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VAPOR SAMPLING SYSTEM

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*G.S. Caprio*  
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THIS DOCUMENT PRESENTS SAMPLING DATA RESULTING FROM THE OCTOBER 12, 1995, SAMPLING OF SST 241-TX-111 USING THE VAPOR SAMPLING SYSTEM.

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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	Gas Chromatograph
GC/FID	Gas Chromatograph/Flame Ionization Detector
GEA	Gamma Energy Analysis
HEPA	High-Efficiency Particulate Air (filter)
NH <sub>3</sub>	Ammonia
NO <sub>2</sub>	Nitrogen Dioxide
NO <sub>x</sub>	Nitric Oxide
H <sub>2</sub> 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-TX-111 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-TX-111. This document presents sampling data resulting from the October 12, 1995 sampling of SST 241-TX-111. 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-TX-111 on October 12, 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 SUMMA<sup>1</sup> canister headspace samples from SST 241-TX-111. The team then sent these samples to the analytical laboratories for analysis.

The VSS comprises a mobile laboratory and stainless-steel transfer tubing that connects the mobile laboratory to the vapor space. 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.

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<sup>1</sup>SUMMA is a registered trademark of Moleetrics, Inc., Cleveland, Ohio.

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 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-TX-111 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 <sup>3</sup> /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,<sup>2</sup> a programmable oven, and a portable computer loaded with the HP-Chemstation<sup>2</sup>.

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

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 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 TOC. 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. 1, *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 S5-069.

### 3.2 OPERATIONS AND SAMPLING PERSONNEL

Steve Carter was the Tank Farm Operations person-in-charge. The other SML vapor team members included:

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

The VSS was set up at SST 241-TX-111 on October 11, 1995 and was allowed to warm up overnight. Sampling began shortly after 10:00 a.m. on October 12, 1995, and was completed by 1:00 p.m. the same day.

### 3.3 INDUSTRIAL HYGIENE FIELD RESULTS

Before hooking up to SST 241-TX-111, an industrial hygiene technician field tested tank vapors. The technician purged the instrument/vent header 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%, NH<sub>3</sub> 400 ppm, O<sub>2</sub> 20.1%, CO<sub>2</sub> 19ppm, and TOC 10.6 ppm.

### 3.4 AMBIENT CONDITIONS

The weather the day of the sampling event, October 12, 1995 was cool and sunny, with a light breeze from the northwest. Graphs of ambient temperatures and pressures taken at the Hanford Meteorological Station, which is about 2.5 miles west of TX-Farm, are provided in Appendix B.

### 3.5 SAMPLE COLLECTION

The hot-water-jacketed sampling probe was located in Riser 12A of SST 241-TX-111. 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-TX-111 on October 11, 1995. The team stabilized the VSS temperature zones by 10:00 a.m. on October 12, 1995, and the system was ready to collect samples. Measured according to the VSS operating procedure, the pressure and temperature of SST 241-TX-111 were 999 mbar (749.5 torr) and 22.6 °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 23.5 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 October 12, 1995, the team collected two SUMMA™ canister samples of ambient

air, one manually 10 meters upwind of the VSS connection with SST 241-TX-111, 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 was performed. The system was evacuated to 293 mbar (219.7 torr) and leakage of ambient air into the system was observed by monitoring system pressure for 15 minutes. Leakage resulted in an increase of 4.80 mbar (3.6 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 10.9 ml/min. 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 0.1%, for TSTs sampled at 50 mL/min was 0.8%, for TSTs sampled at 200 mL/min the dilution was approximately 0.5%, and for sorbent traps the dilution was approximately 0.4%.

The sampling valve was opened and the VSS was purged with sample vapor from SST 241-TX-111 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. Pacific Northwest Laboratory (PNL) provided SUMMA™ canisters, and sorbent traps for organic vapors, ammonia (NH<sub>3</sub>), nitrogen dioxide (NO<sub>2</sub>), and water vapor (H<sub>2</sub>O) and Oak Ridge National Laboratory (ORNL) provided the TST sorbent traps.

### 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-TX-111.

Table 2. TOC Results.

Number of Runs	Description	Average TOC Concentration (ppmC)	% Standard Deviation
7	Propane	6.00	1.38
4	Ambient	2.69	1.90
4	Tank Vapor	26.89	0.34

### 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:

- PNL:       Beta-gamma activity <400 pCi/g of sample media. Alpha activity <100 pCi/g of sample media.
- ORNL:     Beta-gamma activity <450 pCi/g of sample media. Alpha activity <135 pCi/g.

