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		Design Authority									
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2	1	Cog.Eng. R.D. Mahon	<i>[Signature]</i>	7/31/97							
2	1	Cog. Mgr. L.L. Lockrem	<i>[Signature]</i>	7/16/97							
2	2	QA Mike Barnes	<i>[Signature]</i>	7/16/97							
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# VAPOR AND GAS SAMPLING OF SINGLE-SHELL TANK 241-B-102 USING the in Situ Vapor Sampling System

G.S. Caprio

SGN Eurisys Services Company, Richland, WA 99352  
U.S. Department of Energy Contract DE-AC06-96RL13200

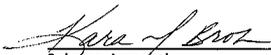
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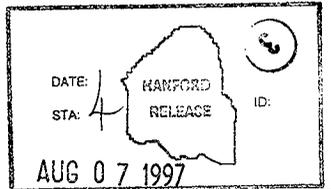
Abstract: THIS DOCUMENT PRESENTS SAMPLING DATA RESULTING FROM THE APRIL 18, 1996 SAMPLING OF SST 241-B-102

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Using the Vapor Sampling System

Approved by: \_\_\_\_\_ Date \_\_\_\_\_  
G. S. Caprio, Field Scientist  
Vapor Sampling Project  
Special Analytical Studies

Approved by: \_\_\_\_\_ Date \_\_\_\_\_  
R. D. Mahon, Project Lead  
Vapor Sampling Project  
Special Analytical Studies

Approved by:  \_\_\_\_\_ Date 7/12/97  
L. L. Lockrem, Manager  
Special Analytical Studies

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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
NH <sub>3</sub>	Ammonia
NO <sub>2</sub>	Nitrogen Dioxide
NO	Nitric Oxide
H <sub>2</sub> O	Water Vapor
OPC	Offsite Property Control
OVM	Organic Vapor Meter
PNNL	Pacific Northwest National Laboratory
SAS	Special Analytical Studies
SML	Sampling and Mobile Laboratories
SST	Single-Shell Tank
TCP	Tank Characterization Plan
team	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-B-102  
USING THE VAPOR SAMPLING SYSTEM

## 1.0 SCOPE

The Vapor Issue Resolution Program tasked the Vapor Team (the team) to collect representative headspace samples from Hanford Site single-shell tank (SST) 241-B-102. This document presents sampling data resulting from the April 18, 1996 sampling of SST 241-B-102. Analytical results will be presented in a separate report issued by Pacific Northwest National Laboratory (PNNL), which supplied and analyzed the sampling media.

## 2.0 SAMPLING EQUIPMENT DESCRIPTION

## 2.1 VAPOR SAMPLING SYSTEM

The team, consisting of Sampling and Mobile Laboratories (SML) and Special Analytical Studies (SAS) personnel, used the vapor sampling system (VSS) to collect representative samples of the air, gases, and vapors from the headspace of SST 241-B-102 with sorbent traps and SUMMA<sup>1</sup> canisters on April 18, 1996. Mahon et al. (1994) describes in detail the VSS, its performance, and its operation.

The VSS comprises a mobile laboratory connected to the vapor space of the waste tank by stainless steel transfer tubing. A vacuum pump draws sample vapor from the tank headspace through the transfer tubing and into 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 total organic carbon (TOC) content of 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 at an elevated and controlled 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.

Highly accurate mass flow controllers control the sample vapor flow rate through the sorbent traps at the sorbent trap station. The controllers FICV-1 through FICV-9 are mounted on top of the sorbent station between the inlet and outlet valves of their respective sampling ports. While 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-B-102 sampling event (see Table 1).

The VSS is equipped with a Hewlett Packard 5890 Series II gas chromatograph (GC) which is equipped with a flame-ionization detector (FID), 1 mL sample loop, 10 port injection valve, 2 meter chromatographic column, programmable

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

oven, and a portable computer loaded with the HP-Chemstation<sup>2</sup> software providing computer control. The oven is programmed to heat from 50°C to 270°C at a rate of 70°C per minute. Helium is the carrier gas, air and hydrogen the combustion gases, and nitrogen the make-up gas. The GC is plumbed to accept 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 by the operator from the computer. HP-Chemstation software activates the 10 port valve which transfers a sample from the sample loop to the HP-5 column. The column is 2m long and has an inside diameter of 0.25mm and is coated with a chemically bonded phenyl methyl silicone layer to minimize sample interference. The sample passes through the column to the FID which generates a TOC signal for that sample. The data is then transmitted to the computer where it is stored for future retrieval and analysis. The GC/FID is configured to quantitatively estimate concentrations of TOC. The GC/FID is configured to confirm sampling system cleanliness, and to quantitatively estimate TOC concentration in ambient air and tank vapor samples in real time.

