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VAPOR AND GAS SAMPLING OF THE SINGLE-SHELL TANK 241-S-101 USING The in Situ Vapor Sampling System

G. S. Caprio

SGN Eurisys Services Company, Richland, WA 99352

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Abstract: THIS DOCUMENT PRESENTS SAMPLING DATA RESULTING FROM THE JUNE 6, 1996 SAMPLING OF SST-241-S-101.

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Date

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Document title: Vapor and Gas Sampling of Single-Shell Tank 241-S-101
Using the In Situ Vapor Sampling System

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LIST OF TERMS

CGI	Combustible Gas Indicator
COC	Chain Of Custody
DOT	U.S. Department of Transportation
GEA	Gamma Energy Analysis
ISVS	In Situ Vapor Sampling System
NH ₃	Ammonia
H ₂ O	Water Vapor
OPC	Offsite Property Control
OVN	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
TOC	Total Organic Carbon
TST	Triple Sorbent Trap
VT	Vapor Team, personnel from Sampling and Mobile Laboratories and Special Analytical Studies
WHC	Westinghouse Hanford Company

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VAPOR AND GAS SAMPLING OF SINGLE-SHELL TANK 241-S-101 USING THE IN SITU VAPOR SAMPLING SYSTEM

1.0 SCOPE

The Vapor Issue Resolution Program tasked the Vapor Team (VT) to collect representative headspace samples from Hanford Site single-shell tank (SST) 241-S-101. This document presents In Situ Vapor Sampling System (ISVS) data resulting from the June 6, 1996 sampling of SST 241-S-101. Analytical results will be presented in separate reports issued by the Pacific Northwest National Laboratory (PNNL) which supplied and analyzed the sample media.

2.0 SAMPLING EQUIPMENT DESCRIPTION

2.1 IN SITU VAPOR SAMPLING SYSTEM

The VT, consisting of Sampling and Mobile Laboratories (SML) and Special Analytical Studies (SAS) personnel, used the ISVS to collect representative samples of the air, gases, and vapors from the headspace of SST 241-S-101 on June 6, 1996. WHC-SD-WM-SDD-068 Rev. 0, *System Design Description for the In Situ Vapor Sampling System* (Blanchard 1996a) describes, in detail the ISVS performance, its characteristics, and its operation.

In situ sampling is a method designed to collect vapor samples of the homogeneous headspace of waste tanks. Sample media, consisting of sorbent traps and radiological filters, are lowered into the tank headspace. Tank gases are drawn through the media by means of the ISVS manifold, which measure the volume of gas drawn through the system. The sample media are collected together in a sample head assembly (SHA). The SHA provides for twelve sorbent or triple sorbent trap (TST) samples (single sample each) to be sampled in sets of four, one SUMMA[™] sampling line, and one line for radiological filtration.

The SHA is protected from external contamination and breakage by a transparent plastic tube. The plastic tube is cut, formed, and connected to the SHA. The plastic tube also prevents any part of the SHA from accidentally falling into the tank.

A set of 1/4 or 5/16 inch diameter flexible tubes, approximately 50 feet long, are held together with spiral wrap to form a "tube bundle", which connects the ISVS to the SHA. The tube bundle and SHA are assembled prior to sampling and are referred to as the "sample assembly".

Sorbent traps are pencil-size stainless steel or glass tubes that contain vapor-adsorbing media. The sorbent traps may be used singly or may be prepared with several individual traps joined in series (a sorbent train). 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. In addition to the sorbent traps, SUMMA[™] canisters are also used to collect samples.

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 each use. The

evacuated canister is filled with sample vapor through a valve, which is then closed to seal the sample inside. SUMMA canisters allow collection and transfer of whole-air samples from location to an analytical laboratory where the sample is analyzed. The standard capacity of each SUMMA canister is 6 liters.

The ISVS consists of five sample stations, (four for sorbent trap sampling and one for SUMMA sampling) terminating in 1/4 inch outside diameter stainless steel tubing. Each sorbent sample station is independently operable at the selected flow rate, from 50 to 500 standard cubic centimeters per minute (scm).

