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1994 Nonmethane Organic Compounds And Speciated Nonmethane Organic Compounds Monitoring Program

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1994 Non-Methane Organic Compounds and Speciated Non-Methane Organic Compounds Monitoring Program

Final Report

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Abstract

Non-Methane Organic Compound (NMOC) and Speciated Non-Methane (SNMOC) sample collection systems were used to collect ambient air in eight areas from June through September where the National Ambient Air Quality Standards (NAAQS) for ozone may be exceeded. The program to collect and analyze ambient air samples was conducted by Radian Corporation in support of the U.S. Environmental Protection Agency, Office of Air quality Planning and Standards (EPA/OAQPS). The NMOC and SNMOC program generally consists of several activities that include site coordination, equipment certification, installation; sample analysis, data reduction, validation, and reporting; statistical analyses and data characterization; and formatting and submittal of the validated data to the Aerometric Information Retrieval System (AIRS). Non-methane hydrocarbons are reported for the base NMOC program. Seventy-eight compounds were targeted for the speciated NMOC base program and the speciated option to the NMOC base program; thirty-eight compounds were targeted for the toxics option, and sixteen compounds were targeted for the carbonyls option. Statistical analysis includes number of occurrences, frequency percent, maximum, minimum, median, and mean concentrations. Standard deviation, skewness, and kurtosis are reported for the speciated, toxics, and carbonyl options. Sites in Long Island, New York, Newark and Plainfield, New Jersey, Birmingham, Alabama, and Fort Worth and El Paso, Texas, participated in the various programs and options.

Key Words

Non-Methane Organic Compound (NMOC)

Speciated Non-Methane Organic Compound (Speciated NMOC)

National Ambient Air Quality Standard (NAAQS)

Gas chromatography/multiple detector (GC/MD)

Urban Air Toxics Monitoring Program (UATMP)

Carbonyl

Gas chromatography with flame ionization detection (GC/FID)

Aerometric Information Retrieval System (AIRS)

Preconcentration direct flame ionization detection (PDFID)

Compendium Method TO-12

C_2 through C_{12} Hydrocarbons

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ABOUT THIS REPORT

This report presents the results, data characterizations, site data comparisons, and technical procedures used for the 1994 Non-Methane Organic Compound (NMOC) and Speciated Non-Methane Organic Compound (Speciated NMOC) base monitoring programs. Information for the carbonyl and toxic option programs associated with the NMOC and Speciated NMOC base sites is also presented. This report is organized into nine major sections. The Background and Introduction is provided in Section 1.0, the Summary of Results for all sites is presented in Section 2.0, and the Aerometric Information Retrieval System - Air Quality Subsystem (AIRS-AQS) is explained in Section 3.0. Conclusions and Recommendations are given in Section 4.0. The detailed program descriptions, sample collection, quality control, sample analysis, and statistics and data characterization procedures for the NMOC and Speciated NMOC base programs, and the Toxics and Carbonyl Options to these programs are presented in Sections 5.0, 6.0, 7.0, and 8.0, respectively. Statistical Analysis is presented in Section 9.0. References are given in Section 10.0. Appendices A through M contain AIRS site descriptions; NMOC base program results by site; speciated NMOC option statistics by site; toxics option statistics by site; speciated NMOC base program statistics by site; duplicate sample and replicate analysis results for the NMOC base program by site; duplicate sample and replicate analysis results for the carbonyl option sites to the NMOC base program; duplicate sample and replicate analysis results for the speciated NMOC base program; EPA audit reports; and speciated NMOC base sample comparison results.

1.0 BACKGROUND AND INTRODUCTION

In certain areas of the country where the National Ambient Air Quality Standard (NAAQS) for ozone may be exceeded, additional measurements of ambient non-methane organic compounds (NMOC) and nitrogen oxides (NO_x) are used to assist the affected states in developing revised ozone control strategies. Measurements of NMOC are a critical input to the Empirical Kinetic Modeling Approach (EKMA) used to estimate hydrocarbon control requirements. Due to previous difficulty in obtaining accurate NMOC measurements, and in order to transfer hydrocarbon sampling and analysis technology to interested state and local

agencies, the United States Environmental Protection Agency (EPA) has supported a centralized program that provides NMOC monitoring and analytical assistance to these state and local agencies through Radian Corporation. This program originated in 1984 with NMOC program support to 23 sites.

In order to support the needs for information concerning the levels of toxic species in ambient air, a gas chromatography/multiple detector (GC/MD) method was developed in 1987 to measure the concentration of 38 selected toxic organic compounds in canister samples collected over a 24-hour period. The method was originally developed for use on the EPA national Urban Air Toxics Monitoring Program (UATMP). The UATMP was developed and implemented in 1987 following an EPA study entitled "The Air Toxic Problem in the United States: An Analysis of Cancer Risks for Selected Pollutants,"[1] which was completed in May 1985. This study concluded that a high potential of elevated individual lifetime risks was associated with certain air toxic compounds frequently found in urban areas. The UATMP method was incorporated into the 1987 NMOC program as an option to the NMOC base sites. Selected NMOC samples from 15 sites were analyzed in 1987 for the 38 UATMP target analytes. Additionally, in 1990 carbonyl monitoring and analysis was added to the NMOC program at three sites for the measurement of formaldehyde, acetaldehyde, and acetone in 3-hour carbonyl cartridges. In 1991, the carbonyl target analyte list was revised to encompass 16 compounds.

