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Tank 241-T-107 Vapor Sampling and Analysis Tank Characterization Report (WHC-SD-WM-ER-447)		ECN No.

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7. Abstract Tank 241-T-107 headspace gas and vapor samples were collected and analyzed to help determine the potential risks to tank farm workers due to fugitive emissions from the tank. The drivers and objectives of waste tank headspace sampling and analysis are discussed in "Program Plan for the Resolution of Tank Vapor Issues" (Osborne and Huckaby 1994). Tank 241-T-107 was vapor sampled in accordance with "Data Quality Objectives for Generic In-Tank Health and Safety Issue Resolution (Osborne et al., 1994).		

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Tank 241-T-107 Vapor Sampling and Analysis Tank Characterization Report

X.0 INTRODUCTION

Tank T-107 headspace gas and vapor samples were collected and analyzed to help determine the potential risks of fugitive emissions to tank farm workers. The drivers and objectives of waste tank headspace sampling and analysis are discussed in *Program Plan for the Resolution of Tank Vapor Issues* (Osborne and Huckaby 1994). Tank T-107 was vapor sampled in accordance with *Data Quality Objectives for Generic In-Tank Health and Safety Issue Resolution* (Osborne et al. 1994). Results presented here represent the best available data on the headspace constituents of tank T-107.

X.1 SAMPLING EVENT

Headspace gas and vapor samples were collected from tank T-107 using the VSS on January 18, 1995 by WHC Sampling and Mobile Laboratories (WHC 1995). Sample collection and analysis were performed as directed by *Tank 241-T-107 Tank Characterization Plan* (the TCP), (Homi 1995). Air from the T-107 headspace was withdrawn from a single elevation 5.5 m below the riser flange via a heated vapor sampling probe/instrument tree mounted in riser 5, and transferred via heated tubing to the VSS sampling manifold. All heated zones of the VSS were maintained at approximately 50 °C. All tank air samples were collected between 5:00 p.m. and 9:00 p.m., with no anomalies noted.

Sampling media were prepared and analyzed by WHC, Oak Ridge National Laboratories (ORNL), and Pacific Northwest Laboratories (PNL). The 40 tank air samples and 2 ambient air control samples collected are listed in Table X-1 by analytical laboratory. Table X-1 also lists the 14 trip blanks and 2 field blanks provided by the laboratories.

A general description of vapor sampling and sample analysis methods is given by Huckaby (1995). The sampling equipment, sample collection sequence, sorbent trap sample air flow rates and flow times, chain of custody information, and a discussion of the sampling event itself are given in WHC 1995 and references therein.

X.2 INORGANIC GASES AND VAPORS

Analytical results of sorbent trap and SUMMA™ canister tank air samples for selected inorganic gases and vapors are given in Table X-2 in parts per million by volume (ppmv). SUMMA™ canisters and inorganic analyte sorbent traps were prepared and analyzed by PNL (Pool et al. 1995).

X.2.1 Ammonia, Hydrogen, and Nitrous Oxide

The reported ammonia concentration, 125 ppmv, is 5 times the National Institute of Occupational Safety and Health (NIOSH) 8-hr recommended exposure limit (REL) of 25 ppmv for ammonia (NIOSH 1995). Ammonia has been observed in virtually all of the waste tanks sampled to date, at concentrations ranging from about 3 ppmv in tank C-108 (Lucke et al. 1995), to 1040 ppmv in BY-108 (McVeety et al. 1995).

The concentration of hydrogen in tank T-107 was measured to be < 94 ppmv. Hydrogen in the waste tanks is of concern as a fuel. Given that the lower flammability limit (LFL) for hydrogen in air is about 4 % by volume, the 94 ppmv hydrogen detection limit corresponds to about 0.24 % of its LFL. At this level, hydrogen is not a flammability concern in tank T-107.

The nitrous oxide concentration in tank T-107 was measured to be 41.5 ppmv. This is greater than the NIOSH 8-hr REL of 25 ppmv for nitrous oxide (NIOSH 1995). Nitrous oxide, also known as laughing gas, has been detected in other waste tanks at concentrations as low as about 12 ppmv in tank TX-105 (Klinger 1995), and as high as about 800 ppmv in tank C-103 (Huckaby and Story 1994).

X.2.2 Carbon Monoxide and Carbon Dioxide

Carbon monoxide in the tank T-107 headspace was determined to be < 12 ppmv, and consequently less than the NIOSH 8-hr REL of 35 ppmv. In ambient air carbon monoxide typically ranges from 0.05 to 0.15 ppmv. Because different analytical methods have been used to measure carbon monoxide in the waste tanks sampled to date, the information on carbon monoxide has varied from tank to tank. Elevated waste tank headspace carbon monoxide concentrations are common, and are thought to be due to the decomposition of organic waste in the tanks. Carbon monoxide has not been measured at very high levels in any of the waste tanks, the highest level measured to date was 26.7 ppmv in tank C-103 (Huckaby and Story 1994).

The tank T-107 carbon dioxide concentration was determined to be 75 ppmv. Carbon dioxide is normally present in the ambient air at a concentration of 350 to 400 ppmv, and is typically at lower than ambient levels in the waste tank headspaces. Carbon dioxide introduced by air exchange with the atmosphere is readily absorbed by caustic supernatant and interstitial liquids of the waste tanks, and converted to carbonate in solution. Carbon dioxide is neither toxicologically important nor flammable, but because it can be measured at the same time as other gases, and may help characterize the waste, it was listed as a target analyte in the TCP.

X.2.3 Nitric Oxide, Nitrogen Dioxide, Water and Tritium

Nitric oxide and nitrogen dioxide concentrations in the tank T-107 headspace were determined to be ≤ 0.05 ppmv and ≤ 0.03 ppmv, respectively. These are both acid gases that would have very low equilibrium concentrations above the high pH sludge in tank T-107. The measurable presence of nitric oxide may be

due to its formation from oxygen and nitrogen in the radiation field of the headspace. The NIOSH 8-hr REL is 25 ppmv for nitric oxide, and the 15-minute short term exposure limit (STEL) for nitrogen dioxide is 1 ppmv.

The water vapor concentration of tank T-107 was determined to be about 12.1 mg/L, for a headspace temperature of 17.2 °C and the measured headspace pressure of 989 mbar (742.8 torr), (WHC 1995). This corresponds to a water vapor partial pressure of 16.2 mbar (12.1 torr), to a dew point of 14.2 °C, and to a relative humidity of 82 %. This relative humidity is similar to that of other tanks that hold primarily sludge.

Silica gel sorbent traps were used to test for tritium. It is assumed that tritium produced by the waste combines with hydroxide ions to form tritium-substituted water. Evaporation of the tritium-substituted water would then result in airborne radioactive contamination. Silica gel sorbent traps adsorb virtually all (normal and tritium-substituted) water vapor from the sampled tank air, and are analyzed at the WHC 222-S laboratory. Radiochemical analysis of the silica gel trap indicated the total activity of the headspace to be less than 50 pCi/L (WHC 1995).

X.2.4 Discussion of Inorganic Gases and Vapors

Aside from water and carbon dioxide, the most abundant waste constituents in the tank T-107 headspace are ammonia and nitrous oxide. Along with hydrogen, they have been detected in most tank headspaces sampled to date, and are usually the dominate waste species.