The system is a portable sampling system. It is designed to allow setup and preparation to be performed outside of the tank farm, with a minimum number of steps to be performed inside the farm. It operates on 110V AC power. The ISVS was designed to meet the requirements of National Fire Protection Association 70 - 1993 (the National Electrical Code) for general industrial use. Before the ISVS can be used in any tank, procedures require a flammability check of the waste tank which shows that concentrations of flammable materials are well below lower flammability limits.

Tank gases passing through the ISVS will either pass through a sorbent trap and then a backup line dryer, or through the on-board activated charcoal/drierite cartridge. A check valve is installed in the system to prevent any possibility of siphoning materials into the waste tanks.

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 1996b). 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 VT retains these documents in the project file. The project specific number for this sampling event is S6-058.

3.2 OPERATIONS AND SAMPLING PERSONNEL

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

- G. S. Caprio, Field Scientist
- R. D. Mahon, Lead Scientist
- C. S. McClellan, Sampling Technician.

The ISVS was set up at SST 241-S-101 on June 6, 1996 and was allowed to warm up for approximately 15 minutes. Sampling began at approximately 11:13 on June 6, 1996, and was completed by 13:30 the same day.

3.3 INDUSTRIAL HYGIENE FIELD RESULTS

Prior to inserting the tube bundle into SST 241-S-101, an industrial hygiene technician field tested tank vapors. The technician purged the instrument with tank gas for 5 minutes and then field measured vapor stream contents

using a combustible gas indicator (CGI) and an organic vapor meter (OVM). The technician measured the tank vapors at the breather filter, three feet down the riser, and twenty feet down the riser. The measurements reported at the breather filter: LEL 0%, NH₃ 50 ppm, O₂ 21.0%, and TOC 20 ppm. The measurements approximately three feet down were: LEL 1%, NH₃ 550 ppm, O₂ 20.7%, and TOC 47 ppm. The measurements approximately twenty feet down were: LEL 1%, NH₃ 650 ppm, O₂ 20.7%, and TOC 51 ppm.

3.4 AMBIENT CONDITIONS

The weather the day of the sampling event, June 6, 1996, was sunny and clear, with a light breeze blowing from S-101 towards S-102. Graphs of ambient temperatures and pressures taken at the Hanford Meteorological Station, which is about 2.5 miles north east of S-Farm, are provided in Appendix B.

3.5 SAMPLE COLLECTION

One analytical laboratory provided sample media. PNNL provided SUMMA[™] canisters, sorbent traps for organic vapors, ammonia (NH₃), NO_x, and water vapor (H₂O).

The VT began inserting the sample media into the SHA at 1530 on June 5, 1996, and finished at approximately 1850. The SHA was connected to tube bundle 14B. The top collar as described in ECN 632433 was used for this sampling event. The sample assembly was transported to 241-S-101 on June 6, 1996, and connected to ISVS #1 for the sampling event.

Prior to sample collection, a leak check of the ISVS sampling manifold and transfer tubing was performed. Pressure gauge readings were recorded at the beginning of the leak check. The gauge readings were used for the leak check calculations but for report purposes will be converted to absolute pressure. The system was evacuated to approximately 135.4 mbar (4 inHg) and leakage of ambient air into the system was observed by monitoring system pressure for 5 minutes. Leakage resulted in an increase of 0 mbar (0 inHg) in system pressure during the 5 minute test.

The tank flange was opened and the tube bundle was lowered 6.7 meters (22 feet). Tank vapor was drawn through each TST, sorbent, and SUMMA[™] line for a specified period of time. Appendix A indicates the exact times and volumes of tank gas that was drawn through each sample.

After the final sample was collected the sample assembly was removed from the tank. A clean work area was prepared and the SHA was disassembled in the farm. Following the HPT survey the samples were packaged as radiation material and transported back to a custody secure RMA. The in-line filters were transported to 222-S for analysis. The next several sampling events were scheduled in SX-farm and therefore the ISVS was left inside the farm.

