorbent	008109
S5015-A32.21U	NH ₃ /NO _x /NO/H ₂ O sorbent	008109
S5015-A33.22U	NH ₃ /NO _x /NO/H ₂ O sorbent	008109
S5015-A34.23U	NH ₃ /NO _x /NO/H ₂ O sorbent	008109
S5015-A35.24U	NH ₃ /NO _x /NO/H ₂ O trip blank	008109
S5015-A36.25U	NH ₃ /NO _x /NO/H ₂ O trip blank	008109
S5015-A37.26U	NH ₃ /NO _x /NO/H ₂ O trip blank	008109

SUMMA[™] canisters were also supplied by OGIST. The sample media is shipped to SML without a COC form. The sample media is inventoried at SML, where the COC is initiated.

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

5.0 QUALITY ASSURANCE AND CONTROLS

5.1 VAPOR SAMPLING SYSTEM CLEANING

Immediately prior to sampling of SST 241-S-102, the VSS manifold was heated to 60 °C and ambient air was purged through the system for approximately 18 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 significant level of contaminants was 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-S-102. For further details, refer to Appendix C of WHC-IP-1127-4.5 (WHC 1995b) and the project-specific file located with SML.

In compliance with the *Vapor Space Probe Cleaning Procedure* (WHC 1993) the team cleaned the hot-water-jacketed probe before it was installed in SST 241-S-102. 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, using a hand-held organic vapor meter, 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 upwind of SST 241-S-102, and a second canister was filled with ambient air via the VSS sampling manifold. The canisters were shipped to PNL for analysis. After this purge, an ambient air sample was drawn through the VSS manifold and a GC/FID run was initiated. This first run showed that organic contaminants were still present in the manifold, so a second 1 hour ambient air purge was started. Throughout this purge, various system valves were actuated to release any contaminants hung up in the VSS valves themselves. A second GC run was initiated and no contaminants were detected by the FID. A third sample confirmed the VSS was free of organic remnants down to the detection limits of the system and ready to sample 241-S-102. For further details, refer to Appendix B of LO-080-450/A0 (WHC 1993) and the project-specific file located with SML.

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, is summarized in Table 6. According to the calibration schedule shown in Table 6, all instrumentation was within its calibration period during the SST 241-S-102 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 sampling devices prepared and handled in the same manner as the samples, but no tank gases are drawn through them.

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 waste tank headspace, but not associated with the waste.

Tables 4 and 5 also list sample blanks used during the sampling of SST 241-S-102.

6.0 ANOMALIES

All samples were collected in accordance with the TCP and WHC-IP-1127-4.5, *Collection of SUMMA Canisters and Sorbent Tube Samples Using the Vapor Sampling System* (1995b). No other anomalies to the TCP or the operating procedure were noted during the sampling of SST 241-S-102. Further details are available in the project-specific file maintained by SML.

When the SUMMA™ canisters were collected it was evident that the pressure was below normal. Usually the pressure is approximately 400 torr, in this case it dropped to approximately 238 torr. It is suspected that during the 18 hour ambient purge moisture collected on the external HEPA filter, causing more restriction than normal.

7.0 REFERENCES

- 49 CFR 100-177, 1992, "Transportation," *Code of Federal Regulations*, as amended.
- Homi, C. S., 1995, *241-S-102 Tank Characterization Plan*, WHC-SD-TP-238, 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 for RCRA and CERCLA Protocol Samples*, Procedure WHC-IP-1127-1.3, Westinghouse Hanford Company, Richland, Washington.
- WHC, 1995b, *Collection of SUMMA Canisters and Sorbent Tube Samples Using the Vapor Sampling System (VSS)*, Procedure WHC-IP-1127-4.5, 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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Set up VSS (Section 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 24.3 °C

