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VAPOR & GAS SAMPLING OF SSTA 241-SX-102 USING THE
VAPOR SAMPLING SYSTEM

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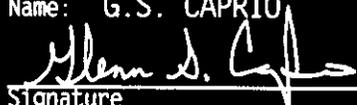
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7. Abstract

THIS DOCUMENT PRESENTS SAMPLING DATA RESULTING FROM THE JULY 19, 1995, SAMPLING OF SST 241-SX-102 USING THE VAPOR SAMPLING SYSTEM.

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CONTENTS

| | | |
|------------|---|-----|
| 1.0 | SCOPE | 1 |
| 2.0 | SAMPLING EQUIPMENT DESCRIPTION | 1 |
| 2.1 | VAPOR SAMPLING SYSTEM | 1 |
| 3.0 | SAMPLING EVENT DESCRIPTION | 3 |
| 3.1 | SPECIFICATIONS | 3 |
| 3.2 | OPERATIONS AND SAMPLING PERSONNEL | 4 |
| 3.3 | INDUSTRIAL HYGIENE FIELD RESULTS | 4 |
| 3.4 | AMBIENT CONDITIONS | 4 |
| 3.5 | SAMPLE COLLECTION | 4 |
| 3.6 | FIELD GC/FID RESULTS | 5 |
| 3.7 | RADIATION SCREENING | 6 |
| 4.0 | SAMPLE CHAIN OF CUSTODY: RECEIPT, STORAGE, AND SHIPMENT | 7 |
| 5.0 | QUALITY ASSURANCE AND CONTROLS | 9 |
| 5.1 | VAPOR SAMPLING SYSTEM CLEANING | 9 |
| 5.2 | INSTRUMENT CALIBRATION | 9 |
| 5.3 | BLANK SAMPLES | 10 |
| 6.0 | ANOMALIES | 11 |
| 7.0 | REFERENCES | 12 |
| APPENDICES | | |
| A | SAMPLE LOG SHEETS | A-1 |
| B | AMBIENT CONDITIONS | B-1 |
| C | CHAIN-OF-CUSTODY FORMS | C-1 |

LIST OF TABLES

| | | |
|---|--|----|
| 1 | Flow Control Calibration | 2 |
| 2 | TOC Results | 5 |
| 3 | Radionuclide Analysis Results | 7 |
| 4 | Pacific Northwest Laboratory Samples | 8 |
| 5 | Calibration Data | 10 |

LIST OF TERMS

| | |
|------------------|---|
| CGI | Combustible Gas Indicator |
| COC | Chain Of Custody |
| DOT | U.S. Department of Transportation |
| GC | Gas Chromatograph |
| GC/FID | Gas Chromatograph/Flame Ionization Detector |
| GEA | Gamma Energy Analysis |
| HEPA | High-Efficiency Particulate Air (filter) |
| NH ₃ | Ammonia |
| NO ₂ | Nitrogen Dioxide |
| NO _x | Nitric Oxide |
| H ₂ O | Water Vapor |
| OPC | Offsite Property Control |
| OVM | Organic Vapor Meter |
| PNL | Pacific Northwest Laboratory |
| SML | Sampling and Mobile Laboratories |
| SST | Single-Shell Tank |
| TCP | Tank Characterization Plan |
| team | SML Vapor Team |
| TOC | Total Organic Carbon |
| TST | Triple Sorbent Trap |
| VSS | Vapor Sampling System |
| WHC | Westinghouse Hanford Company |

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**VAPOR AND GAS SAMPLING OF SINGLE-SHELL TANK 241-SX-102
USING THE VAPOR SAMPLING SYSTEM**

1.0 SCOPE

The Vapor Issue Resolution Program tasked the Sampling and Mobile Laboratories (SML) to collect representative headspace samples from Hanford Site single-shell tank (SST) 241-SX-102. This document presents sampling data resulting from the July 19, 1995 sampling of SST 241-SX-102. Analytical results will be presented in separate reports issued by the laboratories that supplied and analyzed the sampling media.

2.0 SAMPLING EQUIPMENT DESCRIPTION

2.1 VAPOR SAMPLING SYSTEM

The SML vapor team (the team) used the vapor sampling system (VSS) to collect representative samples of the air, gases, and vapors from the headspace of SST 241-SX-102 on July 19, 1995. Mahon et al. (1994) describes in detail the VSS, its performance, and its operation. The team used the VSS to collect sorbent trap and SUMMA¹ canister headspace samples from SST 241-SX-102. The team then sent these samples to the analytical laboratories for analysis.

The VSS comprises a mobile laboratory, a hot-water-jacketed stainless-steel probe that is inserted into the tank headspace, and stainless-steel transfer tubing that connects the mobile laboratory to the probe. A vacuum pump draws sample vapor from the tank headspace and through all transfer tubing and the sampling manifold. Electrically activated, pneumatically actuated, valves direct sample flow within the VSS. Instrumentation housed in the mobile laboratory monitors and controls system temperature, monitors absolute and differential system pressure, meters and controls vapor mass flow, and monitors sample vapor total organic carbon (TOC) content using a gas chromatograph/flame ionization detector (GC/FID).

A key feature of the VSS is its use of heated transfer tubing and a heated sampling manifold. Maintaining the system temperature at an electronically controlled, elevated temperature prevents vapor condensation and reduces vapor adsorption on surfaces exposed to sample vapor. Mahon et al. (1994) describes various tests and observations that indicate the VSS sample transfer efficiency is consistently high.

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

Sorbent trap samples are collected at the sorbent trap station of the sampling manifold. Sorbent traps are pencil-size stainless-steel or glass tubes that contain vapor-adsorbing media. A known amount of sample vapor is passed through the tube, which traps (by adsorption) virtually all the target analytes. The concentration of analytes in the vapor sampled is calculated from the quantity of analyte found in the sorbent media and the volume of vapor passed through the sorbent trap.