3.6 RADIATION SCREENING

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 <15 pCi/g of sample media.
 Alpha activity <5 pCi/g of sample media.

The sample media was not filtered for radiological particulates. The idea of unfiltered samples was to provide better analytical data for the laboratories. The samples were released for shipment based on the analytical results of the series of two filters and tritium trap collected through one of the 1/4 inch flexible lines. Based on the radiological results for the filters and tritium trap it is believed that the same concentration of radiological contaminants passed through the other 13 lines. The filters were analyzed by 222-S Laboratory. Based on the analytical results provided in Table 1 the samples were shipped to PNNL and delivered to J. A. Edwards. The VT scientists use the activity results in Table 1 to calculate pCi/g of sample media. The VT maintains this information in the project-specific file.

Table 1. Radionuclide Analysis Results.

Filter	Sample Identifier	Activity Results ^a (pCi/sample)	Activity ^b (pCi/L of tank gas)
Upstream filter	S6058-A21.OU1	Total Alpha = <0.157 Total Beta = <1.67 GEA = <detectable	= <0.157 = <1.67 = <detectable
Downstream filter	S6058-A22.OD1	Total Alpha = <0.258 Total Beta = <1.99 GEA = <detectable	= <0.258 = <1.99 = <detectable
Tritium Trap	S6058-A03.OT1	Total Activity = 9.5	= 9.5

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 1 liter for the total volume of tank vapor through the filters.

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 and TSTs 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 SAS and transported in a government vehicle to a custody locked storage area. Appendix C lists the sample identifiers, sample types, and COC form numbers for the sampling event.

From the time that samples are received by SAS until they are shipped back to the analytical laboratory, all COCs are maintained by SAS in accordance with WHC-IP-1127-1.3, *Chain-of-Custody/Special Analysis Request for RCRA and CERCLA Protocol Samples* (WHC 1995a).

5.0 QUALITY ASSURANCE AND CONTROLS

5.1 CLEANLINESS OF SYSTEM

Immediately prior to sampling of SST 241-S-101, the ISVS manifold was purged with ambient air for 5 minutes at 1 L/min. After this purge an ambient air SUMMA[™] sample was drawn through the ISVS manifold and the 1/4 inch SUMMA[™] sampling line. A second ambient air SUMMA[™] sample was collected 10 meters upwind from the tank breather filter. The ambient air samples were then

collected to confirm by laboratory analysis that the ISVS sampling manifold was free of trace organic contaminants (or to determine which contaminants were present and at what concentration). For further details, refer to WHC-IP-1127-4.8 (WHC 1995b) and the project-specific file located with the VT.

5.2 INSTRUMENT CALIBRATION

The ISVS uses mass flow meters to measure the flow rate and totalizers to measure the total volume of sample vapor drawn through the sample media. Errors associated with the mass flow meters and totalizers were determined by the Westinghouse Hanford Company (WHC) Standards Laboratory before the SST 241-S-101 sampling event. Duration of flow are specified by the analytical laboratories that supply and analyze the sorbent traps.

The flow measurements for this sampling event may have an error of 6 percent to 14 percent due to the mass flow measuring devices recalibration discrepancies. A detailed description of this discrepancy can be found in internal memo 75-820-96-028 (Trible 1996c).

Instruments located in the ISVS are calibrated on an annual basis at the WHC Standards Laboratory. ISVS instrumentation calibration data, maintained in files by the VT, are summarized in Table 2. According to the calibration schedule shown in Table 2, all instrumentation was within its calibration period during the SST 241-S-101 sampling event.

Table 2. Calibration Data.