Date: March 14, 1995

VSS Personnel: E. Johnson R. Westberg

T. Utecht R. Ragan

Trailer Personnel: N. Buechler

PNL		OGI/ORNL		Port	Description	Desired		Desired		Actual		Actual		Actual	
WHC Sample ID	Sample ID	Valve #				Flow	Duration	Total	Flow	Rate	Start	End	Total	Flow	Total
Group # 1						Rate	(min.)	SCCM	SCCM	SCCM	Time	Time	(min.)	Liters	
Purge with ambient air for 30 min.															
S5015- A01. 049	049		AMBIENT #1 (PNL)			5450	30	163500	5461		09:37	09:38	1.0		
GC Run #1 Ambient air/Cleanliness check															
S5015- A02. 050	050	15	AMBIENT #2 (PNL)				1				10:13	10:14	1.0		
GC Run #2 Ambient air															
Leak check (Appendix A) Leak Rate: 16.8 Torr/Hr.															
Purge with tank air for 30 min.															
Measure tank pressure PE-1 = 741.2 Torr															
S5015- A03. 0T1	T1847(222S)	8	Tritium Trap			200	5	1000	200.40		11:26	11:31	5.0	1.00	
GC Run # 3 (Tank run #1)															
S5015- A04. 056 056 11 SUMMA #3															
S5015- A05. 065 065 13 SUMMA #4															
S5015- A06. 066 066 15 SUMMA # 5															
GC Run # 4 (Tank run # 2)															

				Waste Tank 241-S-102							
PNL		Port	Description	Desired	Desired	Desired	Actual	Actual	Actual	Actual	Actual
OGI/ORNL	Sample ID			Flow	Duration	Total	Flow	Start	End	Total	Total
WHC Sample ID	Sample ID	Valve #		Rate	(min.)	Flow	Rate	Time	Time	Time	Flow
S5015- A07. 527	TST#527	9	TST #1	50	4	200	50.10	12:08	12:12	4.0	0.20
S5015- A08. 530	TST#530	10	TST #2	50	4	200	50.01	12:08	12:12	4.0	0.20
S5015- A09. 531	TST#531	8	TST #3	50	4	200	50.15	12:18	12:22	4.0	0.20
S5015- A11. 532	TST#532	10	TST #4	50	4	200	50.10	12:18	12:22	4.0	0.20
S5015- A10. 520	TST#520	TST FIELD BLANK #1						12:19	12:20	1.0	
S5015- A12. 533	TST#533	9	TST # 5	200	5	1000	200.40	12:30	12:35	5.0	1.00
S5015- A13. 518	TST#518	10	TST # 6	200	5	1000	200.40	12:30	12:35	5.0	1.00
S5015- A14. 506	TST#506	8	TST # 7	200	5	1000	200.40	12:41	12:46	5.0	1.00
S5015- A15. 513	TST#513	10	TST # 8	200	5	1000	200.40	12:41	12:46	5.0	1.00
S5015- A16. 514	TST#514	9	TST # 9	200	20	4000	200.35	12:52	13:12	20.0	4.01
S5015- A18 515	TST#515	10	TST # 10	200	20	4000	200.35	12:52	13:12	20.0	4.01
S5015- A17 543	TST#543	TST FIELD BLANK #2						12:54	12:55	1.0	
S5015- A19. 516	TST#516	8	TST # 11	200	20	4000	200.40	13:18	13:38	20.0	4.01
S5015- A20. 517	TST#517	10	TST # 12	200	20	4000	200.40	13:18	13:38	20.0	4.01
GC Run # 5 (Tank run #3)								13:44			
S5015- A23. 18U	18U	9	NH3/NOx/H2O #1	200	15	3000	200.40	13:50	14:05	15.0	3.01
S5015- A24. 19U	19U	10	NH3/NOx/H2O #2	200	15	3000	200.40	13:50	14:05	15.0	3.01
S5015- A25. 20U	20U	8	NH3/NOx/H2O #3	200	15	3000	200.40	14:12	14:27	15.0	3.01
S5015- A26. 21U	21U	10	NH3/NOx/H2O #4	200	15	3000	200.40	14:12	14:27	15.0	3.01
S5015- A27. 22U	22U	9	NH3/NOx/H2O #5	200	15	3000	200.40	14:32	14:47	15.0	3.01
S5015- A28. 23U	23U	10	NH3/NOx/H2O #6	200	15	3000	200.40	14:32	14:47	15.0	3.01
GC Run # 6								14:53			
TOTAL TANK GAS USED DURING SAMPLING RUNS											57.88