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 system is multi-point calibrated at the weather station on an as available basis and last performed 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.

Sorbent trap samples, pencil-size stainless steel or glass tubes containing vapor-adsorbing media, are collected at the sorbent trap station of the sampling manifold. The rate and the duration of flow are specified by the analytical laboratory providing the sample media, determines the total volume of vapor to be passed through the tube. Virtually all the target analytes are then trapped in the tube by the adsorbing media. Analyte concentration in the tank vapor can then be ascertained from the sorbent media analysis knowing the total volume of vapor which passed through the sorbent trap.

<sup>2</sup>HP-CHEMSTATION is a Registered Trademark of the Hewlett Packard Company, Avondale, Pennsylvania.

SUMMA<sup>™</sup> canisters, stainless steel vessels with their internal surfaces chemically passivated by the SUMMA<sup>™</sup> process to minimize adsorption of gases and vapors, are used to sample tank vapor from the SUMMA<sup>™</sup> sampling station on the sampling manifold. The precleaned and evacuated SUMMA<sup>™</sup> canisters are filled with sample vapor by opening a manually operated valve, which is then shut after pressure equilibration to seal the sample inside. SUMMA<sup>™</sup> canisters allow a 6 liter sample to be transported to an analytical laboratory.

### 3.0 SAMPLING EVENT DESCRIPTION

#### 3.1 SPECIFICATIONS

The Vapor Issue Resolution Program specifies sampling requirements in WHC-SD-WM-TP-335 Rev 2, *Vapor Sampling and Analysis Plan* (Homi 1996). 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. The team retains these documents in the project file. This sample event's project-specific number is S6-044.

#### 3.2 OPERATIONS AND SAMPLING PERSONNEL

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

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

The VSS was set up at SST 241-B-102 on April 17, 1996 and was allowed to warm up overnight. Sampling began shortly after 9:00 a.m. on April 18, 1996, and was completed by 11:30 a.m. the same day.

#### 3.3 INDUSTRIAL HYGIENE FIELD RESULTS

Prior to hooking up to SST 241-B-102, 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> 5ppm, O<sub>2</sub> 20.9%, and TOC 0.0ppm.

#### 3.4 AMBIENT CONDITIONS

The weather the day of the sampling event, April 18, 1996 was cool and sunny with winds from the west at about 5-10 miles per hour. Graphs of ambient temperatures and pressures taken at the Hanford Meteorological Station, which is about 5 miles west of B-Farm, are provided in Appendix B.

#### 3.5 SAMPLE COLLECTION

The hot-water-jacketed sampling probe was located in Riser 7 of SST 241-B-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-B-102 on April 17, 1996. The team stabilized the VSS temperature zones by 9:00 a.m. on April 18, 1996, and the system was ready to collect samples. Measured according to the VSS operating procedure, the pressure and temperature of SST 241-B-102 were 989 mbar (741.6 torr) and 16 °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 23 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. Prior to sampling tank vapors on April 18, 1996, the team collected two SUMMA™ canister samples of ambient air, one manually 10 meters upwind of the VSS connection with SST 241-B-102, 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 292 mbar (219.2 torr) and leakage of ambient air into the system was observed by monitoring system pressure for 15 minutes. Leakage resulted in an increase of 2.8 mbar (2.1 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 6.38 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 TST traps sampled at 100 mL/min was 0.5%, and for sorbent traps the dilution was approximately 0.2%.

The sampling valve was opened and the VSS was purged with sample vapor from SST 241-B-102 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.

One analytical laboratory provided sample media. PNNL provided SUMMA™ canisters, sorbent traps for organic vapors, ammonia (NH<sub>3</sub>), NO<sub>x</sub>, and water vapor (H<sub>2</sub>O), and 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 241-B-102.

Table 2. TOC Results.