Element	Calibration Date	Expiration Date	WHC Standards Laboratory Code
Rotameter AALBORG 102-05	8/8/95	8/8/96	518-28-13-001
Digital Thermometer HH22	1/11/96	1/11/97	518-79-06-003
Vacuum Gauge ASHCROFT	8/7/95	8/7/96	518-31-05-003
Headspace Thermocouple	5/31/96	5/31/97	518-78-02-010
Mass Flowmeters Sierra 822-13-OV1 FM-1/FT-1	8/8/95	8/8/96	518-28-03-015
Mass Flowmeters Sierra 822-13-OV1 FM-2/FT-2	8/8/95	8/8/96	518-28-03-016
Mass Flowmeters Sierra 822-13-OV1 FM-3/FT-3	8/8/95	8/8/96	518-28-03-017
Mass Flowmeters Sierra 822-13-OV1 FM-4/FT-4	8/8/95	8/8/96	518-28-03-018

The totalizers were calibrated in conjunction with the mass flow meters and the calibration data is summarized in Table 3.

Table 3. Totalizer Calibration Data.

Number	Calibration Date	Expiration Date	Flow Rate (stdcm ³ /min)	Time (min)	Calc. Total	UUT	Deviation
3494-1 FT-1	8/8/95	8/8/96	247.1	5.833	1441.2	1500	3.9%
3494-2 FT-2	8/8/95	8/8/96	253.8	7.065	1793.1	1800	0.4%
3494-3 FT-3	8/8/95	8/8/96	262.7	5.081	1334.7	1300	2.6%
3494-4 FT-4	8/8/95	8/8/96	25.2	5.186	1302.8	1300	0.2%

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 ISVS immediately prior to sampling operations.

6.0 ANOMALIES

The VT used the Sampling and Analysis Plan and WHC-IP-1127-4.8, *Vapor Sampling of Waste Tanks Using In Situ Vapor Sampling System (ISVS)*, (1995b) to guide the sample collection. Anomalies, however, were noted during the sample collection.

The SUMMA™ sample line was not connected to the ISVS when sample S6058-A02.309 was collected. The sample collected ambient air that was drawn through the SUMMA™ port on the ISVS. Sample S6058-A04.310 was designated for tank gas but was used as an ambient air sample collected through the SUMMA™ line.

Three of the samples became detached from the flexible tubing inside the SHA. Two of the three were detached before the tube bundle was inserted into the tank, S6058-A16.S90 and S6058-A18.1027, both field blanks. Due to the fact that the two samples were field blanks and the possibility of affecting sample and tube bundle integrity, they were not reconnected before insertion.

After the tube bundle was removed from the tank it was noted that Sample S6058-A12.1023 was detached from the flexible 5/16 inch tubing. It is unknown if the tubing came off before or after the tank gas was drawn through the sample. The volume of this sample is suspect.

These anomalies were also noted on the sample log sheets in Appendix A.

7.0 REFERENCES

- 49 CFR 100-177, 1992, "Transportation," Code of Federal Regulations, as amended.
- Blanchard, R. J., 1996a, *System Design Description for the In Situ Vapor Sampling System*, WHC-SD-WM-SDD-068 Rev. 0, Westinghouse Hanford Company, Richland, Washington.
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- Trible, T.C., R.S. Viswanath, 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, *Vapor Sampling of Waste Tanks Using In Situ Vapor Sampling System (ISVS)*, Procedure WHC-IP-1127-4.8, Westinghouse Hanford Company, Richland, Washington.

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APPENDIX A
SAMPLE LOG SHEETS

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ISVS Sampling of S-101

Set up ISVS (Section 8.1)

Ensure particulate filters are installed

LEAK CHECK (APPENDIX I)

Leak Rate:

0 inch Hg in 5 min

Tank Temperature 30.4 C

Date: 6-Jun-96

ISVS Personnel: Mahon, McClellan

Trailer Personnel: Caprio

WHC Sample ID	PNNL Sample ID	Probe Sample Line	Cart Port	Description	Desired Flow Rate SCCM	Desired Duration (min.)	Desired Total Flow SCC	Actual Flow Rate SCCM	Actual Start Time	Actual End Time	Actual Total Time (min.)	Actual Total Flow SCC
Purge SUMMA line of sample assembly with ambient air					1000	5	5000	1000	1108	1113	5	
S6058- A01 308	308	NA	NA	Upwind SUMMA #1		1			1112	1113	1	
*S6058 A02 309	309	S	SUMMA	Ambient #2		1			1112	1113	1	
Purge SUMMA line of sample assembly with ambient air					1000	5	5000	1000	1128	1133	5	
*S6058 A04 310	310	S	SUMMA	Ambient #3		1			1133	1134	1	

