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VAPOR AND GAS SAMPLING OF SINGLE-SHELL TANK 241-BX-110 USING the in Situ Vapor Sampling System

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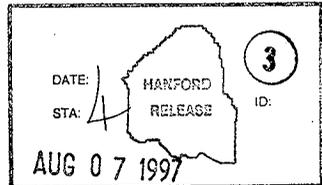
Abstract: THIS DOCUMENT PRESENTS SAMPLING DATA RESULTING FROM THE APRIL 30, 1996 SAMPLING OF SST 241-BX-110

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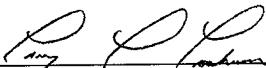
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Using the Vapor Sampling System

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LIST OF TERMS

CGI	Combustible Gas Indicator
COC	Chain Of Custody
DOT	U.S. Department of Transportation
GC/FID	Gas Chromatograph/Flame Ionization Detector
GEA	Gamma Energy Analysis
NH ₃	Ammonia
NO ₂	Nitrogen Dioxide
NO	Nitric Oxide
H ₂ 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

VAPOR AND GAS SAMPLING OF SINGLE-SHELL TANK 241-BX-110 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-BX-110. This document presents sampling data resulting from the April 30, 1996 sampling of SST 241-BX-110. 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-BX-110 with sorbent trap and SUMMA¹ canisters on April 30, 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-BX-110 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

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

oven, and a portable computer loaded with the HP-Chemstation² 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 GC 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 which 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 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 ³ /min)	% Change from 647 to Actual	% Change from Datalogger to Actual
1	200	-0.7	-0.85
2	200	0.05	-0.10
3	200	-0.45	-0.60
4	200	0.05	-0.10
5	200	0.55	0.35
6	200	0.25	0.05
7	200	0.4	0.20
8	200	0.25	-1.81
9	50	-0.128	-0.27
10	200	-1.1	-1.20
11	5000	0.332	0.17

The 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 duration of flow, as 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.

SUMMA[™] canisters, stainless steel vessels with their internal surfaces chemically passivated by the SUMMA[™] process to minimize adsorption of gases and vapors, are used to sample tank vapor from the SUMMA[™] sampling station on the sampling manifold. The precleaned and evacuated SUMMA[™] canisters are

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

filled with sample vapor by opening a manually operated valve, which is then shut after pressure equilibration to seal the sample inside. "SUMMA" 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), which 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, S6-046.

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.

The VSS was set up at SST 241-BX-110 on April 29, 1996 and was allowed to warm up overnight. Sampling began shortly after 11:00 a.m. on April 30, 1996, and was completed by 1:30 p.m. the same day.

3.3 INDUSTRIAL HYGIENE FIELD RESULTS

Prior to hooking up to SST 241-BX-110, 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%, NH₃ 60ppm, O₂ 20.8%, and TOC 1.1ppm.

3.4 AMBIENT CONDITIONS

The weather the day of the sampling event, April 30, 1996 was warm and partly cloudy with winds from the northwest. Graphs of ambient temperatures and pressures taken at the Hanford Meteorological Station, which is about 5 miles west of BX-Farm, are provided in Appendix B.

3.5 SAMPLE COLLECTION

The hot-water-jacketed sampling probe was located in Riser 7 of SST 241-BX-110. 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-BX-110 on April 29, 1996. The team stabilized the VSS temperature zones by 11:00 p.m. on April 30, 1996, and the system was ready to collect samples. Measured according to the VSS operating procedure, the pressure and temperature of SST 241-BX-110 were 997 mbar (748.1 torr) and 15.2 °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 30, 1996, the team collected two SUMMA™ canister samples of ambient air, one manually 10 meters upwind of the VSS connection with SST 241-BX-110, 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 276 mbar (206.8 torr) and leakage of ambient air into the system was observed by monitoring system pressure for 15 minutes. Leakage resulted in an increase of 4.53 mbar (3.4 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 10.96 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 1.0%, 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-BX-110 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 (NH₃), NO_x, and water vapor (H₂O), 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-BX-110.