To protect the sampling manifold and sampling devices from radioactive particulates, all sample vapor for the October 12, 1995, SST 241-TX-111 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-TX-111 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-TX-111 met the laboratory acceptance criteria and the DOT definition of a nonradioactive shipment.

Table 3. Radionuclide Analysis Results.

Filter	Sample Identifier	Activity Results <sup>a</sup> (pCi/sample)	Activity <sup>b</sup> (pCi/L of tank gas)
Upstream HEPA filter (box)	S5069-A28.OU1	Total Alpha = 17500 Total Beta = 21800 GEA = 4690 ( <sup>208</sup> Tl) GEA = 14800 ( <sup>212</sup> Bi) GEA = 13600 ( <sup>212</sup> Pb)	= 54.95 = 68.45 = 14.73 = 46.47 = 42.70
Downstream HEPA filter (box)	S5069-A29.OU1	Total Alpha = 0.404 Total Beta = 3.03 GEA = <detectable	= 0.001 = 0.01 = <detectable
Upstream HEPA filter (VSS)	S5069-A30.OU2	Total Alpha = 1.67 Total Beta = 0.152 GEA = <detectable	= 0.005 = 0.001 = <detectable
Downstream HEPA filter (VSS)	S5069-A31.OU2	Total Alpha = <0.563 Total Beta = 8.53 GEA = <detectable	= <0.002 = 0.03 = <detectable
Tritium trap	S5069-A03.OT1	Total activity = <50.0	= <50.0 <sup>c</sup>

## Notes:

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

<sup>a</sup>All less than (<) values represent the minimum detection limits at Laboratory 222-S.

<sup>b</sup>Numbers 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 318.5 L.

<sup>c</sup>Number 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, and SUMMA™ canisters received from PNL are kept in a custody locked storage area maintained by SML. SML received TSTs by Federal Express from ORNL. ORNL shipped the samples on blue ice and were received chilled at SML. Sorbent trains and tubes were maintained at  $4 \pm 2$  °C in a refrigeration unit. SUMMA™ canisters were stored in the same locked storage area, but were not refrigerated. The sorbent trains and SUMMA™ canisters were picked up from PNL by SML and transported in a government vehicle to a custody locked storage area.

After sampling, the PNL sorbent tubes and SUMMA™ canisters were transported by government vehicle directly to PNL and delivered to J. A. Edwards on October 13, 1995. Table 4 lists the sample identifiers, sample types, and COC form numbers for all PNL samples.



Table 4. Pacific Northwest Laboratory Samples.

Sample Identifier	Sample Type	COC Number
S5069-A01.045	Ambient upwind SUMMA™	009267
S5069-A02.047	Ambient SUMMA™ (VSS)	009267
S5069-A04.068	SUMMA™	009267
S5069-A12.109	SUMMA™	009267
S5069-A20.140	SUMMA™	009267
S5069-A08.T26	NH <sub>3</sub> /NO <sub>x</sub> /H <sub>2</sub> O sorbent	009269
S5069-A09.T27	NH <sub>3</sub> /NO <sub>x</sub> /H <sub>2</sub> O sorbent	009269
S5069-A10.T28	NO <sub>x</sub> /H <sub>2</sub> O sorbent	009269
S5069-A11.T29	NH <sub>3</sub> /H <sub>2</sub> O/H <sub>2</sub> O sorbent	009269
S5069-A16.T30	NH <sub>3</sub> /NO <sub>x</sub> /H <sub>2</sub> O sorbent	009269
S5069-A17.T31	NH <sub>3</sub> /NO <sub>x</sub> /H <sub>2</sub> O sorbent	009269
S5069-A18.T32	NO <sub>x</sub> /H <sub>2</sub> O sorbent	009269
S5069-A19.T33	NH <sub>3</sub> /H <sub>2</sub> O/H <sub>2</sub> O sorbent	009269
S5069-A25.T34	NH <sub>3</sub> /NO <sub>x</sub> /H <sub>2</sub> O field blank	009269
S5069-A26.T35	NH <sub>3</sub> /NO <sub>x</sub> /H <sub>2</sub> O field blank	009269
S5069-A27.T36	NH <sub>3</sub> /NO <sub>x</sub> /H <sub>2</sub> O field blank	009269

On October 16, 1995, the ORNL TSTs were transported by a government vehicle directly to WHC shipping on Off-Site Property Control #W96-0-0006-03. Table 5 lists the sample identifiers, sample types, and COC form numbers for all ORNL samples.