Uncap and insert sample bundle into tank

1137

Connect bundle lines:

1 1

S6058- A21 0U1	0U1	1	11	UPSTREAM FILTER	200	1	1000	224.00	1212			1004
A22 0D1	0D1			DOWNSTRM FILTER								
A03 0T1	0T1			TRITIUM								

Connect bundle lines:

S SUMMA

2 1

3 2

4 3

5 4

Purge Suma line /w tank	S	SUMMA	SUMMA purge	1000	5	5000	1000	1224	1229	5	5000
S6058- A05 311	311	S	SUMMA	Summa #4		1		1229	1230	1	6000
S6058- A06 312	312	S	SUMMA	Summa #5		1		1237	1238	1	6000

* = Anomalies noted on Page 3.

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ISVS Sampling of S-101

WHC Sample ID	Probe		Cart	Description	Desired	Desired	Desired	Actual	Actual	Actual	Actual	Actual
	PNNL	Sample			Flow	Duration	Total	Flow	Start	End	Total	Total
	Sample ID	Line			Rate	(min.)	Flow	Rate	Time	Time	Time	Flow
					SCCM		SCC	SCCM			(min.)	SCC
S6058- A07 S85	S85	2	1	NH3/N2O/NO/H2O	200	10	2000	213.00	1241	NA	NA	2004
S6058- A08 S86	S86	3	2	NH3/N2O/NO/H2O	200	10	2000	205.00	12:41:30	NA	NA	2004
S6058- A09 S87	S87	4	3	NH3/N2O/NO/H2O	200	10	2000	198.00	1242	NA	NA	2002
S6058- A10 S88	S88	5	4	NH3/N2O/NO/H2O	200	10	2000	212.00	12:42:30	NA	NA	2003

Connect bundle lines:

6	1
7	2
8	3
9	4

S6058- A11 1022	1022	6	1	PNNL TST #1	200	1	200	273.00	1306	NA	NA	210
*S6058 A12 1023	1023	7	2	PNNL TST #2	200	1	200	277.00	1306	NA	NA	206
S6058- A13 1024	1024	8	3	PNNL TST #3	200	1	200	250.00	1306	NA	NA	203
S6058- A14 1025	1025	9	4	PNNL TST #4	200	1	200	266.00	1306	NA	NA	210

Remove sample bundle from tank and cap

1315 1320

Dismantle sample bundle

S6058- A21 0U1	S96WV0063	1	1	Bundle line 1 Upstream filter
S6058- A22 0D1	S96WV0064	1	1	Bundle line 1 Downstream filter
S6058- A03 0T1	S96WV0065	1	1	Bundle line 1 tritium trap
S6058- A15 S89	S89	10	NA	Bundle store NH3/N2O/NO/H2O FIELD BLANK #1
*S6058 A16 S90	S90	11	NA	Bundle store NH3/N2O/NO/H2O FIELD BLANK #2
S6058- A17 1026	PNNL #1026	12	NA	Bundle store PNNL TST FIELD BLANK #1
*S6058 A18 ###	PNNL #1027	13	NA	Bundle store PNNL TST FIELD BLANK #2
S6058- A19 1029	PNNL #1029	NA	NA	Bundle store PNNL TST TRIP BLANK #1
S6058- A20 ###	PNNL #1030	NA	NA	Bundle store PNNL TST TRIP BLANK #2

Remove filters from cart manifold ports 1, 2, 3, 4, and SUMMA to release cart.

* = Anomalies noted on Page 3.