The relative standard deviations of the inorganic gas and vapor results given in the last column in Table X-2 are good. Relative standard deviations range from about 1.3 % for water vapor to 15 % for nitrous oxide. Because the precision reported depends both on sampling parameters (e.g., sample flow rate and flow time for sorbent traps) and analytical parameters (e.g., sample preparation, dilutions, etc.), the small relative standard deviations suggest proper control was maintained both in the field and in the laboratories.

X.3 ORGANIC VAPORS

Organic vapors in the tank T-107 headspace were sampled using SUMMATM canisters, which were analyzed by PNL, and triple sorbent traps (TSTs), which were analyzed by ORNL. Gas chromatography (GC) and mass spectroscopy (MS) were used by both laboratories to separate, identify, and quantitate the analytes. Descriptions of sample device cleaning, sample preparations, and analyses are given by Jenkins et al. (1995) and Pool et al. (1995).

SUMMATM sample results should be considered to be the primary organic vapor data for tank T-107. ORNL analyses of TST samples from this and other waste tanks generally agree with, support, and augment the SUMMATM sample results. However, because certain WHC quality assurance requirements were not satisfied by ORNL, the quality assurance assessment of ORNL by Hendrickson (1995) should

be reviewed before results unique to the TST samples are used for decision making.

X.3.1 Positively Identified Organic Compounds

Positive identification of organic analytes using the methods employed by PNL and ORNL involves matching the GC retention times and MS data from a sample with that obtained from analysis of known compounds. The concentration of an analyte in the sample is said to be quantitatively measured if the response of the GC/MS has been established at several known concentrations of that analyte (i.e., the GC/MS has been calibrated for that analyte), and the MS response to the analyte in the sample is between the lowest and highest responses to the known concentrations (i.e., the analyte is within the calibration range).

ORNL and PNL were assigned different lists of organic compounds, or target analytes, to positively identify and measure quantitatively. The ORNL target analyte list was derived from a review of the tank C-103 headspace constituents by a panel of toxicology experts (Mahlum et al. 1994). The PNL target analyte list was comprised of the 40 compounds in the Environmental Protection Agency (EPA) task order 14 (TO-14) method list, which consists primarily of halocarbons and common industrial solvents, plus 14 analytes selected from the toxicology panel's review of tank C-103.

Acetone, acetonitrile, and 2-butanone were the only SUMMATM sample target analytes detected above the 0.005 ppmv quantitation limit. The average concentrations of these compounds in the 3 SUMMATM samples is given in Table X-3. Analysis was performed according to the TO-14 methodology by PNL (EPA 1988, Pool et al. 1995).

Jenkins et al. (1995) report the positive identification of 24 of 27 target analytes in TST samples. 1,1-Dichloroethene, dibutyl butylphosphonate, and tributyl phosphate were the only target analytes not detected in the TST samples. The average concentrations of the target analytes, from the analysis of 3 TSTs, are given in Table X-4. Acetone, acetonitrile, 1-butanol, n-tridecane, and butanenitrile were the only TST target analytes above 0.005 ppmv.

Eleven target analytes were common to both TST and SUMMATM analyses. Table X-5 lists these, and their reported average concentrations in TST and SUMMATM samples. The reported TST sample concentrations of chlorinated compounds (i.e., 1,1-dichloroethene and dichloromethane) and nonpolar compounds (i.e., benzene, toluene, n-hexane, n-heptane, and n-decane) in Table X-5 are all $\leq$ 0.0012 ppmv, and well below the SUMMATM analysis method detection limit of 0.005 ppmv.

The acetone concentration in the SUMMATM samples was reported to be over 7 times as high as in TST samples. Comparison of SUMMATM and TST analyses of acetone in other waste tank samples indicates a similar relationship in 8 of

the 9 waste tanks reported to date¹, for which acetone has been quantitatively measured in SUMMATM samples. When compared to the 250 ppmv NIOSH 8-hr REL for acetone, even the more conservative value of 0.93 ppmv appears to be insignificant.

There is a similar disagreement regarding the acetonitrile concentration in SUMMATM and TST samples from tank T-107. As shown in Table X-5, the average concentration of acetonitrile in SUMMATM samples was more than 3 times that in TST samples. As with acetone, however, neither measurement is high compared to the 20 ppmv NIOSH 8-hr REL for acetonitrile. Until such discrepancies can be addressed, and in lieu of reasons to discount either results, the higher values should be used as the best measurement of such compounds.

X.3.2 Tentatively Identified Organic Compounds

In addition to the target analytes, the ORNL and PNL analytical procedures allow the tentative identification of other organic compounds. Tentative identification of analytes was performed by comparing the MS molecular fragmentation patterns with a library of known MS fragmentation patterns. This method allows an organic analyte to be identified (with reasonable certainty) as an alkane, a ketone, an aldehyde, etc., and may also determine its molecular weight. The method usually does not, however, allow the unambiguous identification of structural isomers, and this ambiguity increases with analyte molecular weight. Many analytes can be tentatively identified with reasonable confidence without having to inject each into the GC/MS to determine their GC retention times or specific MS patterns.

By the nature of the sampling devices, virtually all organic vapors present in the tank headspace are collected by both TST and SUMMATM samples. Analyses of the samples are designed to recover, separate, and identify the organic vapors in the samples. TSTs are not good for collecting highly volatile compounds (i.e., molecules more volatile than propane), but are quite good for most others. In contrast, the recovery of very low volatility compounds (i.e., molecules with more than about 15 carbon atoms) and some polar compounds with moderate volatility (i.e., butanal) from SUMMATM samples has been problematic.

The list of tentatively identified compounds recovered from SUMMATM samples, with estimated concentrations, is given in Table X-6. Compounds are listed in Table X-6 in the order by which they eluted chromatographically, and only non-zero results are included in the reported averages. The list of tentatively identified compounds detected in TST samples, and their estimated concentrations, is given in Table X-7. Compounds are listed in Table X-7 according to the order by which they eluted chromatographically. The averages

¹ The acetone concentrations in tanks BY-103, BY-107, BY-110, BY-111, C-103, TX-105, and TX-118 in SUMMATM samples were reported to be 1.7 to 4.5 times higher than in TST samples. In the tank BY-108 samples the same factor was about 0.5.

reported by ORNL in Table X-7 are all 3-sample averages, and if an analyte was not detected in a sample, its concentration in that sample was considered to be zero for averaging purposes. Estimated concentrations are in mg/m^3 , based on dry air at 0 °C and 1.01 bar.

The tentatively identified organic compounds in TST samples given in X-7 are reordered in Table X-8, where they are sorted alphanumerically. Though the chemical nomenclature is not completely consistent, this arrangement groups related compounds (e.g., nitric acid esters). The same compounds are also presented in Table X-9, where they are sorted according to their average estimated concentrations. The analyte's "Cmpd #", given in the first column of Tables X-7, X-8, and X-9 are consistent.

Concentrations given in Tables X-6 and X-7 should be considered rough estimates. Results in Tables X-6 and X-7 are presented in terms of observed peaks, and are not adjusted for the occurrence of split chromatographic peaks or the assignment of the same identity to different peaks (e.g., Cmpd # 53 and 62 in Table X-7). In these instances, the estimated concentration of a compound appearing as a doublet or triplet is simply the sum of the individual peak estimates.