The sorbent trap station uses highly accurate mass flow controllers to measure and control the flow rate of sample vapor through the sorbent traps. The controllers FICV-1 through FICV-9 are mounted on top of the sorbent station between the inlet and outlet valves. Controllers FICV-10 and FICV-11 are located downstream of the sorbent trap station and the in-line driers, which remove moisture from the sample vapor before it is metered. Errors associated with the mass flow controllers were determined by the Westinghouse Hanford Company (WHC) Standards Laboratory before the SST 241-SX-102 sampling event (see Table 1). Flow rates and the duration of flow are specified by the analytical laboratories that supply and analyze the sorbent traps.

Table 1. Flow Control Calibration.

| Flow-indicating Control valve | Typically used Flow (stdcm 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 VSS is also equipped with a gas chromatograph (GC). The Hewlett Packard 5890 Series II GC is equipped with a flame-ionization detector (FID), a 1 mL sample loop, a 10 port injection valve, a 2 meter chromatographic column, a programmable oven, and a portable computer loaded with the HP-Chemstation²

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

software used to control the GC. The GC is plumbed to directly transfer sample from the VSS manifold to the GC sample loop. After the sample is transferred into the sample loop and reaches equilibrium, the run is initiated manually. HP-Chemstation™ software activates the 10 port valve to transfer the sample from the sample loop to the column. The sample passes through the column and the FID generates a signal for TOC. All data is then transmitted to the computer where it is stored for further analysis.

The GC is equipped with a HP-5 column which is 2 meters long, 0.25 mm inside diameter, and which contains a 0.25 um phenyl methyl silicone phase. The GC oven is programmed to heat from 50 °C to 270 °C at a rate of approximately 70 °C per minute. Helium is the carrier gas, air and hydrogen the combustion gases, and nitrogen the make-up gas.

The GC/FID is configured to quantitatively estimate concentrations of TOC. The GC/FID confirms sampling system cleanliness, ambient air background TOC concentrations during sampling, and TOC concentration of tank vapor samples. The system is multi-point calibrated at the weather station on a as available basis, the last time being January 1995. The GC/FID has displayed a high degree of stability over a period of months. For further details, see Section 3.6, Field GC/FID Results.

The sampling manifold also has a station for sampling vapor with evacuated SUMMA™ canisters. SUMMA™ canisters are stainless-steel vessels with internal surfaces that have been prepared by the SUMMA™ process, which passivates active sites on the canister walls to minimize adsorption of gases and vapors. An analytical laboratory must clean and evacuate SUMMA™ canisters before use. The evacuated canister is filled with sample vapor through a manually operated valve, which is then closed to seal the sample inside. SUMMA™ canisters essentially allow collection and transfer of whole-air samples from the sample site to an analytical laboratory where the sample is analyzed. The standard capacity of each SUMMA™ canister is 6 liters.

3.0 SAMPLING EVENT DESCRIPTION

3.1 SPECIFICATIONS

The Vapor Issue Resolution Program specifies sampling requirements in WHC-SD-WM-TP-335, Rev 0E, *Vapor Sampling and Analysis Plan* (Homi 1995). The Sampling and Analysis Plan also specifies the types and number of samples to be collected, flow rates, and durations. These key sampling parameters are summarized on the sample log sheets in Appendix A. In addition to the sample log sheets, checksheets for each individual sample help ensure correct sampling procedures. SML retains these documents in the project file. This sample event's project-specific number is S5-046.

3.2 OPERATIONS AND SAMPLING PERSONNEL

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

G. S. Caprio, VSS Technician
T. B. Utecht, VSS Technician
R. A. Westberg, Field Scientist.

The VSS was set up at SST 241-SX-102 on July 18, 1995 and was allowed to warm up overnight. Sampling began shortly after 7:30 a.m. on July 19, 1995, and was completed by 11:00 a.m. the same day.

3.3 INDUSTRIAL HYGIENE FIELD RESULTS

Before hooking up to SST 241-SX-102, an industrial hygiene technician field tested tank vapors. The technician purged the vapor probe sample tube for 5 minutes and then field measured vapor stream contents using a combustible gas indicator (CGI) and an organic vapor meter (OVM). The measurements were verbally reported, LEL 0%, NH_3 0 ppm, O_2 21%, and TOC 0 ppm.

3.4 AMBIENT CONDITIONS

The weather the day of the sampling event, July 19, 1995 was sunny and warm with a light breeze from the northwest. Graphs of ambient temperatures and pressures taken at the Hanford Meteorological Station, which is about 2.5 miles northeast of SX-Farm, are provided in Appendix B.

3.5 SAMPLE COLLECTION

The hot-water-jacketed sampling probe was located in Riser R2 of SST 241-SX-102. The probe length, from the sample inlet to the top of the riser flange, was 7.3 meters.

All zones of the VSS were heated to 60 °C during setup of the VSS at SST 241-SX-102 on July 18, 1995. The team stabilized the VSS temperature zones by 7:30 a.m. on July 19, 1995, and the system was ready to collect samples. Measured according to the VSS operating procedure, the pressure and temperature of SST 241-SX-102 were 988 mbar (741.0 torr) and 35.3 °C, respectively. The sample log sheets in Appendix A provide a complete chronology of the sample event including start and end times, flow rates, volumes, and specific sample identifiers.

Approximately 20 hours before the first samples were collected, the team began heating the VSS transfer tubing and sampling manifold. During this warmup period, the team began a purge of all vapor transfer tubing and the sampling manifold with ambient air. Before sampling tank vapors on July 19, 1995, the team collected two SUMMA[™] canister samples of ambient air, one manually 10 meters upwind of the VSS connection with SST 241-SX-102, and the other

using the VSS sampling manifold. The former was collected to establish background levels of trace organic vapors, and the latter was collected to establish the cleanliness of the sampling manifold.

A leak check of the VSS sampling manifold and transfer tubing (up to the connection to the sampling probe) was performed prior to opening the tank probe vapor sampling valve. The system was evacuated to 290 mbar (217.8 torr) and leakage of ambient air into the system was observed by monitoring system pressure for 15 minutes. Leakage resulted in an increase of 5.47 mbar (4.1 torr) in system pressure during the 15 minute test. Given a system volume of not more than 10 L, this pressure increase corresponds to a leak rate of approximately 12.55 mL/min. This leak rate was then estimated for average SUMMA[™], triple sorbent trap (TST), and sorbent sampling pressures. It was found that for the SUMMA[™] canisters, dilution by ambient air was approximately 0.1%, for TSTs sampled at 200 mL/min the dilution was approximately 0.5%, and for sorbent traps the dilution was approximately 0.4%.

