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VAPOR AND GAS SAMPLING OF SINGLE-SHELL TANK 241-S-103 USING the in Situ Vapor Sampling System

G.S. Caprio

SGN Eurisys Services Company, Richland, WA 99352

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Release Approval

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Using the In Situ Vapor Sampling System

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CONTENTS

1.0	SCOPE	1
2.0	SAMPLING EQUIPMENT DESCRIPTION	1
2.1	IN SITU VAPOR SAMPLING SYSTEM	1
3.0	SAMPLING EVENT DESCRIPTION	2
3.1	SPECIFICATIONS	2
3.2	OPERATIONS AND SAMPLING PERSONNEL	2
3.3	INDUSTRIAL HYGIENE FIELD RESULTS	2
3.4	AMBIENT CONDITIONS	3
3.5	SAMPLE COLLECTION	3
3.6	RADIATION SCREENING	3
4.0	SAMPLE CHAIN OF CUSTODY: RECEIPT, STORAGE, AND SHIPMENT	4
5.0	QUALITY ASSURANCE AND CONTROLS	4
5.1	CLEANLINESS OF SYSTEM	4
5.2	INSTRUMENT CALIBRATION	5
5.3	BLANK SAMPLES	6
6.0	ANOMALIES	6
7.0	REFERENCES	7

APPENDICES

SAMPLE LOG SHEETS	A-1
AMBIENT CONDITIONS	B-1
CHAIN-OF-CUSTODY FORMS	C-1

LIST OF TABLES

1. Radionuclide Analysis Results	4
2. Calibration Data	5
3. Totalizer Calibration Data	6

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
SHA	Sample Head Assembly
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-103
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-103. This document presents In Situ Vapor Sampling System (ISVS) data resulting from the June 12, 1996 sampling of SST 241-S-103. 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-103 on June 12, 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 S6-060.

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-103 on June 12, 1996 and was allowed to warm up for approximately 15 minutes. Sampling began at approximately 0900 on June 12, 1996, and was completed by 1115 the same day.

3.3 INDUSTRIAL HYGIENE FIELD RESULTS

Prior to inserting the tube bundle into SST 241-S-103, 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 four feet down the riser. The measurements reported at the breather filter: LEL 0%, NH₃ 0.0 ppm, O₂ 20.9%, HCN 0%, and TOC 1.0 ppm. The measurements approximately three feet down were: LEL 0.0%, NH₃ 75 ppm, O₂ 21.1%, HCN 0%, and TOC 9.6 ppm. The measurements approximately twenty four feet down were: LEL 0.0%, NH₃ 150.0 ppm, O₂ 21.0%, HCN 0%, and TOC 12.5 ppm.

3.4 AMBIENT CONDITIONS

The weather the day of the sampling event, June 12, 1996, was sunny and clear. 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 1515 on June 11, 1996, and finished at approximately 1900. The SHA was connected to tube bundle 14A. The top collar as described in ECN 632433 was used for this sampling event. The sample assembly was transported to 241-S-103 on June 12, 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 135.5 mbar (4.3 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 7.3 meters (24 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	S6060-A21.OU1	Total Alpha = 0.86 Total Beta = 6.17 GEA = <detectable	= 0.86 = 6.17 = <detectable
Downstream filter	S6060-A22.OD1	Total Alpha = <0.462 Total Beta = 1.95 GEA = <detectable	= <detectable = <1.95 = <detectable
Tritium Trap	S6060-A03.OT1	Total Activity = <9.68	= <9.68

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-103, 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-103 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-103 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 WMC-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 threads on SUMMA™ canister #10 valve are badly galled and should be replaced.

During the sampling of the Tritium Trap, a Spectral Gamma Ray Logging System truck was started next to the ISVS. The possibility may exist that vehicle exhaust fumes could contaminate the airspace.

Disassembly of the SHA was performed at the WSCF facility for the first time.. The hood used was a Hazardous waste hood. The waste bottles in the hood contained empty water sample bottles, two, liter capped bottles of Ultima Gold liquid scintillation cocktail type A/B, a 500ml capped bottle of Radsorb, dry polymer and kitty litter. The samples were disassembled over maslin cloth. These anomalies were also noted on the sample log sheets in Appendix A.

