Pacific Northwest National Laboratory

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U.S. Department of Energy

TANK VAPOR CHARACTERIZATION PROJECT

Tank 241-BX-104 Third Temporal Study: Headspace Gas and Vapor Characterization Results from Samples Collected on February 6, 1997

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September 1997

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Richland, Washington 99352

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Summary

This report presents the results from analyses of samples taken from the headspace of waste storage tank 241-BX-104 (Tank BX-104) at the Hanford Site in Washington State. Tank headspace samples collected by SGN Eurisys Service Corporation (SESC) were analyzed by Pacific Northwest National Laboratory (PNNL) to determine headspace concentrations of selected non-radioactive analytes. Analyses were performed by the Vapor Analytical Laboratory (VAL) at PNNL. Vapor concentrations from sorbent trap samples are based on measured sample volumes provided by SESC.

Ammonia was determined to be above the immediate notification limit specified by the sampling and analysis plan (SAP) (Buckley 1996). Hydrogen was the principal flammable constituent of the Tank BX-104 headspace, determined to be present at approximately 0.178% of its lower flammability limit (LFL). Total headspace flammability was estimated to be <0.458% of the LFL.

Average measured concentrations of targeted gases, inorganic vapors, and selected organic vapors are provided in Table S.1. A summary of experimental methods, including sampling methodology, analytical procedures, and quality assurance and control methods are presented in Section 2.0. Detailed descriptions of the analytical results are provided in Section 3.0.

Table S.1. Average Measured Concentrations of Gases and Inorganic and Organic Vapors in Tank BX-104 Sampled on 2/6/97

<u>Category</u>	<u>Sample Medium</u>	<u>Analyte</u>	<u>Concentration^(a)</u>	<u>Units</u>
Inorganic Vapors	Sorbent Traps	Ammonia	174	ppmv
		Nitrogen Dioxide (NO ₂)	<0.16	ppmv
		Nitric Oxide (NO)	0.27	ppmv
		Water	13.3	mg/L
Permanent Gases	SUMMA™ Canisters	Hydrogen	71	ppmv
		Methane	<25	ppmv
		Carbon Dioxide	<17	ppmv
		Carbon Monoxide	<17	ppmv
		Nitrous Oxide (N ₂ O)	119	ppmv
Total Non-Methane Organic Compounds	SUMMA™ Canisters	Total Non-Methane Organic Compounds	42.36	mg/m ³
Volatile Organic Vapors	SUMMA™ Canisters	Tridecane	15.926	mg/m ³
		Dodecane	5.343	mg/m ³
		Tetradecane	4.868	mg/m ³
Volatile Organic Vapors	Sorbent Traps	1-Butanol	8.057	mg/m ³
		Tridecane	4.542	mg/m ³
		Tetradecane	3.053	mg/m ³
Flammables	SUMMA™ Canisters and Sorbent Traps	Flammables	<0.458	% LFL

(a) Concentrations were determined using sample-volume data provided by SGN Eurisys Services Corporation and are based on averaged data from three samples. Mass concentrations are at reference temperature and pressure of 0°C and 1.013 bar.

Acknowledgments

The authors gratefully acknowledge the support of other project staff at PNNL who contributed to the successful completion of this sampling and analysis activity. S. O. Slate, L. M. P. Thomas, and G. W. Dennis supported inorganic laboratory work.

Terms and Abbreviations

% D	% Difference
CAS	Chemical Abstracts Service
CCB	continuing calibration blank
CCV	continuing calibration verification
COC	chain-of-custody
DIW	deionized water
EPA	U.S. Environmental Protection Agency
EQL	estimated quantitation limit
GC/FID	gas chromatography/flame ionization detector
GC/MS	gas chromatograph/mass spectrometer
GC/TCD	gas chromatography/thermal conductivity detection
IC	ion chromatography
ICV	initial calibration verification
IDL	instrument detection limit
IS	internal standard
ISE	ion selective electrode
ISVS	In Situ Vapor Sampling System
LFL	lower flammability limit
MW	molecular weight
NIST	National Institute for Standards and Technology
OSHA	Occupational Safety and Health Administration
PNL	Pacific Northwest Laboratory (previous name for the laboratory)
PNNL	Pacific Northwest National Laboratory
ppbv	part per billion by volume
ppm	parts per million
ppmv	part per million by volume
QA	quality assurance
RPD	relative percent difference
RSD	relative standard deviation
SAP	sample and analysis plan
SCIC	suppressed-conductivity ion chromatography
SESC	SGN Eurisys Service Corporation
SRM	standard reference material
STP	standard temperature and pressure
SUMMA™	process for passivating stainless steel
TBP	tributyl phosphate
TEA	triethanolamine
TIC	tentatively identified compound
TNMOC	total non-methane organic compound
TST	triple sorbent trap
UHP	ultra high purity
UQL	upper quantitation limit
VAL	Vapor Analytical Laboratory
VSS	vapor sampling system
WHC	Westinghouse Hanford Company

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1.0 Introduction

This report presents results of chemical analyses of vapor samples collected by SESC on February 6, 1997 from the headspace of waste storage tank 241-BX-104 (Tank BX-104) at the Hanford Site in Washington State. Pacific Northwest National Laboratory^(a) provided SUMMA™ canisters and sorbent traps for sample collection, and analyzed the samples according to instructions in the SAP (Buckley 1996). Analytical work was performed by the PNNL VAL in the 300 Area of the Hanford Site under the PNNL Tank Vapor Characterization Project.

Pacific Northwest National Laboratory provided six sets of sorbent traps for selected inorganic analytes (four samples and two field blanks), five SUMMA™ canisters for permanent gases and organic analytes (three headspace samples and two ambient air samples), and eight triple sorbent traps (TSTs) for organic analytes (four samples, two field blanks, and two trip blanks). Sample devices and controls were provided to SESC on February 3, 1997, and were returned to PNNL on February 14, 1997. SESC measured and reported to PNNL the sample volumes needed to determine headspace concentrations from sorbent trap samples.

Specific analytical methods for sample analysis are described in Section 2.0. Results and known sampling and analytical variances from established quality assurance (QA) requirements, where significant, are documented in Section 3.0. Chain-of-custody forms used to document possession and transfer of samples and controls are provided in Appendix A. Appendix B contains a complete listing of target analyte results for the organic analyses.

⁰ Pacific Northwest National Laboratory is operated for the U. S. Department of Energy by Battelle under Contract DE-AC06-76RLO 1830. The previous name of the laboratory was Pacific Northwest Laboratory. The former name is used when previously published documents are referenced.

2.0 Analytical Methods

Table 2.1 summarizes the analytes, sampling media, analytical methods, and laboratory procedures. Table 2.2 summarizes information regarding sample media, handling, and storage procedures.

Table 2.1. Sampling and Analysis Methods Summary

<u>Analyte</u>	<u>Sampling Media</u>	<u>Extraction Method</u>	<u>Analysis Method</u>	<u>Procedure</u>
Ammonia	Acidified carbon bead sorbent trap	Aqueous extraction	ISE analysis	PNL-ALO-226
Nitric Oxide and Nitrogen Dioxide	Triethanolamine impregnated sorbent traps	Aqueous extraction	IC	PNL-ALO-212
Water Vapor	Other inorganic sorbent traps + silica gel sorbent trap	None	Gravimetric analysis (sample weight gain)	PNL-TVP-09
Carbon Monoxide, Carbon Dioxide, Hydrogen, Methane, and Nitrous Oxide	SUMMA™ canisters	Analysis of SUMMA™ canister subsample	GC/TCD	PNL-TVP-05
Organic Vapors	Triple sorbent traps	Thermal desorption	GC/MS	PNL-TVP-10
Organic Vapors	SUMMA™ canisters	Cryo-focusing of SUMMA™ canister subsample	GC/MS	PNL-TVP-03
Total Non-Methane Organic Compounds	SUMMA™ canisters	Cryo-focusing of SUMMA™ canister subsample	GC/FID	PNL-TVP-08

Table 2.2. Sample Media Preparation, Handling, and Storage

<u>Sampling Media</u>	<u>Supplier and Catalog Number</u>	<u>Preparation Procedure</u>	<u>Handling and Storage Procedure</u>
Inorganic vapor sorbent traps	SKC No. 226-29 SKC No. 226-40-02 SKC No. 226-10-04	PNL-TVP-09	PNL-TVP-07
SUMMA™ canisters	Scientific Instrumentation Specialist	PNL-TVP-02	PNL-TVP-07
Triple sorbent traps	Supelco CarboTrap 300	PNL-TVP-10	PNL-TVP-07

2.1 Inorganic Vapors

Solid sorbent traps, prepared in multi-trap sampling trains, were supplied to SESC for sampling the tank headspace. Blanks and exposed samples were returned to PNNL for analyses. Analyses were performed to provide information on the tank-headspace concentration of the following analytes: ammonia, nitrogen dioxide (NO₂), nitric oxide (NO), and water. Samples were prepared, handled, and disassembled as described in Technical Procedure PNL-TVP-09^(a).

2.1.1 Sampling Methodology

Standard glass tubes containing sorbent materials to trap ammonia, NO, NO₂, and water vapors were obtained, prepared, and submitted for vapor sampling. The sorbent traps were selected based on their use by the Occupational Safety and Health Administration (OSHA) to perform workplace monitoring and because of available procedures and verification results associated with that particular application. Each sorbent trap contained two sorbent sections separated by a glass wool plug. Sorbent media in the two sections were segregated and analyzed separately (except for analysis for water). Analyses of the second sorbent (breakthrough) sections were performed to demonstrate complete collection of the target analyte by the first sorbent section.

The ammonia sorbent traps contained carbon beads impregnated with sulfuric acid; nominally, 500 mg were contained in the primary and 250 mg in the breakthrough sections. The ammonia was chemisorbed as ammonium sulfate [(NH₄)₂SO₄]. The NO₂ traps contained a zeolite impregnated with triethanolamine (TEA), with 400 mg in the primary and 200 mg in the breakthrough sections. The NO₂ was absorbed and disproportionated to equi-molar quantities of nitrite ions (NO₂⁻) and nitrate ions (NO₃⁻). Glass tubes containing 800 mg of an oxidant were used to convert NO to NO₂. The converted NO was then collected as nitrite and nitrate in an NO₂ trap. The water traps contained a total of 450 mg of silica gel. All sorbent traps for a given analyte were from a single manufacturer's batch.

After sample preparation, sorbent trains were stored at ≤ 10°C because of handling recommendations for the oxidizer tubes attached to some samples. After receipt of exposed and

Pacific Northwest Laboratory. 12/95. *Sorbent Trap Preparation for Sampling and Analysis: Waste Tank Inorganic Vapor Samples*, PNL-TVP-09 (Rev. 2), PNL Technical Procedure, Richland, Washington.

radiologically cleared samples from SESC and disassembly of the sorbent trains, samples were provided to the analytical laboratory at ambient temperature.

The sorbent traps were prepared in multi-trap trains configured so sample air flow passed in order through the ammonia, nitrogen dioxide, oxidizer, nitric oxide, and desiccant traps. Traps were weighed and then connected to each other using uniform lengths of 3/8-in. perfluoroalkoxy-grade (PFA) Teflon® tubing. The perfluoroalkoxy-grade tubing was heated in hot air and forced over the open ends of the traps to form a tight seal. The inlets of the sorbent trains each consist of a short section of tubing having a 3/8-in. stainless steel Swagelok® nut, and sealed using a Swagelok® cap. The trailing ends of the sorbent trains were each sealed with red plastic caps provided by the manufacturer.

2.1.1.1 Concentration Calculations. Concentration, in parts per million by volume (ppmv), was determined by dividing the amount of analyte, in μmol , by the moles of the dried tank air sampled. For example, the concentration of a 3.00-L sample containing 75.0 μg of ammonia equals

$$\frac{(75.0 \mu\text{g})(22.4 \text{ L/mol})}{(17.0 \mu\text{g}/\mu\text{mol})(3.00 \text{ L})} = 32.9 \text{ ppmv} \quad (2.1)$$

Measured sample volumes were specified by SESC at standard temperature and pressure (STP; 0°C, 1.013 bar). Because water vapor is removed as an analyte before the sample air stream passes through the mass flow meters, sample volumes exclude water vapor.

2.1.2 Analytical Procedures

2.1.2.1 Ammonia Analysis. The sorbent material from the ammonia traps was placed into labeled 20-mL glass scintillation vials. Vials containing front-section sorbent material were treated with 10.0 mL of deionized water (DIW), and vials containing breakthrough-section sorbent material were treated with 5.0 mL of DIW. Ammonia present was measured using the ion selective electrode (ISE) procedure PNL-ALO-226^(a). Briefly, the method includes 1) preparing a 1000- $\mu\text{g/mL}$ ammonia stock standard solution from dried reagent-grade NH_4Cl and DIW, 2) preparing 0.1-, 0.5-, 1.0-, 10-, and 100- $\mu\text{g/mL}$ ammonia working calibration standards by serial dilution of the freshly made stock standard, 3) generating an initial calibration curve from the measured electromotive force signal versus ammonia concentration data obtained for the set of working standards, 4) performing a calibration-verification check, using a mid-range dilution of a certified National Institute for Standards and Technology (NIST)-traceable 0.1 M NH_4Cl standard from an independent source, at a minimum of once per batch, 5) continuing this sequence until all samples of the batch have been measured, including duplicates and spiked samples, and 6) remeasuring the complete set of calibration standards (at the end of the session). Electromotive force signal measurements obtained for samples are compared to those for standards to determine ammonia concentration in the samples.

2.1.2.2 Nitrite Analysis. The sorbent material for NO_2 and NO traps were desorbed in an aqueous TEA and n-butanol solution and analyzed by suppressed-conductivity ion chromatography

Procedure entitled "Ammonia (Nitrogen) in Aqueous Samples," PNL-ALO-226 Rev. 0, in the *Analytical Chemistry Laboratory (ACL) Procedure Compendium*, Vol. 3: Inorganic Instrumental Methods. Pacific Northwest National Laboratory, Richland, Washington.

(SCIC) for nitrite according to PNL-ALO-212, Rev. 1^(a) modified to obviate interferences by concentrations of non-target analytes. Specifically, the modifications used were 1) eluent 1.44 mM Na_2CO_3 + 1.8 mM NaHCO_3 at 2.0 mL/min, 2) one guard column (AG4A) and two separator columns (AS4A) in series instead of just one separator column, and 3) all standards, samples, and blanks injected into the sample loop through 0.45- μm syringe filters.

Primary and breakthrough section materials were analyzed separately using identical procedures. Each analytical session was conducted as follows. Working nitrite standards were prepared by diluting a stock nitrite standard with desorbing solution. An initial calibration curve was prepared from the instrument response versus nitrite standard concentration data for the set of working standards. A calibration verification check using one of the midrange standards was performed at a minimum of once per batch. If the instrument response indicated that sample nitrite concentration was outside the calibration range, the sample was diluted with desorbing solution and reanalyzed. After all samples of a batch were analyzed, the complete set of calibration standards was remeasured to verify consistent instrument response. Instrument responses observed for samples were compared to those for standards to determine the nitrite concentration of the samples. Because the analytes were collected on the sorbent as equal quantities of nitrite and nitrate, and the analysis was specific for nitrite, the moles of NO_2 and NO were determined by doubling the analytically determined moles of nitrite.

2.1.2.3 Water Analysis. All sorbent traps used to make each multi-trap train were weighed using a semi-micro mass balance, after labeling and breaking the glass tube ends, without plastic end caps. After receipt of exposed samples, the sorbent traps were again weighed to determine the change in mass. Mass gain was assumed to be entirely due to collection of water vapor. Field blanks were used to correct results.

2.1.3 Quality Assurance/Quality Control

Analytical work was performed according to quality levels identified in PNL-ALO-212, PNL-ALO-226, and Quality Assurance Plan ETD-002. Estimated quantitation limits (EQLs) for the inorganic vapors are given in Table 2.3.

The accuracy of concentration measurements depends on errors associated with both sampling and analysis. Ammonia results were estimated to be within 5% of their true values. The uncertainty includes preparation of standards, purity of the ammonium salt used to prepare standards, potential operator bias, ambient temperature variations, etc. Working standards are traceable to NIST standard reference material (SRM) by using an independent calibration verification standard certified to be NIST-traceable. Nitrite analyses (for NO_2 and NO) are performed using certified but not NIST-traceable SRM; this is because NIST does not make a nitrite SRM. Based on experience in comparing nitrite working standards prepared from several different sources and factors mentioned for ammonia above, the estimated maximum bias for NO_2 results is $\pm 10\%$, and for NO results it is $\pm 5\%$.