The ORNL and PNL methods used to tentatively identify and estimate concentrations are described by Jenkins et al. (1995) and Pool et al. (1995), respectively, and should be reviewed before this data is used for decision making. The proper quantitation of all observed analytes is outside the scope and budget of these analyses, and the estimation of concentrations involves several important assumptions. The validity of each assumption depends on the analyte, and such factors as the specific configuration of the analytical instrumentation.

X.3.4 Discussion of Organic Compounds

A convenient way to consider the organic compounds listed in Tables X-4 through X-7 is to separate them into 2 categories: 1) organic compounds added to tank T-107 as waste that are still evaporating, and 2) organic compounds that have been generated by reactions of the original waste.

The first category encompasses all organic compounds that were placed into the tank as waste. It includes the tentatively identified alkyl-substituted decahydronaphthalenes, and semivolatile branched and straight-chain alkanes. These were used as diluents of tributyl phosphate in various plutonium extraction processes. The semivolatile straight-chain alkanes (i.e., n-undecane, n-dodecane, n-tridecane, n-tetradecane, and n-pentadecane) are often referred to in Hanford site literature as the normal paraffinic hydrocarbons (NPHs). Halogenated solvents, such as trichlorofluoromethane, were probably also placed into the waste tanks as waste. These may have been used as cleaning solvents, and may have been sent to the waste tanks when contaminated.

The tentatively identified cyclosiloxanes and silanes (i.e., Cmpd # 3, 11, 37, and 55 in Table X-7) are also in this category. Small quantities of siloxanes may have been introduced to the waste tank through disposal of hydraulic fluids, but they may also be present in the headspace due to their use in liquid traps at the tank's breather riser.

The second category includes all organic compounds that have been generated via radiolytic and chemical reactions of the waste. The majority of compounds listed in Tables X-3 through X-7 fall into this category, including the alcohols, aldehydes, ketones, nitriles, alkenes, alkyl nitrates, and volatile alkanes, all of which have been associated with the degradation of the NPHs. The hydrolysis of tributyl phosphate, for example, is thought to be the principal source of 1-butanol. By far the most abundant of these in the headspace are the short-chain volatile compounds, however, near the bottom of Table X-7 are several long-chain low volatility compounds that are also probably waste reaction products.

Samples from tank T-107 were found to have a several alkyl nitrates (i.e., nitric acid esters). Though it is reasonable to expect alkyl nitrates to be produced via chemical and radiolytic processes of the NPHs with other waste, their solubility in the aqueous waste supernates would also be expected to significantly reduce their vapor-phase concentrations. That these constituents are at detectible levels in tank T-107 may indicate dry conditions where they are formed.

The notable absence of tributyl phosphate in the tank T-107 samples may be due to a sampling difficulty. The presence of the tributyl phosphate diluents and their degradation products is reason to expect tributyl phosphate to be present in the tank waste. 1-Butanol, which was the fourth most abundant compound found in TST samples, is known to be a product of the hydrolysis of tributyl phosphate. Furthermore, informal tests by ORNL indicate that tributyl phosphate is adsorbed by the glass fiber filters used during sampling to protect the samples from radiolytic particulate contamination. Based on these considerations, the concentration of tributyl phosphate in the tank T-107 headspace should be considered to be unknown.

Though there are many compounds listed in Tables X-3 through X-7, the tank T-107 headspace has a relatively low total organic vapor concentration. The sum of quantitatively measured and estimated TST organic analyte concentrations, by GC/MS analyses, is 1.4 mg/m^3 (Jenkins et al. 1995). EPA task order 12 (T0-12) total nonmethane organic compound measurements of other waste tanks have ranged from as high as $5,000 \text{ mg/m}^3$ in tank C-103 (Rasmussen and Einfeld 1994), to as low as 0.18 mg/m^3 in tank C-111 (Rasmussen 1994), and is about 0.03 to 0.1 mg/m^3 in clean ambient air. In particular, the large number of compounds positively and tentatively identified in TST samples is primarily due to the relatively large 4.0 L TST sample volumes collected.

In summary, the organic vapor concentrations in tank T-107 are relatively low. While not completely typical of NPH-rich tanks, the organic vapors in tank T-107 clearly indicate the presence of trace amounts of the semivolatile NPHs

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and their degradation products. At the reported concentrations, the target analytes do not individually or collectively represent a flammability hazard.

Table X-1
Tank T-107 Gas and Vapor Sample Type and Number

Laboratory	Sampling Device	Nominal Sample Volume (L)	Target Analytes	Number of Samples
Oak Ridge National Laboratories	Triple Sorbent Trap	0.2, 1.0, and 4.0	Organic vapors	12 tank air samples, + 2 trip blanks + 2 field blanks
Pacific Northwest Laboratories	Acidified Carbon Sorbent Trap	3.0	Ammonia	6 tank air samples + 3 trip blank
	Triethanolamine Sorbent Trap	3.0	Nitrogen Dioxide	6 tank air samples + 3 trip blank
	Oxidation Bed + Triethanolamine Sorbent Trap	3.0	Nitric Oxide	6 tank air samples + 3 trip blank
	Silica Gel Sorbent Trap	3.0	Water vapor	6 tank air samples + 3 trip blanks
	SUMMA™ canister	6.0	Organic vapors	3 tank air samples + 2 ambient air samples
WHC 222-S Laboratory	Silica Gel Sorbent Trap	1.0	Tritium-Substituted Water Vapor	1 tank air sample

Table X-2
Tank T-107 Inorganic Gas and Vapor Concentrations

Compound	CAS ¹ number	Sample Type	Number of samples	Average (ppmv)	Standard Deviation (ppmv)	RSD ² (%)
Ammonia, NH ₃	7664-41-7	Sorbent Trap	6	125	2	6
Carbon dioxide, CO ₂	124-38-9	SUMMA TM	3	75	10	13
Carbon monoxide, CO	630-08-0	SUMMA TM	3	< 12	--	--
Hydrogen, H ₂	1333-74-0	SUMMA TM	3	< 94	--	--
Nitric oxide, NO	10102-43-9	Sorbent Trap	6	≤ 0.05	--	10
Nitrogen dioxide, NO ₂	10102-44-0	Sorbent Trap	6	≤ 0.03	--	--
Nitrous oxide, N ₂ O	10024-97-2	SUMMA TM	3	41.5	6.2	15
Water vapor, H ₂ O	7732-18-5	Sorbent Trap	6	16,300 (12.1 mg/L)	200 (0.2 mg/L)	1.3

1. CAS = Chemical Abstracts Service.

2. RSD = relative standard deviation.

Table X-3
Tank T-107 Positively Identified Organic Compounds in SUMMA™ Samples

Cmpd #	Compound	CAS ¹ Number	Average (ppmv)	Standard Deviation (ppmv)	RSD ² (%)
1	Propanone (acetone)	67-64-1	0.93	0.062	7
2	2-Butanone	78-93-3	0.033	0.005	15
3	Ethanenitrile (acetonitrile)	75-05-8	0.17	0.008	5