Also in 1991, some of the agencies participating in the NMOC program requested that hydrocarbon speciation analysis be included as part of the program. Knowledge of the specific individual hydrocarbon compounds present in the ambient air is used for photochemical model input, such as Carbon Bond Four (CB4), necessary for forecasting the NMOC reductions needed to attain the NAAQS for ozone. Consequently, in response to the agency requests, gas chromatography with flame ionization detection (GC/FID) analysis for 78 individual hydrocarbon compounds in the C_2 through C_{12} range was provided for five sites and referred to as Speciated NMOC.

The sampling sites for the 1994 NMOC and Speciated NMOC monitoring program are given in Table 1-1. Table 1-1 includes the EPA Region for each site, the number of sites at each

Table 1-1

1994 NMOC/SMNOC Program Sites

Region	# of Sites	Radian Site Code	AIRS Code	Location	Base Program	Options		
						SNMOC	3-Hr Toxics	Carbonyl
2	1	LINY	36-059-0005	Long Island, NY	NMOC	Yes		
	1	NWNJ	34-013-0011	Newark, NJ	NMOC	Yes	Yes	Yes
	1	PLNJ	34-039-5001	Plainfield, NJ	NMOC	Yes	Yes	Yes
4	1	B1AL	01-073-6002	Birmingham, AL (Tarrant)	SNMOC		Yes	
	1	B2AL	01-073-5002	Birmingham, AL (Pinson)	SNMOC		Yes	
	1	B3AL	01-117-0004	Birmingham, AL (Helena)	SNMOC		Yes	
6	1	FWTX	48-439-1002	Ft. Worth, TX	SNMOC			
	1	EPTX	48-141-0027	El Paso, TX	SNMOC			

location, the Radian site code, the Aerometric Information Retrieval System (AIRS) code, site location, and the base and optional program participation for each site. The AIRS site description detailing the site characteristics are given in Appendix A. There were three NMOC base sites located in Long Island, NY (LINY), Newark, NJ (NWNJ), and Plainfield, NJ (PLNJ). The LINY site has been participating in the NMOC program since 1990; the NWNJ site since 1987; and the PLNJ site since 1988. All three sites chose the Speciated NMOC analysis option, and two sites (NWNJ and PLNJ) chose 3-hour toxics and carbonyl analysis options. There were five Speciated NMOC base sites located in Birmingham, AL (B1AL, B2AL, and B3AL), Fort Worth, TX (FWTX), and El Paso, TX (EPTX). All five sites have been participating in the Speciated NMOC program since 1992, with the exception of EPTX which started in 1991. Three of these sites (B1AL, B2AL, and B3AL) chose the 3-hour toxics analysis option.

The NMOC and Speciated NMOC program generally consists of several activities that include:

- Site coordination;
- Equipment certification, installation, and operator training;
- Sample analysis;
- Data reduction, validation, and reporting;
- Statistical analyses and data characterization;
- Formatting and submittal of the validated data to the AIRS-AQS; and
- Post-sample collection activities, such as equipment recovery and refurbishment, and canister cleanup and archive.

The NMOC and Speciated NMOC program sample collection systems and procedures are identical. Both Toxics and Speciated NMOC option analyses are performed as subsequent analyses on a single sample canister. Carbonyl option samples are collected on the same schedule using a separate cartridge sample collection system.

Sample collection for the 1994 NMOC base program occurred from 6:00 a.m. through 9:00 a.m. local time, Monday through Friday, from July 6 through October 31, 1994 for the NMOC base sites. Sample collection for the 1994 Speciated NMOC base program occurred from 6:00 a.m. through 9:00 a.m. local time, Monday through Friday, from July 5 through October 31, 1994. Historically, the NMOC and Speciated NMOC sampling season has begun in June and ended in September, encompassing approximately 90 sampling days. In 1994, the sites started sampling in July and continued through October 31, for a total of about 81 sampling days. The Birmingham, AL, (B1AL, B2AL, B3AL) began sampling July 5, and the Ft. Worth (FWTX) and El Paso, TX, (EPTX) sites began sampling July 8. The Long Island, NY, site (LINY) began sampling July 6, and the Plainfield and Newark, NJ sites (PLNJ and NWNJ) began sampling July 11. The LINY, PLNJ, and NWNJ sites did not sample during the Labor Day Holiday (September 5) and PLNJ and NWNJ did not sample during the Columbus Day Holiday (October 10).

Sample analyses were performed in accordance with the cryogenic preconcentration direct flame ionization detection (PDFID) methodology described in compendium method TO-12.[2] Based on the 1984 through 1992 studies, the method was shown to be precise, accurate, and effective for indicating the concentration level of total hydrocarbons in ambient air. Sample analyses were performed generally in accordance with the EPA's "Research Protocol Method for Analysis of C_2 Through C_{12} Hydrocarbons in Ambient Air by Gas Chromatography with Cryogenic Concentration."[3] Seventy-eight hydrocarbons are quantitated during this analysis. Chlorinated and oxygenated species are not identified using this procedure.

2.0 SUMMARY OF RESULTS

This section of the report contains summary information on the various base programs and options. Concentration results from all sites are summarized and the data is characterized and analyzed. Sampling and analytical precisions, accuracy, completeness, frequency of occurrence, and historical comparisons for each of the programs have been determined and results are presented (including the results of external audits and comparison samples). Information on the entry of site data into the AIRS-AQS database is provided as well. For more detailed information on each of the base and option program features, refer to Chapters 5.0 through 8.0 of this report.