The tank probe vapor sampling valve was opened and the VSS was purged with sample vapor from SST 241-SX-102 for 30 minutes at a total flow rate of 5.46 L/min. This purge was performed to flush ambient air from the system and saturate the system's active adsorption sites. Because the volume of transfer tubing and the sampling manifold upstream of the sampling devices is estimated to be no more than 10 L, this purge provided about 16.4 air turnovers in the system.

One analytical laboratory provided sample media. Pacific Northwest Laboratory (PNL) provided SUMMA[™] canisters, TSTs, and sorbent traps for organic vapors, ammonia (NH₃), nitrogen dioxide (NO₂), and water vapor (H₂O).

3.6 FIELD GC/FID RESULTS

The GC was single point calibrated on the day of sampling using 6.0 ppmC Propane standard by Scott Specialty Gas. The standard is an E.P.A. Protocol Gas that is ±2% NIST traceable.

Table 2 displays the Field GC/FID results from the sampling of SST 241-SX-102.

Table 2. TOC Results.

| Number of Runs | Description | Average TOC Concentration (ppmC) | % Standard Deviation |
|----------------|-------------|----------------------------------|----------------------|
| 4 | Propane | 6.00 | 0.44 |
| 4 | Ambient | 2.87 | 0.15 |
| 4 | Tank Vapor | 3.36 | 5.29 |

3.7 RADIATION SCREENING

Samples are unconditionally released from the SST farm in accordance with 1995-33300-RSP-03, *Release of Vapor Sampling Equipment* (WHC 1995c). Radiological screening results are used to determine (1) if the samples must be shipped as radioactive or nonradioactive in accordance with U.S. Department of Transportation (DOT) regulations and (2) if the samples meet the laboratory acceptance criteria.

The DOT limits for shipping a nonradioactive sample are 2,000 combined pCi/g of beta-gamma activity and alpha activity. Samples exceeding these DOT limits may be shipped as radioactive material if the samples do not exceed the following laboratory acceptance criteria:

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

To protect the sampling manifold and sampling devices from radioactive particulates, all sample vapor for the July 19, 1995, SST 241-SX-102 vapor sampling event was drawn through a series of four glass-fiber high-efficiency particulate air (HEPA) filters placed upstream of the sampling manifold. These four filters were in place any time tank vapors were flowing through the system. When sampling was complete, the filters were removed and assigned unique sample identifiers. All four HEPA filters were submitted to Laboratory 222-S for total alpha, total beta, and gamma energy analysis (GEA). The HEPA filter closest to the sampling manifold was analyzed to determine if the samples met DOT shipping criteria and laboratory acceptance criteria. Moisture from the tank vapors was collected in a silica gel trap through one of the sorbent station ports and analyzed for tritiated water. SST 241-SX-102 filter and silica gel analysis results are shown in Table 3. SML scientists use the activity results in Table 3 to calculate pCi/g of sample media. SML maintains this information in the project-specific file. The results in Table 3 indicate that the samples collected from SST 241-SX-102 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 HEPA filter (box) | S5046-A28.OU1 | Total Alpha = 1.29 Total Beta = 28.5 GEA = <detectable | = 0.004 = 0.09 = <detectable |
| Downstream HEPA filter (box) | S5046-A29.OD1 | Total Alpha = 55.5 Total Beta = <1.27 GEA = 40.2 (¹³⁷ Cs) | = 0.18 = <0.004 = 0.13 |
| Upstream HEPA filter (VSS) | S5046-A30.OU2 | Total Alpha = 1.12 Total Beta = 4.99 GEA = <detectable | = 0.004 = 0.02 = <detectable |
| Downstream HEPA filter (VSS) | S5046-A31.OD2 | Total Alpha = 321 Total Beta = 404 GEA = 76.5 (²⁰⁸ Tl) | = 1.05 = 1.32 = 0.25 |
| Tritium trap | S5046-A03.OT1 | Total activity = <50.0 | = <50.0 ^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 HEPA filters. Appendix A and the sample checksheets were used to estimate a total flow through the VSS of 306 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, sorbent tubes, and SUMMA[™] canisters received from PNL are kept in a custody locked storage area maintained by SML. Sorbent trains and tubes were maintained at 4 ± 2 °C in a refrigeration unit. SUMMA[™] canisters were stored in the same locked storage area, but were not refrigerated. These sampling devices were picked up from PNL by SML and transported in a government vehicle to a custody locked storage area.

After sampling, the PNL sorbent tubes and SUMMA[™] canisters were transported by government vehicle directly to PNL and delivered to J. A. Edwards on July 27, 1995. Table 4 lists the sample identifiers, sample types, and COC form numbers for all PNL samples.

Table 4. Pacific Northwest Laboratory Samples.

| Sample Identifier | Sample Type | COC Number |
|-------------------|--|------------|
| S5046-A01.020 | Ambient upwind SUMMA™ | 008916 |
| S5046-A02.028 | Ambient SUMMA™ (VSS) | 008916 |
| S5046-A04.041 | SUMMA™ | 008916 |
| S5046-A12.063 | SUMMA™ | 008916 |
| S5046-A20.164 | SUMMA™ | 008916 |
| S5046-A08.U94 | NH ₃ /NO _x /H ₂ O sorbent | 008915 |
| S5046-A09.U95 | NH ₃ /NO _x /H ₂ O sorbent | 008915 |
| S5046-A10.U96 | NO _x /H ₂ O sorbent | 008915 |
| S5046-A11.U97 | NH ₃ /H ₂ O/H ₂ O sorbent | 008915 |
| S5046-A16.U98 | NH ₃ /NO _x /H ₂ O sorbent | 008915 |
| S5046-A17.U99 | NH ₃ /NO _x /H ₂ O sorbent | 008915 |
| S5046-A18.01T | NO _x /H ₂ O sorbent | 008915 |
| S5046-A19.02T | NH ₃ /H ₂ O/H ₂ O sorbent | 008915 |
| S5046-A25.03T | NH ₃ /NO _x /H ₂ O field blank | 008915 |
| S5046-A26.04T | NH ₃ /NO _x /H ₂ O field blank | 008915 |
| S5046-A27.05T | NH ₃ /NO _x /H ₂ O field blank | 008915 |
| S5046-A05.550 | PNL TST | 008917 |
| S5046-A06.551 | PNL TST | 008917 |
| S5046-A07.552 | PNL TST | 008917 |
| S5046-A13.553 | PNL TST | 008917 |
| S5046-A14.554 | PNL TST | 008917 |
| S5046-A15.555 | PNL TST | 008917 |
| S5046-A21.556 | PNL TST Field Blank | 008917 |
| S5046-A22.557 | PNL TST Field Blank | 008917 |
| S5046-A23.558 | PNL TST Trip Blank | 008917 |
| S5046-A24.559 | PNL TST Trip Blank | 008917 |