1. CAS = Chemical Abstract Service.

2. RSD = relative standard deviation.

Table X-4
Tank T-107 Positively Identified Organic Compounds in TST Samples

Cmpd #	Compound	CAS ¹ Number	Average (ppmv)	Standard Deviation (ppmv)	RSD ² (%)
1	Ethanenitrile (acetonitrile)	75-05-8	0.048	0.018	37
2	Propanone (acetone) ³	67-64-1	0.12	0.05	46
3	Dichloromethane (methylene chloride) ⁴	75-09-2	0.00061	0.00063	104
4	Propanenitrile	107-12-0	0.0031	0.0024	77
5	Butanal ⁴	123-72-8	0.00027	0.00055	200
6	n-Hexane ⁴	110-54-3	0.00078	0.00030	38
7	Benzene ⁴	71-43-2	0.00076	0.00031	41
8	1-Butanol	71-36-3	0.023	0.0036	16
9	Butanenitrile	109-74-0	0.0054	0.0012	22
10	2-Pentanone	107-87-9	0.0030	0.0008	27
11	n-Heptane	142-82-5	0.00049	0.00018	37
12	Toluene	108-88-3	0.0012	0.0004	33
13	Pentanenitrile	110-59-8	0.0018	0.0003	17
14	2-Hexanone	591-78-6	0.00073	0.00016	21
15	n-Octane	111-65-9	0.00042	0.00010	23
16	Hexanenitrile	628-73-9	0.0011	0.0002	16
17	2-Heptanone	110-43-0	0.00074	0.00020	27
18	n-Nonane	111-84-2	0.00028	0.00013	47
19	Heptanenitrile	629-08-3	0.00079	0.00009	12
20	2-Octanone	111-13-7	0.00033	0.00007	20
21	n-Decane	124-18-5	0.00052	0.00010	19
22	n-Undecane	1120-21-4	0.0015	0.0002	11
23	n-Dodecane	112-70-3	0.0021	0.0004	21
24	n-Tridecane	629-50-5	0.0056	0.0019	33
Sum of positively identified compounds:			0.62 mg/m ³		

WHC-SD-WM-ER-447 REV. 0

1. CAS = Chemical Abstract Service.
2. RSD = relative standard deviation.
3. Two or more samples were outside calibration range.
4. Two or more samples were below the calibration range.

Table X-5
Tank T-107 Comparison of Positively Identified Organic
Compounds in TST and SUMMA™ Samples

Compound	CAS ¹ Number	TST Average (ppmv)	SUMMA™ Average (ppmv)
1,1-Dichloroethene (vinylidene chloride)	75-35-4	< 0.00058	< 0.005
Dichloromethane (methylene chloride)	75-09-2	0.00061	< 0.005
Propanone (acetone)	67-64-1	0.12	0.93
Ethanenitrile (acetonitrile)	75-05-8	0.048	0.17
Propanenitrile	107-12-0	0.0031	< 0.005
Butanenitrile	109-74-0	0.0054	< 0.005
Benzene	71-43-2	0.00076	< 0.005
Toluene	108-88-3	0.0012	< 0.005
n-Hexane	110-54-3	0.00078	< 0.005
n-Heptane	142-82-5	0.00049	< 0.005
n-Decane	124-18-5	0.00052	< 0.005

1. CAS = Chemical Abstract Service.

Table X-6
Tank T-107 Tentatively Identified Organic Compounds in SUMMA™ Samples

Cmpd #	Compound	CAS ¹ Number	Average (mg/m ³)	Standard Deviation (mg/m ³)
1	Propane ²	74-98-6	0.22	0.005 ³
2	Methanol (methyl alcohol)	67-56-1	1.11	0.07
3	Ethanol ⁴	64-17-5	0.12	--
4	1-Butanol	71-36-3	0.09	< 0.005
Sum of tentatively identified compounds:			1.92	

1. CAS = Chemical Abstract Service.
2. Detected in only 2 samples.
3. 2-sample statistic is average deviation (i.e., range divided by 2).
4. Detected in only 1 sample.

Table X-7
Tank T-107 Tentatively Identified Organic Compounds in TST Samples

Cmpd #	Compound	CAS ¹ Number	Average (mg/m ³)	Standard Deviation (mg/m ³)
1	Methyl Alcohol	67-56-1	0.13	0.01
2	Methyl formate	107-31-3	0.00075	0.00130
3	Silane, fluorotrimethyl	420-56-4	0.00066	0.00114
4	Methane, dichlorofluoro	75-43-4	0.00076	0.00132
5	Ethanol	64-17-5	0.023	0.004
6	Trichloromonofluoromethane	75-69-4	0.038	0.054
7	Isopropyl Alcohol	67-63-0	0.020	0.006
8	Nitric acid, methyl ester	598-58-3	0.00078	0.00136
9	Pentane, 2-methyl-	107-83-5	0.0013	0.0012
10	1-Propanol	71-23-8	0.010	0.002
11	Silanol, trimethyl-	1066-40-6	0.0026	0.0005
12	2-Butanone	78-93-3	0.0024	0.0023
13	1-Hexene, 3,4-dimethyl	16745-94-1	0.00063	0.00109
14	Nitric acid, ethyl ester	625-58-1	0.0053	0.0034
15	1-Propanol, 2-methyl	78-83-1	0.00066	0.00115
16	Furan, tetrahydro-	109-99-9	0.00053	0.00092
17	Acetic acid, methyl ester	79-20-9	0.028	0.016
18	Acetic acid	64-19-7	0.024	0.021
19	2-Butanone, 3-methyl	563-80-4	0.00072	0.00125
20	3-Pentanone	96-22-0	0.0032	0.0006
21	2-Butanol	78-92-2	0.0038	0.0010
22	2-Butanone, 3,3-dimethyl	75-97-8	0.0020	0.0004
23	Nitric acid, propyl ester	627-13-4	0.0071	0.0007
24	Propanoic acid	79-09-4	0.0012	0.0011
25	2-Pentanol, 2-methyl	590-36-3	0.00052	0.00090
26	Pyrazine	290-37-9	0.0034	0.0017
27	Butane, 1-nitro	627-05-4	0.0018	0.0016

Cmpd #	Compound	CAS ¹ Number	Average (mg/m ³)	Standard Deviation (mg/m ³)
28	2-Hexanol, 5-methyl	627-59-8	0.0028	0.0007
29	3-Pentanone, 2-methyl	565-69-5	0.00051	0.00089
30	2-Pentene, 2-methoxy-	61142-47-0	0.0016	0.0014
31	2-Pentanone, 3-methyl	565-61-7	0.00047	0.00081
32	Propylene Glycol	57-55-6	0.023	0.024
33	2-Pentanone, 4,4-dimethyl	590-50-1	0.0023	0.0002
34	3-Hexanone	589-38-8	0.0017	0.0002
35	2H-Pyran-2-one, tetrahydro-5,6-dimethyl-	24405-16-1	0.011	0.001
36	Tetrachloroethylene	127-18-4	0.010	0.002
37	Cyclotrisiloxane, hexamethyl	541-05-9	0.014	0.006
38	Nitric acid, butyl ester	928-45-0	0.0070	0.0006
39	1-Hexanol and others		0.0020	0.0003
40	Cycloheptane, 1,3-dimethoxy-, trans	29887-79-4	0.0021	0.0003
41	Ethylbenzene and others		0.00046	0.00079
42	1-Hexanol	111-27-3	0.0071	0.0011
43	p-Xylene	106-42-3	0.0010	0.0009
44	1-Pentene, 4,4-dimethyl	762-62-9	0.0025	0.0004
45	3-Heptanone	106-35-4	0.0044	0.0003
46	2-Heptanol	543-49-7	0.0021	0.0004
47	Heptanal	111-71-7	0.0030	0.0005
48	3-Aminopropionitrile	151-18-8	0.0024	0.0001
49	Nitric acid, pentyl ester	1002-16-0	0.0036	0.0006
50	3-Ethyl-2-methyl-2-pentanol		0.00042	0.00073
51	Cyclohexane, 1,2,3-trimethyl	1678-97-3	0.00046	0.00080
52	2-Heptanone, 6-methyl	928-68-7	0.0072	0.0008
53	1-Hexanol, 2-ethyl-	104-76-7	0.0050	0.0002
54	1-Heptanol	111-70-6	0.0072	0.0005