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.

Table 5. Oak Ridge National Laboratory Samples.

Sample Identifier	Sample Type	COC Number
S5069-A40.1100	TST	006769
S5069-A41.1103	TST	006769
S5069-A42.1104	TST	006769
S5069-A43.1105	TST	006769
S5069-A44.1106	TST	006769
S5069-A45.1107	TST	006769
S5069-A46.1108	TST	006769
S5069-A47.1109	TST	006769
S5069-A48.1111	TST	006769
S5069-A49.1112	TST	006769
S5069-A50.1113	TST	006769
S5069-A51.1114	TST	006769
S5069-A52.1115	TST Trip Blank	006769
S5069-A53.1116	TST Trip Blank	006769
S5069-A54.1118	TST Field Blank	006769
S5069-A55.1119	TST Field Blank	006769

## 5.0 QUALITY ASSURANCE AND CONTROLS

### 5.1 VAPOR SAMPLING SYSTEM CLEANING

Before sampling of SST 241-TX-111, the VSS manifold and vapor sample transfer tubing was heated to 60 °C and ambient air was purged through the system for 30 minutes. 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.

## 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-TX-111 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	8/25/95	8/25/96	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 prior to sampling operations.

Tables 4 and 5 lists sample blanks used during the sampling of SST 241-TX-111.

## 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).

The actual flow rate for TST sample number S5069-A50.1113 was 19.70 stdcm<sup>3</sup>/min. The flow was extremely low as compared to the previous VSS sampling events. Historically, when the desired flow rate is 200 stdcm<sup>3</sup>/min the anticipated range for the actual flow rate is between 160 and 200 stdcm<sup>3</sup>/min. One logical explanation for the low flow rate is the TST was packed extremely tight, thus restricting the flow through the tube.

## 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. 1, 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 Parallel Sorbent Tube and SUMMA Canister Samples Using the Vapor Sampling System (VSS)*, 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.

APPENDIX A  
SAMPLE LOG SHEETS

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VSS Sampling of  
TX-111

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 22.6 C

GC Standard Runs

GC Ambient Air Runs through port 10

Date: 10/12/95

VSS Personnel: Rich Westberg, Glenn Caprio, Tim Utecht, and Rick Mahon

Trailer Personnel: Tim Utecht

A-3

WHC Sample ID	ORNL/PNL Sample ID	Port Valve #	Description	Desired Flow Rate SCCM	Desired Duration (min.)	Desired Total Flow SCCM	Actual Flow Rate SCCM	Actual Start Time	Actual End Time	Actual Total Time (min.)	Actual Total Flow Liters
Purge with ambient air for 30 min.				5500	30	165000	5500	10/11-10:15	10/12-9:58	1423	7828.00
S5069- A01. 278	278		AMBIENT #1		1			10:07	10:08	1	
GC Run #1	Ambient air/Cleanliness check							10:11			
S5069- A02. 279	279	15	AMBIENT #2		1			10:15	10:16	1	
GC RUN#2	Ambient air							10:17			
LEAK CHECK(APPENDIX A)		Leak Rate: <u>14.4 torr/hr</u>									
Purge with tank air for 30 min				5500	30	165000	5500	10:48	11:18	30	165.00
Measure tank pressure			PE-1 = 749.5 torr					11:20			
GCRUN #3 (Tank run #1)								11:22			
S5069- A04. 280	280	11	SUMMA #3		1			11:26	11:27	1	6.00