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HNF-SD-MM-RPT-244, Rev. 0

ISVS Sampling of S-101

WHC Sample ID	Probe			Description	Desired	Desired	Desired	Actual	Actual	Actual	Actual	Actual
	PNNL	Sample	Cart		Flow	Duration	Total	Flow	Start	End	Total	Total
	Sample ID	Line	Port		Rate	(min.)	Flow	Rate	Time	Time	Time	Flow
					SCCM		SCC	SCCM			(min.)	SCC
										BUNDLE TOTAL TANK GAS USED DURING SAMPLING RUNS (Liters)		

Note: SCCM for the ISVS is reported at 760 torr, 21 C

ANOMALIES

S6058-A02.309	SUMMA line was not connected to cart when sample was collected. Sample collected ambient air drawn in through the SUMMA port on cart.											
S6058-A04.310	Tank gas SUMMA was used for Ambient air through SUMMA line to make up for SUMMA 309 mistake.											
S6058-A12.1023	1325 hrs, after Sample Head Assembly was removed from tank: TST sample line was disconnected at 5/16 inch tygon connection to silica gel. It is unknown if the tygon came off the silica gel before or after the tank gas was drawn through the TSTs. The volume of this sample is suspect.											
S6058-A16.S90	1148 hrs, before Sample Head Assembly was inserted into tank: NH3 Field Blank line was disconnected at 5/16 inch tygon connection to silica gel. Because this was a Field Blank, it was not connected before the Sample Head Assembly was lowered into the tank and sampled.											
S6058-A18.1027	1148 hrs, before Sample Head Assembly was inserted into tank: TST Field Blank line was disconnected at 5/16 inch tygon connection to silica gel. Because this was a Field Blank, it was not connected before the Sample Head Assembly was lowered into the tank and sampled.											

HNF-SD-WM-RPT-244, Rev. 0

S-101 ISVS SAMPLING RADIOLOGICAL SCREENING RESULTS

Note: #VALUE! = <Detectable

S6058-A21.OU1 / S96WV0063

PARALLEL UPSTREAM FILTER

TOTAL VOLUME

ALPHA

BETA

GEA - Co-60

Cs-134

Cs-137

Eu-152

Eu-154

Eu-155

Liters

pCi / filter

pCi / liter

1.00

<0.157

#VALUE!

<1.67

#VALUE!

<9.165

< Detectable

<7.629

< Detectable

<26.89

< Detectable

<61.44

< Detectable

<26.36

< Detectable

<27.87

< Detectable

S6058-A22.OD1 / S96WV0064

PARALLEL DOWNSTREAM FILTER

TOTAL VOLUME

ALPHA

BETA

GEA - Co-60

Cs-134

Cs-137

Eu-152

Eu-154

Eu-155

Liters

pCi / filter

pCi / liter

1.00

<0.258

#VALUE!

<1.99

#VALUE!

<12.08

< Detectable

<8.611

< Detectable

<23.91

< Detectable

<33.34

< Detectable

<36.04

< Detectable

<30.45

< Detectable

S6058-A03.OT1 / S96WV0065

TRITIUM TRAP

TOTAL VOLUME

TOTAL ACTIVITY

Liters

pCi / filter

pCi / liter

1

9.5

9.5

SAMPLE EXPOSURE ANALYSIS, USING TOTAL OF BOTH UPSTREAM AND DOWNSTREAM FILTER ANALYSIS AS POSSIBLE EXPOSURE LEVEL

= BETA and ALPHA Less than DOT shipping limits

Total Alpha (pCi / liter) =

#VALUE!

Total Beta (pCi / liter) =

#VALUE!

Total GEA Cs-137 (pCi/liter) =

< Detectable

SORBERT SAMPLING Used 5 g for sorbent mass

TOTAL VOLUME PER SAMPLE

2.00 Liters

Tritium per SAMPLE

NH3 (5 gram)

3.80 pCi per gram

H2O (5 gram)

3.80 pCi per gram

ALPHA per SAMPLE

NH3 (5 gram)

#VALUE! pCi per gram

H2O (5 gram)

#VALUE! pCi per gram

BETA per SAMPLE

NH3 (5 gram)

#VALUE! pCi per gram

H2O (5 gram)

#VALUE! pCi per gram

GEA per SAMPLE (Cs-137)

NH3 (5 gram)

#VALUE! pCi per gram

H2O (5 gram)