The headspace thermocouple (WHC Standards Laboratory Code 518-78-02-101) was accidentally cut by a tank farm operator prior to the sampling event. Therefore, the tank temperature readings should be used for indication only.

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.
- Homi, C. S., 1996b, *Vapor Sampling and Analysis Plan*, WHC-SD-WM-TP-335 Rev. 2, Westinghouse Hanford Company, Richland, Washington.
- Tribble, 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-103

Set up ISVS (Section 8.1)

Ensure particulate filters are installed

LEAK CHECK (APPENDIX I) Leak Rate:

Tank Temperature 22.6 C

Date: 12-Jun-96

ISVS Personnel: Mahon, McClellan

Trailer Personnel: Caprio

0 inch Hg in 5 min

WHC Sample ID	PNWL 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 line with ambient air												
S6060 A01 001	001	NA	NA	Upwind SUMMA #1	1000	5	5000	1000	0907	0912	5	
S6060 A02 010	010	S	SUMMA	Ambient #2		1			0911	0912	1	
						1			0912	0913	1	

Uncap and insert sample bundle into tank

Connect bundle lines:

1 1

S6060 A21 0U1 0U1 1 1

A22 0D1 0D1

A03 0T1 0T1

UPSTREAM FILTER

DOWNSTREAM FILTER

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	0958	1003	5	5000
S6060 A04 080	080	S	SUMMA	Summa #3		1		1003	1004	1	6000
S6060 A05 082	082	S	SUMMA	Summa #4		1		1011	1012	1	6000
S6060 A06 083	083	S	SUMMA	Summa #5		1		1017	1018	1	6000

ISVS Sampling of S-103

WHC Sample ID	PNNL		Probe	Cart Port	Description	Desired	Desired	Desired	Actual	Actual	Actual	Actual	Actual
	Sample ID		Sample			Flow	Duration	Total	Flow	Start	End	Total	Total
			Line			Rate	(min.)	Flow	Rate	Time	Time	Time	Flow
						SCCM		SCC	SCCM			(min.)	SCC
S6060 A07 S91	S91		2	1	NH3/N2O/NO/H2O	200	10	2000	209.00	1027	NA	NA	2002
S6060 A08 S92	S92		3	2	NH3/N2O/NO/H2O	200	10	2000	210.00	10:27:30	NA	NA	2002
S6060 A09 S93	S93		4	3	NH3/N2O/NO/H2O	200	10	2000	212.00	10:28	NA	NA	2001
S6060 A10 S94	S94		5	4	NH3/N2O/NO/H2O	200	10	2000	210.00	10:28:30	NA	NA	1997

Connect bundle lines:

6	1
7	2
8	3
9	4

S6060 A11 986	986	6	1	PNNL TST #1	200	1	200	230.00	1054	NA	NA	205
S6060 A12 987	987	7	2	PNNL TST #2	200	1	200	200.00	1054	NA	NA	206
S6060 A13 988	988	8	3	PNNL TST #3	200	1	200	245.00	1054	NA	NA	194
S6060 A14 989	989	9	4	PNNL TST #4	200	1	200	253.00	1054	NA	NA	202

Remove sample bundle from tank and cap

1103 1110

Dismantle sample bundle

S6060 A21 0U1	S96WV0067	1	1	Bundle line 1 Upstream filter
S6060 A22 0D1	S96WV0068	1	1	Bundle line 1 Downstream filter
S6060 A03 0T1	S96WV0069	1	1	Bundle line 1 tritium trap
S6060 A15 S95	S95	10	NA	Bundle store NH3/N2O/NO/H2O FIELD BLANK #1
S6060 A16 S96	S96	11	NA	Bundle store NH3/N2O/NO/H2O FIELD BLANK #2
S6060 A17 991	PNNL #991	12	NA	Bundle store PNNL TST FIELD BLANK #1
S6060 A18 992	PNNL #992	13	NA	Bundle store PNNL TST FIELD BLANK #2
S6060 A19 993	PNNL #993	NA	NA	Bundle store PNNL TST TRIP BLANK #1
S6060 A20 994	PNNL #994	NA	NA	Bundle store PNNL TST TRIP BLANK #2