Table 2. TOC Results.

Number of Runs	Description	Average TOC Concentration (ppmC)	% Standard Deviation
3	Propane	6.00	1.54
4	Ambient	3.29	1.38
3	Tank Vapor	4.02	0.97

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 30, 1996, SST 241-BX-110 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. SST 241-BX-110 filter and silica gel analysis results are shown in Table 3. The vapor team scientists use the activity results in Table 3 to calculate pCi/g of sample media. The team maintains this information in the project-specific file. The results in Table 3 indicate that the samples collected from SST 241-BX-110 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 filter (box)	S6046-A21.OU1	Total Alpha = 37.70 Total Beta = 79.50 GEA = 53.8 (¹³⁷ Cs)	= 0.14 = 0.29 = 0.20
Downstream filter (box)	S6046-A22.OD1	Total Alpha = <0.846 Total Beta = 3.98 GEA = <detectable	= <detectable = 0.01 = <detectable
Upstream filter (VSS)	S6046-A23.OU2	Total Alpha = <0.760 Total Beta = 7.82 GEA = <detectable	= <detectable = 0.03 = <detectable
Downstream filter (VSS)	S6046-A24.OD2	Total Alpha = <0.498 Total Beta = 5.53 GEA = <detectable	= <detectable = 0.02 = <detectable
Tritium trap	S6046-A03.OT1	Total activity = 216	= 216 ^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 filters. Appendix A and the sample checksheets were used to estimate a total flow through the VSS of 275.2 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, 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 ± 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 the custody locked storage area.

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.

Table 4. Pacific Northwest National Laboratory Samples.

Sample Identifier	Sample Type	COC Number
S6046-A01.115	Ambient upwind SUMMA™	100078
S6046-A02.121	Ambient SUMMA™ (VSS)	100078
S6046-A04.155	SUMMA™	100078
S6046-A05.213	SUMMA™	100078
S6046-A06.255	SUMMA™	100078
S6046-A07.S67	NH ₃ /NO _x /H ₂ O sorbent	100080
S6046-A08.S68	NH ₃ /NO _x /H ₂ O sorbent	100080
S6046-A09.S69	NH ₃ /NO _x /H ₂ O sorbent	100080
S6046-A10.S70	NH ₃ /NO _x /H ₂ O sorbent	100080
S6046-A15.S71	NH ₃ /NO _x /H ₂ O field blank	100080
S6046-A16.S72	NH ₃ /NO _x /H ₂ O field blank	100080
S6046-A11.969	TST	100079
S6046-A12.970	TST	100079
S6046-A13.971	TST	100079
S6046-A14.972	TST	100079
S6046-A17.975	TST Field Blank	100079
S6046-A18.976	TST Field Blank	100079
S6046-A19.977	TST Trip Blank	100079
S6046-A20.978	TST Trip Blank	100079

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-BX-110, the VSS manifold and vapor sample transfer tubing was heated to 60 °C and ambient air was purged through the system for 1341 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.

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

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-BX-110 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-BX-110.

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.
- Trible, 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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VSS Sampling of
BX-110

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

Date: 4/30/96

VSS Personnel: Glenn Caprio and Rick Mahon

Ensure HEPA filters are installed

Ensure connection to sample probe

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

Tank Temperature 15.2 C

Trailer Personnel: None

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.											
S6046-A01	115	Upwind	AMBIENT #1	5500	30	165000	5500	1103	0924	1341	1
GC Run #1 Ambient air/Cleanliness check											
S6046-A02	121	15	AMBIENT #2		1			1112	1113	1	
GC RUN#2 Ambient air											
LEAK CHECK (APPENDIX A) Leak Rate: 13.6 Torr/Hr											
Purge with tank air for 30 min											
				5500	30	165000	5500	1149	1219	30	165.00
Measure tank pressure PE-1 = 748.1 Torr											
GCRUN #3 (Tank run #1) 1225											