Procedure entitled "Determination of Inorganic Anions by Ion Chromatography," PNL-ALO-212, in the *Analytical Chemistry Laboratory (ACL) Procedure Compendium*, Vol. 3: Inorganic Instrumental Methods. Pacific Northwest National Laboratory, Richland, Washington.

Table 2.3 Quantitation Limits for Selected Inorganic Analytes

<u>Analyte</u>	<u>Formula</u>	<u>EQL^(a)</u> <u>(ppmv)</u>
Ammonia	NH ₃	0.71
Nitrogen Dioxide	NO ₂	0.16
Nitric oxide	NO	0.16
Mass (water) ^(b)	n/a	0.3 mg/L

(a) The lowest calibration standard is defined as the EQL.

(b) The vapor-mass concentration, thought to be largely water vapor, is determined gravimetrically.

n/a = not applicable.

The accuracy of measurements of sample mass is typically ± 0.1 mg, or less than 1% of the mass changes of most samples. The analytical accuracy of measurements of the change in mass of sorbent trains, based on the variability in mass change of field blank multi-trap trains, is determined for each sample job and is typically about ± 1 mg per five-trap sorbent train.

2.2 Permanent Gases

SUMMA™ canister samples were analyzed for carbon dioxide, carbon monoxide, hydrogen, methane, and nitrous oxide (N₂O).

2.2.1 SUMMA™ Canister Preparation

All SUMMA™ canisters are cleaned and verified contaminant-free according to PNNL Technical Procedure PNL-TVP-02^(a) before use. The cleaning procedure uses an EnTech 3000 cleaning system that alternately fills the canisters with purified humid air and evacuates them for several cycles while the canister is heated. If the canister is verified as clean, the canister is evacuated to 5 mtorr and tagged. Before sending the canisters to the field for sampling, the canister vacuum is measured to determine if any leakage has occurred. If the vacuum has remained constant during storage, the canisters are prehumidified with 100 μ L of distilled water and labeled. Canisters stored more than 30 but less than 60 days are re-evacuated and rehumidified before use. If stored more than 60 days, the canisters are recleaned and validated before use. All canisters are stored at room temperature.

2.2.2 Analytical Procedure

The SUMMA™ canister samples were analyzed for five permanent gases by gas chromatography/thermal conductivity detection (GC/TCD). Aliquots of sampled air (undiluted) are drawn directly from each SUMMA™ canister into a 5-mL gas-tight syringe and injected into a Hewlett-Packard 5890 GC/TCD fitted with a loop injector valve and a column switching valve. An

Pacific Northwest Laboratory. 8/94. *Cleaning SUMMA™ Canisters and the Validation of the Cleaning Process*, PNL-TVP-02 (Rev. 0), PNL Technical Procedure, Pacific Northwest Laboratory, Richland, Washington.

aliquot of 5 mL is used so that the 1.0-mL injection loop is completely purged with sample air, ensuring that no dilution of the sample takes place within the injection loop. One set of GC conditions is used to analyze for carbon monoxide, carbon dioxide, N₂O, and methane using helium as the carrier gas. A second GC/TCD analysis is performed for hydrogen using nitrogen as the carrier gas to enhance the signal sensitivity and lower the detection limit for this analyte. The permanent gases and the derived EQLs are listed in Table 2.4.

Table 2.4 Quantitation Limits for Permanent Gases

Analyte	Formula	EQL (ppmv)
Carbon Dioxide	CO ₂	17
Carbon Monoxide	CO	17
Methane	CH ₄	25
Hydrogen	H ₂	17
Nitrous Oxide	N ₂ O	17

2.2.3 Quality Assurance/Quality Control

Standards for the permanent gas analyses were blended from commercially prepared and certified standards. The instrument was calibrated at five different concentrations for methane over a range of 25 to 2100 ppmv, calibrated for carbon monoxide, carbon dioxide, and N₂O over a range of 17 to 2100 ppmv, and calibrated for hydrogen over a range of 17 to 2120 ppmv. An average response factor from the calibration was used for quantification.

Each analyte was quantitated by comparison of sample analyte peak area to the calibration plot generated for the compound. The EQL for the method has been established as the low level calibration standard. Before and after each sample analysis set, a gas standard was run to evaluate system performance and to measure system accuracy. The calculated concentration of the individual gases in the standards fell within $\pm 25\%$ of the expected concentrations.

2.3 Total Non-Methane Organic Compounds

2.3.1 Analytical Procedure

SUMMATM canister samples were analyzed for total non-methane organic compounds (TNMOCs) according to PNNL Technical Procedure PNL-TVP-08^(a), which is similar to U.S. Environmental Protection Agency (EPA) Task Order 12 (TO-12). Twenty-four hours before analysis, SUMMATM canister samples are pressurized with purified air (Aadco Instruments, Inc., 1920 Sherwood St., Clearwater, Florida 34625). The original pressure is first measured using a calibrated diaphragm gauge (Cole Parmer), then pressurized to a level exactly twice the original pressure.

Pacific Northwest Laboratory. 12/95. *Determination of TO-12 Total Nonmethane Organic Compounds in Hanford Waste Tank Headspace Samples Using SUMMATM Passivated Canister Sampling and Flame Ionization Detection*, PNL-TVP-08 (Rev. 1), PNL Technical Procedure, Richland, Washington.

The method uses an EnTech 7000 cryoconcentration system interfaced with a Hewlett-Packard 5890 gas chromatograph/flame ionization detector (GC/FID). The EnTech concentrator is used to pull a metered volume of 50 to 100 mL of sample air from the SUMMA™ canister mounted on an EnTech 7016CA 16-canister autosampler. The sample is cryogenically concentrated, and constituents are trapped in a stainless steel tube containing glass beads and Tenax. The glass bead/Tenax trap is heated to 180°C and purged with ultra high purity (UHP) helium into the GC/FID. The GC oven is programmed to run at a 150°C isothermal temperature. Chromatographic separation is not needed in this method since quantitation is from the entire FID response over the run time.

Concentration in mg/m³ was derived from the 10-point multilevel calibration curve from the propane standard using the following equation:

$$\text{mg/m}^3 = \frac{(\text{ng TNMOC}) \times (\text{dilution factor})}{\text{mL sampled volume}} \quad (2.2)$$

2.3.2 Quality Assurance/Quality Control

The TNMOC is calibrated by using propane as the calibration standard. The instrument calibration mixture for the TNMOC analysis consists of NIST 99.999% propane analyzed using a 10-point, multilevel, linear regression curve.

Immediately before running the analysis sequence, a leak-check procedure, which includes evacuating the transfer lines and monitoring the pressure, must be performed on the sample manifold tower. The control limits on this test require that the change in pressure is <1.5 psi, and the absolute pressure after evacuation is <3 psi for each manifold position specified in the sequence table. If either criterion is not met, it must be corrected before the samples are analyzed.

Before the tank samples were analyzed, a diagnostic check was performed on the GC/FID instrument by running a system cleanliness procedure and an instrument continuing calibration as described in PNL-TVP-08. First, two blank volumes of Aadco purified air were analyzed to check the cleanliness of the system. This demonstrates through the analysis of a zero-air blank that the level of interference is acceptable in the analytical system. The analysis of purified air must be below 0.1 mg/m³. Second, an instrument continuing calibration is run using 100-mL UHP propane followed by one blank volume of Aadco air.

2.4 SUMMA™ Canister Sample Analyses

2.4.1 Analytical Procedure

SUMMA™ canister samples were analyzed according to PNNL Technical Procedure PNL-TVP-03^(a), which is a modified version of EPA Task Order 14 (TO-14). The method uses an EnTech 7000 cryoconcentration system interfaced with a 5972 Hewlett-Packard benchtop gas chromatograph/mass spectrometer (GC/MS). The EnTech concentrator is used to pull a metered

Pacific Northwest National Laboratory. 8/96. *Determination of TO-14 Volatile Organic Compounds in Hanford Tank Headspace Samples Using SUMMA™ Passivated Canister Sampling and Gas Chromatographic-Mass Spectrometric Analysis*, PNL-TVP-03 (Rev. 2), PNNL Technical Procedure, Richland, Washington.

volume of sample air from the SUMMA™ canister, cryogenically concentrate the condensible organic vapors, then transfer the vapors to the GC/MS for analysis. A 100-mL volume of sample is measured and analyzed from the tank headspace. The organic components in the sampled air are separated on a J&W Scientific DB-1 phase, 60-m by 0.32-mm internal diameter with 3-μm film thickness column. The GC oven is programmed to run a temperature gradient beginning at 40°C, hold for 5 min, and ramp at 4°C per min to a final temperature of 260°C, with a 5-min hold.

The instrument calibration mixture for the PNL-TVP-03 analysis consists of organic analytes listed in Appendix B, Table B.1. These target analytes are quantitated in this analysis. The calibration mixture was prepared by blending a commercially prepared TO-14 calibration mixture with a mixture created using a Kin-Tek® permeation-tube standard generation system. The operation of the permeation-tube system follows the method detailed in PNNL Technical Procedure PNL-TVP-06^(a). The standard calibration mix was analyzed using six different concentrations, and a response factor for each compound was calculated. The GC/MS response for these compounds has been determined previously to be linearly related to concentration. Instrument detection limits and EQLs have been determined.

Quantitative concentrations for the target analytes were calculated using the average response factors generated using the internal standard (IS) method described in procedure PNL-TVP-03. The conversion from ppbv to mg/m³ assumes STP conditions (0°C and 1.013 bar) and was calculated using the gross molecular weight (MW) of the compound from the following equation:

$$\text{concentration in mg/m}^3 = \frac{(\text{concentration in ppbv})(\text{MW})}{(1000)(22.4 \text{ L/mol})} \quad (2.3)$$

The tentatively identified compounds (TICs) are determined by mass-spectral interpretation and comparison of the spectra with the EPA/NIST and WILEY electronic mass spectra libraries. Chromatographic peaks with an area count greater than, or equal to, one-tenth of the total area count of the nearest eluting IS are tentatively identified and their concentrations are estimated. The quality of the mass spectra match was then reviewed by the principal investigators before the identification was assigned to each chromatographic peak.

The concentration of each TIC was estimated using a relative response factor calculated using the total peak area for the nearest eluting IS. The IS peak area was used to calculate a response factor using the IS concentration in mg/m³:

$$\text{Response Factor} = \frac{\text{IS conc. (mg/m}^3\text{)}}{\text{IS peak area}} \quad (2.4)$$

The calculated response factor was then multiplied by the TIC peak area to give an estimated concentration for that compound. All calculated sample concentrations were multiplied by a factor of 2 to account for the dilution step described in Section 2.3.1.

Pacific Northwest Laboratory. 11/94. *Preparation of TO-14 Volatile Organic Compounds Gas Standards*, PNL-TVP-06 (Rev. 0). PNL Technical Procedure, Richland, Washington.

2.4.2 Quality Assurance/Quality Control

Before the tank sample was analyzed, a diagnostic check was performed on the GC/MS instrument by running an instrument "high-sensitivity tune," as described in PNL-TVP-03. Upon satisfactory completion of the instrument diagnostic check, a blank volume of purified nitrogen was analyzed to check the cleanliness of the system. The instrument was then calibrated using a standard gas mixture containing the organic compounds listed in Table B.1. A gas mixture containing bromochloromethane, 1,4-difluorobenzene, chlorobenzene- d_5 , and bromofluorobenzene was used as an IS for all blank, calibration standard, and sample analyses. Analyte responses from sample components, ISs, and standards were obtained from the extracted ion plot from their selected mass ion. The calibration was generated by calculating the relative response ratios of the IS to calibration standard responses and plotting the ratios against the ratio of the calibration-standard concentration (in ppbv) to the IS concentration. Once it was determined that the relative response was linear with increasing concentration, an average response factor was calculated for each target analyte and used to determine the concentration of target compounds in each sample. Method blanks were analyzed before and after calibration verification standards.

2.5 Triple Sorbent Trap Sample Analyses

2.5.1 Sampling Methodology

Samples are collected on Supelco 300 graphite-based TSTs. Before field deployment, each trap is heated to 380°C under inert gas flow for a minimum of 60 min. Traps are prepared in batches with each tank sampling job constituting one batch. One trap is selected from each batch and run immediately to verify cleanliness. All remaining traps in the batch receive equal amounts of three surrogate compounds (hexafluorobenzene, toluene- d_8 , and bromobenzene- d_5). One trap per batch is run immediately to verify successful addition of surrogate spikes to that batch. Traps are then placed in individually labeled plastic shipping tubes (Supelco TD³), which are sealed with gasketed end caps. This provides a rugged, headspace-free shipping and storage method. As a precautionary measure, sample tubes are kept in refrigerated storage before and after sampling.

2.5.2 Analytical Procedure

The Supelco 300 tubes were analyzed according to PNNL Technical Procedure PNL-TVP-10^(a), with the exceptions noted in Section 3.4.1. The method employs Supelco CarbotrapTM 300 traps for sample collection and preconcentration. The traps are ground-glass tubes (11.5 cm long X 6 mm OD, 4 mm ID) containing a series of sorbents arranged in order of increasing retentivity. Each trap contains 300 mg of CarbotrapTM C, 200 mg of CarbotrapTM B, and 125 mg of CarbosieveTM S-III. The first two sorbents are deactivated graphite with limited sorption power for less volatile compounds. The final trapping stage, the CarbosieveTM S-III, is a graphitized molecular sieve used to retain the most volatile components, including some permanent gases such as Freon-12. Following sample collection and addition of IS, the traps are transferred to a Dynatherm ACEM 900 thermal desorber unit for analysis. The trap on the ACEM 900 is then desorbed by ballistic heating to 350°C with the sample then transferred to a smaller focusing trap. A 10:1 split is used during the transfer with 10% of the sample analyzed and the rest retained for reanalysis. The split sample

Pacific Northwest National Laboratory. 2/96. *Determination of Volatile Organic Compounds in Hanford Waste Tank Headspace Samples Using Triple Sorbent Trap Sampling and Gas Chromatograph-Mass Spectrometer Analysis*. PNL-TVP-10 (Rev. 2), PNNL Technical Procedure, Richland, Washington.

collected on a second identical Carbotrap™ 300 trap is used for repeat analysis on at least one sample per batch. Since the IS also follows the same path, quantitation may be performed directly on the repeat run without changing the calibration. Following desorption from the Carbotrap™ 300 trap, the analyte is transferred to a long, thin focusing trap filled with the same type of trapping materials as the Carbotrap™ 300 traps and in approximately the same ratios. The purpose of the focusing trap is to provide an interface to a capillary GC column, which may be thermally desorbed using helium at a flow rate compatible with the column and MS interface (1.2 mL/min). The focusing trap is ballistically heated to thermally desorb components onto a capillary GC column. The column is subsequently temperature programmed to separate the method analytes, which are then detected by the MS.

The instrument calibration mixture for the TST analysis consists of the compounds listed in Appendix B, Table B.2. These compounds that are directly quantified in this analysis make up the target analyte list (these compounds will be referred to as target analytes). The calibration mixture is prepared in common with the mixture used for the SUMMA™ analysis (see Section 2.4.2). The standard calibration mix was analyzed using six different concentrations, and a response factor for each compound was calculated. Volumes of standard added to the traps are measured by pressure difference on a SUMMA™ canister of known volume. The GC/MS response for these compounds has been determined previously to be linearly related to concentration.

Quantitative concentrations for the target analytes were calculated directly from the calibration curve generated using the IS method described in procedure PNL-TVP-10. The conversion from ppbv to mg/m³ assumes STP conditions (0°C and 1.013 bar) and was calculated directly from the following equation:

$$\text{mg/m}^3 = \frac{(\text{ppbv}/1000) \times \text{g mol wt of compound}}{22.4 \text{ L/mol}} \quad (2.5)$$

The TICs are determined by mass-spectral interpretation and comparison of the spectra with the EPA/NIST and WILEY Libraries, which are a part of the Hewlett-Packard 5971/5972 instrument operating system. Chromatographic peaks with an area count greater than, or equal to, one-tenth of the total area count of the nearest eluting IS are tentatively identified and quantitatively estimated. The quality of the mass-spectral searches was then reviewed by the principal investigators before the identification was assigned to each chromatographic peak.