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

ISVS Sampling of S-103

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

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

HNF-SD-MM-RPT-245, Rev. 0

S-103 ISVS SAMPLING RADIOLOGICAL SCREENING RESULTS

Note: #VALUE! = <Detectable

S6060-A21.0U1 / S96WV0067
PARALLEL UPSTREAM FILTER
TOTAL VOLUME

	Liters	pCi / filter	pCi / liter
ALPHA	1.00	0.89	0.89
BETA		8.17	8.17
GEA -		<14.99	< Detectable
Cs-134		<9.08	< Detectable
Cs-137		<24.82	< Detectable
Eu-152		<38.59	< Detectable
Eu-154		<26.05	< Detectable
Eu-155		<29.89	< Detectable

S6060-A22.0D1 / S96WV0068
PARALLEL DOWNSTREAM FILTER
TOTAL VOLUME

	Liters	pCi / filter	pCi / liter
ALPHA	1.00	< 0.462	#VALUE!
BETA		1.95	1.95
GEA -		<12.81	< Detectable
Cs-134		<8.086	< Detectable
Cs-137		<24.37	< Detectable
Eu-152		<46.69	< Detectable
Eu-154		<33.61	< Detectable
Eu-155		<29.62	< Detectable

S6060-A03.0T1 / S96WV0069

	Liters	pCi / filter	pCi / liter
TRITIUM TRAP	1		
TOTAL VOLUME			
TOTAL ACTIVITY		< 9.68	#VALUE!

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) = 0.89

Total Beta (pCi / liter) = 8.12

Total GEA Cs-137 (pCi / liter) = #VALUE!

SORBENT SAMPLING Used 5 g for sorbent mass

	2.00 Liters
TOTAL VOLUME PER SAMPLE	
Tritium per SAMPLE	
NH3 (5 gram)	#VALUE! pCi per gram
H2O (5 gram)	#VALUE! pCi per gram
ALPHA per SAMPLE	
NH3 (5 gram)	0.34 pCi per gram
H2O (5 gram)	0.34 pCi per gram
BETA per SAMPLE	
NH3 (5 gram)	3.25 pCi per gram
H2O (5 gram)	3.25 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

	0.20 Liter
TOTAL VOLUME PER SAMPLE	
Tritium per Sample	
ALPHA per Sample	#VALUE! pCi per gram
TST (4.5 gram)	
BETA per Sample	0.04 pCi per gram
TST (4.5 gram)	
GEA per Sample Cs-137	0.36 pCi per gram
TST (4.5 gram)	#VALUE! pCi per gram

SUMMA SAMPLING

	6 Liters (air at 300K, 1 bar = 1.161 g/L)
TOTAL VOLUME PER CANISTER	
Tritium PER SAMPLE	#VALUE! pCi per gram
ALPHA PER SAMPLE	0.74 pCi per gram
BETA PER SAMPLE	6.99 pCi per gram
GEA PER SAMPLE Cs-137	#VALUE! pCi per gram

HNF-SD-MM-RPT-245, Rev. 0

APPENDIX B
AMBIENT CONDITIONS

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WEATHER DURING ISVS SAMPLING OF 241-S-103

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APPENDIX C
CHAIN-OF-CUSTODY FORMS

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Battelle Pacific
National Northwest Lab

CHAIN OF CUSTODY

WHC 100090

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 373-3793Project Designation/Sampling Locations 200 West Tank Farm
241-S-103 Tank Vapor Sample SAF S6060
(ISVS Cart)Collection date 06 - 12 - 96
Preparation date 06 - 10 - 96

Ice Chest No.