2.1 Summary of Concentration Results by Program

This summary section contains information on the results of the NMOC and Speciated NMOC base programs, as well as on the carbonyl, speciated NMOC, and toxics options to these base programs. The information compiled for all sites is used to make annual overall comparisons of the mean data from previous years.

2.1.1 NMOC Base Program

The three sites involved in this program were Long Island, NY (LINY), Newark, NJ (NWNJ), and Plainfield, NJ (PLNJ). LINY has been involved in the NMOC program since 1990, NWNJ has been involved since 1987, and PLNJ since 1988. Results by site are included in Appendix B.

A summary of the NMOC overall site results is contained in Table 2-1. Detected NMOC levels ranged from 0.06 ppmC to 2.52 ppmC. Overall, PLNJ was found to have the highest mean ambient concentration level of NMOC (0.66 ppmC), followed by NWNJ (0.64 ppmC) and LINY (0.45 ppmC). Maximum concentrations were found to also follow this

Table 2-1

NMOC Overall Results, By Site

Site	Cases	Minimum Conc. (ppmC)	Maximum Conc. (ppmC)	Median Conc. (ppmC)	Mean Conc. (ppmC)	Standard Deviation
LINY	74	0.09	1.46	0.36	0.45	0.29
NWNJ	78	0.23	2.51	0.55	0.64	0.40
PLNJ	71	0.06	2.52	0.50	0.66	0.54
OVERALL	223	0.06	2.52	0.46	0.59	0.43

trend: PLNJ, 2.52 ppmC; NWNJ, 2.51 ppmC; LINY, 1.46 ppmC. The standard deviations indicate that the data were much more variable at PLNJ ($\sigma = 0.539$) than they were at NWNJ ($\sigma = 0.397$) and LINY ($\sigma = 0.292$).

2.1.2 Speciated NMOC Option to the NMOC Base Program

All three of the NMOC base sites (LINY, NWNJ, and PLNJ) elected to participate in the speciated NMOC option and had nine, nine, and eight of their NMOC samples speciated, respectively. The 26 samples were analyzed and the summary data are contained in Table 2-2. Results by site are included in Appendix C.

For the three sites the overall detected average concentrations ranged from a low of 0.33 ppbC for *n*-tridecane, to a high of 35.00 ppbC for toluene. The highest level of a target compound encountered was 229.05 ppbC for acetylene at PLNJ. This sample was taken on September 21, 1994 and also contained the highest levels of 1,3-butadiene, 2-methyl-1-pentene, propyne, and toluene detected at any of the three sites.

Table 2-2

Speciated NMOC Option Results (LINY, NWNJ, PLNJ)

Compound	Number of Occurrences	Freq (%)	ppbC				
			Min.	Max.	Median	Avg.	Std. Dev.
1,2,3-Trimethylbenzene	26	100	1.26	14.96	4.25	4.52	2.91
1,2,4-Trimethylbenzene	25	96	0.36	5.49	1.82	2.09	1.43
1,3,5-Trimethylbenzene	26	100	0.57	6.99	2.01	2.55	1.84
1,3-Butadiene	21	81	0.34	2.66	0.91	0.96	0.56
1-Butene	25	96	2.07	58.95	7.14	11.01	12.70
1-Decene	26	100	2.01	21.25	6.37	7.60	5.31
1-Dodecene	23	88	0.24	6.39	1.23	1.70	1.66
1-Hexene	13	50	0.23	4.60	0.71	1.01	1.17
1-Nonene	10	38	0.28	1.00	0.49	0.52	0.24
1-Octene	21	81	0.31	3.06	0.74	1.02	0.83
1-Pentene	23	88	0.33	27.85	1.09	2.68	5.63
1-Tridecene	13	50	0.21	0.86	0.37	0.44	0.19
1-Undecene	25	96	0.28	2.80	1.14	1.19	0.69
2,2,3-Trimethylpentane	25	96	0.32	3.63	0.96	1.28	0.90
2,2,4-Trimethylpentane	26	100	1.73	24.97	5.97	7.40	5.81
2,2-Dimethylbutane	26	100	2.97	34.99	9.96	11.83	8.05
2,3,4-Trimethylpentane	26	100	0.62	9.38	2.08	2.73	2.22
2,3-Dimethylbutane	26	100	0.66	9.00	2.18	2.76	1.95
2,3-Dimethylpentane	17	65	0.34	3.60	1.19	1.49	1.06
2,4-Dimethylpentane	24	92	0.43	7.39	1.56	2.18	1.85
2-Ethyl-1-butene	1	4	0.80	0.80	0.80	0.80	0.00
2-Methyl-1-butene	23	88	0.45	8.40	1.90	2.54	2.14
2-Methyl-1-pentene	18	69	0.26	2.90	0.84	1.08	0.71
2-Methyl-2-butene	25	96	0.51	14.55	2.15	4.23	4.06
2-Methylheptane	25	96	0.50	6.73	1.46	2.00	1.54
2-Methylhexane	26	100	0.54	20.77	2.55	3.51	3.92
2-Methylpentane	26	100	2.16	25.10	10.54	10.65	6.82