The concentration of each TIC was estimated using a relative response factor calculated using the total peak area for the nearest eluting IS. The IS peak area was used to calculate a response factor using the IS concentration in mg/m³:

$$\text{Response Factor} = \frac{\text{IS conc. (mg/m}^3\text{)}}{\text{IS peak area}} \quad (2.6)$$

The calculated response factor was then multiplied by the TIC peak area to give an estimated concentration for that compound.

2.5.3 Quality Assurance/Quality Control

Before tank samples were analyzed, a diagnostic check was performed on the GC/MS instrument by running a full auto tune, as described in PNL-TVP-10. Upon satisfactory completion of the instrument diagnostic check, a blank trap was analyzed to check the cleanliness of the system. The instrument was then calibrated using six different concentrations of standard gas mixture containing the compounds listed in Table B.2. A gas mixture containing difluorobenzene, chlorobenzene- d_5 , and 1,4 bromofluorobenzene was used as an IS for all calibration standard and sample analyses. Analyte responses from sample components, ISs, and standards were obtained from the extracted ion plot from their selected mass ion. A continuing calibration was generated by calculating the relative response ratios of the IS to calibration standard responses and plotting the ratios against the ratio of the calibration-standard concentration (in ppbv) to the IS concentration. Once it was determined that the relative response was linear with increasing concentration, an average response factor was calculated for each target analyte and used to determine the concentration of target compounds in each sample.

3.0 Analysis Results

Results from the sampling of the headspace of Tank BX-104 on February 6, 1997 (Sample Job V7004) are provided below.

3.1 Inorganic Vapors

Measured vapor concentrations of ammonia, nitric oxide (NO), nitrogen dioxide (NO₂), and water are given in Table 3.1. The vapor concentration results were based on four samples for each compound with the exception of only three samples for water vapor. The four inorganic vapors were collected at the same time using sorbent traps connected in series. Sample air was drawn first through an ammonia trap, then through a three-tube system that collected nitrogen dioxide and nitric oxide (described below), and then through a desiccant trap to remove any remaining water vapor.

Two field blank multi-trap trains, identical to sample multi-trap trains discussed in Section 2.1, were included in the tube bundle lowered into the headspace of Tank BX-104 during Sample Job V7004. No air was pulled through these field blank multi-trap trains. Any analyte found in the field blank multi-trap trains over and above levels in unexposed tubes was attributed to passive sampling. Data in Table 3.1 have been corrected for these minor effects of passive sampling.

Results provided in Table 3.1 are estimated to be accurate to within $\pm 10\%$ and within the $\pm 30\%$ specified by the SAP. Percent relative standard deviations of the measured concentrations were $<8\%$, which is within the 25% specified by the SAP.

3.1.1 Ammonia

Ammonia analyses were performed on February 20 and 21, 1997, 14 and 15 days after sample collection and within established holding times (Ligotke et al. 1995). All samples (100%) were successfully analyzed, and no deviations from the procedure were noted.

The blank-corrected ammonia quantities in the sorbent traps ranged from 13.1 to 15.4 μmol in front sections; blank corrected back sorbent section ammonia concentrations were $<0.01 \mu\text{mol}$. Blank corrections of 0.14 μmol in front and 0.04 μmol in the back sections, were about 1% of collected quantities. The analysis of one sample was a duplicate and indicated a reproducibility of $\pm 0.6\%$. One blank sorbent trap was spiked with 17 ppm of ammonia and yielded a percentage recovery of 100%. One sample leachate was spiked after initial analysis with approximately the quantity of ammonia in the sample and yielded a percentage recovery of 98%. The initial and continuing calibration verification (ICV, CCV) standards, using NIST-traceable material, yielded percentage recoveries of 96% and 99% (ICV) and 98%, 99%, 91%, and 94% (CCV) during the analytical sessions. A five-point calibration was performed over an ammonia range of 0.1 to 100 $\mu\text{g/ml}$.

3.1.2 Nitric Oxide and Nitrogen Dioxide

Nitric oxide and nitrogen dioxide analyses were performed on February 21 and 24, 1997, 15 and 18 days after sample collection, and within established holding times (Ligotke et al. 1995). All samples (100%) were successfully analyzed. No deviations from the procedure were noted.

Blank-corrected NO_2^- quantities in the NO_2 sorbent traps were all $<0.013 \mu\text{mol}$. Nitrite blank levels used to correct data were $0.0119 \mu\text{mol}$ in front (four of four blanks analyzed) and $0.0070 \mu\text{mol}$ in back (two of four blanks analyzed) sorbent sections. Blank-corrected NO_2^- quantities in the NO traps averaged $0.0115 \mu\text{mol}$. The analyses of two samples were duplicated and yielded repeatabilities of $\pm 0\%$ and $\pm 5.2\%$. Two sample leachates were spiked with 0.25 and 0.5 ppm NO_2^- and yielded percentage recoveries of 81% and 79% , respectively. A 4-point calibration was performed over a concentration range of 0 to $0.5 \mu\text{g/mL NO}_2^-$ in the desorbing matrix.

3.1.3 Water

Analyses for water vapor were performed on February 18, 1997, within established holding times (Ligotke et al. 1995). One of the four samples was not analyzed since the ammonia tube of that train was returned from the field broken and glass pieces were obviously missing.

All multi-trap sample mass gain is assumed to be due to adsorption of water. This is justified because the total mass concentration of other vapors in the headspace of Hanford waste tanks are typically from two to three orders of magnitude less than the mass concentration of the water vapor found in even relatively dry tanks. Water vapor concentrations are given in Table 3.1 for both moist air at tank conditions and for dry air at STP (0°C and 1.013 bar). Because the sample volumes were measured after all water vapor was removed by the sorbent traps, the measured sample volumes are for dry air. The average water vapor concentration was 13.3 mg of water per L of dry air at STP. The result was determined from an average mass gain of 25.3 mg from three of four multi-trap trains. The blank correction applied to the results was -0.55 mg per multi-trap train. A control mass was measured and indicated a measurement accuracy of $\pm 0.1 \text{ mg}$. The average water vapor concentration corresponds to a tank headspace dew point at 14.4°C and relative humidity at 72% at the time of sampling.

3.2 Permanent Gases

Analyses for hydrogen was performed on March 5, 1997 and other permanent gases were performed on March 7, 1997. All analyses were conducted within the 60-day administrative holding time as specified in the WHC Tank Vapor Characterization QA Plan (WHC 1994). All samples (100%) were successfully analyzed and used in the averages. No deviations from standard procedures were noted.

Measured concentrations of carbon monoxide, carbon dioxide, hydrogen, methane, and N_2O are provided in Table 3.2. Results were based on three samples for each compound. Hydrogen at an average concentration of 71 ppmv and N_2O at an average concentration of 119 ppmv were the only permanent gases detected in Tank BX-104. The relative percent difference (RPD) between duplicate analyses of a single SUMMA™ canister were 1.4% and 0% for hydrogen and nitrous oxide, respectively.

Results provided in Table 3.2 are estimated to be accurate to within $\pm 30\%$ as specified by the SAP.

3.3 Total Non-Methane Organic Compounds

Analyses for TNMOCs were performed on April 11, 1997, which exceeded the 60-day administrative holding time as specified in the WHC Tank Vapor Characterization QA Plan (WHC 1994). All three tank samples and the two ambient samples (100%) were successfully analyzed and used in the averages.

Table 3.3 lists results of the EPA TO-12 analysis of SUMMA™ canister samples for TNMOCs. Results in Table 3.3 are reported in two different units; in the upper row the mass concentration (mg/m^3) of non-methane organic compounds is given at STP (0°C and 1.013 bar), and in the lower row, by EPA TO-12 convention, as ppmv of carbon based on propane as the standard. The average concentration in the three tank headspace samples was $42.36 \text{ mg}/\text{m}^3$ or 17.64 ppmv of carbon. The $42.36 \text{ mg}/\text{m}^3$ value compares to $38.45 \text{ mg}/\text{m}^3$ for the sum of all target compounds identified in the analysis of the SUMMA™ canisters. The $38.45 \text{ mg}/\text{m}^3$ value should be considered a minimum value because TICs were not reported for this temporal study. Results provided in Table 3.3 are estimated to be accurate to within $\pm 30\%$ as specified by the SAP. The RPD for duplicate analysis of a single SUMMA™ canister was 0.4%.

3.3.1 Procedural Deviations, Observations, and Anomalies.

The calibration method described in Section 2.3.2 reflects a deviation from procedure PNL-TVP-08. Refer to Deviation Report JAE082996 for further details.

3.4 Organic Compound Characterization

Organic vapors in the Tank BX-104 headspace were sampled with SUMMA™ canisters and TSTs. These sampling methods are fundamentally different, but provide comparable results for many of the target analytes.

3.4.1 SUMMA™ Canister Results

Analyses of SUMMA™ canisters for organic vapors were performed on May 14 and 16, 1997. All analyses exceeded the 60-day administrative holding time as specified in the WHC Tank Vapor Characterization QA Plan (WHC 1994). All samples (100%) were successfully analyzed. Procedural deviations, observations, and anomalies are presented in Section 3.4.2.1.

Measured concentrations of target analytes and TICs are presented in Table 3.4. Thirty-eight target analytes above the instrument detection limit (IDL) were detected in the tank headspace samples. Thirty-seven target analytes were identified in two or more tank headspace samples. Tridecane at $15.926 \text{ mg}/\text{m}^3$, dodecane at $5.434 \text{ mg}/\text{m}^3$, and tetradecane at $4.868 \text{ mg}/\text{m}^3$ were the three most abundant compounds identified in the tank headspace samples. The total average concentration of the target analytes was $38.45 \text{ mg}/\text{m}^3$. This compares to a total concentration of $42.36 \text{ mg}/\text{m}^3$ identified in the TO-12 analysis of the three tank headspace samples.

SUMMA™ canister sample V7004-A05.161 was analyzed in replicate for target analytes to determine analytical precision. The RPD results are presented in Table 3.5. The RPDs were calculated for analytes detected above the IDL and found in both replicates. Thirty-five of 38 target compounds had RPDs of less than 10%.

Results of analyses of the ambient air and ambient air through the ISVS samples are provided in Table 3.6. Ten target analytes were observed in one or both of the ambient air samples. All target compounds, with the exceptions of acetone and tridecane, were observed below their EQLs.

A representative total ion chromatogram showing the major constituents identified in the SUMMA™ analysis is provided in Figure 3.1.

Appendix B, Table B.1 contains a complete listing of target analyte results from the SUMMA™ analyses. These data originate directly from the evaluated instrument data and have not been rounded. The intent of the data is to list the analytes that were analyzed and to present the detection limit values associated with analytes that were not detected.

3.4.1.1 Procedural Deviations, Observations, and Anomalies. The SUMMA™ canister samples were analyzed in one batch. The tank samples were diluted and reanalyzed in a second batch. The sample analytical sequence runs were as follows:

Batch #1: (file identifier 17051402.b) - V7004-A01.097, V7004-A02.120, V7004-A04.153, V7004-A05.161, V7004-A05.161 REP, V7004-A06.166;

Batch #2: (file identifier 17051602.b) - V7004-A04.153, V7004-A05.161, V7004-A05.161 REP, V7004-A06.166.

Batch #1:

This analytical sequence was run using 100 mL volumes to quantify target compounds in each tank sample.

Two target compounds (chloroethane at 47.60% and pyridine at 53.79%) surpassed the 30% relative standard deviation (% RSD) acceptance criteria for initial calibration. Tetradecane surpassed the 0.05 response factor (RF) criterion for the initial calibration. Tetradecane was found in all tank samples at concentrations above the upper quantitation limit (UQL), with the exceptions of ambient air samples V7004-A01.097 and V7004-A02.120, where it was found at concentration below the IDL. Chloroethane was not found in the tank samples at concentrations higher than its IDL. Pyridine was not found in all tank samples at concentrations higher than its IDL, with the exceptions of samples V7004-A05.161 and V7004-A05.161 REP, where it was found at concentrations between its IDL and EQL. Due to the initial calibration performance, the uncertainty associated with the results is higher than normal.

Tetradecane surpassed the 0.05 RF criterion for the CCV. However, the CCV passed the procedural criterion requiring $\pm 25\%$ D passage for 85% of all target compounds.

Batch #2:

This analytical sequence was run using 100 mL volumes of diluted 1:20 samples to quantify target compounds in each tank sample. Two target compounds (chloroethane at 47.60% and pyridine at 53.79%) surpassed the 30% RSD acceptance criteria for initial calibration. Tetradecane surpassed the 0.05 RF criterion for the initial calibration. Tetradecane was found

in all tank samples at concentrations between its EQL and UQL. Chloroethane and pyridine were not found in the tank samples at concentrations higher than their IDLs. Due to the initial calibration performance, the uncertainty associated with the results is higher than normal.

Three target compounds (carbon tetrachloride at 28.2%, tridecane at 31.2% and tetradecane at 43.1%) were outside the 25% D acceptance criteria for the CCV sample. However, the CCV passed the procedural criterion requiring $\pm 25\%$ D passage for 85% of all target compounds. Carbon tetrachloride was not found in the tank samples at concentrations higher than its IDL. Tridecane was found in all tank samples at concentrations between its EQL and UQL. Due to the CCV performance for this compound, a higher than normal uncertainty is associated with the results.

Information common to both batches:

Two target compounds (acetone and 1,2,4-trichlorobenzene) were found in the initial calibration blank above their EQLs.

Instrument detection limits, precision, and accuracy have not been experimentally evaluated for methanol, ethanol and 1,3-butadiene. Sample results are flagged with a "<" when the absolute number of nanograms calculated in the sample is less than the lowest concentration standard used in the initial calibration. Methanol, 1,3-butadiene and ethanol results falling within their calibration range are quantitative results as evidenced by a valid calibration for these compounds.

3.4.2 Triple Sorbent Trap Sample Results

Analyses of TSTs were performed on May 7 and 8, 1997. All analyses exceeded the 60-day administrative holding time as specified in the WHC Tank Vapor Characterization QA Plan (WHC 1994). All samples (100%) were successfully analyzed. Procedural deviations, observations, and anomalies are presented in Section 3.4.2.1.

Measured concentrations of target analytes and TICs are presented in Table 3.7. Results are based on three samples for each compound. Thirty-eight target analytes above the IDL were detected in the tank headspace samples. All 38 target analytes were identified in two or more tank headspace samples. The compounds 1-butanol at 8.057 mg/m³, tridecane at 4.542 mg/m³, and tetradecane at 3.053 mg/m³ were the three most abundant compounds identified in the tank headspace sample. The total concentration of the target analytes was 29.53 mg/m³.

Triple sorbent trap sample V7004-A12.1383 was analyzed in replicate for target analytes to determine analytical precision. The RPD results are presented in Table 3.8. The RPDs were calculated for analytes detected above the detection limit and found in both replicates. Twenty-seven of 37 target analytes had RPDs of less than 10%.

Results of analyses of the field and trip blanks are provided in Table 3.9. Fifteen target compounds were identified in one or more of the blank samples. Two of the fifteen target compounds, acetonitrile and nonane, exceed their EQLs.

A representative total ion chromatogram showing the major constituents identified in the triple sorbent trap analysis is provided in Figure 3.2.

Appendix B, Tables B.2 and B.3 contain complete listings of target analyte results from the TST analyses. These data originate directly from the evaluated instrument data and have not been rounded. The intent of the data is to list the analytes that were analyzed and to present the detection limit values associated with analytes that were not detected.

3.4.2.1 Procedural Deviations, Observations, and Anomalies. Samples were run under the protocols of procedure PNL-TVP-10, Rev. 2 with the initial calibration performed on 04/08/97 and quantitated against a CCV run at beginning of the batch. Only target compounds were evaluated as stated in the SAP for this temporal study. The TST samples were analyzed in two batches. The sample analytical sequence runs were as follows:

Batch #1 (file identifier 47050701.b) - V7004-A17.1386, V7004-A18.1387, V7004-A19.1388, V7004-A20.1389;

Batch #2 (file identifier 47050801.b) - V7004-A11.1382, V7004-A12.1383, V7004-A12.1383 REP, V7004-A13.1384.