Number of Runs	Description	Average TOC Concentration (ppmC)	% Standard Deviation
3	Propane	6.00	0.88
4	Ambient	3.52	0.22
3	Tank Vapor	5.96	1.50

## 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 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:

PNNL: 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 April 18, 1996, SST 241-B-102 vapor sampling event was drawn through a series of four 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 filters were submitted to Laboratory 222-S for total alpha, total beta, and gamma energy analysis (GEA). The 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.

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 filter (box)	S6044-A21.OU1	Total Alpha = <0.003 Total Beta = 25.80 GEA = 48.0 ( <sup>137</sup> Cs)	= <detectable = 0.09 = 0.17
Downstream filter (box)	S6044-A22.OD1	Total Alpha = <0.003 Total Beta = 41.7 GEA = 140.0 ( <sup>137</sup> Cs)	= <detectable = 0.01 = 0.51
Upstream filter (VSS)	S6044-A23.OU2	Total Alpha = 1.83 Total Beta = 291.00 GEA = 3100.0 ( <sup>137</sup> Cs)	= 0.01 = 1.06 = 11.26
Downstream filter (VSS)	S6044-A24.OD2	Total Alpha = 1.46 Total Beta = 516 GEA = 1000.0 ( <sup>137</sup> Cs)	= 0.01 = 1.88 = 3.63
Tritium trap	S6044-A03.OT1	Total activity = <5.60	= <5.60 <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 filters. Appendix A and the sample checksheets were used to estimate a total flow through the VSS of 275.2 L.

<sup>c</sup>Number is calculated using a total volume of 1 L passing through the tritium trap.

The filter media was transported to 222-S Laboratory for analysis. The analysis was considered "non-typical" based on the previous tanks sampled.

Somewhere in the analytical process the downstream filters were incorrectly numbered or placed in an incorrect planchets. The filters were analyzed several times and the last reported results can be found in Table 3. The vapor team scientists use the activity results in Table 3 to calculate pCi/g of sample media. Even though the result were considered "non-typical" they did meet the laboratory acceptance criteria and the DOT definition of a nonradioactive shipment. For further details on these radiation results please refer to the 241-B-102 project-specific file maintained by the vapor team.

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

All sorbent trains, TSTs, and SUMMA™ canisters received from PNNL are kept in a custody locked storage area maintained by SML. Sorbent trains, tubes and traps 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 sample media was picked up from PNNL by SML and transported in a government vehicle to a custody locked storage area.

Table 4. Pacific Northwest National Laboratory Samples.

Sample Identifier	Sample Type	COC Number
S6044-A01.015	Ambient upwind SUMMA™	100072
S6044-A02.016	Ambient SUMMA™ (VSS)	100072
S6044-A04.018	SUMMA™	100072
S6044-A05.119	SUMMA™	100072
S6044-A06.252	SUMMA™	100072
S6044-A07.S55	NH <sub>3</sub> /NO <sub>x</sub> /H <sub>2</sub> O sorbent	100074
S6044-A08.S56	NH <sub>3</sub> /NO <sub>x</sub> /H <sub>2</sub> O sorbent	100074
S6044-A09.S57	NH <sub>3</sub> /NO <sub>x</sub> /H <sub>2</sub> O sorbent	100074
S6044-A10.S58	NH <sub>3</sub> /NO <sub>x</sub> /H <sub>2</sub> O sorbent	100074
S6044-A15.S59	NH <sub>3</sub> /NO <sub>x</sub> /H <sub>2</sub> O field blank	100074
S6044-A16.S60	NH <sub>3</sub> /NO <sub>x</sub> /H <sub>2</sub> O field blank	100074
S6044-A11.935	TST	100073
S6044-A12.936	TST	100073
S6044-A13.937	TST	100073
S6044-A14.939	TST	100073
S6044-A17.940	TST Field Blank	100073
S6044-A18.941	TST Field Blank	100073
S6044-A19.942	TST Trip Blank	100073
S6044-A20.943	TST Trip Blank	100073

After sampling, the PNNL sorbent tubes, TSTs, and SUMMA™ canisters were transported by government vehicle directly to PNNL and delivered to J. A. Edwards on May 15, 1996. Table 4 lists the sample identifiers, sample types, and COC form numbers for all PNNL 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.