S6046-A03	0T1	S96WV0059	5	Tritium Trap	200	5	1000	200.00	1228	1233	5	1.00
S6046-A04	155	11	SUMMA #3		1			1238	1239	1	6.00	
S6046-A05	213	13	SUMMA #4		1			1242	1243	1	6.00	
S6046-A06	255	15	SUMMA #5		1			1246	1247	1	6.00	
GCRUN #4 (Tank run # 2) 1248												

EX-110.XLS 5/14/96 12:27 PM

VSS Sampling of
BX-110

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
S6046- A07 S67	#S67	1	NH3/NOx/H2O (#1)	200	10	2000	200.00	1252	1302	10	2.00
S6046- A08 S68	#S68	2	NH3/NOx/H2O (#2)	200	10	2000	200.00	1252	1302	10	2.00
S6046- A09 S69	#S69	3	NH3/NOx/H2O (#3)	200	10	2000	200.00	1252	1302	10	2.00
S6046- A10 S70	#S70	4	NH3/NOx/H2O (#4)	200	10	2000	200.00	1252	1302	10	2.00
S6046- A11 969	#969	5	TST #1	100	2	200	100.00	1252	1254	2	0.20
S6046- A12 970	#970	6	TST #2	100	2	200	100.00	1252	1254	2	0.20
S6046- A13 971	#971	7	TST #3	100	2	200	100.00	1252	1254	2	0.20
S6046- A14 972	#972	8	TST #4	100	2	200	100.00	1252	1254	2	0.20

S6046- A17 975	#975		TST FIELD BLANK #1					1258	1259	1	
S6046- A18 976	#976		TST FIELD BLANK #2					1258	1259	1	

S6046- A15 S71	#S71		NH3/NOx/H2O FIELD BLANK #1					1309	1310	1	
S6046- A16 S72	#S72		NH3/NOx/H2O FIELD BLANK #2					1309	1310	1	

GCRUN #5	(Tank run #3)							1304			
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TOTAL TANK GAS USED DURING SAMPLING RUNS 27.80

VSS Sampling of
BX-110

WHC Sample ID	ORNL/PNL Sample ID	Port Valve #	Description	Desired	Desired	Desired	Actual	Actual	Actual	Actual	Actual	Actual
				Flow Rate SCCM	Duration (min.)	Total Flow SCCM	Flow Rate SCCM	Start Time	End Time	Total Time (min.)	Total Flow Liters	
S6046- A21 0U1	S96VV0054		Upstream HEPA(box)									
S6046- A22 0D1	S96VV0055		Downstream HEPA(box)									
S6046 A23 0U2	S96VV0056		Upstream HEPA(VSS)									
S6046- A24 0D2	S96VV0057		Downstream HEPA (VSS)									
Trip Blanks (DO NOT EXPOSE)												
S6046- A19 977	TST#977		TST TRIP #1									
S6046- A20 978	TST#978		TST TRIP #2									