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-SX-102, the VSS manifold and vapor sample transfer tubing was heated to 60 °C and ambient air was purged through the system for 20.5 hours. Also, all pertinent system valves were actuated to release any contaminants that may have collected in the VSS valves themselves. After this purge an ambient air sample was drawn through the VSS manifold and a GC/FID run was initiated. No significant level of contaminants was detected. A second ambient air GC/FID run confirmed that the VSS manifold and transfer tubing was free of organic remnant residue down to ambient levels. A SUMMA™ canister ambient air sample was then collected to confirm by laboratory analysis that the VSS sampling manifold was free of trace organic contaminants (or to determine which contaminants were present and at what concentration), as discussed in Section 3.5. For further details, refer to Appendix E of WHC-IP-1127-4.10 (WHC 1995b) and the project-specific file located with SML.

In compliance with LO-080-405/A0, *Vapor Space Probe Cleaning Procedure* (WHC 1993) the team cleaned the hot-water-jacketed probe before it was installed in SST 241-SX-102. This procedure requires a solvent rinse of all internal probe surfaces with acetone and methanol to clear the sample line of possible contamination remaining from the construction process. The probes are then heated to 90 °C, and dry air is passed through the probe to evaporate the solvents. Before the probes are released, the team ensures by a hand-held organic vapor meter that the total organic concentration in the sample line is below 1 ppmv.

5.2 INSTRUMENT CALIBRATION

Instruments located in the VSS are calibrated on an annual basis at the WHC Standards Laboratory. VSS instrumentation calibration data, maintained in files by SML, are summarized in Table 5. According to the calibration schedule shown in Table 5, all instrumentation was within its calibration period during the SST 241-SX-102 sampling event.

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 | 3/30/95 | 3/30/96 | 804-67-74-009 |

5.3 BLANK SAMPLES

Trip blanks are samples that accompany the sample media from the point of generation through sample analysis. They are transported to the field with the sample collection media but remain unopened during the sampling event. Analysis of trip blanks is used to assess cross-contamination of sample media during field transport and storage.

Field blanks are sampling devices similar to trip blanks. They are prepared and handled in the same manner as the sampling media, but no tank vapors are drawn through them.

Spiked blanks are prepared as regular sampling media but also contain a known amount of special analyte. Tank vapors are drawn through these blanks and

they are handled and analyzed just like any other sample. Analysis of the spiked blanks is used to evaluate potential sample loss during shipment or storage.

Ambient blanks are samples of ambient air collected at the sampling location. Analysis of ambient blanks is used to assess contamination that may be present in the atmosphere or in the transfer tubing or sampling manifold of the VSS immediately prior to sampling operations.

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

6.0 ANOMALIES

All samples were collected in accordance with the Tank Characterization Plan (TCP) and WHC-IP-1127-4.10, *Collection of Parallel Sorbent Tube and SUMMA Canister Samples Using the Vapor Sampling System* (1995b).

TST sample numbers S5046-A06.551 and S5046-A07.552 were broken while removing them from the sorbent station. The samples were collected before they were broken.

It also appears that the radiation results acquired from 222-S laboratory were inconsistent with the results of other VSS sampling events. Historically the furthest upstream HEPA filter sample will contain the greatest amount of Alpha, Beta, and Gamma radiation as compared to the three other downstream HEPA filter. The sample analysis for this event indicated that the furthest downstream HEPA filter contained the highest concentration of radiation.

7.0 REFERENCES

- 49 CFR 100-177, 1992, "Transportation," *Code of Federal Regulations*, as amended.
- Homi, C. S., 1995, *Vapor Sampling and Analysis Plan*, WHC-SD-WM-TP-335, Rev. 0E, Westinghouse Hanford Company, Richland, Washington.
- Mahon, R. D., C. M. Jones, and M. S. Story, 1994 (draft), *Evaluation of the Capabilities and Use of the Vapor Sampling System for Tank Headspace Sampling and Characterization*, SD-WM-RPT-094, Westinghouse Hanford Company, Richland, Washington.
- WHC, 1995a, *Chain-of-Custody/Special Analysis Request for RCRA and CERCLA Protocol Samples*, Procedure WHC-IP-1127-1.3, Rev. 1, Westinghouse Hanford Company, Richland, Washington.
- WHC, 1995b, *Collection of Parallel Sorbent Tube and SUMMA Canister Samples Using the Vapor Sampling System*, Procedure WHC-IP-1127-4.10, Westinghouse Hanford Company, Richland, Washington.
- WHC, 1995c, *Release of Vapor Sampling Equipment*, Procedure 1995-33300-RSP-03, Westinghouse Hanford Company, Richland, Washington.
- WHC, 1993, *Vapor Space Probe Cleaning Procedure*, Procedure LO-080-405/A0, Westinghouse Hanford Company, Richland, Washington.