## 5.0 QUALITY ASSURANCE AND CONTROLS

### 5.1 VAPOR SAMPLING SYSTEM CLEANING

Immediately prior to sampling of SST 241-B-102, the VSS manifold and vapor sample transfer tubing was heated to 60 °C and ambient air was purged through the system for 1334 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 the team.

### 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 the team, are summarized in Table 5. According to the calibration schedule shown in Table 5, all instrumentation was within its calibration period during the SST 241-B-102 sampling event.

Due to calibration discrepancies, the mass flow measurements for this sampling event may have an error of 6% to 14%. A detailed description of this discrepancy can be found in internal memo 75820-96-028.

### 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.

Table 4 lists sample blanks used during the sampling of SST 241-B-102.

Table 5. 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	08/25/95	08/25/96	804-67-74-009

## 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)*. There were no anomalies during the VSS sampling event.

7.0 REFERENCES

- 49 CFR 100-177, 1992, "Transportation," Code of Federal Regulations, as amended.
- Homi, C. S., 1996, *Vapor Sampling and Analysis Plan*, WHC-SD-WM-TP-335 Rev. 1D, 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.
- Tribble, T. C., Viswanath, R. S., 1996c, *Recommendation concerning the ISVS/VSS comparison study data with respect to calibration errors in Mass flow monitors and controllers*, (internal memo 75820-96-028 to L.D. Pennington, August 28), 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 (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.

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**APPENDIX A**  
**SAMPLE LOG SHEETS**

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YSS Sampling of  
B-102

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

Date: 4/18/96

Ensure HEPA filters are installed

VSS Personnel: Glenn Caprio and Rick Mahon

Ensure connection to sample probe

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

Trailer Personnel: Tim Utecht

Tank Temperature 16 C

GC Standard Runs

GC Ambient Air Runs through port 10

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.											
S6044- A01	015	Upwind	AMBIENT #1	5500	30	165000	5500	4/17/96 1040	4/18/96 0854	1334	
GC Run #1	Ambient air/Cleanliness check										
S6044- A02	016	15	AMBIENT #2		1			0914	0915	1	
GC RUN#2	Ambient air										
LEAK CHECK(APPENDIX A) Leak Rate: B.4 Torr/hr											
Purge with tank air for 30 min											
				5500	30	165000	5500	1002	1032	30	165.00
Measure tank pressure PE-1 = 741.6 Torr											
GC RUN #3	Tank run #1										
S6044- A03	0T1	S96VV0045	5	200	5	1000	200.00	1040	1045	5	1.00
Tritium Trap											
S6044- A04	018	018	11		1			1050	1051	1	6.00
SUMMA #3											
S6044- A05	119	119	13		1			1054	1055	1	6.00
SUMMA #4											
S6044- A06	252	252	15		1			1058	1059	1	6.00
SUMMA #5											
GC RUN #4	Tank run # 2										
								1100			

YSS Sampling of B-102

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
S6044- A07 S55	#S55	1	NH3/NOx/H2O (#1)	200	10	2000	200.00	1104	1114	10	2.00
S6044- A08 S56	#S56	2	NH3/NOx/H2O (#2)	200	10	2000	200.00	1104	1114	10	2.00
S6044- A09 S57	#S57	3	NH3/NOx/H2O (#3)	200	10	2000	200.00	1104	1114	10	2.00
S6044- A10 S58	#S58	4	NH3/NOx/H2O (#4)	200	10	2000	200.00	1104	1114	10	2.00
S6044- A11 935	#935	5	TST #1	100	2	200	100.00	1104	1108	2	0.20
S6044- A12 936	#936	6	TST #2	100	2	200	100.00	1104	1106	2	0.20
S6044- A13 937	#937	7	TST #3	100	2	200	100.00	1104	1106	2	0.20
S6044- A14 939	#939	8	TST #4	100	2	200	100.00	1104	1106	2	0.20
S6044- A17 940	#940		TST FIELD BLANK #1					1110	1112	2	
S6044- A18 941	#941		TST FIELD BLANK #2					1112	1114	2	
S6044- A15 S59	#S59		NH3/NOx/H2O FIELD BLANK #1					1127	1129	2	
S6044- A16 S60	#S60		NH3/NOx/H2O FIELD BLANK #2					1127	1129	2	
GCRUN #5 (Tank run #3)								1116			
TOTAL TANK GAS USED DURING SAMPLING RUNS											27.80