Waste Tank
241-S-102

WHC Sample ID	PNL		Port	Description	Desired		Desired	Desired		Actual		Actual	
	OGI/ORNL	Sample ID			Flow	Rate		Duration	(min.)	Flow	Rate	Start	End
S5015- A32. 0U1		T1848(222S)		Upstream HEPA(box)								15:20	
S5015- A33. 0D1		T1849(222S)		Downstream HEPA(box)								15:20	
S5015- A34. 0U2		T1850(222S)		Upstream HEPA (VSS)								15:20	
S5015- A35. 0D2		T1851(222S)		Downstream HEPA (VSS)								15:20	

Trip Blanks (DO NOT EXPOSE)

S5015- A21. 511	TST#511	TST TRIP #1											
S5015- A22. 519	TST#519	TST TRIP #1											
S5015- A29. 33U	33U	NH3/NOx/H2O	TRIP #1										
S5015- A30. 34U	34U	NH3/NOx/H2O	TRIP #2										
S5015- A31. 35U	35U	NH3/NOx/H2O	TRIP #3										

[illegible]

VSS SAMPLING RADIOLOGICAL SCREENING RESULTS

S-102

A-7

HEPA BOX UPSTREAM FILTER	Liters	334.11	pcI / filter	pcI / filter	HEPA BOX DOWNSTREAM FILTER	Liters	334.11	pcI / filter	pcI / filter
TOTAL VOLUME		990.00		2.96	TOTAL VOLUME		334.11		1.74
BETA		16.60		0.05	ALPHA		0.514		< 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	- TL-208		ND		< Detectable
- Cs-137		1.300		3.89					
VSS UPSTREAM FILTER	Liters	334.11	pcI / filter	pcI / filter	VSS DOWNSTREAM FILTER	Liters	334.11	pcI / filter	pcI / filter
TOTAL VOLUME		1.58		< Detectable	BETA		1.24		0.00371139
BETA		0.32		< Detectable	ALPHA		34.7		0.10385894
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	- TL-208		ND		< Detectable
TRITIUM TRAP	Liters	1.0	pcI / filter	pcI / filter					
TOTAL VOLUME		< 50.0		< 50.0					
TOTAL ACTIVITY									
SAMPLE EXPOSURE ANALYSIS, USING VSS DOWNSTREAM FILTER ANALYSIS AS POSSIBLE EXPOSURE LEVEL									
= BETA @ 0.004 pcI/Liter and ALPHA @ 0.104 pcI/Liter, GEA not detected									
SORBENT SAMPLING	3.00 Liters				TSTS	liters	0.2	pcI per sample	Alpha
TOTAL VOLUME PER SAMPLE		0.312 pcI			527, 530, 531, 532		1		0.104
ALPHA per Sample		0.012 pcI			533, 518, 506, 513		0.42		
BETA per Sample					514, 515, 516, 517				
ALL SORBENTS									
NH3 (0.75 gram)		0.42 pcI per gram							
NO2 (0.60 gram)		0.52 pcI per gram							
H2O (0.45 gram)		0.69 pcI per gram							
SUMMA SAMPLING	6 Liters								
TOTAL VOLUME PER CANISTER		1.87 pcI							
ALPHA AND BETA PER SAMPLE									

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APPENDIX B
AMBIENT CONDITIONS

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WEATHER DURING VSS SAMPLING OF 241-S-102

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APPENDIX C
CHAIN-OF CUSTODY FORMS