APPENDIX A
SAMPLE LOG SHEETS

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Waste Tank
241-8X-102

Date: 7/19/95

VSS Personnel: Westberg and Caprio

Trailer Personnel: Utecht

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

Ensure HEPA filters are installed

Ensure connection to sample probe

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

Tank Temperature 35.3 C

GC Standard Runs

GC Ambient Air Runs through port 10

| WHC Sample ID | PNL ORNL 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. | | | | | | | | | | | |
| S5046-A01.020 | 020 | | Oversight | 5500 | 30 | 165000 | 5500 | 7/18-11:10 | 7/19-7:32 | 1232 | 6778.00 |
| S5046-A01.020 AMBIENT #1 | | | | | | | | | | | |
| GC Run #1 Ambient air/Cleanliness check | | | | | | | | | | | |
| S5046-A02.028 | 028 | 15 | AMBIENT #2 | | 1 | | | 7:57 | | | |
| S5046-A02.028 AMBIENT #2 | | | | | | | | | | | |
| GC RUN#2 Ambient air | | | | | | | | | | | |
| LEAK CHECK (APPENDIX A) Leak Rate: <u>16.4 torr/hr</u> | | | | | | | | | | | |
| Purge with tank air for 30 min | | | | | | | | | | | |
| | | | | 5500 | 30 | 165000 | 5500 | 8:17 | 8:32 | 30 | 165.00 |
| Measure tank pressure PE-1 = 741.0 torr | | | | | | | | | | | |
| GC RUN #3 (Tank run #1) | | | | | | | | | | | |
| S5046-A04.041 | 041 | 11 | SUMMA #3 | | 1 | | | 9:20 | | | |
| S5046-A04.041 SUMMA #3 | | | | | | | | | | | |
| GC RUN #3 SUMMA #3 | | | | | | | | | | | |
| | | | | | | | | 9:27 | 9:28 | 6.00 | |

Waste Tank
241-SX-102

| WHC Sample ID | PNL ORNL Sample ID | Port Valve # | Description | Desired | | Actual | | Desired Total Flow SCCM | Actual Start Time | Actual End Time | Actual Total Time (min.) | Actual Total Flow Liters | |
|-------------------------|--------------------|--------------|------------------|----------------|-----------------|----------------|-------|-------------------------|-------------------|-----------------|--------------------------|--------------------------|--|
| | | | | Flow Rate SCCM | Duration (min.) | Flow Rate SCCM | Time | | | | | | |
| S5046-A05.550 | TST#550 | 1 | TST #1 | 200 | 5 | 200.00 | 9:32 | 1000 | 9:32 | 9:37 | 5 | 1.00 | |
| S5046-A06.551 | TST#551 | 2 | TST #2 | 200 | 5 | 200.00 | 9:32 | 1000 | 9:32 | 9:37 | 5 | 1.00 | |
| S5046-A07.552 | TST#552 | 3 | TST #3 | 200 | 5 | 196.60 | 9:32 | 1000 | 9:32 | 9:37 | 5 | 0.98 | |
| S5046-A03.0T1 | T-2204 (222-S) | 4 | Tritium Trap | 200 | 5 | 200.00 | 9:32 | 1000 | 9:32 | 9:37 | 5 | 1.00 | |
| S5046-A08.U94 | U94 | 5 | NH3/NOx/H2O (#1) | 200 | 15 | 200.00 | 9:32 | 3000 | 9:32 | 9:47 | 15 | 3.00 | |
| S5046-A09.U95 | U95 | 6 | NH3/NOx/H2O (#2) | 200 | 15 | 200.00 | 9:32 | 3000 | 9:32 | 9:47 | 15 | 3.00 | |
| S5046-A10.U96 | U96 | 7 | NOx/H2O (#3) | 200 | 15 | 191.90 | 9:32 | 3000 | 9:32 | 9:47 | 15 | 2.88 | |
| S5046-A11.U97 | U97 | 8 | NH3/H2O/H2O (#4) | 200 | 15 | 195.00 | 9:32 | 3000 | 9:32 | 9:47 | 15 | 2.93 | |
| GCRUN #4 (Tank run # 2) | | | | | | 9:55 | | | | | | | |
| S5046-A12.063 | 063 | 13 | SUMMA #4 | 1 | | 9:59 | | 10:00 | | | | 6.00 | |
| S5046-A13.553 | TST#553 | 1 | TST #4 | 200 | 5 | 200.00 | 10:19 | 1000 | 10:19 | 10:24 | 5 | 1.00 | |
| S5046-A14.554 | TST#554 | 2 | TST #5 | 200 | 5 | 200.00 | 10:19 | 1000 | 10:19 | 10:24 | 5 | 1.00 | |
| S5046-A15.555 | TST#555 | 3 | TST #6 | 200 | 5 | 193.50 | 10:19 | 1000 | 10:19 | 10:24 | 5 | 0.97 | |
| S5046-A16.U98 | U98 | 5 | NH3/NOx/H2O (#5) | 200 | 15 | 200.00 | 10:19 | 3000 | 10:19 | 10:34 | 15 | 3.00 | |
| S5046-A17.U99 | U99 | 6 | NH3/NOx/H2O (#6) | 200 | 15 | 200.00 | 10:19 | 3000 | 10:19 | 10:34 | 15 | 3.00 | |
| S5046-A18.01T | 01T | 7 | NOx/H2O (#7) | 200 | 15 | 191.30 | 10:19 | 3000 | 10:19 | 10:34 | 15 | 2.87 | |
| S5046-A19.02T | 02T | 8 | NH3/H2O/H2O (#8) | 200 | 15 | 193.50 | 10:19 | 3000 | 10:19 | 10:34 | 15 | 2.90 | |
| GCRUN #5 (Tank run #3) | | | | | | 10:36 | | | | | | | |
| S5046-A20.164 | 164 | 15 | SUMMA #5 | 1 | | 10:40 | | 10:41 | | | | 6.00 | |

Waste Tank
241-9X-102

| WHC Sample ID | PNL ORNL Sample ID | Port Valve # | Description | Desired | | Actual | | Desired | | Actual | |
|---------------|--------------------------|-----------------|-------------|----------------------|--------------------|----------------------|---------------|-----------------------|-------------|-------------------------|----------------------|
| | | | | Flow Rate SCCM | Duration (min.) | Flow Rate SCCM | Start Time | Total Flow SCCM | End Time | Total Time (min.) | Flow Rate SCCM |

| | | | | | | | | | | | |
|------------------------|---------|---|-------------------------|--|--|--|-------|--|--|--|-------|
| S5046-A21.556 | TST#556 | 1 | TST FIELD BLANK #1 | | | | 10:27 | | | | 10:28 |
| S5046-A22.557 | TST#557 | 2 | TST FIELD BLANK #2 | | | | 10:27 | | | | 10:28 |
| S5046-A25.03T | 03T | 5 | 3/NOx/H2O FIELD BLANK#1 | | | | 10:40 | | | | 10:41 |
| S5046-A26.04T | 04T | 6 | 3/NOx/H2O FIELD BLANK#2 | | | | 10:40 | | | | 10:41 |
| S5046-A27.05T | 05T | 7 | 3/NOx/H2O FIELD BLANK#3 | | | | 10:40 | | | | 10:41 |
| GCRUN#6 (Tank run # 4) | | | | | | | 10:48 | | | | |