Batch #1:

Samples included in this batch consisted of the two field blanks and two trip blanks.

The CCV showed acceptable performance as specified in the procedure for all target compounds except chloromethane (40.0%), methanol (26.1%), and ethanol (38.5). The uncertainty in the CCV impacts the quantitation of these compounds.

Trace amounts (below EQL) of 1,1-dichloroethane, chloroform, and tetradecane were seen in the CCB. None of these compounds were found in the samples.

Batch #2:

Samples included in this batch consisted of the tank samples.

The CCV was within nominal limits for all compounds except chloromethane (47.2%), methanol (33.1%), chloroethane (26.5%), and ethanol (51.6%). The uncertainty in the CCV impacts the quantitation of these compounds.

Trace amounts (below EQL) of 1,1-dichloroethane, chloroform, tetrahydrofuran, and tetradecane were seen in the CCB.

The total ion chromatogram for these samples showed a typical NPH pattern with a small but visible hydrocarbon hump.

Of particular interest in this sampling job was the positive identification of tributyl phosphate (TBP), which was observed in all three BX-104 samples.

Information common to both batches:

TBP is included in the target list based on a calibration performed on January 5 and 9, 1996. The TBP was introduced onto a series of double sorbent traps as a methanolic solution standard rather than a vapor standard. This served to determine the retention time and verify the mass spectral characteristics of the compound. However, verification of the calibration acceptability was not performed because the compound is not present in the CCV. At present, it is not possible to prepare a gas standard from this material. The calibration information on TBP demonstrated that detectability at 0.8 ppbv (based on a 200-mL sample) was possible.

Methanol, ethanol, and 1,3-butadiene are not currently included in the method performance section of the procedure; however, these analytes were analyzed by this method. The low level standard is used as the EQL for these compounds. Sample results are flagged with a less-than symbol (<) when less than the EQL.

3.5 Flammability

The analytical results presented above can be used to estimate the Tank BX-104 headspace flammability at the time of sampling. Flammability is calculated using the ammonia concentration from the inorganic analysis, carbon monoxide, hydrogen, and methane concentrations measured from the permanent gas analysis, and the total non-methane organic concentration determined from the TO-12 analysis. Table 3.10 summarizes the calculated flammability data. Hydrogen was the principal flammable constituent of the Tank BX-104 headspace, determined to be present at approximately 0.178% of its LFL. Total headspace flammability was estimated to be <0.458% of the LFL.

Table 3.1 Inorganic Vapor Concentrations from Tank BX-104 Sampled on 2/6/97

Analyte	CAS Number	V7004-A07-28R	V7004-A08-29R	V7004-A09-30R	V7004-A10-31R	Average	Standard Deviation
Ammonia (ppmv)	7664-41-7	157	185	169	183	174	13
Nitric Oxide (ppmv)		0.25	0.26	0.29	0.28	0.27	0.02
Nitrogen Dioxide (ppmv)		<0.16	<0.16	<0.16	<0.16	<0.16	
Water ^(a) (mg/L)		NA	12.5	13.6	13.8	13.3	0.7
Water ^(b) (mg/L)		NA	11.4	12.4	12.6	12.1	0.6

Footnotes

(a) Dry air at 0°C and 1.013 bar.

(b) Moist air at tank temperature and pressure.

NA Not Available; ammonia tube broken in field, glass pieces lost.

Table 3.2 Permanent Gas Analysis Results from Tank BX-104 Sampled on 2/6/97

Permanent Gas Analyte	Ambient Air Upwind	Ambient Air Through Bundle	Tank Samples				RPD ^(c) (%)	Mean	
	V7004-A01.097 ^(a) (ppmv)	V7004-A02.120 ^(a) (ppmv)	V7004-A04.153 ^(a) (ppmv)	V7004-A06.166 ^(a) (ppmv)	V7004-A05.161 ^(a) (ppmv)	V7004-A05.161 ^{(a)(b)} (ppmv)		(ppmv)	St.Dev.
Hydrogen	<17	<17	70	72	71	72	1.4	71	1.0
Methane	<25	<25	<25	<25	<25	<25		<25	
Carbon Dioxide	465	467	<17	<17	<17	<17		<17	
Carbon Monoxide	<17	<17	<17	<17	<17	<17		<17	
Nitrous Oxide	<17	<17	119	119	119	119	0.0	119	0.0

Footnotes

(a) Sample identification number.

(b) Replicate analysis for V7004-A05.161; results are not included in the calculation of average concentrations.

(c) Relative percent difference (RPD) based on replicate analysis.

Table 3.3 Total Non-Methane Organic Compound Analysis Results from Tank BX-104 Sampled on 2/6/97

	Ambient Air Upwind	Ambient Air Through Bundle	Tank Samples						
	V7004-A01.097 ^(a)	V7004-A02.120 ^(a)	V7004-A04.153 ^(a)	V7004-A06.166 ^(a)	V7004-A05.161 ^(a)	V7004-A05.161 ^{(a)(b)}	RPD ^(c)	Mean	St.Dev.
	Concentration	Concentration	Concentration	Concentration	Concentration	Concentration	(%)		
TO-12 (mg/m ³)	< 0.59	< 0.59	41.25	42.06	43.78	43.61	0.4	42.36	1.29
Total Carbon (ppmv)								17.64	

Footnotes

(a) Sample identification number.

(b) Replicate analysis for V7004-A05.161; results are not included in the calculation of average concentrations.

(c) Relative percent difference (RPD) based on replicate analysis.

Table 3.4 Target Organic Compound Concentrations in SUMMA™ Canisters from Tank BX-104 Sampled on 2/6/97

Target Analytes ^(a)	CAS	MW	Ret V7004-A05.161 ^{(b)(c)} ISVS				V7004-A06.166 ^(b) ISVS				V7004-A04.153 ^(b) ISVS				Mean and Standard Deviation			
			Time	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	St. Dev.	(ppbv)	St. Dev.		
Dichlorodifluoromethane	75-71-8	121	7.9	0.011	2.1	J	0.011	2.1	J	0.011	2.0	J	0.011	0.000	2.1	0.058		
Chloromethane	74-87-3	50	8.9	0.003	1.5	J	0.003	1.5	J	0.002	1.1	U	0.003	d	1.5	d		
Methanol	67-56-1	32	10.0	0.898	628	Y	0.853	596	Y	0.814	569	Y	0.855	0.042	598	30		
Butane	106-97-8	58	10.8	0.638	246		0.623	240		0.622	240		0.627	0.009	242	3.4		
Ethanol	64-17-5	46	12.6	0.252	123	Y	0.235	115	Y	0.148	72	Y	0.212	0.056	103	27		
Acetonitrile	75-05-8	41	13.0	0.228	125		0.217	119		0.224	122		0.223	0.005	122	3.0		
Acetone	67-64-1	58	13.7	1.526	589		1.444	557		1.524	588		1.498	0.047	578	18		
Trichlorofluoromethane	75-69-4	137	14.1	0.400	65		0.380	62		0.378	62		0.386	0.012	63	2.0		
Pentane	109-66-0	72	14.9	0.453	141		0.426	132		0.447	139		0.442	0.014	137	4.4		
Methylene Chloride	75-09-2	85	15.8	0.009	2.2	J,B	0.009	2.3	J,B	0.007	1.9	J,B	0.008	0.001	2.2	0.19		
112trichloro122trifluoroethane	76-13-1	187	16.3	0.013	1.6	J	0.013	1.6	J	0.013	1.6	J	0.013	0.000	1.6	0.015		
Propanenitrile	107-12-0	55	17.1	0.120	49		0.115	47		0.112	46		0.116	0.004	47	1.7		
Propanol	71-23-8	60	17.1	0.586	218		0.578	216		0.538	201		0.568	0.026	212	9.5		
2-Butanone	78-93-3	72	18.6	0.478	148		0.416	129		0.379	118		0.424	0.050	132	16		
Hexane	110-54-3	86	19.9	0.304	79		0.293	76		0.280	73		0.292	0.012	76	3.2		
Tetrahydrofuran	109-99-9	72	20.8	0.714	222		0.696	216		0.634	197		0.681	0.042	212	13		
Butanenitrile	109-74-0	69	21.9	0.097	31		0.086	28		0.105	34		0.096	0.010	31	3.1		
1-Butanol	71-36-3	74	22.3	4.248	1284		3.835	1159		4.637	1401		4.240	0.401	1281	121		
Benzene	71-43-2	78	22.8	0.009	2.7	J	0.009	2.5	J	0.010	2.8	J	0.009	0.000	2.7	0.11		
Cyclohexane	110-82-7	84	23.3	0.033	8.8	J	0.019	5.1	J	0.033	8.8	J	0.028	0.008	7.5	2.1		
Heptane	142-82-5	100	25.2	0.225	50		0.202	45		0.225	50		0.217	0.013	49	3.0		
4-Methyl-2-Pentanone	108-10-1	100	26.3	0.029	6.5	J	0.027	6.1	J	0.031	7.0	J	0.029	0.002	6.5	0.47		
Pyridine	110-86-1	79	26.5	0.021	5.8	J	0.019	5.3	U	0.019	5.3	U	d	d	d	d		
Pentanenitrile	110-59-8	83	27.4	0.031	8.4	J	0.029	7.8	J	0.033	8.8	J	0.031	0.002	8.4	0.52		
Toluene	108-88-3	92	28.5	0.029	7.0		0.027	6.6		0.026	6.4		0.027	0.001	6.7	0.28		
Octane	111-65-9	114	30.5	0.143	28		0.133	26		0.134	26		0.137	0.005	27	1.0		
Tetrachloroethylene	127-18-4	166	31.0	0.011	1.5	J	0.010	1.4	J	0.004	0.57	U	0.011	d	1.4	d		
Hexanenitrile	628-73-9	97	32.8	0.058	13		0.048	11	J	0.056	13		0.054	0.005	12	1.2		
Ethylbenzene	100-41-4	106	33.4	0.004	0.85	J	0.004	0.81	J	0.004	0.76	J	0.004	0.000	0.81	0.045		
p/m-Xylene	106-42-3	106	33.9	0.016	3.3	J	0.014	3.0	J	0.013	2.8	J	0.014	0.001	3.1	0.26		
Cyclohexanone	108-94-1	98	34.3	0.129	29		0.091	21		0.102	23		0.107	0.020	25	4.5		
o-Xylene	95-47-6	106	35.1	0.008	1.7	J	0.007	1.5	J	0.007	1.4	J	0.007	0.001	1.6	0.15		
Nonane	111-84-2	128	35.5	0.085	15		0.075	13		0.078	14		0.079	0.005	14	0.94		
Decane	124-18-5	142	40.1	0.119	19		0.105	17		0.109	17		0.111	0.007	17	1.1		

Table 3.4 (Cont'd) Target Organic Compound Concentrations in SUMMA™ Canisters from Tank BX-104 Sampled on 2/6/97

Target Analytes ^(a)	CAS	MW	Ret Time	V7004-A05.161 ^{(b)(c)} ISVS			V7004-A06.166 ^(b) ISVS			V7004-A04.153 ^(b) ISVS			Mean and Standard Deviation			
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	St. Dev.	(ppbv)	St. Dev.
Undecane	1120-21-4	156	44.4	0.726	104		0.632	91		0.613	88		0.657	0.060	94	8.6
Dodecane	112-40-3	170	48.5	6.136	807	*	5.042	663		5.123	674		5.434	0.609	715	80
Tridecane	629-50-5	184	52.2	16.845	2047	*	15.322	1862	*	15.610	1897	*	15.926	0.809	1935	98
Tetradecane	629-59-4	198	55.8	5.288	597	*	3.815	431	*	5.502	621	*	4.868	0.918	550	104
Total Concentration of Target Analytes													38.45			

Data Quality Flags

B Compound found in associated laboratory blank.

J Target compound detected above the IDL but below the EQL.

U Target compound not detected at or above the IDL.

Y Initial calibration and CCV were performed; however, the analyte was not part of the current operating procedure.

* Denotes diluted value was reported for target compound in table.

Footnotes

(a) Detected target analytes.

(b) Sample identification number.

(c) Replicates of this sample are found in Table 3.5.

(d) Mean and/or standard deviation are not meaningful for this analyte.

Table 3.5 Comparison of Target Organic Compound Concentrations from Replicate Analysis of a Single SUMMATM Canister from Tank BX-104 Sampled on 2/6/97

Target Analytes ^(a)	CAS	MW	Ret Time	V7004-A05.161 ^(b) ISVS						RPD ^(c) (%)
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	
Dichlorodifluoromethane	75-71-8	121	7.9	0.011	2.1	J	0.011	2.0	J	4
Chloromethane	74-87-3	50	8.9	0.003	1.5	J	0.003	1.4	J	0
Methanol	67-56-1	32	10.0	0.898	628	Y	0.863	603	Y	4
Butane	106-97-8	58	10.8	0.638	246		0.617	238		3
Ethanol	64-17-5	46	12.6	0.252	123	Y	0.241	117	Y	4
Acetonitrile	75-05-8	41	13.0	0.228	125		0.223	121		3
Acetone	67-64-1	58	13.7	1.526	589		1.518	585		1
Trichlorofluoromethane	75-69-4	137	14.1	0.400	65		0.395	64		1
Pentane	109-66-0	72	14.9	0.453	141		0.452	140		0
Methylene Chloride	75-09-2	85	15.8	0.009	2.2	J,B	0.009	2.3	J,B	1
1,1,2-trichloro-2,2,2-trifluoroethane	76-13-1	187	16.3	0.013	1.6	J	0.014	1.6	J	4
Propanenitrile	107-12-0	55	17.1	0.120	49		0.120	49		0
Propanol	71-23-8	60	17.1	0.586	218		0.588	219		0
2-Butanone	78-93-3	72	18.6	0.478	148		0.467	145		2
Hexane	110-54-3	86	19.9	0.304	79		0.307	80		1
Tetrahydrofuran	109-99-9	72	20.8	0.714	222		0.722	224		1
Butanenitrile	109-74-0	69	21.9	0.097	31		0.094	30		3
1-Butanol	71-36-3	74	22.3	4.248	1284		4.347	1314		2
Benzene	71-43-2	78	22.8	0.009	2.7	J	0.009	2.7	J	0
Cyclohexane	110-82-7	84	23.3	0.033	8.8	J	0.024	6.4	J	31
Heptane	142-82-5	100	25.2	0.225	50		0.221	49		2
4-Methyl-2-Pentanone	108-10-1	100	26.3	0.029	6.5	J	0.030	6.6	J	2
Pyridine	110-86-1	79	26.5	0.021	5.8	J	0.021	6.0	J	3
Pentanenitrile	110-59-8	83	27.4	0.031	8.4	J	0.032	8.6	J	2
Toluene	108-88-3	92	28.5	0.029	7.0		0.029	7.0		1
Octane	111-65-9	114	30.5	0.143	28		0.144	28		1
Tetrachloroethylene	127-18-4	166	31.0	0.011	1.5	J	0.011	1.5	J	1
Hexanenitrile	628-73-9	97	32.8	0.058	13		0.061	14		4
Ethylbenzene	100-41-4	106	33.4	0.004	0.85	J	0.004	0.89	J	5
p/m-Xylene	106-42-3	106	33.9	0.016	3.3	J	0.016	3.4	J	3
Cyclohexanone	108-94-1	98	34.3	0.129	29		0.130	30		1
o-Xylene	95-47-6	106	35.1	0.008	1.7	J	0.008	1.8	J	2
Nonane	111-84-2	128	35.5	0.085	15		0.086	15		1
Decane	124-18-5	142	40.1	0.119	19		0.120	19		1
Undecane	1120-21-4	156	44.4	0.726	104		0.736	106		1
Dodecane	112-40-3	170	48.5	6.136	807	*	6.041	794	*	2
Tridecane	629-50-5	184	52.2	16.845	2047	*	19.842	2411	*	16
Tetradecane	629-59-4	198	55.8	5.288	597	*	6.541	739	*	21

Data Quality Flags

B Compound found in associated laboratory blank.

J Target compound detected above the IDL but below the EQL.

Y Initial calibration and CCV were performed; however, the analyte was not part of the current operating procedure.

* Denotes diluted value was reported for target compound in table.

Footnotes

(a) Detected target analytes.

(b) Sample identification number.

(c) Relative percent differences (RPDs) based on mg/m³ values.