VSS Sampling of  
TX-111

WHC Sample ID	ORNL/PNL Sample ID	Port Valve #	Description	Desired Flow Rate SCCM	Desired Duration (min.)	Desired Total Flow SCCM	Actual Flow Rate SCCM	Actual Start Time	Actual End Time	Actual Total Time (min.)	Actual Total Flow Liters
S5069- A08. T26	T26	1	NH3/NOx/H2O (#1)	200	15	3000	200.00	11:31	11:46	15	3.00
S5069- A09. T27	T27	2	NH3/NOx/H2O (#2)	200	15	3000	200.00	11:31	11:46	15	3.00
S5069- A10. T28	T28	3	NOx/H2O (#3)	200	15	3000	200.00	11:31	11:46	15	3.00
S5069- A11. T29	T29	4	NH3/H2O/H2O (#4)	200	15	3000	200.00	11:31	11:46	15	3.00
S5069- A40. 1100	ORNL #1100	5	ORNL TST #1	200	20	4000	183.80	11:31	11:51	20	3.68
S5069- A41. 1103	ORNL #1103	6	ORNL TST #2	200	20	4000	167.40	11:31	11:51	20	3.35
S5069- A42. 1104	ORNL #1104	7	ORNL TST #3	200	20	4000	173.30	11:31	11:51	20	3.47
S5069- A43. 1105	ORNL #1105	8	ORNL TST #4	200	20	4000	189.10	11:31	11:51	20	3.78
GCRUN #4 (Tank run # 2)								11:57			
S5069- A12. 281	281	13	SUMMA #4		1			12:06	12:07	1	6.00
A-4 S5069- A16. T30	T30	1	NH3/NOx/H2O (#5)	200	15	3000	200.00	12:14	12:29	15	3.00
S5069- A17. T31	T31	2	NH3/NOx/H2O (#6)	200	15	3000	200.00	12:14	12:29	15	3.00
S5069- A18. T32	T32	3	NOx/H2O (#7)	200	15	3000	200.00	12:14	12:29	15	3.00
S5069- A19. T33	T33	4	NH3/H2O/H2O (#8)	200	15	3000	200.00	12:14	12:29	15	3.00
S5069- A44. 1106	ORNL #1106	5	ORNL TST #5	50	4	200	50.00	12:14	12:18	4	0.20
S5069- A45. 1107	ORNL #1107	6	ORNL TST #6	50	4	200	50.00	12:14	12:18	4	0.20
S5069- A46. 1108	ORNL #1108	7	ORNL TST #7	50	4	200	50.00	12:14	12:18	4	0.20
S5069- A47. 1109	ORNL #1109	8	ORNL TST #8	50	4	200	50.00	12:14	12:18	4	0.20
GCRUN #5 (Tank run #3)								12:33			
S5069- A03. OT1 T-2332 (222-S)		4	Tritium Trap	200	5	1000	200.00	12:38	12:43	5	1.00
S5069- A48. 1111	ORNL #1111	5	ORNL TST #9	200	5	1000	200.00	12:38	12:43	5	1.00
S5069- A49. 1112	ORNL #1112	6	ORNL TST #10	200	5	1000	200.00	12:38	12:43	5	1.00
S5069- A50. 1113	ORNL #1113	7	ORNL TST #11	200	5	1000	19.70	12:38	12:43	5	0.10
S5069- A51. 1114	ORNL #1114	8	ORNL TST #12	200	5	1000	189.80	12:38	12:43	5	0.95

A-C-50-A-20-1-99, Rev. 0

VSS Sampling of  
TX-111

WHC Sample ID	ORNL/PNL Sample ID	Port Valve #	Description	Desired Flow Rate SCCM	Desired Duration (min.)	Desired Total Flow SCCM	Actual Flow Rate SCCM	Actual Start Time	Actual End Time	Actual Total Time (min.)	Actual Total Flow Liters
GCRUN#6 (Tank run # 4)								12:48			
S5069- A20. 282	282	15	SUMMA # 5		1			12:55	12:56	1	6.00
S5069- A54. 1118	ORNL #1118		RNL TST FIELD BLANK #1					12:48	12:49		
S5069- A55. 1119	ORNL #1119		ORNL TST FIELD BLANK #2					12:48	12:49		
S5069- A25. T34	T34		NH3/NOx/H2O FIELD BLANK #1					12:40	12:41		
S5069- A26. T35	T35		NH3/NOx/H2O FIELD BLANK #2					12:40	12:41		
S5069- A27. T36	T36		NH3/NOx/H2O FIELD BLANK #3					12:40	12:41		

WHC-SD-WM-RPT-199, Rev. 0

TOTAL TANK GAS USED DURING SAMPLING RUNS

61.12

S5069- A28. OU1	T-2333 ( 222S)		Upstream HEPA(box)								
S5069- A29. OD1	T-2334 ( 222S)		Downstream HEPA(box)								
S5069 A30. OU2	T-2335 ( 222S)		Upstream HEPA(VSS)								
S5069- A31. OD2	T-2336 (222S)		Downstream HEPA (VSS)								

Trip Blanks (DO NOT EXPOSE)