TOTAL TANK GAS USED DURING SAMPLING RUNS 48.53

| | | | | | | | | | | | |
|---------------|----------------|--|-----------------------|--|--|--|--|--|--|--|--|
| S5046-A28.OU1 | T-2205 (222S) | | Upstream HEPA(box) | | | | | | | | |
| S5046-A29.OD1 | T-2208 (222S) | | Downstream HEPA(box) | | | | | | | | |
| S5046-A30.OU2 | T-2207 (222S) | | Upstream HEPA(VSS) | | | | | | | | |
| S5046-A31.OD2 | T-2208 (222S) | | Downstream HEPA (VSS) | | | | | | | | |

| | | | | | | | | | | | |
|-----------------------------|---------|--|-------------|--|--|--|--|--|--|--|--|
| Trip Blanks (DO NOT EXPOSE) | | | | | | | | | | | |
| S5046-A23.558 | TST#558 | | TST TRIP #1 | | | | | | | | |
| S5046-A24.559 | TST#559 | | TST TRIP #2 | | | | | | | | |

* Tubes designated with an asterisk were broken while removing.

SX-102
TOTAL TANK VAPOR USED

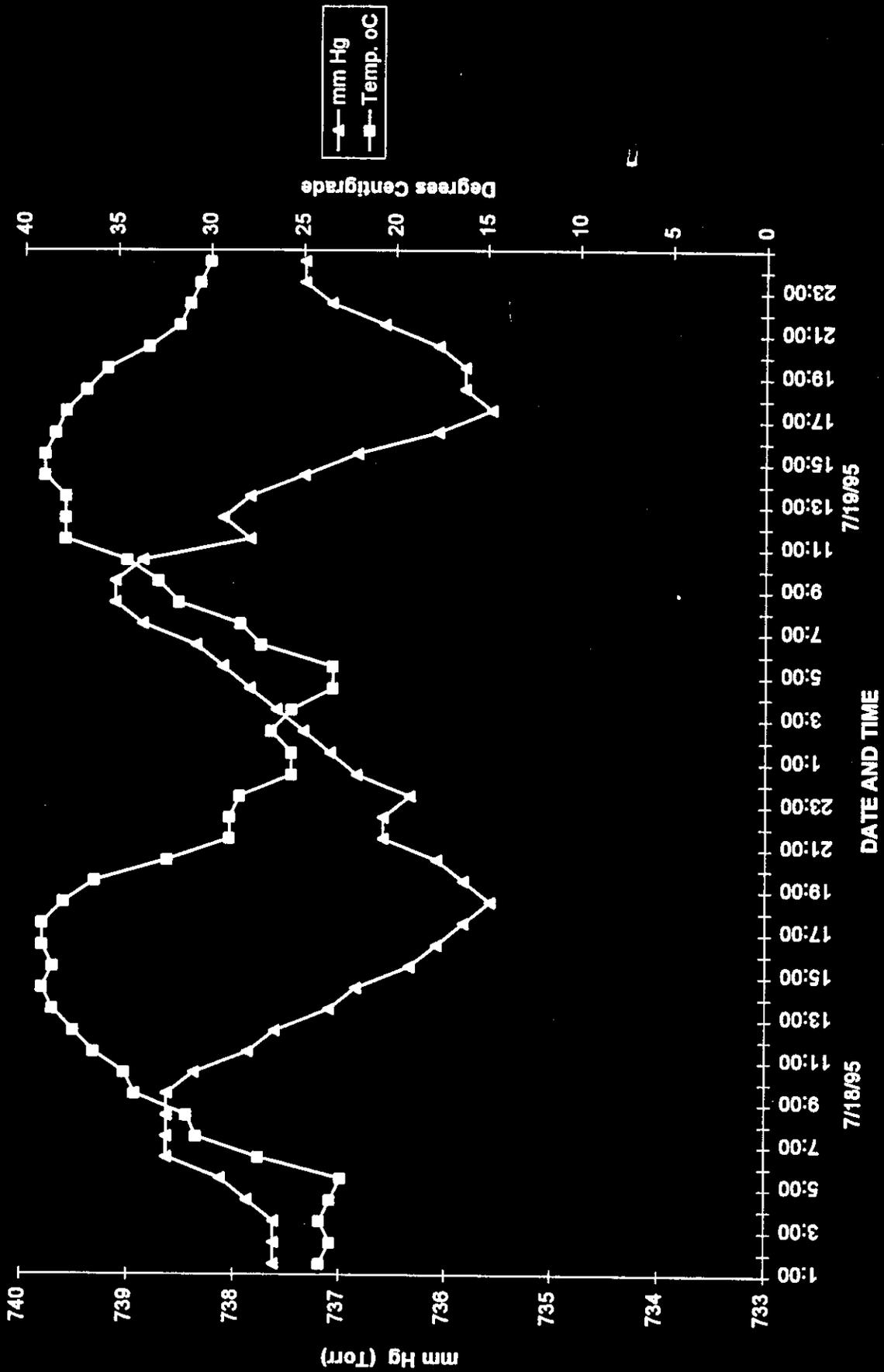
| | NUMBER OF EVENTS | TIME IN MINUTES | VOLUME IN SCCM | TOTAL VOLUME, LITERS |
|------------------------------------|------------------|-----------------|----------------|----------------------|
| LEAK CHECKS | 1 | 0 | 5600 | 5.60 |
| TANK PURGE PUMP DOWNS | 3 | 1 | 5600 | 16.80 |
| TANK PURGE TIME (From Spreadsheet) | 1 | 30 | 5450 | 165.00 |
| GC PURGES | 4 | 2 | 5000 | 40.00 |
| SUMMA PURGES | 3 | 2 | 5000 | 30.00 |
| ALL SAMPLES COLLECTED | | | | 48.53 |
| TOTAL FOR TANK SAMPLING RUN | | | | 305.93 |