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009090

Westinghouse Hanford Company		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST										Page 1 of 1	
Collector	T.B. WITTE										Telephone No.	373-2891	
Project Designation	N/A										SAF No.	35015	
Ice Chest No.	N/A										Method of Shipment	Ground Vehicle #929	
Shipped To	200-5 LABS										Bill of Lading/AF Bill No.	N/A	
Possible Sample Hazards/Remarks	NONE										Offsite Property No.	N/A	
Special Handling and/or Storage	N/A										Preservative	N/A	
											Type of Container	Silica Gel / Hepta Filter	
											No. of Containers	5	
											Volume	N/A	
SAMPLE ANALYSIS													
Sample No.	Matrix*	Date Sampled	Time Sampled										
35015-071	N/A	3-14-95	T-	1847									
35015-041	N/A	3-14-95	T-	1848									
35015-001	N/A	3-14-95	T-	1849									
35015-042	N/A	3-14-95	T-	1850									
35015-002	N/A	3-14-95	T-	1859									
CHAIN OF POSSESSION													
Relinquished By	Date/Time	Received By	Date/Time										
T.B. WITTE	0900 3-14-95	JP Buehler	0800 3-14-95										
Relinquished By	Date/Time	Received By	Date/Time										
JP Buehler	1312 3-15-95	JP Buehler	3-14-95										
Relinquished By	Date/Time	Received By	Date/Time										
Relinquished By	Date/Time	Received By	Date/Time										
SPECIAL INSTRUCTIONS				X = Silica Gel / Hepta Filters Please fax info to Tim Utecht at 373-7076 Thanks.									
Matrix*				S = Soil SE = Sediment SO = Solid SL = Sludge W = Water O = Oil A = Air DS = Drum Solids DL = Drum Liquids T = Tissue WI = Wipe L = Liquid V = Vegetation O = Other									
LABORATORY SECTION				Title									
Received By				Date/Time									
DISPOSITION				Disposed By									
Date/Time				Date/Time									

Westinghouse
Hanford Company

CHAIN OF CUSTODY

ORNL-006758

Custody Form Initiator Amy Dindal

Company Contact Roger Jenkins

Project Designation/Sampling Locations 241-S-102 (VSS)

Ice Chest No. *SmL-485*

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 *3-14-95* ^{*704*}Field Logbook No. *WHC-N-467-10*

Offsite Property No.

Sample Identification

Rec'd 3/30/95
ORNL

S5015-A7.527	TST# 527	ORNL Triple Sorbent Trap ✓
S5015-A8.530	TST# 530	ORNL Triple Sorbent Trap ✓
S5015-A9.531	TST# 531	ORNL Triple Sorbent Trap ✓
S5015-A11.532	TST# 532	ORNL Triple Sorbent Trap ✓
S5015-A12.533	TST# 533	ORNL Triple Sorbent Trap ✓
S5015-A13.518	TST# 518	ORNL Triple Sorbent Trap ✓
S5015-A14.506	TST# 506	ORNL Triple Sorbent Trap ✓
S5015-A15.513	TST# 513	ORNL Triple Sorbent Trap ✓
S5015-A16.514	TST# 514	ORNL Triple Sorbent Trap ✓
S5015-A18.515	TST# 515	ORNL Triple Sorbent Trap ✓
S5015-A19.516	TST# 516	ORNL Triple Sorbent Trap ✓
S5015-A20.517	TST# 517	ORNL Triple Sorbent Trap ✓
S5015-A21.511	TST# 511	ORNL Trip Blank ✓
S5015-A22.519	TST# 519	ORNL Trip Blank ✓
S5015-A10.520	TST# 520	ORNL Field Blank ✓
S5015-A17.543	TST# 543	ORNL Field Blank ✓

[] Field Transfer of Custody

Chain of Possession

(Sign and Print Names)