Cmpd #	Compound	CAS ¹ Number	Average (mg/m ³)	Standard Deviatjon (mg/m ³)
55	Cyclotetrasiloxane, octamethyl	556-67-2	0.010	0.009
56	.alpha.-Methylstyrene and others		0.0012	0.0011
57	Benzonitrile	100-47-0	0.0020	0.0003
58	Octanal	124-13-0	0.0028	0.0004
59	Cyclopropane, 1-ethyl-2-pentyl	62238-08-8	0.0016	0.0002
60	Nonane, 2,6-dimethyl-	17302-28-2	0.0020	0.00002
61	Nitric acid, hexyl ester	20633-11-8	0.0015	0.0001
62	1-Hexanol, 2-ethyl-	104-76-7	0.017	0.005
63	Mixture		0.0011	0.0010
64	Benzyl Alcohol	100-51-6	0.0012	0.0010
65	Cyclohexanone, 3,3,5-trimethyl	873-94-9	0.0016	0.0001
66	5-Undecene	4941-53-1	0.0023	0.0002
67	Decane , 2-methyl	6975-98-0	0.0005	0.0009
68	1-Octanol	111-87-5	0.0025	0.0001
69	Decahydronaphthalene	493-02-7	0.00048	0.00083
70	Phenol, 3-methyl-	108-39-4	0.0019	0.0001
71	Acetophenone	98-86-2	0.0041	0.0009
72	Octanenitrile	124-12-9	0.0048	0.0003
73	Cyclohexane, 1,2,3-trimethyl-	1678-97-3	0.0028	0.0003
74	2-Nonanone	821-55-6	0.0020	0.0001
75	Nonanal	124-19-6	0.0087	0.0001
76	Naphthalene, decahydro-2-methyl and others		0.0020	0.0017
77	Benzoic acid, 2-[(trimethylsilyloxy) trimethyl]	3789-85-3	0.0040	0.0006
78	Cyclohexane, pentyl	4292-92-6	0.0016	0.0002
79	Hexane, 2,3,3-trimethyl-	16747-28-7	0.0021	0.0010
80	Nonanol	28473-21-4	0.0032	0.0011

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Cmpd #	Compound	CAS ¹ Number	Average (mg/m ³)	Standard Deviation (mg/m ³)
81	Nonanenitrile	2243-27-8	0.0026	0.0022
82	2-Decanone	693-54-9	0.0024	0.00005
83	Ethanone, 1-(3-methylphenyl)-	585-74-0	0.0012	0.0010
84	Decanal	112-31-2	0.0034	0.0001
85	Undecane, 2,6-dimethyl-	17301-23-4	0.0024	0.0003
86	Benzene, 1-methyl-4-nitro-	99-99-0	0.0020	0.0003
87	Benzene, 1-methyl-4-nitro- & cyclohexane, 2-butyl-1,1, 3-trimethyl		0.0016	0.0001
88	Cyclohexane, hexyl	4292-75-5	0.0022	0.0005
89	Benzothiazole	95-16-9	0.0038	0.0003
90	Decane, 2-methyl	6975-98-0	0.0046	0.0005
91	2(3H)-Furanone, 5-ethyldihydro	695-06-7	0.0020	0.0001
92	4-Undecanol	4272-06-4	0.0024	0.0006
93	1-Octadecyne	629-89-0	0.0019	0.0002
94	Tridecane, 6-methyl-	13287-21-3	0.0013	0.0011
95	Tridecane, 4-methyl-	26730-12-1	0.0021	0.0004
96	Tridecane, 2-methyl-	1560-96-9	0.0015	0.0013
97	Undecane, 2,9-dimethyl-	17301-26-7	0.0014	0.0012
98	Dodecane, 2,6,11-trimethyl	31295-56-4	0.016	0.003
99	Butanoic acid, 1-methylpropyl ester	819-97-6	0.00046	0.00080
100	Tetradecane	629-59-4	0.030	0.007
101	Decane, 2,3,5-trimethyl-	62238-11-3	0.0025	0.0008
102	Nonane, 5-(2-methylpropyl)-	62185-53-9	0.0011	0.0010
103	Diphenyl ether	101-84-8	0.0024	0.0002
104	Dodecane, 2,6,10-trimethyl	3891-98-3	0.00092	0.00159
105	Tetradecane, 5-methyl	25117-32-2	0.00058	0.00100
106	Tetradecane, 4-methyl	25117-24-2	0.0014	0.0012

Cmpd #	Compound	CAS ¹ Number	Average (mg/m ³)	Standard Deviation (mg/m ³)
107	Decane, 5-propyl-	17312-62-8	0.028	0.007
108	Tetradecane, 3-methyl	18435-22-8	0.0029	0.0008
109	6-Dodecanone	6064-27-3	0.0016	0.0002
110	Tetradecane	629-59-4	0.0016	0.0001
111	2,5-Cyclohexadiene-1,4-dione, 2,6-bis-(1,1-dimethylethyl)-	719-22-2	0.00058	0.00101
112	Pentadecane	629-62-9	0.040	0.012
113	Cyclohexane, 1,(1,5-dimethylhexyl)-	29799-19-7	0.0014	0.0012
114	Nonane, 2-methyl-5-propyl-	31081-17-1	0.00072	0.00125
115	Hexadecane, 7,9-dimethyl	21164-95-4	0.0020	0.0018
116	Undecane, 4-methyl	2980-69-0	0.00045	0.00078
117	Octadecane, 2-methyl	1560-88-9	0.0020	0.0017
118	Cyclohexane, (4-methylpentyl)-	61142-20-9	0.0026	0.0006
119	Tridecane, 2-methyl-	1560-96-9	0.00046	0.00079
120	Tetradecane, 6,9-dimethyl	55045-13-1	0.00045	0.00078
121	Hexadecane	544-76-3	0.016	0.006
122	2-Furanmethanol, tetrahydro-, acetate	637-64-9	0.0030	0.0003
123	Octanal, 7-hydroxy-3,7-dimethyl	107-75-5	0.00044	0.00076
124	Hexadecane, 2,6,10,14-tetramethyl-	638-36-8	0.0036	0.0012
125	Heptadecane	629-78-7	0.0033	0.0009
126	Octadecane, 2,6-dimethyl	75163-97-2	0.0012	0.0010
127	Benzenesulfonamide, N-butyl	3622-84-2	0.021	0.002
128	Octadecane	593-45-3	0.017	0.018
129	Isopropyl Palmitate	142-91-6	0.0037	0.0020
Sum of tentatively identified compounds:			0.78	