S5069- A52. 1115	RNL TST#111		ORNL TST TRIP #1								
S5069- A53. 1116	RNL TST#111		ORNL TST TRIP #2								

TX-111  
TOTAL TANK VAPOR USED

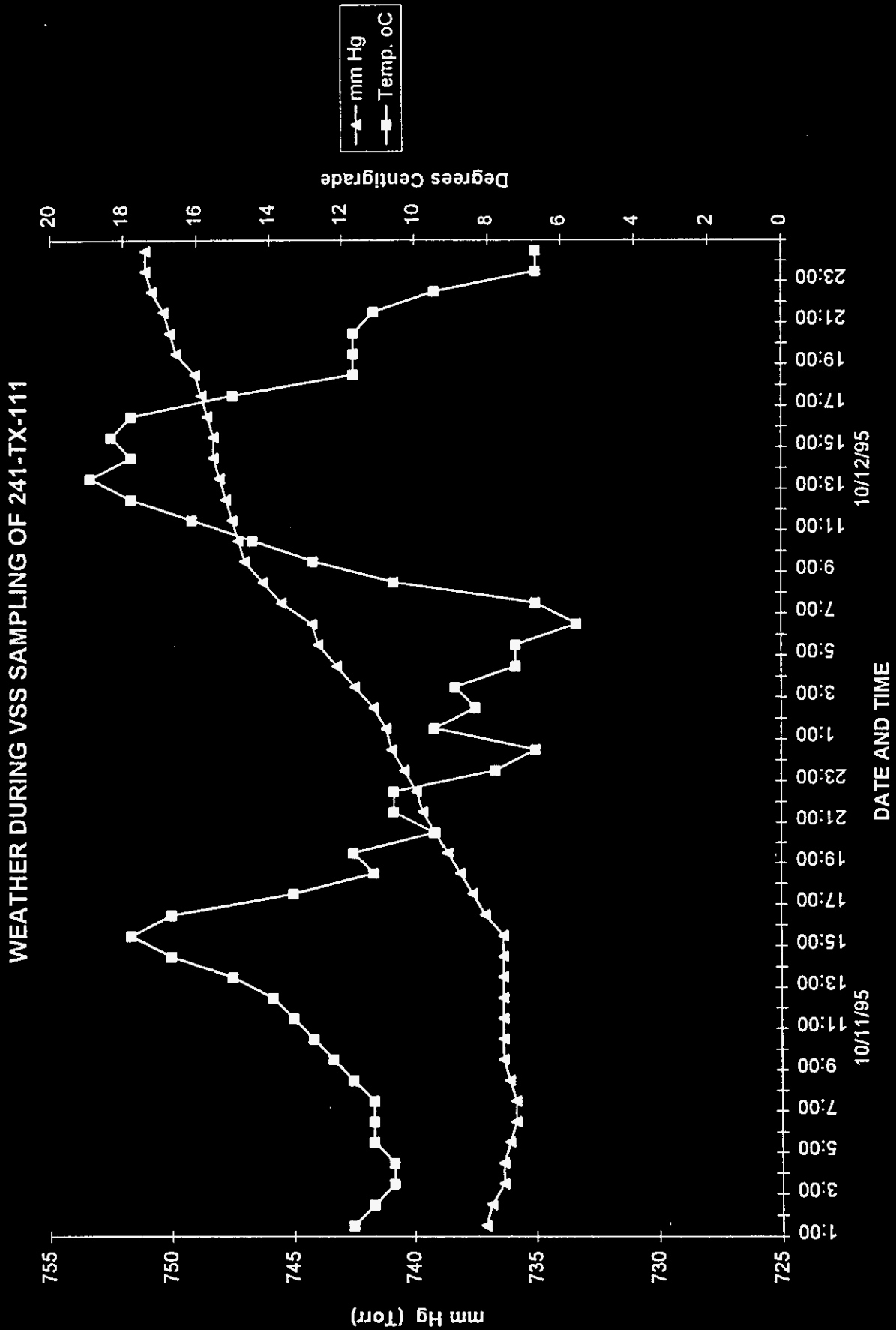
	NUMBER OF EVENTS	TIME IN MINUTES	VOLUME IN SCCM	TOTAL VOLUME, LITERS
LEAK CHECKS	1	0	5600	5.60
TANK PURGE PUMP DOWNS	3	1	5600	16.80
TANK PURGE TIME (From Spreadsheet)	1	30	5500	165.00
GC PURGES	4	2	5000	40.00
SUMMA PURGES	3	2	5000	30.00
ALL SAMPLES COLLECTED				61.12
TOTAL FOR TANK SAMPLING RUN				318.52