#VALUE! pCi per gram

TST SAMPLING Used 4.5 g for TST mass

TOTAL VOLUME PER SAMPLE

0.20 Liter

Tritium per Sample

TST (4.5 gram)

0.42 pCi per gram

ALPHA per Sample

TST (4.5 gram)

#VALUE! pCi per gram

BETA per Sample

TST (4.5 gram)

#VALUE! pCi per gram

GEA per Sample (Cs-137)

TST (4.5 gram)

#VALUE! pCi per gram

SUMMA SAMPLING

TOTAL VOLUME PER CANISTER

6 Liters (air at 300K, 1 bar = 1.161 g/L)

Tritium PER SAMPLE

8.18 pCi per gram

ALPHA PER SAMPLE

#VALUE! pCi per gram

BETA PER SAMPLE

#VALUE! pCi per gram

GEA PER SAMPLE (Cs-137)

#VALUE! pCi per gram

HNF-SD-MM-RPT-244, Rev. 0

APPENDIX B
· AMBIENT CONDITIONS

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WEATHER DURING ISVS SAMPLING OF 241-S-101

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APPENDIX C
CHAIN-OF-CUSTODY FORMS

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Battelle Pacific
National Northwest Lab

CHAIN OF CUSTODY

WHC 100087

Custody Form Initiator

J. A. Edwards - PNNL

Telephone (509) 373-0141

Page 85-3009 / FAX 376-2329

Company Contact

R. D. Mahon - WHC

Telephone (509) 373-2891

Page 85-3656 / FAX 373-3793

Project Designation/Sampling Locations 200 West Tar
241-S-101 Tank Vapor Sample SAF 5
(ISVS)

Collection date 06 - 06 - 96

Preparation date 05 - 30 - 96

Ice Chest No.

Field Logbook No. WHC-147-8

Bill of Lading/Airbill No.

N/A

Offsite Property No. N/A

Method of Shipment

Government Truc

Shipped to

PNNL

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification

S6058 - A01 . 308 Collect Ambient Air Sample SUMMA #1
 S6058 - A02 . 309 Collect Ambient Air Sample SUMMA #2 (through tube bundle)

S6058 - A04 . 310 Collect SUMMA #3
 S6058 - A05 . 311 Collect SUMMA #4
 S6058 - A06 . 312 Collect SUMMA #5

[] Field Transfer of Custody		[X] Chain of Possession		(Sign and Print Names)	
Relinquished By	Date	Time	Received By	Date	Time
J A Edwards	06- 03 -96	1255	CSM McCallan	06- 03 -96	1255
CSM McCallan	6-12-96	1146	GS Caprio	6-12-96	1146
GS Caprio	6-12-96	1230	J A Edwards	6-12-96	1230

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 222S?
- RSR/release? (a ≤100B ≤400 pCi/g)
- COC copy for LRB, RIDS filed?

Pick-up / Delivery

Y/N
 Y/N
 Y/N
 Y/N
 Y/N
 Y/N
 Y/N

Comments:

S6058-A02.309 Summa line was not connected to ISVS when this sample was collected. This sample collected air drawn in through the Summa port on the cart

S6058-A04.310 Tank Gas Summa was used for ambient air through the Summa line to make up for Summa 309 mistake

(Revised 05/30/96 PNNL)

MX 6/2/96

(WHC-SD-WM-TP-335, REV. 2, Table 2b)

POC

POC

Battelle Pacific
National Northwest Lab

CHAIN OF CUSTODY

WHC 100089

Custody Form Initiator

J. A. Edwards - PNNL

Telephone (509) 373-0141

Page 85-3009 / FAX 376-2329

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-S-101 Tank Vapor Sample SAF S6058

(ISVS Cart)

Collection date 06 - 06 - 96

Preparation date 05 - 30 - 96

Ice Chest No.