Relinquished By	Date	Time	Received By	Date	Time
<i>AB Dindal</i>	<i>3/9/95</i>	<i>10:55am</i>	<i>AP Buehler / AB Buehler</i>	<i>3-10-95</i>	<i>1445</i>
<i>AP Buehler / AB Buehler</i>	<i>3-14-95</i>	<i>1000</i>	<i>T-B UTEAT / T-B UTEAT</i>	<i>3-14-95</i>	<i>1000</i>
<i>T-B UTEAT / T-B UTEAT</i>	<i>3-28-95</i>	<i>0900</i>	<i>AB Dindal / AB Dindal</i>	<i>3-20-95</i>	<i>1557</i>

Inspected cooler &

traps OK

ABD

3/30/95

Temperature (°C)	Min	Max
When shipped (ORNL)	-40°	-2°
When received (WHC)	-3°C	7°C
When shipped (WHC)	-5°C	5°C
When received (ORNL)	-1°	9°

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) 373-2891

Page 85-3152 / FAX 373-3793

Project Designation/Sampling Locations 200 West Tank Farm

241-S-102 Tank Vapor Sample SAF S5-015

(VSS Truck)

Collection date 03 - 14 - 95

Preparation date 03 - 08 - 95

Ice Chest No.

Field Logbook No. WHC-N-47-4

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

S5-015 - A29 . 18U	NH ₃ /NO _x /H ₂ O (Sorbent Trap # 1)	Line # 9
S5-015 - A30 . 19U	NH ₃ /NO _x /H ₂ O (Sorbent Trap # 2)	Line # 10
S5-015 - A31 . 20U	NH ₃ /NO _x /H ₂ O (Sorbent Trap # 3)	Line # 8
S5-015 - A32 . 21U	NH ₃ /NO _x /H ₂ O (Sorbent Trap # 4)	Line # 10
S5-015 - A33 . 22U	NH ₃ /NO _x /H ₂ O (Sorbent Trap # 5)	Line # 9
S5-015 - A34 . 23U	NH ₃ /NO _x /H ₂ O (Sorbent Trap # 6)	Line # 10
S5-015 - A35 . 24U	NH ₃ /NO _x /H ₂ O (Trap Trip Blank # 1)	
S5-015 - A36 . 25U	NH ₃ /NO _x /H ₂ O (Trap Trip Blank # 2)	
S5-015 - A37 . 26U	NH ₃ /NO _x /H ₂ O (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>G W Dennis</i>	03-10-95	1315	J A Edwards <i>J A Edwards</i>	03-10-95	1315
J A Edwards <i>J A Edwards</i>	03-10-95	0940	Neil Buechler <i>Neil Buechler</i>	03-10-95	0940
<i>Neil Buechler</i>	3-14-95	1000	<i>T B LITECAT</i>	3-14-95	1000
<i>T B LITECAT</i>	3-14-95	1010	<i>J A Edwards</i>	3-17-95	1010

Final Sample Disposition

Comments:

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

(Revised 10/17/94 PNL)

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) 373-2891

Page 85-3152 / FAX 373-3793

Project Designation/Sampling Locations 200 West Tank Farm

241-S-102 Tank Vapor Sample SAF S5-015

(VSS Truck)

Collection date 03 - 14 - 95

Preparation date 03 - 08 - 95

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

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification

S5-015 - A01 .049

S5-015 - A02 .050

Ambient Air SUMMA #1 Upwind of S-102

Ambient Air SUMMA #2 Through Port 15

S5-015 - A04 .056

S5-015 - A05 .065

S5-015 - A06 .066

SUMMA #3 Port 11

SUMMA #4 Port 13

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>	03-10-95	0940	Neil Buechler <i>N Buechler</i>	03-10-95	0940
<i>NP Buechler / N Buechler</i>	3-14-95	1000	<i>T B LUTCH / T B Lutch</i>	03-14-95	1000
<i>T B LUTCH / T B Lutch</i>	3-17-95	1010	<i>J A Edwards / J A Edwards</i>	3-17-95	1010

Final Sample Disposition

Comments:

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

(Revised 10/17/94 PNL)