Field Logbook No. WHC-N-647-2

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

S6060 - A01 .001 Collect Ambient Air Sample SUMMA #1
 S6060 - A02 .010 Collect Ambient Air Sample SUMMA #2 (through tube bundle)

S6060 - A04 .080 Collect SUMMA #3
 S6060 - A05 .082 Collect SUMMA #4
 S6060 - A06 .083 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 <i>J A Edwards</i>	06-10-96	1430	R M Arnold <i>R M Arnold</i>	06-10-96	1430
R M Arnold <i>R M Arnold</i>	06-11-96	1230	R D Mahon <i>R D Mahon</i>	06-11-96	1230
R D Mahon <i>R D Mahon</i>	06-18-96	0811	GS CAPRIO <i>GS CAPRIO</i>	06-18-96	0811
GS CAPRIO <i>GS CAPRIO</i>	06-18-96	1053	J A Edwards <i>J A Edwards</i>	06-18-96	1053

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:

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

(Revised 05/30/96 PNNL)

Battelle Pacific
Northwest Laboratory

CHAIN OF CUSTODY

WHC 100091

Custody Form Initiator

J. A. Edwards - PNL

Telephone (509) 373-0141

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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-S-103 Tank

Vapor Sample SAF S6060

(ISVS Cart)

Collection date 06-12-96

Preparation date 06-07-96

Ice Chest No.

Field Logbook No. WHC-N 617-8

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

S6060 - A11 . 986 •	PNL Triple Sorbent Trap (TST) Sample # 1
S6060 - A12 . 987 •	PNL TST Sample # 2
S6060 - A13 . 988 •	PNL TST Sample # 3
S6060 - A14 . 989 •	PNL TST Sample # 4
S6060 - A17 . 991 •	Open, close & store TST Field Blank # 1
S6060 - A18 . 992 •	Open, close & store TST Field Blank #2
S6060 - A19 . 993 •	Store TST Trip Blank #1
S6060 - A20 . 994 •	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	06-07-96	1425	JA Edwards	06-07-96	1425
JA Edwards	06-10-96	1430	RM Arnold	06-10-96	1430
RM Arnold	06-11-96	1230	RD Mahon	06-11-96	1230
RD Mahon	06-18-96	0811	GS Caprio	06-18-96	0811
GS Caprio	06-18-96	1046	JA Edwards	06-18-96	1046

Final Sample Disposition

Comments:

- PNL (onlv) 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?

Pick-up / Delivery

☒ N
☒ N
☒ N / ☒ N
☒ N / ☒ N
☒ N / ☒ N
☒ N
☒ N
☒ N
☒ N
☒ 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 -15°C / Lo ____°C (at return to PNL from WHC)
 Hi -15°C / Lo +5°C (at delivery from WHC to PNL)

POC

POC

(Revised 06/21/95 PNL)

Battelle Pacific
National Northwest Lab

CHAIN OF CUSTODY

WHC 100092

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-103 Tank Vapor Sample SAF S6060

(ISVS Cart)

Collection date 06 - 12 - 96

Preparation date 06 - 07 - 96

Ice Chest No.

Field Logbook No. WHC-N-677-8

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

S6060 - A07 . S91

Collect NH₃/NO_x/H₂O Sorbent Trap

S6060 - A08 . S92

Collect NH₃/NO_x/H₂O Sorbent Trap

S6060 - A09 . S93

Collect NH₃/NO_x/H₂O Sorbent Trap

S6060 - A10 . S94

Collect NH₃/NO_x/H₂O Sorbent Trap

S6060 - A15 . S95

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

S6060 - A16 . S96

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>JA Edwards</i>	06-10-96	1130	JA Edwards <i>JA Edwards</i>	06-10-96	1130
JA Edwards <i>JA Edwards</i>	06-10-96	1430	JA Edwards <i>JA Edwards</i>	06-10-96	1430
R D Mahon <i>R D Mahon</i>	06-11-96	1230	R D Mahon <i>R D Mahon</i>	06-11-96	1230
R D Mahon <i>R D Mahon</i>	06-18-96	0811	GS CAPRIO <i>JA Edwards</i>	06-18-96	0811
GS CAPRIO <i>JA Edwards</i>	06-18-96	1043	JA Edwards <i>JA Edwards</i>	06-18-96	1043

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/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:

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

A-6000-407 (12/92) WEF061

POC

POC

(Revised 05/30/96 PNNL)

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>620719</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			