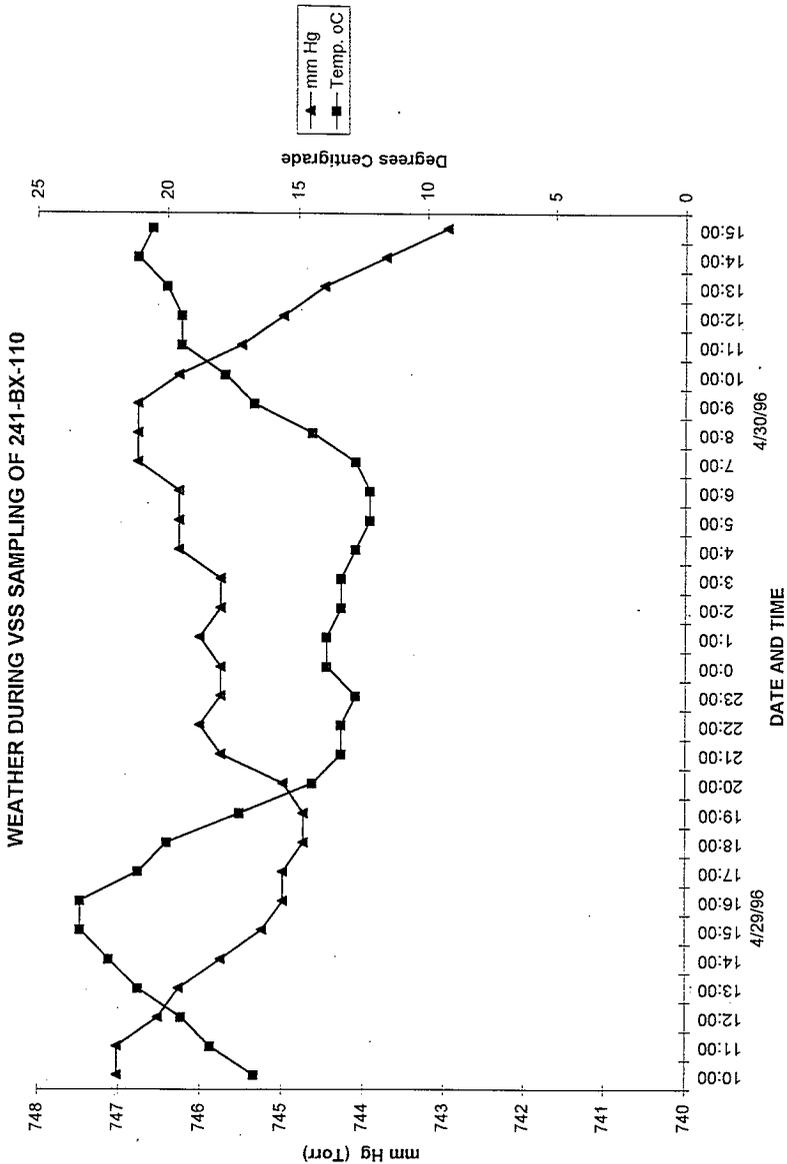
VSS SAMPLING RADIOLOGICAL SCREENING RESULTS
BX-110

Note: #VALUE! = < Detectable									
S6046-A21.OU.1 / S96VV0054 FILTER BOX DOWNSTREAM FILTER	Liters 275.20	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
ALPHA	37.70	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable
BETA	49.85	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable
GEA - Cs-60	48.87	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable
Cs-134	53.80	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable
Cs-137	43.75	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable
Eu-152	23.27	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable
Eu-154	29.48	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable
Eu-155									
S6046-A23.OU.2 / S96VV0056 VSS UPSTREAM FILTER	Liters 275.20	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
ALPHA	40.760	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable
BETA	7.82	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable
GEA - Cs-60	13.14	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable
Cs-134	13.17	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable
Cs-137	13.17	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable
Eu-152	13.17	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable
Eu-154	13.17	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable
Eu-155	13.17	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable
S6046-A03.O1.1 / S96VV00 TRITIUM TRAP	Liters 1	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
TOTAL VOLUME	216	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable
TOTAL ACTIVITY	216	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable
SAMPLE EXPOSURE ANALYSIS USING VSS DOWNSTREAM FILTER ANALYSIS AS POSSIBLE EXPOSURE LEVEL = BETA and ALPHA. Less than D01 shipping limits									
SORBENT SAMPLING Used 5 g for sorbent mass									
TOTAL VOLUME PER SAMPLE	2.00	Liters							
Tritium per Sample	86.40	pCi per gram							
NH3 (5 gram)	86.40	pCi per gram							
H2O (5 gram)	86.40	pCi per gram							
NOX (5 gram)	86.40	pCi per gram							
ALPHA per Sample	#VALUE!	pCi per gram							
H2O (5 gram)	#VALUE!	pCi per gram							
H2O (5 gram)	#VALUE!	pCi per gram							
NOX (5 gram)	#VALUE!	pCi per gram							
BETA per Sample	0.01	pCi per gram							
NH3 (5 gram)	0.01	pCi per gram							
H2O (5 gram)	0.01	pCi per gram							
NOX (5 gram)	0.01	pCi per gram							
GEA per Sample	< Detectable	pCi per gram							
SUMMA SAMPLING									
TOTAL VOLUME PER CANISTER	6	Liters (air at 300K, 1 bar = 1.161 g/L)							
Tritium per Sample	186.05	pCi per gram							
BETA per Sample	0.02	pCi per gram							
ALPHA per Sample	#VALUE!	pCi per gram							
GEA per Sample	< Detectable	pCi per gram							
S6046-A22.OU.1 / S96VV0055 FILTER BOX DOWNSTREAM FILTER	Liters 275.20	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
ALPHA	40.846	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable
BETA	13.98	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable
GEA - Cs-60	49.165	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable
Cs-134	35.79	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable
Cs-137	50.52	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable
Eu-154	38.61	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable
Eu-155	27.73	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable
S6046-A24.OU.2 / S96VV0057 VSS DOWNSTREAM FILTER	Liters 275.20	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
ALPHA	40.498	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable
BETA	5.53	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable
GEA - Cs-60	13.14	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable
Cs-134	13.17	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable
Cs-137	13.17	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable
Eu-154	13.17	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable
Eu-155	13.17	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable	< Detectable
TOTAL FLOW									
TOTAL VOLUME									
TOTAL ACTIVITY									
TOTAL VOLUME PER SAMPLE	0.20	Liter							
Tritium per Sample	9.60	pCi per gram							
ALPHA per Sample	#VALUE!	pCi per gram							
TST (4.5 gram)	#VALUE!	pCi per gram							
BETA per Sample	0.00	pCi per gram							
TST (4.5 gram)	< Detectable	pCi per gram							
GEA per Sample									