1. CAS = Chemical Abstract Service.

Table X-8
Tank T-107 Tentatively Identified Organic Compounds
in TST Samples -- Sorted Alphabetically

Cmpd #	Compound	CAS ¹ Number	Average (mg/m ³)	Standard Deviation (mg/m ³)
56	.alpha.-Methylstyrene and others		0.0012	0.0011
15	1-Propanol, 2-methyl	78-83-1	0.00066	0.00115
62	1-Hexanol, 2-ethyl-	104-76-7	0.017	0.005
54	1-Heptanol	111-70-6	0.0072	0.0005
13	1-Hexene, 3,4-dimethyl	16745-94-1	0.00063	0.00109
42	1-Hexanol	111-27-3	0.0071	0.0011
44	1-Pentene, 4,4-dimethyl	762-62-9	0.0025	0.0004
68	1-Octanol	111-87-5	0.0025	0.0001
53	1-Hexanol, 2-ethyl-	104-76-7	0.0050	0.0002
39	1-Hexanol and others		0.0020	0.0003
93	1-Octadecyne	629-89-0	0.0019	0.0002
10	1-Propanol	71-23-8	0.010	0.002
12	2-Butanone	78-93-3	0.0024	0.0023
28	2-Hexanol, 5-methyl	627-59-8	0.0028	0.0007
52	2-Heptanone, 6-methyl	928-68-7	0.0072	0.0008
46	2-Heptanol	543-49-7	0.0021	0.0004
25	2-Pentanol, 2-methyl	590-36-3	0.00052	0.00090
74	2-Nonanone	821-55-6	0.0020	0.0001
122	2-Furanmethanol, tetrahydro-, acetate	637-64-9	0.0030	0.0003
30	2-Pentene, 2-methoxy-	61142-47-0	0.0016	0.0014
31	2-Pentanone, 3-methyl	565-61-7	0.00047	0.00081
19	2-Butanone, 3-methyl	563-80-4	0.00072	0.00125
33	2-Pentanone, 4,4-dimethyl	590-50-1	0.0023	0.0002
82	2-Decanone	693-54-9	0.0024	0.00005
21	2-Butanol	78-92-2	0.0038	0.0010

Cmpd #	Compound	CAS ¹ Number	Average (mg/m ³)	Standard Deviation (mg/m ³)
22	2-Butanone, 3,3-dimethyl	75-97-8	0.0020	0.0004
91	2(3H)-Furanone, 5-ethylidihydro	695-06-7	0.0020	0.0001
111	2,5-Cyclohexadiene-1,4-dione, 2,6-bis-(1,1-dimethylethyl)-	719-22-2	0.00058	0.00101
35	2H-Pyran-2-one, tetrahydro-5,6-dimethyl-	24405-16-1	0.011	0.001
29	3-Pentanone, 2-methyl	565-69-5	0.00051	0.00089
20	3-Pentanone	96-22-0	0.0032	0.0006
34	3-Hexanone	589-38-8	0.0017	0.0002
50	3-Ethyl-2-methyl-2-pentanol		0.00042	0.00073
48	3-Aminopropionitrile	151-18-8	0.0024	0.0001
45	3-Heptanone	106-35-4	0.0044	0.0003
92	4-Undecanol	4272-06-4	0.0024	0.0006
66	5-Undecene	4941-53-1	0.0023	0.0002
109	6-Dodecanone	6064-27-3	0.0016	0.0002
18	Acetic acid	64-19-7	0.024	0.021
17	Acetic acid, methyl ester	79-20-9	0.028	0.016
71	Acetophenone	98-86-2	0.0041	0.0009
87	Benzene, 1-methyl-4-nitro- & cyclohexane, 2-butyl-1,1, 3-trimethyl		0.0016	0.0001
86	Benzene, 1-methyl-4-nitro-	99-99-0	0.0020	0.0003
127	Benzenesulfonamide, N-butyl	3622-84-2	0.021	0.002
77	Benzoic acid, 2-[(trimethylsilyloxy) trimethyl]	3789-85-3	0.0040	0.0006
57	Benzonitrile	100-47-0	0.0020	0.0003
89	Benzothiazole	95-16-9	0.0038	0.0003
64	Benzyl Alcohol	100-51-6	0.0012	0.0010
27	Butane, 1-nitro	627-05-4	0.0018	0.0016

Cmpd #	Compound	CAS ¹ Number	Average (mg/m ³)	Standard Deviation (mg/m ³)
99	Butanoic acid, 1-methylpropyl ester	819-97-6	0.00046	0.00080
40	Cycloheptane, 1,3-dimethoxy-, trans	29887-79-4	0.0021	0.0003
113	Cyclohexane, 1,(1,5-dimethylhexyl)-	29799-19-7	0.0014	0.0012
51	Cyclohexane, 1,2,3-trimethyl	1678-97-3	0.00046	0.00080
88	Cyclohexane, hexyl	4292-75-5	0.0022	0.0005
118	Cyclohexane, (4-methylpentyl)-	61142-20-9	0.0026	0.0006
78	Cyclohexane, pentyl	4292-92-6	0.0016	0.0002
73	Cyclohexane, 1,2,3-trimethyl-	1678-97-3	0.0028	0.0003
65	Cyclohexanone, 3,3,5-trimethyl	873-94-9	0.0016	0.0001
59	Cyclopropane, 1-ethyl-2-pentyl	62238-08-8	0.0016	0.0002
55	Cyclotetrasiloxane, octamethyl	556-67-2	0.010	0.009
37	Cyclotrisiloxane, hexamethyl	541-05-9	0.014	0.006
69	Decahydronaphthalene	493-02-7	0.00048	0.00083
84	Decanal	112-31-2	0.0034	0.0001
90	Decane, 2-methyl	6975-98-0	0.0046	0.0005
67	Decane, 2-methyl	6975-98-0	0.0005	0.0009
101	Decane, 2,3,5-trimethyl-	62238-11-3	0.0025	0.0008
107	Decane, 5-propyl-	17312-62-8	0.028	0.007
103	Diphenyl ether	101-84-8	0.0024	0.0002
98	Dodecane, 2,6,11-trimethyl	31295-56-4	0.016	0.003
104	Dodecane, 2,6,10-trimethyl	3891-98-3	0.00092	0.00159
5	Ethanol	64-17-5	0.023	0.004
83	Ethanone, 1-(3-methylphenyl)-	585-74-0	0.0012	0.0010
41	Ethylbenzene and others		0.00046	0.00079
16	Furan, tetrahydro-	109-99-9	0.00053	0.00092
125	Heptadecane	629-78-7	0.0033	0.0009