YSS Sampling of  
B-102

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
S6044- A21 OU1	S96WV0041		Upstream HEPA(box)								
S6044- A22 OD1	S96WV0042		Downstream HEPA(box)								
S6044 A23 OU2	S96WV0043		Upstream HEPA(VSS)								
S6044- A24 OD2	S96WV0044		Downstream HEPA (VSS)								

Trip Blanks (DO NOT EXPOSE)

S6044- A19 942	TST#942		TST TRIP #1								
S6044- A20 943	TST#943		TST TRIP #2								



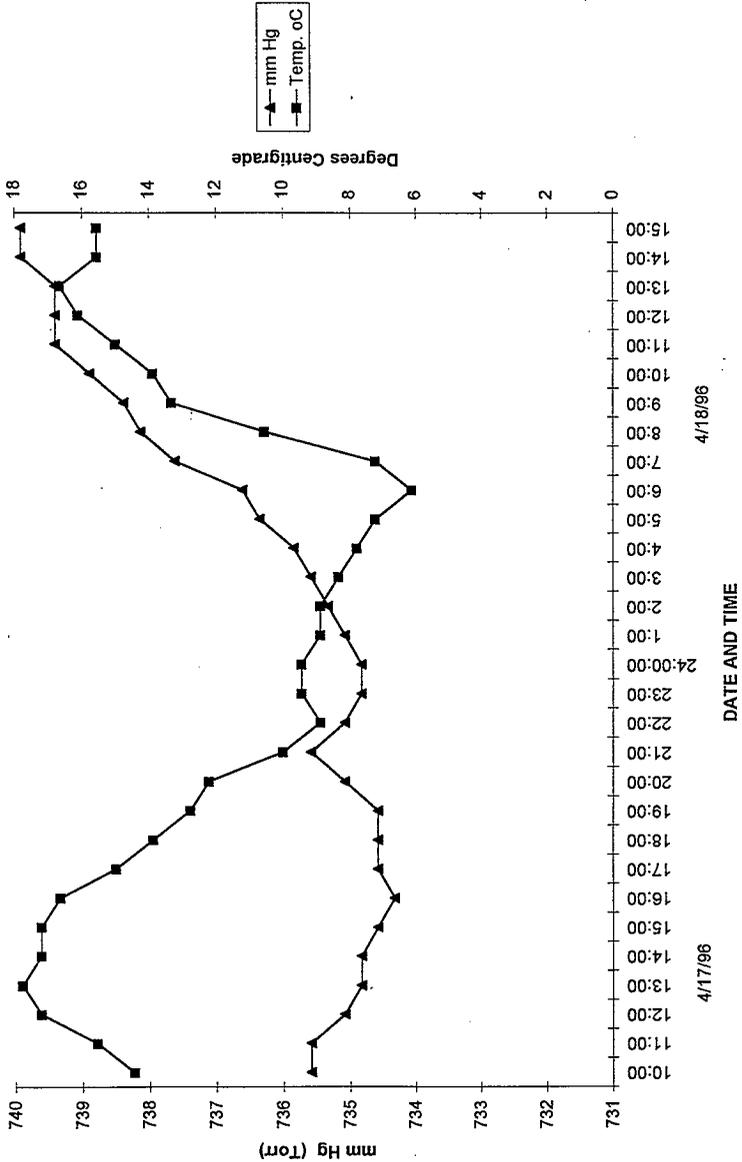


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**APPENDIX B**  
**AMBIENT CONDITIONS**

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WEATHER DURING VSS SAMPLING OF 241-B-102



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**APPENDIX C**  
**CHAIN-OF-CUSTODY FORMS**

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**Battelle Pacific Northwest Laboratory**      **CHAIN OF CUSTODY**      **WHC 100073**

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-B-102 Tank      Vapor Sample SAF S6044  
 (VSS Truck)

Ice Chest No.      Field Logbook No. WHC- P-597-10

Ertco Hi/Lo thermometer No.      PNL-T-003

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**

S6044 - A11 . 935 \*      PNL Triple Sorbent Trap (TST) Sample # 1  
 S6044 - A12 . 936 \*      PNL TST Sample # 2  
 S6044 - A13 . 937 \*      PNL TST Sample # 3  
 S6044 - A14 . 939 \*      PNL TST Sample # 4