Table 2-2

Continued

Compound	Number of Occurrences	Freq (%)	ppbC				
			Min.	Max.	Median	Avg.	Std. Dev.
3-Methyl-1-butene	21	81	0.23	2.18	0.71	0.83	0.55
3-Methylheptane	24	92	0.33	5.64	1.27	1.71	1.31
3-Methylhexane	26	100	1.30	11.62	3.59	4.53	2.88
3-Methylpentane	25	96	1.11	25.68	6.92	7.64	6.18
4-Methyl-1-pentene	24	92	0.31	3.79	0.87	1.03	0.76
α-Pinene	26	100	0.29	12.19	2.65	4.24	3.62
Acetylene	26	100	2.66	229.05	9.92	25.68	47.56
β-Pinene	25	96	0.35	2.95	1.16	1.34	0.71
Benzene	26	100	2.80	34.09	8.37	10.79	8.00
cis-2-Butene	26	100	0.34	6.60	1.60	1.97	1.60
cis-2-Hexene	17	65	0.28	1.78	0.51	0.65	0.44
cis-2-Pentene	22	85	0.38	6.00	1.27	1.82	1.49
Cyclohexane	23	88	0.35	13.84	3.62	4.03	3.52
Cyclopentane	23	88	0.31	5.58	1.24	1.60	1.39
Cyclopentene	19	73	0.29	2.52	0.56	0.85	0.68
Ethane	26	100	5.63	147.40	22.38	31.57	34.02
Ethylbenzene	26	100	1.29	15.15	4.94	5.30	3.52
Ethylene	26	100	4.97	133.21	18.43	28.92	31.27
Isobutane	26	100	2.24	48.85	8.87	13.63	12.49
Isobutene	1	4	8.40	8.40	8.40	8.40	0.00
Isopentane	26	100	6.37	94.21	27.37	33.09	25.82
Isoprene	26	100	0.30	3.89	1.11	1.52	1.12
Isopropylbenzene	18	69	0.23	1.33	0.39	0.49	0.28
m-Ethyltoluene	26	100	1.15	12.94	3.85	4.84	3.38
Methylcyclohexane	26	100	0.43	7.36	1.54	2.00	1.59
Methylcyclopentane	26	100	0.69	13.88	2.75	3.60	3.02
n-Butane	26	100	3.15	90.36	14.96	22.86	23.87
n-Decane	24	92	0.57	8.68	2.61	3.23	2.36

Table 2-2

Continued

Compound	Number of Occurrences	Freq (%)	ppbC				
			Min.	Max.	Median	Avg.	Std. Dev.
n-Dodecane	26	100	0.30	5.58	1.16	1.49	1.20
n-Heptane	26	100	0.45	8.01	2.20	2.84	2.15
n-Hexane	26	100	1.12	35.26	4.32	6.36	7.18
n-Nonane	24	92	0.32	4.56	1.63	1.82	1.21
n-Octane	26	100	0.38	5.30	0.97	1.59	1.44
n-Pentane	26	100	1.80	54.36	8.79	12.51	12.46
n-Propylbenzene	25	96	0.35	3.23	1.02	1.28	0.81
n-Tridecane	7	27	0.13	0.64	0.31	0.33	0.17
n-Undecane	26	100	0.27	9.93	2.35	2.67	2.09
o-Ethyltoluene	26	100	0.73	8.57	2.29	2.95	1.97
o-Xylene	26	100	1.53	18.29	6.02	6.85	4.58
p-Diethylbenzene	26	100	0.26	5.88	0.87	1.33	1.30
p-Ethyltoluene	22	85	0.45	4.39	1.25	1.65	1.09
m-/*p*-Xylene	26	100	3.77	51.37	16.32	17.84	12.14
Propane	26	100	3.01	52.51	18.23	21.10	14.36
Propylene	26	100	2.50	35.77	8.96	10.88	8.28
Propyne	6	23	0.46	1.47	0.84	0.96	0.43
Styrene	22	85	0.28	3.78	0.80	1.11	0.92
trans-2-Butene	24	92	0.64	9.51	2.11	2.99	2.53
trans-2-Hexene	18	69	0.28	6.06	0.66	1.17	1.42
trans-2-Pentene	26	100	0.34	11.04	2.05	3.25	2.79
Toluene	26	100	6.82	118.11	25.46	35.00	29.16

2.1.3 Carbonyl Option to the NMOC Base Program

Two of the NMOC base sites chose the carbonyl option: Newark, NJ (NWNJ) and Plainfield, NJ (PLNJ). Results of the studies are contained in Tables 2-3 and 2-4. Tolualdehydes comprise meta-, para-, and ortho-tolualdehyde. Because these three components cannot be speciated on the analytical system, tolualdehydes are reported as one compound.

For NWNJ, the mean concentrations of the carbonyl compounds ranged from 0.14 ppbv for valeraldehyde to 7.64 ppbv for formaldehyde. The highest level of any carbonyl compound detected was 38.22 ppbv for formaldehyde at NWNJ. This level was detected in the sample taken September 20, 1994. This one sample also contained the highest recorded site levels of eight other carbonyls: acetaldehyde, propionaldehyde, crotonaldehyde, butyr/isobutyraldehyde, benzaldehyde, tolualdehydes, hexanaldehyde, and 2,5-dimethylbenzaldehyde. No reason for these high levels was identified. The high standard deviation shown for formaldehyde in Table 2-3 indicates the large variability in this individual component of the data set. High speciated hydrocarbons were also recorded on September 21, 1994.