Table 3.6 Target Organic Compound Concentrations in Ambient Air and Ambient Air through the ISVS in SUMMATM Canisters Associated with the Sampling of Tank BX-104 on 2/6/97

Target Analytes ^(a)	CAS	MW	Ret Time	V7004-A01.097 ^(b)			V7004-A02.120 ^(b)		
				Ambient Air			Ambient Air Through ISVS		
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag
Dichlorodifluoromethane	75-71-8	121	7.9	0.003	0.58	J	0.003	0.63	J
Chloromethane	74-87-3	50	8.9	0.003	1.5	J	0.002	1.1	J
Acetone	67-64-1	58	13.7	0.021	8.2	J,B	0.038	15	B
Methylene Chloride	75-09-2	85	15.8	0.006	1.6	J,B	0.002	0.53	U
1,1,2-trichloro-1,2,2-trifluoroethane	76-13-1	187	16.3	0.004	0.48	U	0.024	2.8	J
2-Butanone	78-93-3	72	18.6	0.010	3.1	J	0.022	6.9	J
1-Butanol	71-36-3	74	22.3	0.003	0.97	U	0.013	4.0	J
1,2,4-Trichlorobenzene	120-82-1	181	48.1	0.018	2.2	J,B	0.003	0.35	U
Hexachloro-1,3-butadiene	87-68-3	261	49.9	0.020	1.7	J,B	0.005	0.40	U
Tridecane	629-50-5	184	52.2	0.006	0.73	U	0.077	9.4	

Data Quality Flags

B Compound found in associated laboratory blank.

J Target compound detected above the IDL but below the EQL.

U Target compound not detected at or above the IDL.

Footnotes

(a) Detected target analytes.

(b) Sample identification number.

Table 3.7 Target Organic Compound Concentrations in Triple Sorbent Traps from Tank BX-104 Sampled on 2/6/97

Target Analytes ^(a)	CAS	MW	Ret V7004-A11.1382 ^(b) ISVS				V7004-A12.1383 ^{(b)(c)} ISVS				V7004-A13.1384 ^(b) ISVS				Mean and Standard Deviation			
			Time	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag		(mg/m ³)	(ppbv)	Flag		(mg/m ³)	St. Dev.	(ppbv)	St. Dev.
Dichlorodifluoromethane	75-71-8	121	7.8	0.021	3.8	J	0.021	4.0	J		0.017	3.2	J		0.020	0.002	3.7	0.40
Methanol	67-56-1	32	10.0	2.459	1719	Y	1.454	1016	Y		1.267	886	Y		1.727	0.641	1207	448
Butane	106-97-8	58	10.7	1.223	471		0.876	337			0.880	339			0.993	0.200	383	77
Chloroethane	75-00-3	65	12.0	0.032	11	J	0.024	8.3	J		0.025	8.7	J		0.027	0.004	9.3	1.4
Ethanol	64-17-5	46	12.5	2.104	1023	Y	1.222	594	Y		1.329	646	Y		1.552	0.482	754	234
Acetonitrile	75-05-8	41	13.0	0.565	308		0.366	200			0.316	172			0.416	0.132	227	72
Acetone	67-64-1	58	13.6	1.297	500		0.963	371			1.033	398			1.098	0.176	423	68
Trichlorofluoromethane	75-69-4	137	14.1	0.495	81		0.476	78			0.445	73			0.472	0.025	77	4.1
Pentane	109-66-0	72	14.9	0.889	277		0.616	192			0.617	192			0.707	0.157	220	49
Methylene Chloride	75-09-2	85	15.7	0.058	15	J	0.058	15	J		0.056	15	J		0.057	0.001	15	0.37
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	187	16.2	0.007	0.78	J	0.005	0.54	J		0.008	0.97	J		0.006	0.002	0.76	0.22
Propanenitrile	107-12-0	55	17.0	0.203	82		0.157	64			0.156	64			0.172	0.027	70	11
Propanol	71-23-8	60	17.0	1.214	453		0.612	228			0.646	241			0.824	0.338	307	126
2-Butanone	78-93-3	72	18.5	0.558	173		0.382	119			0.398	123			0.446	0.097	138	30
Hexane	110-54-3	86	19.8	0.555	144		0.443	115			0.444	115			0.480	0.064	125	17
Tetrahydrofuran	109-99-9	72	20.7	0.809	251		0.696	216			0.697	217			0.734	0.065	228	20
Butanenitrile	109-74-0	69	21.8	0.131	43		0.117	38			0.123	40			0.124	0.007	40	2.3
1,1,1-Trichloroethane	71-55-6	133	21.8	0.004	0.68	J	0.004	0.67	J		0.004	0.61	J		0.004	0.000	0.65	0.038
1-Butanol	71-36-3	74	22.2	9.083	2749	E	7.508	2273	E		7.579	2294	E		8.057	0.890	2439	269
Benzene	71-43-2	78	22.7	0.019	5.4		0.021	6.0			0.021	6.1			0.020	0.001	5.8	0.36
Heptane	142-82-5	100	25.1	0.313	70		0.310	69			0.328	73			0.317	0.010	71	2.2
4-Methyl-2-Pentanone	108-10-1	100	26.3	0.096	22		0.079	18			0.089	20			0.088	0.009	20	1.9
Pentanenitrile	110-59-8	83	27.3	0.063	17		0.060	16			0.067	18			0.063	0.004	17	0.95
1,1,2-Trichloroethane	79-00-5	133	27.8	0.011	1.8	J	0.010	1.6	J		0.011	1.8	J		0.010	0.001	1.7	0.089
Toluene	108-88-3	92	28.4	0.042	10		0.044	11			0.046	11			0.044	0.002	11	0.47
Octane	111-65-9	114	30.4	0.123	24		0.157	31			0.200	39			0.160	0.039	31	7.6
Tetrachloroethylene	127-18-4	166	30.9	0.006	0.85	J	0.010	1.3	J		0.013	1.8	J		0.010	0.003	1.3	0.46
Hexanenitrile	628-73-9	97	32.7	0.035	8.2		0.043	10			0.052	12			0.043	0.008	10	1.9
Ethylbenzene	100-41-4	106	33.4	0.004	0.88	J	0.005	0.95	J		0.005	1.1	J		0.005	0.001	0.98	0.12
p/m-Xylene	106-42-3	106	33.8	0.013	2.7	J	0.014	3.0	J		0.019	4.0	J		0.015	0.003	3.2	0.69
o-Xylene	95-47-6	106	35.0	0.005	1.1	J	0.006	1.3	J		0.009	1.9	J		0.007	0.002	1.4	0.41
Nonane	111-84-2	128	35.4	0.026	4.5		0.037	6.4			0.060	11			0.041	0.017	7.2	3.1
Decane	124-18-5	142	40.0	0.019	3.0	J	0.028	4.4	J		0.054	8.5			0.034	0.018	5.3	2.9
Undecane	1120-21-4	156	44.4	0.111	16		0.233	34			0.488	70			0.278	0.192	40	28
Dodecane	112-40-3	170	48.4	1.259	166		2.401	316			4.469	589	E		2.710	1.627	357	214
Tridecane	629-50-5	184	52.2	2.296	280		4.168	507	E		7.163	872	E		4.542	2.455	553	299
Tetradecane	629-59-4	198	55.7	1.549	175		2.889	327	E		4.720	534	E		3.053	1.592	345	180
Tributyl Phosphate	126-73-8	266	63.1	0.024	2.0	Z	0.141	12	Z		0.231	19	Z		0.132	0.104	11	8.8
Total Concentration of Target Analytes															29.53			

Data Quality Flags

E Target compound exceeds the upper quantification limit (UQL).

J Target compound detected above the IDL but below the EQL.

Y Initial calibration and CCV were performed; however, the analyte was not part of the current operating procedure.

Z Retention time and mass spectral characteristics were determined and detectability possible at 0.8 ppbv; however, this compound is not currently part of the analytical method. See Section 3.4.2 for more information.

Footnotes

(a) Detected target analytes

(b) Sample identification number.

(c) Replicates of this sample are found in Table 3.8.

Table 3.8 Comparison of Target Organic Compound Concentrations from Replicate Analysis of a Single Triple Sorbent Trap from Tank BX-104 Sampled on 2/6/97

Target Analytes ^(a)	CAS	MW	Ret Time	V7004-A12.1383 ^(b) ISVS						RPD ^(c) (%)
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	
Dichlorodifluoromethane	75-71-8	121	7.8	0.021	4.0	J	0.022	4.1	J	4
Methanol	67-56-1	32	10.0	1.454	1016	Y	1.248	872	Y	15
Butane	106-97-8	58	10.7	0.876	337		0.903	348		3
Chloroethane	75-00-3	65	12.0	0.024	8.3	J	0.004	1.5	U	
Ethanol	64-17-5	46	12.5	1.222	594	Y	1.240	603	Y	1
Acetonitrile	75-05-8	41	13.0	0.366	200		0.406	222		10
Acetone	67-64-1	58	13.6	0.963	371		0.811	313		17
Trichlorofluoromethane	75-69-4	137	14.1	0.476	78		0.486	79		2
Pentane	109-66-0	72	14.9	0.616	192		0.633	197		3
Methylene Chloride	75-09-2	85	15.7	0.058	15	J	0.045	12	J	25
1,1,2-trichloro-2,2,2-trifluoroethane	76-13-1	187	16.2	0.005	0.54	J	0.004	0.51	J	7
Propanenitrile	107-12-0	55	17.0	0.157	64		0.159	65		1
Propanol	71-23-8	60	17.0	0.612	228		0.676	252		10
2-Butanone	78-93-3	72	18.5	0.382	119		0.307	95		22
Hexane	110-54-3	86	19.8	0.443	115		0.441	115		0
Tetrahydrofuran	109-99-9	72	20.7	0.696	216		0.716	222		3
Butanenitrile	109-74-0	69	21.8	0.117	38		0.119	39		2
1,1,1-Trichloroethane	71-55-6	133	21.8	0.004	0.67	J	0.004	0.74	J	10
1-Butanol	71-36-3	74	22.2	7.508	2273	E	7.264	2199	E	3
Benzene	71-43-2	78	22.7	0.021	6.0		0.024	6.9		14
Heptane	142-82-5	100	25.1	0.310	69		0.303	68		2
4-Methyl-2-Pentanone	108-10-1	100	26.3	0.079	18		0.076	17		5
Pentanenitrile	110-59-8	83	27.3	0.060	16		0.059	16		0
1,1,2-Trichloroethane	79-00-5	133	27.8	0.010	1.6	J	0.010	1.7	J	3
Toluene	108-88-3	92	28.4	0.044	11		0.045	11		2
Octane	111-65-9	114	30.4	0.157	31		0.155	30		1
Tetrachloroethylene	127-18-4	166	30.9	0.010	1.3	J	0.009	1.3	J	4
Hexanenitrile	628-73-9	97	32.7	0.043	10		0.039	9.0		10
Ethylbenzene	100-41-4	106	33.4	0.005	0.95	J	0.004	0.94	J	2
p/m-Xylene	106-42-3	106	33.8	0.014	3.0	J	0.014	3.0	J	3
o-Xylene	95-47-6	106	35.0	0.006	1.3	J	0.006	1.3	J	3
Nonane	111-84-2	128	35.4	0.037	6.4		0.037	6.5		0
Decane	124-18-5	142	40.0	0.028	4.4	J	0.026	4.2	J	7
Undecane	1120-21-4	156	44.4	0.233	34		0.233	33		0
Dodecane	112-40-3	170	48.4	2.401	316		2.421	319		1
Tridecane	629-50-5	184	52.2	4.168	507	E	4.163	507	E	0
Tetradecane	629-59-4	198	55.7	2.889	327	E	2.824	319	E	2
Tributyl Phosphate	126-73-8	266	63.1	0.141	12	Z	0.046	3.9	Z	101

Data Quality Flags

E Target compound exceeds the upper quantification limit (UQL).

J Target compound detected above the IDL but below the EQL.

U Target compound not detected at or above the IDL.

Y Initial calibration and CCV were performed; however, the analyte was not part of the current operating procedure.

Z Retention time and mass spectral characteristics were determined and detectability possible at 0.8 ppbv; however, this compound is not currently part of the analytical method. See Section 3.4.2 for more information.

Footnotes

(a) Detected target analytes.

(b) Sample identification number.

(c) Relative percent differences (RPDs) based on mg/m³ values.

Table 3.9 Target Organic Compound Concentrations in Triple Sorbent Trap Blank Samples Associated with the Sampling of Tank BX-104 on 2/6/97

Target Analytes ^(a)	CAS	MW	Ret	V7004-A17.1386 ^(b)			V7004-A18.1387 ^(b)			V7004-A19.1388 ^(b)			V7004-A20.1389 ^(b)		
				Field Blank #1			Field Blank #2			Trip Blank #1			Trip Blank #2		
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag
Butane	106-97-8	58	10.7	0.004	1.4	U	0.018	6.8	J	0.004	1.4	U	0.004	1.4	U
Acetonitrile	75-05-8	41	13.0	0.100	55		0.050	27		0.003	1.8	U	0.003	1.8	U
Acetone	67-64-1	58	13.6	0.008	3.2	J	0.009	3.6	J	0.007	2.8	U	0.007	2.8	U
Pentane	109-66-0	72	14.9	0.003	0.89	U	0.008	2.5	J	0.003	0.89	U	0.003	0.89	U
Methylene Chloride	75-09-2	85	15.7	0.029	7.6	J	0.041	11	J	0.025	6.6	J	0.102	27	J
1,1,2-trichloro-2,2,2-trifluoroethane	76-13-1	187	16.2	0.004	0.43	J	0.005	0.63	J	0.003	0.36	U	0.003	0.36	U
cis-1,2-Dichloroethene	156-59-2	97	19.4	0.004	0.84	J	0.004	0.82	J	0.003	0.76	J	0.003	0.74	J
Hexane	110-54-3	86	19.8	0.001	0.33	J	0.002	0.51	J	0.001	0.32	U	0.001	0.32	U
Benzene	71-43-2	78	22.7	0.002	0.50	J	0.002	0.65	J	0.001	0.40	U	0.001	0.40	U
4-Methyl-2-Pentanone	108-10-1	100	26.3	0.007	1.5	J	0.006	1.4	J	0.002	0.46	U	0.002	0.46	U
1,1,2-Trichloroethane	79-00-5	133	27.8	0.011	1.9	J	0.011	1.8	J	0.011	1.9	J	0.011	1.9	J
Toluene	108-88-3	92	28.4	0.008	2.0	J	0.008	2.0	J	0.001	0.31	J	0.001	0.26	J
Nonane	111-84-2	128	35.4	0.015	2.5		0.008	1.4	J	0.001	0.22	U	0.001	0.22	U
Decane	124-18-5	142	40.0	0.016	2.5	J	0.011	1.8	J	0.003	0.47	U	0.003	0.47	U
Undecane	1120-21-4	156	44.4	0.004	0.63	U	0.012	1.8	J	0.004	0.63	U	0.004	0.63	U

Data Quality Flags

J Target compound detected above the IDL but below the EQL.

U Target compound not detected at or above the IDL.

Footnotes

(a) Detected target analytes.

(b) Sample identification number.

Table 3.10 Flammability Data for Tank BX-104 Sampled on 12/12/96

Analyte	CAS #	Lower Flammability Limit(LFL)	Average	% of LFL ^(a)
			Measured Concentrations	
Ammonia (ppm)	7664-41-7	150000	174	0.116
Carbon Monoxide (ppm)	630-08-0	125000	<17	<0.014
Hydrogen (ppm)	1333-74-0	40000	71	0.178
Methane (ppm)	74-82-8	50000	<25	<0.050
TNMOC (mg/m ³)		42000	42.36	0.101
Total				<0.458

(a) Less than values are calculated using the average concentration less than values.
These values are summed to determine the total LFL.

3.21

Figure 3.2b Typical Total Ion Chromatogram (36 - 70 min) for Triple Sorbent Trap Samples from Tank BX-104 Sampled on 2/6/97

4.0 Conclusions

The concentrations of inorganic and organic analytes were determined from samples of the headspace of Tank BX-104 on February 6, 1997 (Sample Job V7004). The vapor concentrations were based either on whole-volume samples (SUMMA™ canisters) or on sorbent traps exposed to sample flow. In the case of the canisters, the concentrations were based on analytical results and the tracking of dilution/concentration of sample volumes obtained directly from the canisters. In the case of the sorbent traps, concentrations were based on analytical results and sample volumes reported by SESC. Known sampling and analytical variances from established quality assurance requirements, where significant, were documented in this report, as required by the SAP (Buckley 1996). Immediate notification was provided because the ammonia concentration exceeded the 150 ppmv notification level; notification levels and notification procedures are described in the SAP (Buckley 1996).