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APPENDIX B
AMBIENT CONDITIONS

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WEATHER DURING VSS SAMPLING OF 241-SX-102



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APPENDIX C
CHAIN-OF-CUSTODY FORMS

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008334

Westinghouse Hanford Company

CHAIN OF CUSTODY/SAMPLE ANALYSIS RECORD

Company Contact: **R.O. Mahon** Telephone No. **373-7437**

Project Designation: **VAPOR Sampling** Sampling Location: **SX-102**

Field Report No.: **WHC-N-647 #10** Method of Shipment: **by Vehicle #930**

Shipped To: **200-S Labs** Office Property No.: **N/A**

Possible Sample Hazards/Remarks: **NONE**

| Sample No. | Matrix | Date Sampled | Time Sampled | Preservative | Type of Container | No. of Containers | Volume | Special Handling and/or Storage |
|-------------|--------|--------------|--------------|--------------|-------------------|-------------------|--------|---------------------------------|
| S5046 - OT1 | Soil | 7/17/95 | 9:32 AM | N/A | Petri Dish | 5 | 47ml | |
| S5046 - O41 | Soil | 7/17/95 | 8-11 AM | | | | | |
| S5046 - O41 | Soil | 7/17/95 | 8-11 AM | | | | | |
| S5046 - O42 | Soil | 7/17/95 | 8-11 AM | | | | | |
| S5046 - O42 | Soil | 7/17/95 | 8-11 AM | | | | | |

CHAIN OF POSSESSION

Received By: **Stan S. Corzoba** Date/Time: **7-19-95 2:15P**

Received By: **EE Debes** Date/Time: **7-19-95 145**

Received By: _____ Date/Time: _____

Received By: _____ Date/Time: _____

Received By: _____ Date/Time: _____

Special Instructions: **Please fax info to Tim Utecht at 373-7076.**

Thanks

Silicate/HEPA filters

Matrix:

- Soil
- Sediment
- Soil
- Sludge
- Water
- Oil
- Air
- Drum Solids
- Drum Liquids
- Thru
- Wipe
- Liquid
- Vegetation
- Other

Disposed By: _____ Date/Time: _____

**Battelle
Pacific Northwest Lab**

CHAIN OF CUSTODY

WHC 008916

Custody Form Initiator **J. A. Edwards - PNL**

Telephone (509) 373-0141
Page 85-3009 / FAX 376-0418

Company Contact **R. D. Mahon - WHC**

Telephone (509) 373-2891
Page 85-3152 / FAX 373-3793

Project Designation/Sampling Locations **200 West Tank Farm
241-SX-102 Tank Vapor Sample SAF S5046
(VSS Truck)**

Collection date **07 - 19 - 95**
Preparation date **07 - 07 - 95**

Ice Chest No.

Field Logbook No. **WHC-N-692 10**

Bill of Lading/Airbill No. **N/A**

Offsite Property No. **N/A**

Method of Shipment **Government Truck**

Shipped to **PNL**

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

Sample Identification

| | |
|-------------------|--|
| S5046 - A01 . 020 | Ambient Air SUMMA #1 Upwind of SX-102 |
| S5046 - A02 . 028 | Ambient Air SUMMA #2 Through Port # 15 |
| S5046 - A04 . 041 | SUMMA #3 Port # 15 |
| S5046 - A12 . 063 | SUMMA #4 Port # 15 |
| S5046 - A20 . 164 | SUMMA #5 Port # 13 |

| Field Transfer of Custody | | Chain of Possession (Sign and Print Names) | | | |
|--------------------------------|----------|--|------------------------------|----------|------|
| Relinquished By | Date | Time | Received By | Date | Time |
| J A Edwards <i>J A Edwards</i> | 07-10-95 | 1410 | T B Utecht <i>T B Utecht</i> | 07-10-95 | 1410 |
| <i>T B Utecht</i> | 7-27-95 | 1315 | <i>J A Edwards</i> | 7-27-95 | 1315 |
| | | | | | |
| | | | | | |

Comments:

Final Sample Disposition

| | | |
|---|---------------------------------------|------------------|
| PNL (only) Checklist | Pick-up / Delivery | Comments: |
| <input type="checkbox"/> Media labeled and checked? | <input checked="" type="checkbox"/> Y | |
| <input type="checkbox"/> Letter of instruction? | <input checked="" type="checkbox"/> Y | |
| <input type="checkbox"/> Media in good condition? | <input checked="" type="checkbox"/> Y | |
| <input type="checkbox"/> COC info/signatures complete? | <input checked="" type="checkbox"/> Y | |
| <input type="checkbox"/> Rad release stickers on samples? | <input checked="" type="checkbox"/> Y | |
| <input type="checkbox"/> Activity report from 222S? | <input checked="" type="checkbox"/> Y | |
| <input type="checkbox"/> COC copy for LRB, RIDS filed? | <input checked="" type="checkbox"/> Y | |
| POC <i>(Signature)</i> | POC <i>(Signature)</i> | |

(Revised 10/17/94 PNL)

Battelle Pacific Northwest Laboratory

CHAIN OF CUSTODY

WHC 008915

Custody Form Initiator **J. A. Edwards - PNL**

Telephone (509) 373-0141
Page 85-3009 / FAX 376-0418

Company Contact **R. D. Mahon - WHC**

Telephone (509) 373-2891
Page 85-3152 / FAX 373-3793

Project Designation/Sampling Locations **200 West Tank Farm
241-SX-102 Tank Vapor Sample SAF S5046
(VSS Truck)**

Collection date **07 - 19 - 95**
Preparation date **07 - 07 - 95**

Ice Chest No.