For PLNJ, the mean values ranged from 0.27 ppbv for hexanaldehyde to 5.28 ppbv for acetone. An anomalously high level of 27.24 ppbv acetaldehyde was detected in the sample taken September 16, 1994. None of the other species identified in this sample were present at unusually high concentrations and no reason for the high acetaldehyde level is known. The data was verified and the result was found to be valid.

Typical urban ambient levels range from 1.8 to 15.5 ppbv for formaldehyde and 1.0 to 8.5 ppbv for acetaldehyde.[4] The mean levels observed at NWNJ and PLNJ fall within these ranges.

2.1.4 Speciated NMOC Base Program

Five Speciated NMOC base sites participated in the 1994 program. Three of these sites were located in Birmingham, AL (B1AL, B2AL, and B3AL), one in Ft. Worth, TX (FWTX), and

Table 2-3

1994 NMOC Newark, NJ (NWNJ) Carbonyl Option Site Summary

Analyte	Number of Occurrences	Frequency (%)	Mean Conc. (ppbv)	Maximum Conc. (ppbv)	Minimum Conc. (ppbv)	Standard Deviation
Formaldehyde	10	100	7.64	38.22	2.13	10.91
Acetaldehyde	10	100	5.73	21.07	1.13	5.96
Acrolein	1	10	0.17	0.17	0.17	NA
Acetone	10	100	5.64	12.56	3.20	3.16
Propionaldehyde	10	100	0.81	4.01	0.20	1.15
Crotonaldehyde	5	50	0.85	1.39	0.53	0.36
Butyr/Isobutyraldehyde	10	100	0.54	1.85	0.24	0.47
Benzaldehyde	4	40	0.37	0.70	0.21	0.22
Isovaleraldehyde	0	NA	NA	NA	NA	NA
Valeraldehyde	4	40	0.14	0.23	0.06	0.07
Tolualdehydes	10	100	1.01	2.05	0.38	0.57
Hexanaldehyde	6	60	0.22	0.51	0.11	0.16
2,5-Dimethylbenzaldehyde	3	30	0.18	0.28	0.10	0.09

NA = Not Applicable

Table 2-4

1994 NMOC Plainfield, NJ (PLNJ) Carbonyl Option Site Summary

Analyte	Number of Occurrences	Frequency (%)	Mean Conc. (ppbv)	Maximum Conc. (ppbv)	Minimum Conc. (ppbv)	Standard Deviation
Formaldehyde	11	100	3.35	4.86	2.77	0.74
Acetaldehyde	11	100	4.99	27.24	1.60	7.45
Acrolein	0	NA	NA	NA	NA	NA
Acetone	11	100	5.28	7.20	3.81	1.07
Propionaldehyde	11	100	0.53	0.87	0.40	0.13
Crotonaldehyde	8	73	0.40	0.47	0.26	0.07
Butyr/Isobutyraldehyde	11	100	0.47	0.79	0.31	0.14
Benzaldehyde	4	36	0.33	0.50	0.26	0.12
Isovaleraldehyde	0	NA	NA	NA	NA	NA
Valeraldehyde	0	NA	NA	NA	NA	NA
Tolualdehydes	0	NA	NA	NA	NA	NA
Hexanaldehyde	2	18	0.27	0.35	0.18	0.12
2,5-Dimethylbenzaldehyde	0	NA	NA	NA	NA	NA

NA = Not Applicable

one in El Paso, TX (EPTX). The three Birmingham sites and FWTX have all been involved in the Speciated NMOC program since 1992. EPTX joined the program in 1991.

A summary of the Speciated NMOC overall site results is contained in Table 2-5. Due to its large volume, one copy of the speciated NMOC base program summary data by site has been provided to the EPA/OAQPS project officer. Overall average concentrations ranged from a low of 0.46 ppbC for 1-tridecene, to a high of 28.72 ppbC for isopentane. The highest level of a target compound encountered was 3370.75 ppbC for *n*-hexane at EPTX on September 14, 1994. This same sample also contained the highest recorded levels of 11 other species: 1-pentene, 2,3-dimethylbutane, 2,4-dimethylpentane, 2-methylpentane, 3-methylpentane, cyclohexane, cyclopentane, isobutane, isopentane, methylcyclopentane, and *n*-pentane. Due to the extremely anomalous nature of this data, the value and sample integrity was reverified and no known cause was identified.

2.1.5 Toxics Option to the NMOC and Speciated NMOC Base Program

Two NMOC base sites (NWNJ and PLNJ) and three Speciated NMOC base sites (B1AL, B2AL, and B3AL) chose to include the toxics option in their monitoring programs. A summary of the toxics option overall site results is contained in Table 2-6. A total of 38 compounds were targeted. Results of the toxics option by site appears in Appendix D.

Average concentrations ranged from 0.01 ppbv for 1,1-dichloroethane, to 13.16 ppbv for acetylene. The highest level encountered was 197.78 ppbv for acetylene at PLNJ. This sample was taken on September 21, 1994, which is the same sample that high levels of acetylene were identified in the Speciated NMOC analysis (see Section 2.1.3). This sample also contained the highest levels of chloroform and chlorobenzene detected overall at the toxics option sites. No cause for these high levels was identified.