S6044 - A17 . 940 \*      Open, close & store TST Field Blank # 1      In VSS truck  
 S6044 - A18 . 941 \*      Open, close & store TST Field Blank #2      In VSS truck

S6044 - A19 . 942 \*      Store TST Trip Blank #1  
 S6044 - A20 . 943 \*      Store TST Trip Blank #2

[ ] Field Transfer of Custody			[ X ] Chain of Possession			(Sign and Print Names)		
Relinquished By	Date	Time	Received By	Date	Time			
<del>H. Jahn</del> / <u>J.A. Edwards</u>	04-12-96			04-12-96				
<del>J.A. Edwards</del> / <u>J.A. Edwards</u>	04-17-96	1400	<del>J. R. Utter</del> / <u>J. R. Utter</u>	4-17-96	1400			
<del>J. R. Utter</del> / <u>R.D. Mahon</u>	04-18-96	0730	<u>R.D. Mahon</u> / <u>R.D. Mahon</u>	04-18-96	0730			
<u>R.D. Mahon</u> / <u>R.D. Mahon</u>	05-15-96	1316	<u>GS Caprio</u> / <u>J.A. Call</u>	05-15-96	1316			
<u>GS Caprio</u> / <u>J.A. Call</u>	05-15-96	1420	<u>J.A. Edwards</u> / <u>J.A. Edwards</u>	5-15-96	1420			

**Final Sample Disposition**

**Comments:**

- PNL (only) Checklist
- ◊ 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
  - ◊ Sorbents shipped on ice? (<5°C)      Y/N / 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

**Comments:**

Cooler Temperature Status

Hi -15 °C / Lo -15 °C (pick up at PNL to WHC) |

Hi    °C / Lo    °C (delivery at WHC from PNL) |

Hi    °C / Lo    °C (at return to PNL from WHC) |

Hi ±5 °C / Lo -17 °C (at delivery from WHC to PNL) |

POC (12)      POC (12)

(Revised 06/21/95 PNL)

<b>Battelle Pacific National Northwest Lab</b>	<b>CHAIN OF CUSTODY</b>	<b>WHC 100074</b>
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Custody Form Initiator	J. A. Edwards - PNNL	Telephone (509) 373-0141 Page 85-3009 / FAX 376-0418
Company Contact	R. D. Mahon - WHC	Telephone (509) 373-7437 Page 85-9656 / FAX 373-3793
Project Designation/Sampling Locations	200 West Tank Farm 241-B-102 Tank Vapor Sample SAF S6044 VSS	Collection date 04-18-96 Preparation date 04-16-96
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	PNNL	
Possible Sample Hazards/Remarks	Unknown at time of sampling	

Sample Identification

S6044 - A07 . S55 -	Collect NH <sub>3</sub> /NO <sub>x</sub> /H <sub>2</sub> O Sorbent Trap
S6044 - A08 . S56 -	Collect NH <sub>3</sub> /NO <sub>x</sub> /H <sub>2</sub> O Sorbent Trap
S6044 - A09 . S57 -	Collect NH <sub>3</sub> /NO <sub>x</sub> /H <sub>2</sub> O Sorbent Trap
S6044 - A10 . S58 -	Collect NH <sub>3</sub> /NO <sub>x</sub> /H <sub>2</sub> O Sorbent Trap
S6044 - A15 . S59 -	Open, close and store NH <sub>3</sub> /NO <sub>x</sub> /H <sub>2</sub> O field blank #1
S6044 - A16 . S60 -	Open, close and store NH <sub>3</sub> /NO <sub>x</sub> /H <sub>2</sub> O field blank #2

Field Transfer of Custody	Chain of Possession		(Sign and Print Names)			
Relinquished By	Date	Time	Received By	Date	Time	
G W Dennis / J. A. Edwards	04-17-96	1030	J A Edwards / J A Edwards	04-17-96	1030	
J A Edwards / J A Edwards	04-17-96	1400	T. R. Butler / T. R. Butler	04-17-96	1400	
T. R. Butler / R. D. Mahon	04-18-96	0730	R D Mahon / R D Mahon	04-18-96	0730	
R D Mahon / R D Mahon	05-15-96	1315	GS Carpio / GS Carpio	05-15-96	1315	
GS Carpio / J. A. Edwards	05-15-96	1400	J A Edwards / J A Edwards	5-15-96	1400	

Final Sample Disposition

Comments:

PNNL (only) Checklist

- Media labeled and checked?
- Letter of instruction?
- Media in good condition?
- COC info/signatures complete?
- Rad release stickers on samples?
- Activity report from 2225?
- RSR/copy? (a ≤100/β ≤400 pCi/g)
- COC copy for LRB, RIDS filed?