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**APPENDIX B**  
**AMBIENT CONDITIONS**

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APPENDIX C  
CHAIN-OF-CUSTODY FORMS

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CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Westinghouse Hanford Company

Collector: GS (APPIO/RA Westberg)  
 Sample Number: S5069  
 Project Title: VAPOR Sampling of TX-111  
 Shipped To (Lab): 222-S LABS  
 Protocol: None  
 Contact/Requestor: RD Mahon  
 Sample Origin: TX-111  
 Logbook #: ~~WHT-N-647-10~~ WHT-N-647-10  
 Method of Shipment: Government Vehicle  
 Data Surround: ASAP  
 Offsite Property No.: N/A  
 Bill of Lading/Alt Bill No.: N/A  
 Ice Chest #: N/A  
 Purchase Order/Charge Code: E61638  
 Tel. No.: 373-7437 MSIN 53-27 FAX 373-7076  
 Perservative:

Sample No.	Lab. ID	* Date	Time	No/Type Container	Sample Analysis	MSDS	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Hold Time
S5069-0u1	T-2334	X		(1) Ret. Dish	TA/TB/GEA	( )			
S5069-0D1	T-2334	X		(1)	TA/TB/GEA	( )			
S5069-0u2	T-2335	X		(1)	TA/TB/GEA	( )			
S5069-0D2	T-2336	X		(1)	TA/TB/GEA	( )			
S5069-0T1	T-2332	X		(1) Glass Container	Total Activity	( )			
						( )			
						( )			
						( )			
						( )			
						( )			
						( )			
						( )			
						( )			

COPY

SPECIAL INSTRUCTIONS: Please fax Results to Rick Mahon 373-7076  
 List all known wastes.

- Matrix \*
- DS = Drum Solids
  - DL = Drum Liquids
  - T = Tissue
  - WT = Wipe
  - L = Liquid
  - V = Vegetation
  - Other =
  - S = Soil
  - SE = Sediment
  - SO = Solid
  - SL = Sludge
  - W = Water
  - O = Oil
  - A = Air

Relinquished By: *R. Westberg* / *RA Westberg*  
 Date/Time: 10/12/95 / 14:45  
 Sign: *[Signature]*  
 Relinquished By: *[Signature]*  
 Date/Time: 10-12-95 1445  
 Relinquished By: *[Signature]*  
 Date/Time:   
 Relinquished By:   
 Date/Time:   
 Disposed By:   
 Date/Time:   
 FINAL SAMPLE DISPOSITION:   
 Disposal Method: e.g. Return to customer, per lab procedure, used in process.

All samples containing hazardous materials shall be picked up by requestor and returned to parent container or site of origin.

**Battelle  
Pacific Northwest Lab**

**CHAIN OF CUSTODY**

**WHC 009267**

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 East Tank Farm Collection date <sup>10</sup> 09 - 12 - 95  
 241-TX-111 Tank Vapor Sample SAF S5069 Preparation date 09 - 22 - 95  
 (VSS Truck)

Ice Chest No. Field Logbook No. WHC-N-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**

S5069 - A01 . 278 Ambient Air SUMMA #1 Upwind of TX-111  
 S5069 - A02 . 279 Ambient Air SUMMA #2 Through Port # \_\_\_\_

S5069 - A04 . 280 SUMMA #3 Port # \_\_\_\_  
 S5069 - A12 . 281 SUMMA #4 Port # \_\_\_\_  
 S5069 - A20 . 282 SUMMA #5 Port # \_\_\_\_

[ ] Field Transfer of Custody		[ X ] Chain of Possession		(Sign and Print Names)	
Relinquished By	Date	Time	Received By	Date	Time
JA Edwards <i>JA Edwards</i>	09-22-95	1430	TRW Clauss <i>TRW Clauss</i>	09-22-95	1430
TRW Clauss <i>TRW Clauss</i>	9/26/95	13:22	GS Caprio <i>GS Caprio</i>	9/26/95	1322
GS CAPRIO <i>GS CAPRIO</i>	10/13/95	10:35	RA Westberg <i>RA Westberg</i>	10/13/95	10:35
RA Westberg <i>RA Westberg</i>	10/13/95	11:25	JA Edwards <i>JA Edwards</i>	10-13-95	11:25