Table 2-5

Speciated NMOC Base Program Results (B1AL, B2AL, B3AL, FWTX, EPTX)

Compound	Number of Occurrences	Freq (%)	ppbC				
			Min.	Max.	Median	Avg.	Std. Dev.
1,2,3-Trimethylbenzene	391	99	0.28	18.57	2.72	3.22	2.01
1,2,4-Trimethylbenzene	373	95	0.28	21.96	2.07	3.41	3.75
1,3,5-Trimethylbenzene	345	88	0.23	11.74	1.22	1.77	1.55
1,3-Butadiene	247	63	0.17	5.79	0.69	0.97	0.75
1-Butene	380	96	0.30	17.15	2.46	3.28	2.63
1-Decene	391	99	0.24	28.92	3.27	4.69	4.22
1-Dodecene	368	93	0.22	7.54	0.79	1.22	1.17
1-Hexene	181	46	0.17	4.65	0.81	0.98	0.68
1-Nonene	100	25	0.18	1.72	0.48	0.60	0.36
1-Octene	202	51	0.17	3.46	0.47	0.69	0.58
1-Pentene	262	67	0.22	33.55	1.13	1.82	2.66
1-Tridecene	85	22	0.23	1.77	0.39	0.46	0.25
1-Undecene	363	92	0.22	9.25	1.01	1.45	1.28
2,2,3-Trimethylpentane	287	73	0.22	5.15	0.66	0.93	0.73
2,2,4-Trimethylpentane	390	99	0.33	36.70	3.51	5.24	4.80
2,2-Dimethylbutane	392	99	0.53	79.55	6.51	9.32	9.40
2,3,4-Trimethylpentane	358	91	0.23	14.86	1.33	2.02	1.86
2,3-Dimethylbutane	374	95	0.28	204.15	1.69	2.82	10.60
2,3-Dimethylpentane	272	69	0.17	15.88	0.94	1.72	1.94
2,4-Dimethylpentane	346	88	0.20	54.05	1.02	1.74	3.22
2-Ethyl-1-butene	16	4	0.28	1.93	0.89	0.94	0.52
2-Methyl-1-butene	333	85	0.16	20.86	1.40	1.91	1.92
2-Methyl-1-pentene	218	55	0.23	4.16	1.04	1.18	0.69
2-Methyl-2-butene	340	86	0.24	29.77	1.37	2.35	2.77
2-Methylheptane	335	85	0.23	7.82	0.92	1.29	1.04
2-Methylhexane	344	87	0.21	19.67	1.19	1.95	2.19
2-Methylpentane	389	99	0.30	1557.17	4.22	10.33	78.87

Table 2-5

Continued

Compound	Number of Occurrences	Freq (%)	ppbC				
			Min.	Max.	Median	Avg.	Std. Dev.
3-Methyl-1-butene	211	54	0.21	4.87	0.51	0.66	0.54
3-Methylheptane	306	78	0.16	6.90	0.80	1.14	0.92
3-Methylhexane	379	96	0.23	16.38	2.40	3.13	2.31
3-Methylpentane	384	97	0.27	2393.21	2.84	10.76	121.98
4-Methyl-1-pentene	300	76	0.19	3.15	0.64	0.84	0.56
α-Pinene	380	96	0.25	20.84	1.94	2.74	2.64
Acetylene	374	95	0.40	51.82	5.67	8.72	8.51
Acetylene/Ethane[a]	4	1	1.98	4.63	3.21	3.26	1.22
β-Pinene	370	94	0.26	6.33	0.99	1.12	0.64
Benzene	393	100	0.68	52.77	5.55	7.89	7.05
cis-2-Butene	258	65	0.21	8.81	0.79	1.09	1.13
cis-2-Hexene	142	36	0.17	1.79	0.49	0.56	0.28
cis-2-Pentene	284	72	0.18	13.27	0.77	1.20	1.28
Cyclohexane	296	75	0.20	48.92	1.10	2.35	4.17
Cyclopentane	287	73	0.22	34.15	0.77	1.29	2.42
Cyclopentene	171	43	0.17	4.31	0.54	0.67	0.52
Ethane	386	98	0.43	109.15	9.41	13.76	13.78
Ethylbenzene	383	97	0.25	24.75	2.29	3.49	3.16
Ethylene	371	94	0.36	75.09	8.52	11.91	10.22
Isobutane	393	100	0.48	988.86	3.95	9.58	53.55
Isobutene	4	1	1.10	11.90	3.23	4.86	4.88
Isopentane	393	100	0.99	2215.17	13.21	28.72	114.85
Isoprene	338	86	0.22	16.27	1.26	2.12	2.27
Isopropylbenzene	155	39	0.16	2.19	0.42	0.50	0.27
m-Ethyltoluene	381	97	0.23	16.74	2.16	2.95	2.42
Methylcyclohexane	327	83	0.17	9.18	0.96	1.42	1.25
Methylcyclopentane	368	93	0.19	814.70	1.70	5.02	42.42
n-Butane	392	99	0.58	329.43	7.84	14.21	24.65