5.0 References

Buckley, L. L. 1996. *Vapor Sampling and Analysis Plan*. WHC-SD-WM-TP-335, Rev. 2C, Westinghouse Hanford Company, Richland, Washington.

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Pacific Northwest National Laboratory. *Analytical Laboratory Procedure Compendium*. Procedure PNL-ALO-271. PNL-MA-599, Pacific Northwest National Laboratory, Richland, Washington.

Pacific Northwest National Laboratory. *Quality Assurance Plan for Activities Conducted by the Pacific Northwest National Laboratory Vapor Analytical Laboratory (VAL) and the Pacific Northwest National Laboratory Tank Vapor Characterization Project*. ETD-002, Rev. 1, Pacific Northwest National Laboratory, Richland, Washington.

U.S. Department of Energy. *Hanford Analytical Services Quality Assurance Plan (HASQAP)*. DOE/RL-94-55, Rev. 2, United States Department of Energy, Richland, Washington.

Westinghouse Hanford Company (WHC). 1994. *Quality Assurance Project Plan for Tank Vapor Characterization*. WHC-SD-WM-QAPP-013, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

Appendix A

Chain-of-Custody Sample Control Forms

Custody Form Initiator

J. A. Edwards - PNNL

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

Company Contact

R. D. Mahon - SESC

Telephone (509) 373-7533
Page 85-9656 / FAX 373-3193Project Designation/Sampling Locations 200 West Tank Farm
241-BX-104 Tank Vapor Sample SAF V7004
Temporal #4 Riser # 7 ISVS
Ice Chest No.Collection date 2-6-97
Preparation date 01-23-97

Field Logbook No. WHC-647-E

Bill of Lading/Airbill No.

N/A

Offsite Property No. N/A

Method of Shipment

Government Truck

Collectors: C. Caplan

Shipped to

PNNL

E. Mast

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification

V7004 - A07 . 28R Collect NH₃/NO_x/H₂O Sorbent Trap
V7004 - A08 . 29R Collect NH₃/NO_x/H₂O Sorbent Trap
V7004 - A09 . 30R Collect NH₃/NO_x/H₂O Sorbent Trap
V7004 - A10 . 31R Collect NH₃/NO_x/H₂O Sorbent Trap

Sample Date/Time

2/6/97 1139
2/6/97 1139
2/6/97 1140
2/6/97 1140V7004 - A15 . 32R Open, close and store NH₃/NO_x/H₂O field blank #1
V7004 - A16 . 33R Open, close and store NH₃/NO_x/H₂O field blank #22/6/97 —
2/6/97 —

[] Field Transfer of Custody			[X] Chain of Possession		(Sign and Print Names)		
Relinquished By	Date	Time	Received By	Date	Time		
L M Thomas <i>L M Thomas</i>	01-27-97	1015	J A Edwards <i>J A Edwards</i>	01-27-97	1015		
J A Edwards <i>J A Edwards</i>	02-03-97	0945	E Mast <i>E Mast</i>	02-03-97	0945		
E Mast <i>E Mast</i>	2-14-97	0900	C S McDowell <i>C S McDowell</i>	2-14-97	0900		
C S McDowell <i>C S McDowell</i>	2-14-97	1015	J A Edwards <i>J A Edwards</i>	2-14-97	1015		
J A Edwards <i>J A Edwards</i>	2-14-97	1100	L M Thomas <i>L M Thomas</i>	2-14-97	1100		

Final Sample Disposition

Comments: DURING DISASSEMBLY HPT WAS REMOVING TRAIN ZBR BY CUTTING C-FLX INSIDE OF TUBE SHA, THE END OF SHA WAS RAD HOT, AND FRACTURED GLASS TUBE HOLDING "BLACK" SORBENT. IT WAS COVERED W/ PLASTIC AND TAPED SINCE RED CAP NO LONGER FIT.

PNNL (only) Checklist	Pick-up / Delivery	Comments:
Media labeled and checked?	☒ Y/N	
Letter of instruction?	☒ Y/N	
Media in good condition?	☒ Y/N	1 ☒ Y/N
COC info/signatures complete?	☒ Y/N	1 ☒ Y/N
Rad release stickers on samples?	☒ Y/N	1 ☒ Y/N
Activity report from 222S?	☒ Y/N	1 ☒ Y/N
RSR/release? (a ≤100/B ≤400 pCi/g)	☒ Y/N	1 ☒ Y/N
COC copy for LRB, RIDS filed?	☒ Y/N	1 ☒ Y/N

POC

(Signature)

POC

(Signature)

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

(Revised 10/01/96 PNNL)

A-6000-407 (12/92) WEF061

1 of 1

Custody Form Initiator

J. A. Edwards - PNNL

Telephone (509) 373-0141

Page 85-3009 / FAX 376-0418

Company Contact

R. D. Mahon - SESC

Telephone (509) 373-7533

Page 85-9656 / FAX 373-3193

Project Designation/Sampling Locations 200 West Tank Farm

241-BX-104 Tank Vapor Sample SAF V7004

Temporal #3 Riser # 7 ISVS

Ice Chest No.

Collection date 2-6-97

Preparation date 02-03-97

Field Logbook No. WHC-N-647-8

Bill of Lading/Airbill No.

N/A

Offsite Property No. N/A

Method of Shipment

Government Truck

Collectors: G. CAPMO

Shipped to

PNNL

ES. MAST

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification

V7004 - A01 . 097

Collect Ambient Air Sample SUMMA #1

Sample Date/Time

2/6/97 1050

V7004 - A02 . 120

Collect Ambient Air Sample SUMMA #2

2/6/97 1053

V7004 - A04 . 153

Collect SUMMA #3

2/6/97 1125

V7004 - A05 . 161

Collect SUMMA #4

2/6/97 1130

V7004 - A06 . 166

Collect SUMMA #5

2/6/97 1135

[] Field Transfer of Custody		[X] Chain of Possession		(Sign and Print Names)		
Relinquished By	Date	Time	Received By	Date	Time	
J A Edwards J A Edwards	02-03-97	0930	ES MAST ES	02-3-97	0930	
ES MAST ES	2-14-97	0900	CS McCallister CS McCallister	2-14-97	0900	
CS McCallister CS McCallister	2-14-97	1010	J A Edwards J A Edwards	2-14-97	1010	

Final Sample Disposition

Comments:

PNNL (only) Checklist	Pick-up / Delivery	Comments:
Media labeled and checked?	Y/N	
Letter of instruction?	Y/N	
Media in good condition?	Y/N	
COC info/signatures complete?	Y/N	
Rad release stickers on samples?	Y/N	
Activity report from 222S?	Y/N	
RSR/release? (a ≤100/B ≤400 pCi/g)	Y/N	
COC copy for LRB, RIDS filed?	Y/N	

POC

E

POC

E

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

(Revised 10/01/96 PNNL)

A-6000-407 (12/92) WEF061

1 of 1

Custody Form Initiator

J. A. Edwards - PNL

Telephone

(509) 373-0141

Page 85-3009 / P8-08 / FAX 376-0418

Company Contact

R. D. Mahon - WHC

Telephone

(509) 373-7437

Page 85-9656 / S3-27 / FAX 373-7076

Project Designation/Sampling Locations 200 West Tank Farm
241-BX-104 Tank Vapor Sample SAF V7004
Temporal #4 Riser # 7 (ISVS Cart)
Ice Chest No.

Collection date 2-6-97

Preparation date 01-31-97

Field Logbook No. WHC 47-8
RUST-

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

RUST-

Collector(s)

G. CAPMA

E. MAST

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification

V7004 - A11 . 1382	PNL Triple Sorbent Trap (TST) Sample #1	2-6-97 / 1202
V7004 - A12 . 1383	PNL TST Sample #2	2-6-97 / 1203
V7004 - A13 . 1384	PNL TST Sample #3	2-6-97 / 1203
V7004 - A14 . 1385	PNL TST Sample #4	2-6-97 / 1203
V7004 - A17 . 1386	Open, close & store TST Field Blank #1	2-6-97 / ~
V7004 - A18 . 1387	Open, close & store TST Field Blank #2	2-6-97 / ~
V7004 - A19 . 1388	Store TST Trip Blank #1	2-6-97 / ~
V7004 - A20 . 1389	Store TST Trip Blank #2	2-6-97 / ~

[] Field Transfer of Custody		[X] Chain of Possession		(Sign and Print Names)	
Relinquished By	Date	Time	Received By	Date	Time
JL Julia	01-31-97	1230	JA Edwards	01-31-97	1230
JA Edwards	02-3-97	0930	ES MAST	2/3/97	0930
ES MAST	2-14-97	0900	CS McCallister	2-14-97	0900
CS McCallister	2-14-97	1015	JA Edwards	2-14-97	1015

Final Sample Disposition

Comments:

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

Pick-up / Delivery

POC (E) POC (E)

Comments:

Cooler Temperature Status

Hi -17 °C / Lo -17 °C (pick up at PNL to WHC)

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

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

Hi +6 °C / Lo -14 °C (at delivery from WHC to PNL)

(Revised 06/21/95 PNL)

Appendix B

Listing of All Target Compounds for Organic Compound Analysis

Table B.1 SUMMA™ Analysis Results for All Target Analytes from Tank BX-104 Sampled on 2/6/97

Target Analytes	CAS	MW	Ret Time	V7004-A01.097			V7004-A02.120			V7004-A05.161 ISVS			V7004-A05.161 ISVS			V7004-A06.166 ISVS			V7004-A04.153 ISVS		
				Ambient Air			Ambient Air Through ISVS			V7004-A05.161 ISVS			Rep			V7004-A06.166 ISVS			V7004-A04.153 ISVS		
				(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag
Dichlorodifluoromethane	75-71-8	120.9	7.9	0.0031	0.58 J		0.0034	0.63 J		0.0114	2.11 J		0.011	2.03 J		0.0114	2.11 J		0.0109	2.01 J	
Chloromethane	74-87-3	50.5	8.9	0.0034	1.49 J		0.0024	1.08 J		0.0033	1.48 J		0.0033	1.44 J		0.0033	1.46 J		0.0024	1.06 U	
Methanol	67-56-1	32.0	10.0	<0.110	<77 Y		<0.110	<77 Y		0.898	627.84 Y		0.8626	603.08 Y		0.8528	596.22 Y		0.8136	568.79 Y	
Vinyl Chloride	75-01-4	62.5	10.0	0.0016	0.57 U		0.0016	0.57 U		0.0016	0.57 U		0.0016	0.57 U		0.0016	0.57 U		0.0016	0.57 U	
1,3-Butadiene	106-99-0	54.0	10.6	<0.083	<34 Y		<0.083	<34 Y		<0.083	<34 Y		<0.083	<34 Y		<0.083	<34 Y		<0.083	<34 Y	
Butane	106-97-8	58.1	10.8	0.0024	0.92 U		0.0024	0.92 U		0.6375	245.71		0.6171	237.83		0.6226	239.97		0.622	239.72	
Bromomethane	74-83-9	94.9	6.4	0.0052	1.23 U		0.0052	1.23 U		0.0052	1.23 U		0.0052	1.23 U		0.0052	1.23 U		0.0052	1.23 U	
Chloroethane	75-00-3	64.5	12.1	0.0054	1.88 U		0.0054	1.88 U		0.0054	1.88 U		0.0054	1.88 U		0.0054	1.88 U		0.0054	1.88 U	
Ethanol	64-17-5	46.1	12.6	<0.110	<53 Y		<0.110	<53 Y		0.2524	122.89 Y		0.2413	117.46 Y		0.2352	114.51 Y		0.1475	71.82 Y	
Acetonitrile	75-05-8	41.1	13.0	0.004	2.18 U		0.004	2.18 U		0.2282	124.53		0.2225	121.43		0.2174	118.63		0.2244	122.46	
Acetone	67-64-1	58.1	13.7	0.0211	8.15 J,B		0.0379	14.6 B		1.5264	588.7		1.518	585.45		1.4441	556.97		1.5243	587.88	
Trichlorofluoromethane	75-69-4	137.4	14.1	0.0048	0.78 U		0.0048	0.78 U		0.4	65.23		0.3954	64.48		0.3795	61.88		0.3778	61.61	
Pentane	109-66-0	72.0	14.9	0.0038	1.18 U		0.0038	1.18 U		0.453	140.65		0.4524	140.45		0.4262	132.33		0.4474	138.89	
1,1-Dichloroethene	75-35-4	96.9	15.5	0.0038	0.88 U		0.0038	0.88 U		0.0038	0.88 U		0.0038	0.88 U		0.0038	0.88 U		0.0038	0.88 U	
Methylene Chloride	75-09-2	84.9	15.8	0.0062	1.63 J,B		0.002	0.53 U		0.0085	2.24 J,B		0.0086	2.26 J,B		0.0087	2.28 J,B		0.0073	1.94 J,B	
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	187.4	16.3	0.004	0.48 U		0.0236	2.82 J		0.0132	1.58 J		0.0137	1.63 J		0.0134	1.6 J		0.0134	1.61 J	
Propanenitrile	107-12-0	55.1	17.1	0.0038	1.55 U		0.0038	1.55 U		0.1202	48.88		0.1202	48.88		0.1154	46.94		0.112	45.55	
Propanol	71-23-8	60.1	17.1	0.0028	1.04 U		0.0028	1.04 U		0.5861	218.46		0.588	219.16		0.5784	215.58		0.5384	200.67	
1,1-Dichloroethane	75-34-3	99.0	18.0	0.002	0.45 U		0.002	0.45 U		0.002	0.45 U		0.002	0.45 U		0.002	0.45 U		0.002	0.45 U	
2-Butanone	78-93-3	72.1	18.6	0.0098	3.05 J		0.0223	6.92 J		0.4777	148.4		0.4671	145.09		0.4161	129.25		0.3788	117.67	
cis-1,2-Dichloroethene	156-59-2	96.9	19.5	0.0034	0.79 U		0.0034	0.79 U		0.0034	0.79 U		0.0034	0.79 U		0.0034	0.79 U		0.0034	0.79 U	
Hexane	110-54-3	86.2	19.9	0.0032	0.83 U		0.0032	0.83 U		0.3044	79.11		0.3071	79.82		0.2926	76.05		0.2801	72.81	
Chloroform	67-66-3	119.4	20.0	0.0026	0.49 U		0.0026	0.49 U		0.0026	0.49 U		0.0026	0.49 U		0.0026	0.49 U		0.0026	0.49 U	
Tetrahydrofuran	109-99-9	72.1	20.8	0.0016	0.5 U		0.0016	0.5 U		0.7137	221.69		0.7222	224.35		0.6955	216.06		0.6337	196.86	
1,2-Dichloroethane	107-06-2	99.0	21.4	0.0022	0.5 U		0.0022	0.5 U		0.0022	0.5 U		0.0022	0.5 U		0.0022	0.5 U		0.0022	0.5 U	
Butanenitrile	109-74-0	69.1	21.9	0.0034	1.1 U		0.0034	1.1 U		0.0967	31.34		0.0939	30.44		0.0859	27.85		0.1051	34.06	
1,1,1-Trichloroethane	71-55-6	133.4	21.9	0.0032	0.54 U		0.0032	0.54 U		0.0032	0.54 U		0.0032	0.54 U		0.0032	0.54 U		0.0032	0.54 U	
1-Butanol	71-36-3	74.0	22.3	0.0032	0.97 U		0.0132	3.99 J		4.2479	1283.77		4.3467	1313.64		3.8352	1159.06		4.6366	1401.23	
Benzene	71-43-2	78.1	22.8	0.0016	0.46 U		0.0016	0.46 U		0.0094	2.69 J		0.0094	2.7 J		0.0088	2.53 J		0.0096	2.75 J	
Carbon Tetrachloride	56-23-5	153.8	23.1	0.0034	0.5 U		0.0034	0.5 U		0.0034	0.5 U		0.0034	0.5 U		0.0034	0.5 U		0.0034	0.5 U	
Cyclohexane	110-82-7	84.2	23.3	0.0036	0.96 U		0.0036	0.96 U		0.0329	8.75 J		0.0241	6.4 J		0.0192	5.1 J		0.0329	8.76 J	
1,2-Dichloropropane	78-87-5	113.0	24.3	0.003	0.59 U		0.003	0.59 U		0.003	0.59 U		0.003	0.59 U		0.003	0.59 U		0.003	0.59 U	
Trichloroethene	79-01-6	131.4	24.7	0.0024	0.41 U		0.0024	0.41 U		0.0024	0.41 U		0.0024	0.41 U		0.0024	0.41 U		0.0024	0.41 U	
Heptane	142-82-5	100.2	25.2	0.0018	0.4 U		0.0018	0.4 U		0.2246	50.21		0.2209	49.38		0.2018	45.1		0.2253	50.37	
4-Methyl-2-Pentanone	108-10-1	100.2	26.3	0.0034	0.76 U		0.0034	0.76 U		0.0289	6.46 J		0.0296	6.63 J		0.027	6.05 J		0.0312	6.99 J	
cis-1,3-Dichloropropene	10061-01-5	111.0	26.4	0.0024	0.48 U		0.0024	0.48 U		0.0024	0.48 U		0.0024	0.48 U		0.0024	0.48 U		0.0024	0.48 U	
Pyridine	110-86-1	79.1	26.5	0.0186	5.27 U		0.0186	5.27 U		0.0205	5.82 J		0.0211	5.98 J		0.0186	5.27 U		0.0186	5.27 U	
trans-1,3-Dichloropropene	10061-02-6	111.0	27.4	0.0018	0.36 U		0.0018	0.36 U		0.0018	0.36 U		0.0018	0.36 U		0.0018	0.36 U		0.0018	0.36 U	
Pentanenitrile	110-59-8	83.2	27.4	0.0042	1.13 U		0.0042	1.13 U		0.0312	8.4 J		0.0319	8.6 J		0.029	7.81 J		0.0328	8.84 J	
1,1,2-Trichloroethane	79-00-5	133.4	27.8	0.0028	0.47 U		0.0028	0.47 U		0.0028	0.47 U		0.0028	0.47 U		0.0028	0.47 U		0.0028	0.47 U	
Toluene	108-88-3	92.1	28.5	0.002	0.49 U		0.002	0.49 U		0.0287	6.97		0.0289	7.03		0.0273	6.64		0.0264	6.41	
1,2-Dibromoethane	106-93-4	187.9	30.0	0.0052	0.62 U		0.0052	0.62 U		0.0052	0.62 U		0.0052	0.62 U		0.0052	0.62 U		0.0052	0.62 U	
Octane	111-65-9	114.0	30.5	0.0024	0.47 U		0.0024	0.47 U		0.1426	27.96		0.1437	28.18		0.133	26.08		0.1343	26.34	
Tetrachloroethylene	127-18-4	165.8	31.0	0.0042	0.57 U		0.0042	0.57 U		0.0112	1.52 J		0.0111	1.51 J		0.0101	1.36 J		0.0042	0.57 U	
Chlorobenzene	108-90-7	112.6	32.6	0.0026	0.52 U		0.0026	0.52 U		0.0026	0.52 U		0.0026	0.52 U		0.0026	0.52 U		0.0026	0.52 U	
Hexanenitrile	628-73-9	97.0	32.8	0.0025	0.57 U		0.0052	1.2 U		0.0582	13.42		0.0607	14		0.0482	11.1 J		0.056	12.91	