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APPENDIX B
AMBIENT CONDITIONS

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APPENDIX C
CHAIN-OF-CUSTODY FORMS

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Battelle Pacific National Northwest Lab CHAIN OF CUSTODY WHC 100080

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 Collection date 64 - 30 - 96
 241-BX-110 Tank Vapor Sample SAF S6046 Preparation date 04 - 22 - 96
 VSS

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

S6046 - A07 . S67
 S6046 - A08 . S68
 S6046 - A09 . S69
 S6046 - A10 . S70
 Collect NH₃/NO_x/H₂O Sorbent Trap
 Collect NH₃/NO_x/H₂O Sorbent Trap
 Collect NH₃/NO_x/H₂O Sorbent Trap
 Collect NH₃/NO_x/H₂O Sorbent Trap

S6046 - A15 . S71
 S6046 - A16 . S72
 Open, close and store NH₃/NO_x/H₂O field blank #1
 Open, close and store NH₃/NO_x/H₂O field blank #2

[] Field Transfer of Custody		[X] Chain of Possession		(Sign and Print Names)		
Relinquished By	Date	Time	Received By	Date	Time	
G W Dennis / J.S.W.D	04-22-96	1330	J Edwards / J Edwards	04-22-96	1330	
J Edwards / J Edwards	04-29-96	1510	C S McCallum / C S McCallum	04-29-96	1510	
C S McCallum / C S McCallum	04-21-96	1645	R D Mahon / R D Mahon	04-29-96	1645	
R D Mahon / R D Mahon	05-15-96	1312	G S Appert / G S Appert	05-15-96	1312	
G S Appert / G S Appert	5-15-96	1410	J Edwards / J Edwards	5-15-96	1410	

Final Sample Disposition

Comments:

- PNNL (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
 - Rad release stickers on samples? Y/N
 - Activity report from 222S? Y/N
 - RSR/copy? (a ≤100/B ≤400 pCi/g) Y/N
 - COC copy for LRB, RIDS filed? Y/N

POC POC

(Revised 11/30/95 PNNL)

Battelle Pacific
Northwest Laboratory

CHAIN OF CUSTODY

WHC 100079

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-BX-110 Tank Vapor Sample SAF S6046
(VSS Truck)

Collection date 04-22-96
Preparation date 04-28-96

Ice Chest No.