**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 / Y/N          |           |
| COC info/signatures complete?    | Y/N / Y/N          |           |
| Rad release stickers on samples? | Y/N / Y/N          |           |
| Activity report from 222S?       | Y/N / Y/N          |           |
| COC copy for LRB, RIDS filed?    | Y/N / Y/N          |           |
- POC *[Signature]* POC *[Signature]*

(Revised 10/17/94 PNL)

**Battelle Pacific Northwest Laboratory**

**CHAIN OF CUSTODY**

**WHC 009268**

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-TX-111 Tank Vapor Sample SAF S5069  
(VSS Truck)

Collection date 09 - \_\_ - 95  
Preparation date 09 - 22 - 95

Ice Chest No.

Field Logbook No. WHC-\_\_-\_\_-\_\_

Erico Hi/Lo thermometer No. PNL-T-00\_\_

Bill of Lading/Airbill No. N/A

Offsite Property No. N/A

Method of Shipment Government Truck

Shipped to WHC

Possible Sample Hazard: Remarks Unknown at time of sampling

**Sample Identification**

S5069 - A05 . 690	PNL Triple Sorbent Trap (TST) Sample # 1	
S5069 - A06 . 691	PNL TST Sample # 2	
S5069 - A07 . 692	PNL TST Sample # 3	
S5069 - A13 . 693	PNL TST Sample # 4	
S5069 - A14 . 694	PNL TST Sample # 5	
S5069 - A15 . 695	PNL TST Sample # 6	
S5069 - A21 . 696	Open, close & store PNL TST Field Blank # 1	In VSS truck
S5056 - A22 . 697	Open, close & store PNL TST Field Blank # 2	In VSS truc
S5069 - A23 . 698	Store PNL TST Trip Blank # 1	None
S5069 - A24 . 699	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
JL Julya <i>J.A. Edwards for JL Julya</i>	09-22-95	1430	TRW Claus <i>TRW Claus</i>	09-22-95	1430
TRW Claus <i>TRW Claus</i>	09-26-95	1315	GS CAPRIO <i>GS CAPRIO</i>	9/26/95	1315
GS CAPRIO <i>GS CAPRIO</i>	10-13-95	10:30	RA Westby / RA Westby	10/13/95	10:30
RA Westby / RA Westby	10-13-95	11:25	J.A. Edwards / J.A. Edwards	10-13-95	11:25

**Final Sample Disposition**

Comments:

- PNL (only) Checklist**
- 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? (<5°C)  Y /  N
  - Hi/Lo thermometer - *Keep upright!*  Y /  N
  - Hi/Lo thermometer  Y /  N
  - Rad release stickers on samples?  Y /  N
  - Activity report from 222S?  Y /  N
  - COC copy for LRB, RIDS filed?  Y /  N

POC *(Signature)* POC *(Signature)*

Comments:

*Not Used !!*

**Cooler Temperature Status**

Hi	___ °C / Lo	___ °C (pick up at PNL to WHC)	
Hi	___ °C / Lo	___ °C (delivery at WHC from PNL)	
Hi	-2 °C / Lo	-2 °C (at return to PNL from WHC)	
Hi	-2 °C / Lo	-2 °C (at delivery from WHC to PNL)	

(Revised 06/21/95 PNL)

**Battelle Pacific Northwest Laboratory**

**CHAIN OF CUSTODY**

**WHC 009269**

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 East Tank Farm**  
**241-TX-111 Tank Vapor Sample SAF S5069**  
**(VSS Truck)**

Collection date ~~09~~ <sup>10</sup> - 12 - 95  
Preparation date 09 - 22 - 95

Ice Chest No.