Cmpd #	Compound	CAS ¹ Number	Average (mg/m ³)	Standard Deviation (mg/m ³)
47	Heptanal	111-71-7	0.0030	0.0005
121	Hexadecane	544-76-3	0.016	0.006
124	Hexadecane, 2,6,10,14-tetramethyl-	638-36-8	0.0036	0.0012
115	Hexadecane, 7,9-dimethyl	21164-95-4	0.0020	0.0018
79	Hexane, 2,3,3-trimethyl-	16747-28-7	0.0021	0.0010
129	Isopropyl Palmitate	142-91-6	0.0037	0.0020
7	Isopropyl Alcohol	67-63-0	0.020	0.006
4	Methane, dichlorofluoro	75-43-4	0.00076	0.00132
2	Methyl formate	107-31-3	0.00075	0.00130
1	Methyl Alcohol	67-56-1	0.13	0.01
63	Mixture		0.0011	0.0010
76	Naphthalene, decahydro-2-methyl and others		0.0020	0.0017
61	Nitric acid, hexyl ester	20633-11-8	0.0015	0.0001
49	Nitric acid, pentyl ester	1002-16-0	0.0036	0.0006
14	Nitric acid, ethyl ester	625-58-1	0.0053	0.0034
23	Nitric acid, propyl ester	627-13-4	0.0071	0.0007
8	Nitric acid, methyl ester	598-58-3	0.00078	0.00136
38	Nitric acid, butyl ester	928-45-0	0.0070	0.0006
75	Nonanal	124-19-6	0.0087	0.0001
114	Nonane, 2-methyl-5-propyl-	31081-17-1	0.00072	0.00125
102	Nonane, 5-(2-methylpropyl)-	62185-53-9	0.0011	0.0010
60	Nonane, 2,6-dimethyl-	17302-28-2	0.0020	0.00002
81	Nonanenitrile	2243-27-8	0.0026	0.0022
80	Nonanol	28473-21-4	0.0032	0.0011
126	Octadecane, 2,6-dimethyl	75163-97-2	0.0012	0.0010
128	Octadecane	593-45-3	0.017	0.018
117	Octadecane, 2-methyl	1560-88-9	0.0020	0.0017

Cmpd #	Compound	CAS ¹ Number	Average (mg/m ³)	Standard Deviation (mg/m ³)
123	Octanal, 7-hydroxy-3,7-dimethyl	107-75-5	0.00044	0.00076
58	Octanal	124-13-0	0.0028	0.0004
72	Octanenitrile	124-12-9	0.0048	0.0003
43	p-Xylene	106-42-3	0.0010	0.0009
112	Pentadecane	629-62-9	0.040	0.012
9	Pentane, 2-methyl-	107-83-5	0.0013	0.0012
70	Phenol, 3-methyl-	108-39-4	0.0019	0.0001
24	Propanoic acid	79-09-4	0.0012	0.0011
32	Propylene Glycol	57-55-6	0.023	0.024
26	Pyrazine	290-37-9	0.0034	0.0017
3	Silane, fluorotrimethyl	420-56-4	0.00066	0.00114
11	Silanol, trimethyl-	1066-40-6	0.0026	0.0005
36	Tetrachloroethylene	127-18-4	0.010	0.002
106	Tetradecane, 4-methyl	25117-24-2	0.0014	0.0012
100	Tetradecane	629-59-4	0.030	0.007
120	Tetradecane, 6,9-dimethyl	55045-13-1	0.00045	0.00078
108	Tetradecane, 3-methyl	18435-22-8	0.0029	0.0008
105	Tetradecane, 5-methyl	25117-32-2	0.00058	0.00100
110	Tetradecane	629-59-4	0.0016	0.0001
6	Trichloromonofluoromethane	75-69-4	0.038	0.054
96	Tridecane, 2-methyl-	1560-96-9	0.0015	0.0013
95	Tridecane, 4-methyl-	26730-12-1	0.0021	0.0004
94	Tridecane, 6-methyl-	13287-21-3	0.0013	0.0011
119	Tridecane, 2-methyl-	1560-96-9	0.00046	0.00079
85	Undecane, 2,6-dimethyl-	17301-23-4	0.0024	0.0003
116	Undecane, 4-methyl	2980-69-0	0.00045	0.00078
97	Undecane, 2,9-dimethyl-	17301-26-7	0.0014	0.0012

1. CAS = Chemical Abstract Service.

Table X-9
Tank T-107 Tentatively Identified Organic Compounds
in TST Samples -- Sorted by Average Concentration

Cmpd #	Compound	CAS ¹ Number	Average (mg/m ³)	Standard Deviation (mg/m ³)
1	Methyl Alcohol	67-56-1	0.13	0.01
112	Pentadecane	629-62-9	0.040	0.012
6	Trichloromonofluoromethane	75-69-4	0.038	0.054
100	Tetradecane	629-59-4	0.030	0.007
17	Acetic acid, methyl ester	79-20-9	0.028	0.016
107	Decane, 5-propyl-	17312-62-8	0.028	0.007
18	Acetic acid	64-19-7	0.024	0.021
32	Propylene Glycol	57-55-6	0.023	0.024
5	Ethanol	64-17-5	0.023	0.004
127	Benzenesulfonamide, N-butyl	3622-84-2	0.021	0.002
7	Isopropyl Alcohol	67-63-0	0.020	0.006
128	Octadecane	593-45-3	0.017	0.018
62	1-Hexanol, 2-ethyl-	104-76-7	0.017	0.005
121	Hexadecane	544-76-3	0.016	0.006
98	Dodecane, 2,6,11-trimethyl	31295-56-4	0.016	0.003
37	Cyclotrisiloxane, hexamethyl	541-05-9	0.014	0.006
35	2H-Pyran-2-one, tetrahydro-5,6-dimethyl-	24405-16-1	0.011	0.001
36	Tetrachloroethylene	127-18-4	0.010	0.002
55	Cyclotetrasiloxane, octamethyl	556-67-2	0.010	0.009
10	1-Propanol	71-23-8	0.010	0.002
75	Nonanal	124-19-6	0.0087	0.0001
54	1-Heptanol	111-70-6	0.0072	0.0005
52	2-Heptanone, 6-methyl	928-68-7	0.0072	0.0008
42	1-Hexanol	111-27-3	0.0071	0.0011
23	Nitric acid, propyl ester	627-13-4	0.0071	0.0007
38	Nitric acid, butyl ester	928-45-0	0.0070	0.0006

Cmpd #	Compound	CAS ¹ Number	Average (mg/m ³)	Standard Deviation (mg/m ³)
14	Nitric acid, ethyl ester	625-58-1	0.0053	0.0034
53	1-Hexanol, 2-ethyl-	104-76-7	0.0050	0.0002
72	Octanenitrile	124-12-9	0.0048	0.0003
90	Decane, 2-methyl	6975-98-0	0.0046	0.0005
45	3-Heptanone	106-35-4	0.0044	0.0003
71	Acetophenone	98-86-2	0.0041	0.0009
77	Benzoic acid, 2-[(trimethyl- silyloxy) trimethyl)	3789-85-3	0.0040	0.0006
21	2-Butanol	78-92-2	0.0038	0.0010
89	Benzothiazole	95-16-9	0.0038	0.0003
129	Isopropyl Palmitate	142-91-6	0.0037	0.0020
49	Nitric acid, pentyl ester	1002-16-0	0.0036	0.0006
124	Hexadecane, 2,6,10,14-tetramethyl-	638-36-8	0.0036	0.0012
26	Pyrazine	290-37-9	0.0034	0.0017
84	Decanal	112-31-2	0.0034	0.0001
125	Heptadecane	629-78-7	0.0033	0.0009
80	Nonanol	28473-21-4	0.0032	0.0011
20	3-Pentanone	96-22-0	0.0032	0.0006
122	2-Furanmethanol, tetrahydro-, acetate	637-64-9	0.0030	0.0003
47	Heptanal	111-71-7	0.0030	0.0005
108	Tetradecane, 3-methyl	18435-22-8	0.0029	0.0008
73	Cyclohexane, 1,2,3-trimethyl-	1678-97-3	0.0028	0.0003
58	Octanal	124-13-0	0.0028	0.0004
28	2-Hexanol, 5-methyl	627-59-8	0.0028	0.0007
81	Nonanenitrile	2243-27-8	0.0026	0.0022
11	Silanol, trimethyl-	1066-40-6	0.0026	0.0005
118	Cyclohexane, (4-methylpentyl)-	61142-20-9	0.0026	0.0006