Field Logbook No. WHC-N-647.8

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

S6058 - A07 . S85

Collect NH₃/NO_x/H₂O Sorbent Trap

S6058 - A08 . S86

Collect NH₃/NO_x/H₂O Sorbent Trap

S6058 - A09 . S87

Collect NH₃/NO_x/H₂O Sorbent Trap

S6058 - A10 . S88

Collect NH₃/NO_x/H₂O Sorbent Trap

S6058 - A15 . S89

Open, close and store NH₃/NO_x/H₂O field blank #1

S6058 - A16 . S90

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 <i>G.W. Dennis</i>	05-31-96	1100	J A Edwards <i>J A Edwards</i>	05-31-96	1100
J A Edwards <i>J A Edwards</i>	6-3-96	1255	CJM <i>CJM</i>	6-07-96	1255
<i>CJM</i>	6-12-96	1146	GS CAPRIO <i>GS CAPRIO</i>	6-12-96	1146
GS CAPRIO <i>GS CAPRIO</i>	6-12-96	1230	J A Edwards <i>J A Edwards</i>	6-12-96	1230

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 222S?
- ◇ RSR/release? (a ≤100/B ≤400 pCi/g)
- ◇ COC copy for LRB, RIDS filed?

Pick-up / Delivery

- Y/N
- Y/N
- Y/N
- Y/N
- Y/N
- Y/N
- Y/N
- Y/N

Comments:

S6058-A16, S90 → NH₃ Field Blank was disconnected at 5/16" TYPON to Silica Gel. Because this was a field blank it was not reconnected before being lowered into the tank.

6/2/96 JHC

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

(WHC-SD-WM-TP-335, REV. 2, Table 2b)

A-6000-407 (12/92) WEF061

(Revised 05/30/96 PNNL)

1 of 1

C-4

Battelle Pacific
Northwest Laboratory

CHAIN OF CUSTODY

WHC 100088

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 373-7076Project Designation/Sampling Locations 200 West Tank Farm
241-S-101 Tank Vapor Sample SAF S6058
(ISVS Cart)Collection date 06 - 06 - 96
Preparation date 06 - 03 - 96

Ice Chest No.

Field Logbook No. WHC- N-647-8

Ertco Hi/Lo thermometer No. PNL-T-006

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

S6058 - A11 . 1022 . PNL Triple Sorbent Trap (TST) Sample # 1
 S6058 - A12 . 1023 . PNL TST Sample # 2
 S6058 - A13 . 1024 . PNL TST Sample # 3
 S6058 - A14 . 1025 . PNL TST Sample # 4
 S6058 - A17 . 1026 . Open, close & store TST Field Blank # 1
 S6058 - A18 . 1027 . Open, close & store TST Field Blank # 2
 S6058 - A19 . 1029 . Store TST Trip Blank #1
 S6058 - A20 . 1030 . 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	06-04-96	12:20	JA Edwards	06-04-96	12:20
JA Edwards	06-04-96	12:55	CS McElhiney	6-3-96	12:55
CS McElhiney	6-12-96	1146	CS Caprio	6-12-96	1146
CS Caprio	6-12-96	1230	Edwards	6-12-96	1230

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 2225? ☒
- COC copy for LRB, RIDS filed? ☒

Pick-up / Delivery

- ☒ N
- ☒ N
- ☒ N
- ☒ N
- ☒ N
- ☒ N
- ☒ N
- ☒ N
- ☒ N
- ☒ N

Comments:

S6058 - A12 . 1023 . → TST Sample line was disconnected at 5/16" Tygon connection to silica gel. It is unknown if the Tygon came off before or after tank Gas was drawn thru. Cooler Temperature Status
 IHI -20 °C / Lo -20 °C (pick up at PNL to WHC)
 IHI - °C / Lo - °C (delivery at WHC from PNL)
 IHI 10 °C / Lo 10 °C (at return to PNL from WHC)
 IHI +13 °C / Lo -21 °C (at delivery from WHC to PNL)

S6058 - A18 . 1027 → TST Field blank was disconnected at 5/16" Tygon to silica gel. (Revised 06/21/95 PNL) Because this was a field blank, it was not reconnected before being lowered into tank.

6/12/96 JAC

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>620720</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			