Table 2-5

Continued

Compound	Number of Occurrences	Freq (%)	ppbC				
			Min.	Max.	Median	Avg.	Std. Dev.
n-Decane	332	84	0.17	22.35	1.05	1.98	2.46
n-Dodecane	347	88	0.15	23.80	0.74	1.24	2.12
n-Heptane	367	93	0.21	15.28	1.37	2.05	1.83
n-Hexane	385	98	0.32	3370.75	2.81	13.79	171.62
n-Nonane	317	80	0.21	20.02	0.74	1.20	1.54
n-Octane	307	78	0.18	8.72	0.86	1.10	0.93
n-Pentane	390	99	0.71	467.02	6.56	11.52	26.12
n-Propylbenzene	297	75	0.18	4.90	0.74	0.99	0.77
n-Tridecane	51	13	0.23	1.74	0.33	0.51	0.36
n-Undecane	359	91	0.23	26.07	1.18	1.84	2.58
o-Ethyltoluene	375	95	0.24	10.49	1.41	1.82	1.35
o-Xylene	375	95	0.26	24.98	2.78	3.91	3.53
p-Diethylbenzene	309	78	0.21	5.56	0.71	0.97	0.77
p-Ethyltoluene	295	75	0.16	7.46	0.82	1.15	0.93
m-/*p*-Xylene	392	99	0.55	71.93	7.25	10.88	10.06
Propane	393	100	1.08	377.44	10.24	19.41	29.50
Propylene	384	97	0.34	31.71	3.68	5.20	4.59
Propyne	58	15	0.25	1.51	0.64	0.67	0.27
Styrene	311	79	0.16	6.58	0.73	0.94	0.74
trans-2-Butene	298	76	0.22	9.77	1.00	1.40	1.33
trans-2-Hexene	214	54	0.19	2.81	0.58	0.72	0.48
trans-2-Pentene	354	90	0.27	25.53	1.35	2.12	2.60
Toluene	393	100	0.95	130.37	13.19	18.88	17.44

*These compounds coeluted in some cases on the analytical system used.

Table 2-6

1994 Toxics Option Results

Compound	Number of Occurrences	Freq (%)	ppbv				
			Min.	Max.	Median	Avg.	Std. Dev.
Acetylene	39	98	0.38	197.78	3.59	13.16	33.65
Propylene	40	100	0.18	8.74	0.93	1.72	1.86
Chloromethane	40	100	0.33	1.31	0.57	0.59	0.17
Vinyl Chloride	3	8	0.04	0.07	0.04	0.05	0.02
1,3-Butadiene	39	98	0.02	3.45	0.19	0.52	0.81
Bromomethane	12	30	0.01	0.07	0.03	0.03	0.02
Chloroethane	8	20	0.03	0.36	0.08	0.11	0.11
Methylene Chloride	40	100	0.05	10.74	0.18	0.70	1.79
trans-1,2-Dichloroethylene	12	30	0.01	0.14	0.07	0.06	0.05
1,1-Dichloroethane	5	13	0.01	0.02	0.01	0.01	0.01
Chloroprene	0	NA	NA	NA	NA	NA	NA
Bromochloromethane	0	NA	NA	NA	NA	NA	NA
Chloroform	40	100	0.01	0.15	0.03	0.04	0.03
1,2-Dichloroethane	7	18	0.01	0.38	0.07	0.12	0.14
1,1,1-Trichloroethane	40	100	0.13	1.16	0.23	0.33	0.22
Benzene	40	100	0.13	4.22	0.52	0.82	0.84
Carbon Tetrachloride	40	100	0.05	0.11	0.07	0.07	0.01
1,2-Dichloropropane	1	3	0.06	0.06	0.06	0.06	0.00
Bromodichloromethane	0	NA	NA	NA	NA	NA	NA
Trichloroethylene	31	78	0.01	0.53	0.03	0.07	0.11
cis-1,3-Dichloropropene	0	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	0	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	0	NA	NA	NA	NA	NA	NA
Toluene	40	100	0.27	12.45	1.32	2.12	2.49
Dibromochloromethane	0	NA	NA	NA	NA	NA	NA
n-Octane	38	95	0.02	0.47	0.05	0.10	0.09
Tetrachloroethylene	40	100	0.01	2.20	0.08	0.17	0.35
Chlorobenzene	11	28	0.01	0.04	0.02	0.02	0.01

Table 2-6

Continued

Compound	Number of Occurrences	Freq (%)	ppbv				
			Min.	Max.	Median	Avg.	Std. Dev.
Ethylbenzene	40	100	0.05	2.05	0.21	0.36	0.37
m-/*p*-Xylene	40	100	0.18	5.55	0.69	1.07	1.07
Bromoform	1	3	0.03	0.03	0.03	0.03	0.00
Styrene	40	100	0.03	0.61	0.10	0.13	0.11
1,1,2,2-Tetrachloroethane	7	18	0.01	0.06	0.02	0.02	0.02
o-Xylene	40	100	0.09	2.32	0.32	0.50	0.48
m-Dichlorobenzene	17	43	0.01	0.14	0.01	0.02	0.03
p-Dichlorobenzene	38	95	0.01	0.33	0.03	0.05	0.07
o-Dichlorobenzene	25	63	0.01	0.07	0.02	0.02	0.01

2.2 Data Characterization and Analysis

This section contains information pertaining to how the data collected in the 1994 NMOC and Speciated NMOC Programs and their options was characterized and analyzed. The frequency of occurrence for each of the compounds speciated in the NMOC base program and the Speciated NMOC, carbonyl, and toxics option programs is provided. Information on the monthly results from the NMOC program, and how the 1994 program compares with previous years is contained in this section. Historical information from each of the sites involved in the 1994 programs is provided.