Cmpd #	Compound	CAS ¹ Number	Average (mg/m ³)	Standard Deviation (mg/m ³)
44	1-Pentene, 4,4-dimethyl	762-62-9	0.0025	0.0004
101	Decane, 2,3,5-trimethyl-	62238-11-3	0.0025	0.0008
68	1-Octanol	111-87-5	0.0025	0.0001
12	2-Butanone	78-93-3	0.0024	0.0023
85	Undecane, 2,6-dimethyl-	17301-23-4	0.0024	0.0003
103	Diphenyl ether	101-84-8	0.0024	0.0002
92	4-Undecanol	4272-06-4	0.0024	0.0006
82	2-Decanone	693-54-9	0.0024	0.00005
48	3-Aminopropionitrile	151-18-8	0.0024	0.0001
33	2-Pentanone, 4,4-dimethyl	590-50-1	0.0023	0.0002
66	5-Undecene	4941-53-1	0.0023	0.0002
88	Cyclohexane, hexyl	4292-75-5	0.0022	0.0005
95	Tridecane, 4-methyl-	26730-12-1	0.0021	0.0004
46	2-Heptanol	543-49-7	0.0021	0.0004
40	Cycloheptane, 1,3-dimethoxy-, trans	29887-79-4	0.0021	0.0003
79	Hexane, 2,3,3-trimethyl-	16747-28-7	0.0021	0.0010
60	Nonane, 2,6-dimethyl-	17302-28-2	0.0020	0.00002
76	Naphthalene, decahydro-2-methyl and others		0.0020	0.0017
22	2-Butanone, 3,3-dimethyl	75-97-8	0.0020	0.0004
91	2(3H)-Furanone, 5-ethylidihydro	695-06-7	0.0020	0.0001
117	Octadecane, 2-methyl	1560-88-9	0.0020	0.0017
74	2-Nonanone	821-55-6	0.0020	0.0001
57	Benzonitrile	100-47-0	0.0020	0.0003
86	Benzene, 1-methyl-4-nitro-	99-99-0	0.0020	0.0003
115	Hexadecane, 7,9-dimethyl	21164-95-4	0.0020	0.0018
39	1-Hexanol and others		0.0020	0.0003
93	1-Octadecyne	629-89-0	0.0019	0.0002

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Cmpd #	Compound	CAS ¹ Number	Average (mg/m ³)	Standard Deviation (mg/m ³)
70	Phenol, 3-methyl-	108-39-4	0.0019	0.0001
27	Butane, 1-nitro	627-05-4	0.0018	0.0016
34	3-Hexanone	589-38-8	0.0017	0.0002
87	Benzene, 1-methyl-4-nitro- & cyclohexane, 2-butyl-1,1, 3-trimethyl		0.0016	0.0001
110	Tetradecane	629-59-4	0.0016	0.0001
30	2-Pentene, 2-methoxy-	61142-47-0	0.0016	0.0014
65	Cyclohexanone, 3,3,5-trimethyl	873-94-9	0.0016	0.0001
78	Cyclohexane, pentyl	4292-92-6	0.0016	0.0002
109	6-Dodecanone	6064-27-3	0.0016	0.0002
59	Cyclopropane, 1-ethyl-2-pentyl	62238-08-8	0.0016	0.0002
96	Tridecane, 2-methyl-	1560-96-9	0.0015	0.0013
61	Nitric acid, hexyl ester	20633-11-8	0.0015	0.0001
97	Undecane, 2,9-dimethyl-	17301-26-7	0.0014	0.0012
106	Tetradecane, 4-methyl	25117-24-2	0.0014	0.0012
113	Cyclohexane, 1,(1,5-dimethylhexyl)-	29799-19-7	0.0014	0.0012
9	Pentane, 2-methyl-	107-83-5	0.0013	0.0012
94	Tridecane, 6-methyl-	13287-21-3	0.0013	0.0011
24	Propanoic acid	79-09-4	0.0012	0.0011
83	Ethanone, 1-(3-methylphenyl)-	585-74-0	0.0012	0.0010
126	Octadecane, 2,6-dimethyl	75163-97-2	0.0012	0.0010
56	.alpha.-Methylstyrene and others		0.0012	0.0011
64	Benzyl Alcohol	100-51-6	0.0012	0.0010
102	Nonane, 5-(2-methylpropyl)-	62185-53-9	0.0011	0.0010
63	Mixture		0.0011	0.0010
43	p-Xylene	106-42-3	0.0010	0.0009
104	Dodecane, 2,6,10-trimethyl	3891-98-3	0.00092	0.00159

Cmpd #	Compound	CAS ¹ Number	Average (mg/m ³)	Standard Deviation (mg/m ³)
8	Nitric acid, methyl ester	598-58-3	0.00078	0.00136
19	2-Butanone, 3-methyl	563-80-4	0.00072	0.00125
114	Nonane, 2-methyl-5-propyl-	31081-17-1	0.00072	0.00125
4	Methane, dichlorofluoro	75-43-4	0.00076	0.00132
2	Methyl formate	107-31-3	0.00075	0.00130
13	1-Hexene, 3,4-dimethyl	16745-94-1	0.00063	0.00109
3	Silane, fluorotrimethyl	420-56-4	0.00066	0.00114
15	1-Propanol, 2-methyl	78-83-1	0.00066	0.00115
16	Furan, tetrahydro-	109-99-9	0.00053	0.00092
105	Tetradecane, 5-methyl	25117-32-2	0.00058	0.00100
111	2,5-Cyclohexadiene-1,4-dione, 2,6-bis-(1,1-dimethylethyl)-	719-22-2	0.00058	0.00101
29	3-Pentanone, 2-methyl	565-69-5	0.00051	0.00089
25	2-Pentanol, 2-methyl	590-36-3	0.00052	0.00090
67	Decane, 2-methyl	6975-98-0	0.0005	0.0009
41	Ethylbenzene and others		0.00046	0.00079
50	3-Ethyl-2-methyl-2-pentanol		0.00042	0.00073
51	Cyclohexane, 1,2,3-trimethyl	1678-97-3	0.00046	0.00080
99	Butanoic acid, 1-methylpropyl ester	819-97-6	0.00046	0.00080
31	2-Pentanone, 3-methyl	565-61-7	0.00047	0.00081
69	Decahydronaphthalene	493-02-7	0.00048	0.00083
116	Undecane, 4-methyl	2980-69-0	0.00045	0.00078
123	Octanal, 7-hydroxy-3,7-dimethyl	107-75-5	0.00044	0.00076
120	Tetradecane, 6,9-dimethyl	55045-13-1	0.00045	0.00078
119	Tridecane, 2-methyl-	1560-96-9	0.00046	0.00079

1. CAS = Chemical Abstract Service.

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