Field Logbook No. **WHC-N-472-10**

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

| | | | |
|----------------------|--|--------------------------|-----------------|
| S5046 - A08 . U941 - | NH ₃ /NO _x /H ₂ O | (INORG Sorbent Trap # 1) | Line # <u>5</u> |
| S5046 - A09 . U951 - | NH ₃ /NO _x /H ₂ O | (INORG Sorbent Trap # 2) | Line # <u>6</u> |
| S5046 - A10 . U961 - | NO _x /H ₂ O | (INORG Sorbent Trap # 3) | Line # <u>7</u> |
| S5046 - A11 . U971 - | NH ₃ /H ₂ O/H ₂ O | (INORG Sorbent Trap # 4) | Line # <u>8</u> |
| S5046 - A16 . U981 - | NH ₃ /NO _x /H ₂ O | (INORG Sorbent Trap # 5) | Line # <u>5</u> |
| S5046 - A17 . U991 - | NH ₃ /NO _x /H ₂ O | (INORG Sorbent Trap # 6) | Line # <u>6</u> |
| S5046 - A18 . 01T - | NO _x /H ₂ O | (INORG Sorbent Trap # 7) | Line # <u>7</u> |
| S5046 - A19 . 02T - | NH ₃ /H ₂ O/H ₂ O | (INORG Sorbent Trap # 8) | Line # <u>8</u> |
| S5046 - A25 . 03T - | NH ₃ /NO _x /H ₂ O | (INORG Field Blank # 1) | |
| S5046 - A26 . 04T - | NH ₃ /NO _x /H ₂ O | (INORG Field Blank # 2) | |
| S5046 - A27 . 05T - | NH ₃ /NO _x /H ₂ O | (INORG Field Blank # 3) | |

| Field Transfer of Custody | | Chain of Possession (Sign and Print Names) | | | |
|---------------------------------|----------|--|---------------------------------|----------|------|
| Relinquished By | Date | Time | Received By | Date | Time |
| G W Dennis <i>G.W. Dennis</i> | 07-10-95 | 1335 | J A Edwards <i>J.A. Edwards</i> | 07-10-95 | 1335 |
| J A Edwards <i>J.A. Edwards</i> | 07-10-95 | 1410 | T B Urech <i>T.B. Urech</i> | 07-10-95 | 1410 |
| T.B. Urech <i>T.B. Urech</i> | 7-27-95 | 1315 | J A Edwards <i>J.A. Edwards</i> | 7-27-95 | 1315 |

Final Sample Disposition

Comments:

| PNL (only) Checklist | Pick-up / Delivery | Comments: |
|----------------------------------|---------------------------------------|------------------------------------|
| Media labeled and checked? | <input checked="" type="checkbox"/> N | |
| Letter of instruction? | <input checked="" type="checkbox"/> N | |
| Media in good condition? | <input checked="" type="checkbox"/> N | |
| COC info/signatures complete? | <input checked="" type="checkbox"/> N | |
| Sorbents shipped on ice? (<10°C) | <input checked="" type="checkbox"/> N | |
| Rud release stickers on samples? | <input checked="" type="checkbox"/> N | |
| Activity report from 222S? | <input checked="" type="checkbox"/> N | |
| COC copy for LRI, RIDS filed? | <input checked="" type="checkbox"/> N | |
| COC copy for sorbent follow-on? | <input checked="" type="checkbox"/> N | Original COC follows sorbent media |

POC *[Signature]* POC *[Signature]*

(Revised 05/10/95 PNL)

Battelle Pacific Northwest Laboratory

CHAIN OF CUSTODY

WHC 008917

Custody Form Initiator **J. A. Edwards - PNL**

Telephone **(509) 373-0141**
Page **85-3009 / P8-08 / FAX 373-0418**

Company Contact **R. D. Mahon - WHC**

Telephone **(509) 373-7437**
Page **85-9858 / S3-27 / FAX 373-7076**

Project Designation/Sampling Locations **200 West Tank Farm
241-SX-102 Tank Vapor Sample SAF S5046
(VSS Truck)**

Collection date **07-19-95**
Preparation date **07-07-95**

Ice Chest No.

Field Logbook No. **WHC-N-472**

Exco Hi/Lo thermometer No. **PNL-T-006 ⑦/10**

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

| | | |
|-----------------------|---|-----------------|
| S5046 - A05 . 550 - | PNL Triple Sorbent Trap (TST) Sample # 1 | Line # <u>1</u> |
| * S5046 - A06 . 551 - | PNL TST Sample # 2 | Line # <u>2</u> |
| * S5046 - A07 . 552 - | PNL TST Sample # 3 | Line # <u>3</u> |
| S5046 - A13 . 553 ✓ | PNL TST Sample # 4 | Line # <u>1</u> |
| S5046 - A14 . 554 ✓ | PNL TST Sample # 5 | Line # <u>2</u> |
| S5046 - A15 . 555 - | PNL TST Sample # 6 | Line # <u>3</u> |
| S5046 - A21 . 556 - | Open, close & store PNL TST Field Blank # 1 | In VSS truck |
| S5046 - A22 . 557 - | Open, close & store PNL TST Field Blank # 2 | In VSS truck |
| S5046 - A23 . 558 - | Store PNL TST Trip Blank # 1 | None |
| S5046 - A24 . 559 - | Store PNL TST Trip Blank # 2 | None |

| Field Transfer of Custody | | | Chain of Possession (Sign and Print Names) | | |
|---------------------------|----------|------|--|----------|------|
| Relinquished By | Date | Time | Received By | Date | Time |
| J A Edwards | 07-10-95 | 1410 | T B Utech | 07-10-95 | 1410 |
| J A Edwards | 7-27-95 | 1315 | J A Edwards | 7-27-95 | 1315 |

Final Sample Disposition

Comments:

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

Comments:

SEE BELOW ⑦ 7-27-95

Cooler Temperature Status

| | |
|-----|---|
| iii | -12 °C / Lo -12 °C (pick up at PNL to WHC) |
| iii | °C / Lo °C (delivery at WHC from PNL) |
| iii | °C / Lo °C (at return to PNL from WHC) |
| iii | 7° °C / Lo -13 °C (at delivery from WHC to PNL) |

(Revised 06/21/95 PNL)

* TST numbers S5046-A06.551 and S5046-A07.552 were broken while removing them from the sorbent station. The samples were collected before being broken.