Pick-up / Delivery

- /
- /
- /
- /
- /
- /
- /
- /

Comments:

POC POC

(Revised 11/30/95 PNNL)

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

C.O.C.# /00/31  
Page 1 of 1

Westinghouse Hanford Company  
 Collector(s) Glenn Caprio/Rick Mahon  
 Contact/Requestor Rick Mahon  
 Tel. No. 373-7437 MSIN 373-7076 FAX 373-7076  
 SAF Number S6-144 + S6-141(1+2+3) Purchase Order/Charge Code E29937175745  
 Legbook# N/A Ice Chest# N/A Temp. N/A  
 Project Title Vapor Sampling Method of Shipment Government Vehicle  
 Shipped To (Lab) 222-S Date of Landing/Air Bill No. N/A  
 Protocol Name 222-S Offsite Property No. N/A

Sample No.	Lab. ID	Date	Time	No./Type Container	Sample Analysis	Preservative
3684-A21-1333	S96HW0041			(1) petri dish	AT/TB/GEA	N/A
3684-A22-031	S96HW0042			(1) petri dish	AT/TB/GEA	N/A
3684-A23-032	S96HW0043			(1) petri dish	AT/TB/GEA	N/A
3684-A24-033	S96HW0044			(1) petri dish	AT/TB/GEA	N/A
3684-A25-034	S96HW0045			(1) silica gel		N/A
3684-A26-035	S96HW0046			(1) Petri dish	AT/TB/GEA (Petri dish - Press. Lab. F. 1122)	N/A
3684-A27-036	S96HW0047			(1) Petri dish	AT/TB/GEA (Petri dish - Press. Lab. F. 1122)	N/A
3684-A28-037	S96HW0048			(1) Petri dish	AT/TB/GEA (Petri dish - Press. Lab. F. 1122)	N/A

POSSIBLE SAMPLE HAZARDS/REMARKS  
 List all brown wastes.  
 MSDS Yes  No

Relinquished By	Print	Sign	Date/Time	Received By	Print	Sign	Date/Time
Glenn S Caprio	Glenn S Caprio	[Signature]	4/18/96 1515	Amber Leishear	Amber Leishear	[Signature]	4/18/96 1515
[Signature]	[Signature]	[Signature]	5-1-96	Rick Mahon	Rick Mahon	[Signature]	1/14/96 1336
Rick Mahon	Rick Mahon	[Signature]	1/14/96 1350	Mark Grant	Mark Grant	[Signature]	5-1-96 1350

FINAL SAMPLE DISPOSITION  
 Disposal Method - e.g. Return to customer, per lab procedure, used in process.  
 Sample S96HW0045 (silica gel) used in process. All others returned.  
 Date/Time 5-1-96  
 A-6001-500 (07/95)

SPECIAL INSTRUCTIONS  
 please fax the report to Rick Mahon at 373-7076 once the analysis is completed. The date and time of each analysis should be included in the report. Thanks.

- Matrix\*
- S - Soil
  - SE - Sediment
  - SO - Sludge
  - W - Wastewater
  - D - Oil
  - A - Air
  - DS - Dism. Solids
  - L - Lipids
  - T - Tissue
  - W3 - Wipes
  - L - Liquid
  - V - Vegetation
  - X - Other

## DISTRIBUTION SHEET

To Distribution	From Special Analytical Support, Numatec Hanford	Page 1 of 1 Date 8/7/97
Project Title/Work Order VAPOR AND GAS SAMPLING USING THE IN SITU VAPOR SAMPLING SYSTEM		EDT No. <i>621262</i> ECN No.

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
<u>Lockheed Martin Hanford Company</u>					
L. L. Buckley	R2-12	X			
<u>Lockheed Martin Services, Inc.</u>					
Central Files	A3-88	X			
<u>SGN Eurisys Services Corporation</u>					
E. S. Mast	S3-90	X			
<u>PNNL</u>					
J. L. Huckaby	K6-80	X			