Field Logbook No. WHC-N-647/0

Enco Hi/Lo thermometer No. PNL-T-004

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

S6046 - A11 . 969	PNL Triple Sorbent Trap (TST) Sample # 1	
S6046 - A12 . 970	PNL TST Sample # 2	
S6046 - A13 . 971	PNL TST Sample # 3	
S6046 - A14 . 972	PNL TST Sample # 4	
S6046 - A17 . 975	Open, close & store TST Field Blank # 1	In VSS truck
S6046 - A18 . 976	Open, close & store TST Field Blank #2	In VSS truck
S6046 - A19 . 977	Store TST Trip Blank #1	
S6046 - A20 . 978	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
JL Julia	04-29-96	1215	JA Edwards	04-29-96	1215
JA Edwards	04-29-96	1510	CS Mahon	04-29-96	1510
CS Mahon	04-29-96	1643	RD Mahon	04-29-96	1643
RD Mahon	05-15-96	1312	CS Mahon	05-15-96	1312
CS Mahon	5-15-96	1410	JA Edwards	5-15-96	1410
JA Edwards	5-15-96	1410	JL Julia	5-15-96	1410

Final Sample Disposition

Comments:

- PNL (only) Checklist
- Media labeled and checked?
- Letter of instruction?
- Media in good condition?
- COC info/signatures complete?
- Sorbents shipped on ice? (<5°C)
- Hi/Lo thermometer - Keep upright!
- Hi/Lo thermometer
- Rad release stickers on samples?
- Activity report from 222S?
- COC copy for LRB, RIDs filed?

Comments:

I. Cooler Temperature Status

Hi -18 °C / Lo -18 °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 -18 °C (at delivery from WHC to PNL)

POC POC

(Revised 06/21/95 PNL)

Westinghouse Hanford Company		CHAIN OF CUSTODY/SAMPLE ANALYSIS REPORT		COC# 100147		
Collector(s) Glenn Caprio/Rick Mahon		Contact/Requestor Rick Mahon		Page 1 of 1		
SAF Number S6046		Sample Origin BX110		Tel. No. 373-7437 MSIN S3-27 FAX 373-7076		
Project Title Vapor Sampling		Jobbook# N/A		Purchase Order/Charge Code E29937/75745		
Shipped To (Lab) 222-S		Method of Shipment Government Vehicle		Ice Chest# N/A Temp. N/A		
Preferred None		Date Turnaround 24 hr		Bill of Lading/Air Bill No. N/A		
		OR/Kit Property No. N/A				
Sample No.	Lab ID	* Date	Time	Ref/Type/Container	Sample Analysis	Preservative
564W-421-041	S96W	X 4/26/76	1430	(D) petri dish	AI/TB/GEA	N/A
564W-422-011	S96W	X		(D) petri dish	AI/TB/GEA	N/A
564W-423-042	S96W	X		(D) petri dish	AI/TB/GEA	N/A
564W-424-022	S96W	X		(D) petri dish	AI/TB/GEA	N/A
564W-425-077	S96W	X		(S) silica-ge	Total Activity	N/A
				()		
				()		
				()		
				()		
				()		
				()		
POSSIBLE SAMPLE HAZARDS/REMARKS List all known wastes.						
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.						
Relinquished By	Print	Sign	Print	Received By	Print	Sign
Glenn S Caprio	MSD	MSD	MSD	N. L. APPLERS	Rogginia	MSD
Relinquished By	Date/Time	Date/Time	Date/Time	Received By	Date/Time	Date/Time
Relinquished By	Date/Time	Date/Time	Date/Time	Received By	Date/Time	Date/Time
Relinquished By	Date/Time	Date/Time	Date/Time	Received By	Date/Time	Date/Time
Disposal						
FINAL SAMPLE DISPOSITION Disposal Method: 4 & Return to container, per lab procedure, used in process.						
All samples containing hazardous materials shall be picked up by requester and returned to parent container or site of origin.						

A-6001-500 (7/75)

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. <u>614233</u> 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			