Field Logbook No. **WHC-N-647-10**

Method of Shipment **Government Truck**

Shipped to **WHC**

Possible Sample Hazards/Remarks **Unknown at time of sampling**

**Sample Identification**

S5069 - A08 . T26	NH <sub>3</sub> /NO <sub>x</sub> /H <sub>2</sub> O	(INORG Sorbent Trap # 1)
S5069 - A09 . T27	NH <sub>3</sub> /NO <sub>x</sub> /H <sub>2</sub> O	(INORG Sorbent Trap # 2)
S5069 - A10 . T28	NO <sub>x</sub> /H <sub>2</sub> O	(INORG Sorbent Trap # 3)
S5069 - A11 . T29	NH <sub>3</sub> /H <sub>2</sub> O/H <sub>2</sub> O	(INORG Sorbent Trap # 4)
S5069 - A16 . T30	NH <sub>3</sub> /NO <sub>x</sub> /H <sub>2</sub> O	(INORG Sorbent Trap # 5)
S5069 - A17 . T31	NH <sub>3</sub> /NO <sub>x</sub> /H <sub>2</sub> O	(INORG Sorbent Trap # 6)
S5069 - A18 . T32	NO <sub>x</sub> /H <sub>2</sub> O	(INORG Sorbent Trap # 7)
S5069 - A19 . T33	NH <sub>3</sub> /H <sub>2</sub> O/H <sub>2</sub> O	(INORG Sorbent Trap # 8)
S5069 - A25 . T34	NH <sub>3</sub> /NO <sub>x</sub> /H <sub>2</sub> O	(INORG Field Blank # 1)
S5069 - A26 . T35	NH <sub>3</sub> /NO <sub>x</sub> /H <sub>2</sub> O	(INORG Field Blank # 2)
S5069 - A27 . T36	NH <sub>3</sub> /NO <sub>x</sub> /H <sub>2</sub> O	(INORG Field Blank # 3)

[ ] Field Transfer of Custody		[ X ] Chain of Possession		(Sign and Print Names)	
Relinquished By	Date	Time	Received By	Date	Time
G W Dennis <i>G.W. Dennis</i>	09-26-95	11:10	TRW Clauss <i>TRW Clauss</i>	09-26-95	11:15
TRW Clauss <i>TRW Clauss</i>	09-26-95	11:32	GSCAPRIO <i>GSCAPRIO</i>	09-26-95	13:12
GSCAPRIO <i>GSCAPRIO</i>	10-13-95	10:35	RA Westberg <i>RA Westberg</i>	10-13-95	10:35
RA Westberg <i>RA Westberg</i>	10-13-95	11:25	JA Edwards <i>JA Edwards</i>	10-13-95	11:25

**Final Sample Disposition**

Comments:

**PNL (only) Checklist**

- ◊ 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? (<10°C)  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

**Comments:**

Original COC follows sorbent media

POC *(Signature)* POC *(Signature)*

(Revised 05/10/95 PNL)

<b>ORNL</b>	<b>CHAIN OF CUSTODY (Rev 1)</b>	<b># 006769</b>
Custody Form Initiator	Amy Dindal	Sampling Location
ORNL Contact	Roger Jenkins	Telephone
Method of Shipment	Federal Express	Shipped to
		241-TX-111 (VSS)
		(615) 576-8594
		Rick Mahon, WHC

Sample Identification

not completed dtd 10/17/95

WHC Identifier	TST #	Trap Type	Received at WHC (✓)	Received at ORNL (✓)
S5069-A40.1100	1100	SAMPLE		✓
S5069-A41.1103	1103	SAMPLE		✓
S5069-A42.1104	1104	SAMPLE		✓
S5069-A43.1105	1105	SAMPLE		✓
S5069-A44.1106	1106	SAMPLE		✓
S5069-A45.1107	1107	SAMPLE		✓
S5069-A46.1108	1108	SAMPLE		✓
S5069-A47.1109	1109	SAMPLE		✓
S5069-A48.1111	1111	SAMPLE		✓
S5069-A49.1112	1112	SAMPLE		✓
S5069-A50.1113	1113	SAMPLE		✓
S5069-A51.1114	1114	SAMPLE		✓
S5069-A52.1115	1115	TRIP BLANK		✓
S5069-A53.1116	1116	TRIP BLANK		✓
S5069-A54.1118	1118	FIELD BLANK		✓
S5069-A55.1119	1119	FIELD BLANK		✓

**COMMENTS:** Note extremely low flow on sample #S5069-A50.1113  
 No tamper tape on outside of cooler & did not fill in "received@whc" col.

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

Relinquished By	Date	Time	Received By	Date	Time
AB Dindal	10/19/95	1256	RA Westberg	10/10/95	19:00
RA Westberg	10/16/95	1005	K.J. Yang	10/16/95	1005
K.J. Yang	10/16/95	1125	AB Dindal	10/17/95	1407

**Cooler Temperature Status**

Temperature (°C)	Min	Max
When Shipped from ORNL	-1	2
When Received at WHC	-1	11
When Shipped from WHC	-1	5
When Received at ORNL	1	13



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