Table B.1 (Cont'd) SUMMA™ Analysis Results for All Target Analytes from Tank BX-104 Sampled on 2/6/97

Target Analytes	CAS	MW	Ret Time	V7004-A01.097			V7004-A02.120			V7004-A05.161 ISVS			V7004-A05.161 ISVS			V7004-A06.166 ISVS			V7004-A04.153 ISVS		
				Ambient Air			Ambient Air Through ISVS			V7004-A05.161 ISVS			Rep			V7004-A06.166 ISVS			V7004-A04.153 ISVS		
				(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag
Ethylbenzene	100-41-4	106.2	33.4	0.0028	0.59 U		0.0028	0.59 U		0.004	0.85 J		0.0042	0.89 J		0.0039	0.81 J		0.0036	0.76 J	
p/m-Xylene	106-42-3	106.2	33.9	0.013	2.74 U		0.013	2.74 U		0.0157	3.32 J		0.0161	3.4 J		0.0143	3.02 J		0.0133	2.81 J	
Cyclohexanone	108-94-1	98.1	34.3	0.0058	1.32 U		0.0058	1.32 U		0.1291	29.47		0.1304	29.77		0.0908	20.73		0.1022	23.32	
Styrene	100-42-5	104.2	34.8	0.0022	0.47 U		0.0022	0.47 U		0.0022	0.47 U		0.0022	0.47 U		0.0022	0.47 U		0.0022	0.47 U	
1,1,2,2-Tetrachloroethane	79-34-5	167.9	35.0	0.0042	0.56 U		0.0042	0.56 U		0.0042	0.56 U		0.0042	0.56 U		0.0042	0.56 U		0.0042	0.56 U	
o-Xylene	95-47-6	106.2	35.1	0.0028	0.59 U		0.0028	0.59 U		0.0082	1.73 J		0.0084	1.76 J		0.0073	1.54 J		0.0068	1.43 J	
Nonane	111-84-2	128.0	35.5	0.0016	0.28 U		0.0016	0.28 U		0.0853	14.89		0.0858	14.99		0.0747	13.05		0.0779	13.6	
1-Ethyl-2-Methyl-Benzene	611-14-3	120.2	32.7	0.0018	0.34 U		0.0018	0.34 U		0.0018	0.34 U		0.0018	0.34 U		0.0018	0.34 U		0.0018	0.34 U	
1,3,5-Trimethylbenzene	108-67-8	120.2	38.7	0.0018	0.34 U		0.0018	0.34 U		0.0018	0.34 U		0.0018	0.34 U		0.0018	0.34 U		0.0018	0.34 U	
1,2,4-Trimethylbenzene	95-63-6	120.2	39.9	0.0026	0.48 U		0.0026	0.48 U		0.0026	0.48 U		0.0026	0.48 U		0.0026	0.48 U		0.0026	0.48 U	
Decane	124-18-5	142.3	40.1	0.003	0.47 U		0.003	0.47 U		0.1188	18.7		0.1201	18.9		0.1053	16.58		0.109	17.16	
1,3-Dichlorobenzene	541-73-1	147.0	40.5	0.0018	0.27 U		0.0018	0.27 U		0.0018	0.27 U		0.0018	0.27 U		0.0018	0.27 U		0.0018	0.27 U	
1,4-Dichlorobenzene	106-46-7	147.0	40.7	0.0018	0.27 U		0.0018	0.27 U		0.0018	0.27 U		0.0018	0.27 U		0.0018	0.27 U		0.0018	0.27 U	
1,2-Dichlorobenzene	95-50-1	147.0	41.8	0.0018	0.27 U		0.0018	0.27 U		0.0018	0.27 U		0.0018	0.27 U		0.0018	0.27 U		0.0018	0.27 U	
Undecane	1120-21-4	156.0	44.4	0.0282	4.04 U		0.0282	4.04 U		0.7256	103.98		0.7362	105.51		0.6323	90.61		0.6128	87.82	
1,2,4-Trichlorobenzene	120-82-1	181.5	48.1	0.0177	2.18 J,B		0.0028	0.35 U		0.0028	0.35 U		0.0028	0.35 U		0.0028	0.35 U		0.0028	0.35 U	
Dodecane	112-40-3	170.0	48.5	0.0098	1.29 U		0.0098	1.29 U		6.1357	806.85 *		6.0407	794.36 *		5.0419	663.02		5.1232	673.71	
Hexachloro-1,3-butadiene	87-68-3	260.8	49.9	0.0197	1.69 J,B		0.0046	0.4 U		0.0046	0.4 U		0.0046	0.4 U		0.0046	0.4 U		0.0046	0.4 U	
Tridecane	629-50-5	184.0	52.2	0.006	0.73 U		0.0771	9.37		16.8448	2046.67 *		19.842	2410.83 *		15.3223	1861.69 *		15.6102	1896.66 *	
Tetradecane	629-59-4	198.0	55.8	0.0042	0.47 U		0.0042	0.47 U		5.2876	597.17 *		6.5406	738.68 *		3.8153	430.89 *		5.5016	621.34 *	

B Compound found in associated laboratory blank.

J Target compound detected above the IDL but below the EQL.

U Target compound not detected at or above the IDL.

Y Initial calibration and CCV were performed; however, the analyte was not part of the current operating procedure.

* Denotes diluted value was reported for target compound in table.

Table B.2 Triple Sorbent Trap Analysis Results for All Target Analytes from Tank BX-104 Sampled on 2/6/97.

Target Analytes	CAS	MW	Ret Time	V7004-A11.1382 ISVS			V7004-A12.1383 ISVS			V7004-A12.1383 ISVS REP			V7004-A13.1384 ISVS		
				(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag
Dichlorodifluoromethane	75-71-8	120.9	7.8	0.0205	3.8	J	0.0213	3.95	J	0.0222	4.11	J	0.0173	3.2	J
Chloromethane	74-87-3	50.5	8.8	0.0033	1.48	U	0.0034	1.5	U	0.0034	1.5	U	0.0033	1.48	U
1,2-dichloro-1,1,2,2-tetrafluoroethane	76-14-2	170.9	9.5	0.0033	0.44	U	0.0034	0.44	U	0.0034	0.44	U	0.0033	0.44	U
Methanol	67-56-1	32.0	10.0	2.4591	1719.25	Y	1.4536	1016.22	Y	1.2476	872.21	Y	1.2671	885.85	Y
Vinyl Chloride	75-01-4	62.5	9.9	0.0032	1.14	U	0.0032	1.15	U	0.0032	1.15	U	0.0032	1.14	U
1,3-Butadiene	106-99-0	54.0	10.5	< 0.208	< 86	Y	< 0.208	< 86	Y	< 0.208	< 86	Y	< 0.208	< 86	Y
Butane	106-97-8	58.1	10.7	1.2233	471.32		0.8755	337.3		0.9026	347.74		0.8798	338.98	
Chloroethane	75-00-3	64.5	12.0	0.0316	10.97	J	0.024	8.32	J	0.0044	1.52	U	0.0251	8.71	J
Ethanol	64-17-5	46.1	12.5	2.1041	1023.06	Y	1.2216	593.96	Y	1.2395	602.66	Y	1.3289	646.12	Y
Acetonitrile	75-05-8	41.1	13.0	0.5653	308.45		0.3663	199.87		0.4064	221.76		0.3158	172.3	
Acetone	67-64-1	58.1	13.6	1.297	500.2		0.9631	371.45		0.8114	312.95		1.033	398.39	
Trichlorofluoromethane	75-69-4	137.4	14.1	0.4954	80.79		0.4758	77.58		0.4857	79.2		0.4452	72.6	
Pentane	109-66-0	72.0	14.9	0.8888	276.5		0.6164	191.76		0.6334	197.06		0.6168	191.9	
1,1-Dichloroethene	75-35-4	96.9	15.5	0.0022	0.5	U	0.0022	0.51	U	0.0022	0.51	U	0.0022	0.5	U
Methylene Chloride	75-09-2	84.9	15.7	0.0584	15.39	J	0.0577	15.23	J	0.045	11.88	J	0.0557	14.69	J
1,1,2-trichloro-1,1,2,2-trifluoroethane	76-13-1	187.4	16.2	0.0065	0.78	J	0.0045	0.54	J	0.0042	0.51	J	0.0081	0.97	J
Propanenitrile	107-12-0	55.1	17.0	0.2026	82.4		0.1566	63.7		0.1587	64.52		0.1564	63.62	
Propanol	71-23-8	60.1	17.0	1.2144	452.64		0.6117	227.99		0.6761	251.99		0.6462	240.85	
1,1-Dichloroethane	75-34-3	99.0	17.9	0.0015	0.34	U	0.0015	0.34	U	0.0015	0.34	U	0.0015	0.34	U
2-Butanone	78-93-3	72.1	18.5	0.5576	173.2		0.3823	118.77		0.3066	95.23		0.3975	123.47	
cis-1,2-Dichloroethene	156-59-2	96.9	19.4	0.0026	0.61	U	0.0027	0.62	U	0.0027	0.62	U	0.0026	0.61	U
Hexane	110-54-3	86.2	19.8	0.5548	144.2		0.4427	115.06		0.4412	114.68		0.4439	115.37	
Chloroform	67-66-3	119.4	20.0	0.003	0.57	U	0.003	0.57	U	0.003	0.57	U	0.003	0.57	U
Tetrahydrofuran	109-99-9	72.1	20.7	0.8093	251.41		0.6956	216.08		0.7161	222.46		0.6972	216.57	
1,2-Dichloroethane	107-06-2	99.0	21.3	0.0012	0.26	U	0.0012	0.27	U	0.0012	0.27	U	0.0012	0.26	U
Butanenitrile	109-74-0	69.1	21.8	0.1312	42.52		0.117	37.91		0.1192	38.62		0.123	39.86	
1,1,1-Trichloroethane	71-55-6	133.4	21.8	0.004	0.68	J	0.004	0.67	J	0.0044	0.74	J	0.0037	0.61	J
1-Butanol	71-36-3	74.0	22.2	9.083	2749.46	E	7.5079	2272.66	E	7.2644	2198.97	E	7.5789	2294.14	E
Benzene	71-43-2	78.1	22.7	0.0189	5.42		0.0209	6.01		0.0241	6.9		0.0211	6.06	
Carbon Tetrachloride	56-23-5	153.8	23.0	0.0015	0.22	U	0.0015	0.22	U	0.0015	0.22	U	0.0015	0.22	U
Cyclohexane	110-82-7	84.2	23.3	0.0043	1.16	U	0.0044	1.17	U	0.0044	1.17	U	0.0043	1.16	U
1,2-Dichloropropane	78-87-5	113.0	24.2	0.002	0.4	U	0.002	0.4	U	0.002	0.4	U	0.002	0.4	U
Trichloroethene	79-01-6	131.4	24.7	0.0038	0.65	U	0.0039	0.66	U	0.0039	0.66	U	0.0038	0.65	U
Heptane	142-82-5	100.2	25.1	0.3126	69.89		0.3102	69.34		0.3029	67.72		0.328	73.33	
4-Methyl-2-Pentanone	108-10-1	100.2	26.3	0.0964	21.55		0.0793	17.73		0.0757	16.92		0.0892	19.94	
cis-1,3-Dichloropropene	10061-01-5	111.0	26.3	0.0013	0.27	U	0.0013	0.27	U	0.0013	0.27	U	0.0013	0.27	U
Pyridine	110-86-1	79.1	26.5	0.0226	6.4	U	0.0228	6.46	U	0.0228	6.46	U	0.0226	6.4	U

Table B.2 (Cont'd) Triple Sorbent Trap Analysis Results for All Target Analytes from Tank BX-104 Sampled on 2/6/97.

Target Analytes	CAS	MW	Ret Time	V7004-A11.1382 ISVS			V7004-A12.1383 ISVS			V7004-A12.1383 ISVS REP			V7004-A13.1384 ISVS		
				(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag
trans-1,3-Dichloropropene	10061-02-6	111.0	27.3	0.0028	0.57	U	0.0028	0.57	U	0.0028	0.57	U	0.0028	0.57	U
Pentanenitrile	110-59-8	83.2	27.3	0.0631	17		0.0595	16.02		0.0593	15.98		0.0665	17.92	
1,1,2-Trichloroethane	79-00-5	133.4	27.8	0.0108	1.81	J	0.0098	1.64	J	0.0101	1.69	J	0.0105	1.77	J
Toluene	108-88-3	92.1	28.4	0.0424	10.3		0.0444	10.79		0.0451	10.95		0.0462	11.24	
1,2-Dibromoethane	106-93-4	187.9	29.9	0.0025	0.3	U	0.0025	0.3	U	0.0025	0.3	U	0.0025	0.3	U
Octane	111-65-9	114.0	30.4	0.1225	24.08		0.1567	30.79		0.1546	30.37		0.2001	39.33	
Tetrachloroethylene	127-18-4	165.8	30.9	0.0063	0.85	J	0.0097	1.31	J	0.0093	1.26	J	0.0131	1.77	J
Chlorobenzene	108-90-7	112.6	32.5	0.0012	0.23	U	0.0012	0.23	U	0.0012	0.23	U	0.0012	0.23	U
Hexanenitrile	628-73-9	97.0	32.7	0.0353	8.16		0.0433	9.99		0.039	9		0.0518	11.97	
Ethylbenzene	100-41-4	106.2	33.4	0.0042	0.88	J	0.0045	0.95	J	0.0044	0.94	J	0.0052	1.11	J
p/m-Xylene	106-42-3	106.2	33.8	0.0127	2.67	J	0.014	2.96	J	0.0144	3.03	J	0.0189	3.98	J
Cyclohexanone	108-94-1	98.1	34.2	0.0132	3.01	U	0.0134	3.06	U	0.0134	3.06	U	0.0132	3.01	U
Styrene	100-42-5	104.2	34.7	0.0016	0.35	U	0.0017	0.36	U	0.0017	0.36	U	0.0016	0.35	U
1,1,2,2-Tetrachloroethane	79-34-5	167.9	34.9	0.0061	0.82	U	0.0062	0.83	U	0.0062	0.83	U	0.0061	0.82	U
o-Xylene	95-47-6	106.2	35.0	0.0052	1.1	J	0.0062	1.31	J	0.006	1.26	J	0.009	1.89	J
Nonane	111-84-2	128.0	35.4	0.0259	4.53		0.0368	6.44		0.0369	6.47		0.0601	10.52	
1-Ethyl-2-methyl benzene	611-14-3	120.2	38.4	0.0025	0.46	U	0.0025	0.47	U	0.0025	0.47	U	0.0025	0.46	U
1,3,5-Trimethylbenzene	108-67-8	120.2	38.6	0.0025	0.46	U	0.0025	0.47	U	0.0025	0.47	U	0.0025	0.46	U
1,2,4-Trimethylbenzene	95-63-6	120.2	39.9	0.0026	0.49	U	0.0027	0.5	U	0.0027	0.5	U	0.0026	0.49	U
Decane	124-18-5	142.3	40.0	0.0189	2.97	J	0.0282	4.43	J	0.0264	4.15	J	0.0541	8.52	
1,3-Dichlorobenzene	541-73-1	147.0	40.4	0.0033	0.51	U	0.0034	0.51	U	0.0034	0.51	U	0.0033	0.51	U
1,4-Dichlorobenzene	106-46-7	147.0	40.6	0.003	0.46	U	0.003	0.46	U	0.003	0.46	U	0.003	0.46	U
1,2-Dichlorobenzene	95-50-1	147.0	41.7	0.005	0.76	U	0.005	0.77	U	0.005	0.77	U	0.005	0.76	U
Undecane	1120-21-4	156.0	44.4	0.1111	15.95		0.2334	33.52		0.2326	33.4		0.4883	70.12	
1,2,4-Trichlorobenzene	120-82-1	181.5	48.0	0.0164	2.02	U	0.0166	2.05	U	0.0166	2.05	U	0.0164	2.02	U
Dodecane	112-40-3	170.0	48.4	1.2593	165.93		2.4013	316.41		2.4208	318.97		4.4686	588.8	E
Hexachloro-1,3-butadiene	87-68-3	260.8	49.8	0.0217	1.86	U	0.0219	1.88	U	0.0219	1.88	U	0.0217	1.86	U
Tridecane	629-50-5	184.0	52.2	2.2959	279.5		4.1678	507.38	E	4.1631	506.82	E	7.1631	872.03	E
Tetradecane	629-59-4	198.0	55.7	1.5491	175.25		2.8891	326.85	E	2.824	319.48	E	4.7196	533.93	E
Tributyl Phosphate	126-73-8	266.0	63.1	0.0236	1.99	Z	0.1414	11.91	Z	0.0463	3.89	Z	0.2309	19.44	Z

E Target compound exceeds upper quantification limit (UQL).

J Target compound detected above the IDL but below the EQL.

U Target compound not detected at or above the IDL.

Y Initial calibration and CCV were performed; however, the analyte was not part of the current operating procedure.

Z Retention time and mass spectral characteristics were determined and detectability possible at 0.8 ppbv;

however, this compound is not currently part of the analytical method. See Section 3.4.2 for more information.

Table B.3 Triple Sorbent Trap Analysis Results for All Target Analytes from Blank Samples Associated with the Sampling of Tank BX-104 on 2/6/97.

Target Analytes	CAS	MW	Ret Time	V7004-A17.1386 FB #1			V7004-A18.1387 FB #2			V7004-A19.1388 TB #1			V7004-A20.1389 TB #2		
				(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag
Dichlorodifluoromethane	75-71-8	120.91	7.827	0.0043	0.79	U	0.0043	0.79	U	0.0043	0.79	U	0.0043	0.79	U
Chloromethane	74-87-3	50.49	8.837	0.0032	1.4	U	0.0032	1.4	U	0.0032	1.4	U	0.0032	1.4	U
1,2-dichloro-1,1,2,2-tetrafluoroethane	76-14-2	170.92	9.507	0.0032	0.41	U	0.0032	0.41	U	0.0032	0.41	U	0.0032	0.41	U
Methanol	67-56-1	32.04	9.953	<0.274	<192	Y	<0.274	<192	Y	<0.274	<192	Y	<0.274	<192	Y
Vinyl Chloride	75-01-4	62.5	9.9	0.003	1.08	U	0.003	1.08	U	0.003	1.08	U	0.003	1.08	U
1,3-Butadiene	106-99-0	54	10.516	<0.208	<86	Y	<0.208	<86	Y	<0.208	<86	Y	<0.208	<86	Y
Butane	106-97-8	58.14	10.729	0.0036	1.39	U	0.0177	6.8	J	0.0036	1.39	U	0.0036	1.39	U
Chloroethane	75-00-3	64.51	12.026	0.0041	1.42	U	0.0041	1.42	U	0.0041	1.42	U	0.0041	1.42	U
Ethanol	64-17-5	46.07	12.493	<0.274	<133	Y	<0.274	<133	Y	<0.274	<133	Y	<0.274	<133	Y
Acetonitrile	75-05-8	41.05	12.972	0.1001	54.63		0.0502	27.39		0.0033	1.8	U	0.0033	1.8	U
Acetone	67-64-1	58.08	13.62	0.0084	3.22	J	0.0093	3.61	J	0.0072	2.78	U	0.0072	2.78	U
Trichlorofluoromethane	75-69-4	137.37	14.088	0.0044	0.72	U	0.0044	0.72	U	0.0044	0.72	U	0.0044	0.72	U
Pentane	109-66-0	72	14.885	0.0029	0.89	U	0.0079	2.47	J	0.0029	0.89	U	0.0029	0.89	U
1,1-Dichloroethene	75-35-4	96.94	15.48	0.0021	0.47	U	0.0021	0.47	U	0.0021	0.47	U	0.0021	0.47	U
Methylene Chloride	75-09-2	84.93	15.714	0.0289	7.62	J	0.0412	10.86	J	0.0251	6.61	J	0.102	26.89	J
1,1,2-trichloro-1,2,2-trifluoroethane	76-13-1	187.38	16.245	0.0036	0.43	J	0.0053	0.63	J	0.003	0.36	U	0.003	0.36	U
Propanenitrile	107-12-0	55.08	16.979	0.0019	0.77	U	0.0019	0.77	U	0.0019	0.77	U	0.0019	0.77	U
Propanol	71-23-8	60.1	17.011	0.0053	1.99	U	0.0053	1.99	U	0.0053	1.99	U	0.0053	1.99	U
1,1-Dichloroethane	75-34-3	98.96	17.925	0.0014	0.32	U	0.0014	0.32	U	0.0014	0.32	U	0.0014	0.32	U
2-Butanone	78-93-3	72.11	18.541	0.0022	0.68	U	0.0022	0.68	U	0.0022	0.68	U	0.0022	0.68	U
cis-1,2-Dichloroethene	156-59-2	96.94	19.445	0.0036	0.84	J	0.0035	0.82	J	0.0033	0.76	J	0.0032	0.74	J
Hexane	110-54-3	86.18	19.806	0.0013	0.33	J	0.002	0.51	J	0.0013	0.32	U	0.0013	0.32	U
Chloroform	67-66-3	119.38	19.976	0.0029	0.53	U	0.0029	0.53	U	0.0029	0.53	U	0.0029	0.53	U
Tetrahydrofuran	109-99-9	72.11	20.688	0.0035	1.07	U	0.0035	1.07	U	0.0035	1.07	U	0.0035	1.07	U
1,2-Dichloroethane	107-06-2	98.96	21.337	0.0011	0.25	U	0.0011	0.25	U	0.0011	0.25	U	0.0011	0.25	U
Butanenitrile	109-74-0	69.11	21.794	0.0014	0.45	U	0.0014	0.45	U	0.0014	0.45	U	0.0014	0.45	U
1,1,1-Trichloroethane	71-55-6	133.4	21.847	0.0027	0.44	U	0.0027	0.44	U	0.0027	0.44	U	0.0027	0.44	U
1-Butanol	71-36-3	74	22.24	0.0075	2.29	U	0.0075	2.29	U	0.0075	2.29	U	0.0075	2.29	U
Benzene	71-43-2	78.11	22.708	0.0017	0.5	J	0.0023	0.65	J	0.0014	0.4	U	0.0014	0.4	U
Carbon Tetrachloride	56-23-5	153.82	23.005	0.0014	0.2	U	0.0014	0.2	U	0.0014	0.2	U	0.0014	0.2	U
Cyclohexane	110-82-7	84.16	23.271	0.0041	1.09	U	0.0041	1.09	U	0.0041	1.09	U	0.0041	1.09	U
1,2-Dichloropropane	78-87-5	112.99	24.228	0.0019	0.38	U	0.0019	0.38	U	0.0019	0.38	U	0.0019	0.38	U
Trichloroethene	79-01-6	131.39	24.663	0.0036	0.61	U	0.0036	0.61	U	0.0036	0.61	U	0.0036	0.61	U
Heptane	142-82-5	100.2	25.11	0.0015	0.35	U	0.0015	0.35	U	0.0015	0.35	U	0.0015	0.35	U
4-Methyl-2-Pentanone	108-10-1	100.16	26.268	0.0069	1.54	J	0.0063	1.41	J	0.0021	0.46	U	0.0021	0.46	U
cis-1,3-Dichloropropene	10061-01-5	110.97	26.29	0.0013	0.25	U	0.0013	0.25	U	0.0013	0.25	U	0.0013	0.25	U

Table B.3 (Cont'd) Triple Sorbent Trap Analysis Results for All Target Analytes from Blank Samples Associated with the Sampling of Tank BX-104 on 2/6/97.

Target Analytes	CAS	MW	Ret Time	V7004-A17.1386 FB #1			V7004-A18.1387 FB #2			V7004-A19.1388 TB #1			V7004-A20.1389 TB #2		
				(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag
Pyridine	110-86-1	79.1	26.46	0.0214	6.06	U	0.0214	6.06	U	0.0214	6.06	U	0.0214	6.06	U
trans-1,3-Dichloropropene	10061-02-6	110.97	27.321	0.0027	0.53	U	0.0027	0.53	U	0.0027	0.53	U	0.0027	0.53	U
Pentanenitrile	110-59-8	83.15	27.321	0.0008	0.22	U	0.0008	0.22	U	0.0008	0.22	U	0.0008	0.22	U
1,1,2-Trichloroethane	79-00-5	133.4	27.767	0.0111	1.87	J	0.0108	1.81	J	0.0114	1.91	J	0.011	1.85	J
Toluene	108-88-3	92.14	28.405	0.0083	2.02	J	0.0084	2.04	J	0.0013	0.31	J	0.0011	0.26	J
1,2-Dibromoethane	106-93-4	187.86	29.925	0.0024	0.28	U	0.0024	0.28	U	0.0024	0.28	U	0.0024	0.28	U
Octane	111-65-9	114	30.371	0.0027	0.52	U	0.0027	0.52	U	0.0027	0.52	U	0.0027	0.52	U
Tetrachloroethylene	127-18-4	165.83	30.934	0.0025	0.34	U	0.0025	0.34	U	0.0025	0.34	U	0.0025	0.34	U
Chlorobenzene	108-90-7	112.56	32.518	0.0011	0.22	U	0.0011	0.22	U	0.0011	0.22	U	0.0011	0.22	U
Hexanenitrile	628-73-9	97	32.709	0.0029	0.66	U	0.0029	0.66	U	0.0029	0.66	U	0.0029	0.66	U
Ethylbenzene	100-41-4	106.17	33.358	0.0014	0.3	U	0.0014	0.3	U	0.0014	0.3	U	0.0014	0.3	U
p/m-Xylene	106-42-3	106.17	33.794	0.003	0.63	U	0.003	0.63	U	0.003	0.63	U	0.003	0.63	U
Cyclohexanone	108-94-1	98.14	34.229	0.0125	2.85	U	0.0125	2.85	U	0.0125	2.85	U	0.0125	2.85	U
Styrene	100-42-5	104.15	34.697	0.0015	0.33	U	0.0015	0.33	U	0.0015	0.33	U	0.0015	0.33	U
1,1,2,2-Tetrachloroethane	79-34-5	167.85	34.931	0.0058	0.77	U	0.0058	0.77	U	0.0058	0.77	U	0.0058	0.77	U
o-Xylene	95-47-6	106.17	35.005	0.0019	0.4	U	0.0019	0.4	U	0.0019	0.4	U	0.0019	0.4	U
Nonane	111-84-2	128	35.377	0.0145	2.54		0.0082	1.43	J	0.0013	0.22	U	0.0013	0.22	U
1-Ethyl-2-methyl benzene	611-14-3	120.19	38.364	0.0024	0.44	U	0.0024	0.44	U	0.0024	0.44	U	0.0024	0.44	U
1,3,5-Trimethylbenzene	108-67-8	120.19	38.587	0.0024	0.44	U	0.0024	0.44	U	0.0024	0.44	U	0.0024	0.44	U
1,2,4-Trimethylbenzene	95-63-6	120.19	39.852	0.0025	0.47	U	0.0025	0.47	U	0.0025	0.47	U	0.0025	0.47	U
Decane	124-18-5	142.28	40.043	0.0161	2.54	J	0.0114	1.8	J	0.003	0.47	U	0.003	0.47	U
1,3-Dichlorobenzene	541-73-1	147	40.394	0.0032	0.48	U	0.0032	0.48	U	0.0032	0.48	U	0.0032	0.48	U
1,4-Dichlorobenzene	106-46-7	147	40.607	0.0029	0.43	U	0.0029	0.43	U	0.0029	0.43	U	0.0029	0.43	U
1,2-Dichlorobenzene	95-50-1	147	41.744	0.0047	0.72	U	0.0047	0.72	U	0.0047	0.72	U	0.0047	0.72	U
Undecane	1120-21-4	156	44.369	0.0044	0.63	U	0.0122	1.75	J	0.0044	0.63	U	0.0044	0.63	U
1,2,4-Trichlorobenzene	120-82-1	181.45	47.983	0.0155	1.91	U	0.0155	1.91	U	0.0155	1.91	U	0.0155	1.91	U
Dodecane	112-40-3	170	48.398	0.0255	3.36	U	0.0255	3.36	U	0.0255	3.36	U	0.0255	3.36	U
Hexachloro-1,3-butadiene	87-68-3	260.76	49.801	0.0205	1.76	U	0.0205	1.76	U	0.0205	1.76	U	0.0205	1.76	U
Tridecane	629-50-5	184	52.16	0.026	3.17	U	0.026	3.17	U	0.026	3.17	U	0.026	3.17	U
Tetradecane	629-59-4	198	55.678	0.019	2.15	U	0.019	2.15	U	0.019	2.15	U	0.019	2.15	U
Tributyl Phosphate	126-73-8	266	63.1	0.0099	0.83	Z	0.0099	0.83	Z	0.0099	0.83	Z	0.0099	0.83	Z

J Target compound detected above the IDL but below the EQL.

U Target compound not detected at or above the IDL.

Y Initial calibration and CCV were performed; however, the analyte was not part of the current operating procedure.

Z Retention time and mass spectral characteristics were determined and detectability possible at 0.8 ppbv; however, this compound is not currently part of the analytical method. See Section 3.4.2 for more information.

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