2.2.1 Frequency of Occurrence

The following sections summarize the frequencies that speciated compounds were detected during the respective programs or options in 1994.

2.2.1.1 Speciated NMOC Option to the NMOC Base Program

A total of 26 samples from the three NMOC base sites (LINY, NWNJ, and PLNJ) were speciated. The number of occurrences of each compound and frequency percent data for this option are contained in the first three columns of Table 2-2.

For the three sites, the overall frequency percent of detection of the 78 target compounds ranged from 3.9% for 2-ethyl-1-butene and isobutene, to 100% for 38 different compounds. The compounds detected in all samples compared with those detected in none of the samples are outlined by site in Table 2-7. Table 2-8 shows the frequencies of detection for each compound broken down into frequency categories: 0-25% (3), 25-50% (2), 50-75% (8), 75-90% (11), and 90-100 percent (53).

Table 2-7

Entirely Present and Entirely Absent Compounds for the Speciated NMOC Option by Site (LINY, NWNJ, PLNJ)

Site (# of Samples)	100% (Detected in All Samples)		0% (Detected in No Samples)
LINY (9)	1,2,3-Trimethylbenzene	Isobutane	Isobutene
	1,3,5-Trimethylbenzene	Isopentane	
	1-Butene	Isoprene	
	1-Decene	*m*-Ethyltoluene	
	1-Dodecene	Methylcyclohexane	
	1-Undecene	Methylcyclopentane	
	2,2,4-Trimethylpentane	*m*-/*p*-Xylene	
	2,2-Dimethylbutane	*n*-Butane	
	2,3,4-Trimethylpentane	*n*-Dodecane	
	2,3-Dimethylbutane	*n*-Heptane	
	2-Methylhexane	*n*-Hexane	
	2-Methylpentane	*n*-Octane	
	3-Methylhexane	*n*-Pentane	
	3-Methylpentane	*n*-Undecane	
	α-Pinene	*o*-Ethyltoluene	
	Acetylene	*o*-Xylene	
	β-Pinene	*p*-Diethylbenzene	
	Benzene	Propane	
	cis-2-Butene	Propylene	
	Ethane	*trans*-2-Pentene	
	Ethylbenzene	Toluene	
	Ethylene		

Table 2-7

Continued

Site (# of Samples)	100% (Detected in All Samples)		0% (Detected in No Samples)
NWNJ (9)	1,2,3-Trimethylbenzene	Ethylbenzene	2-Ethyl-1-butene
	1,2,4-Trimethylbenzene	Ethylene	
	1,3,5-Trimethylbenzene	Isobutane	
	1-Decene	Isopentane	
	2,2,3-Trimethylpentane	Isoprene	
	2,2,4-Trimethylpentane	*m*-Ethyltoluene	
	2,2-Dimethylbutane	Methylcyclohexane	
	2,3,4-Trimethylpentane	Methylcyclopentane	
	2,3-Dimethylbutane	*m*-/*p*-Xylene	
	2,4-Dimethylpentane	*n*-Butane	
	2-Methyl-1-butene	*n*-Decane	
	2-Methyl-2-butene	*n*-Dodecane	
	2-Methylheptane	*n*-Heptane	
	2-Methylhexane	*n*-Hexane	
	2-Methylpentane	*n*-Nonane	
	3-Methylheptane	*n*-Octane	
	3-Methylhexane	*n*-Pentane	
	3-Methylpentane	*n*-Propylbenzene	
	4-Methyl-1-pentene	*n*-Undecane	
	α-Pinene	*o*-Ethyltoluene	
	Acetylene	*o*-Xylene	
	β-Pinene	*p*-Diethylbenzene	
	Benzene	Propane	
	cis-2-Butene	Propylene	
	Cyclohexane	*trans*-2-Pentene	
	Cyclopentane	Toluene	
	Ethane		

Table 2-7

Continued

Site (# of Samples)	100% (Detected in All Samples)		0% (Detected in No Samples)
PLNJ (8)	1,2,3-Trimethylbenzene	Isobutane	2-Ethyl-1-butene
	1,2,4-Trimethylbenzene	Isopentane	Isobutene
	1,3,5-Trimethylbenzene	Isoprene	
	1-Butene	*m*-Ethyltoluene	
	1-Decene	Methylcyclohexane	
	1-Undecene	Methylcyclopentane	
	2,2,3-Trimethylpentane	*m*-/*p*-Xylene	
	2,2,4-Trimethylpentane	*n*-Butane	
	2,2-Dimethylbutane	*n*-Dodecane	
	2,3,4-Trimethylpentane	*n*-Heptane	
	2,3-Dimethylbutane	*n*-Hexane	
	2-Methyl-2-butene	*n*-Octane	
	2-Methylheptane	*n*-Pentane	
	2-Methylhexane	*n*-Propylbenzene	
	2-Methylpentane	*n*-Undecane	
	3-Methylhexane	*o*-Ethyltoluene	
	α-Pinene	*o*-Xylene	
	Acetylene	*p*-Diethylbenzene	
	Benzene	Propane	
	cis-2-Butene	Propylene	
	Ethane	*trans*-2-Butene	
	Ethylbenzene	*trans*-2-Pentene	
	Ethylene	Toluene	

Table 2-8

Compound Frequencies of Occurrence for the Speciated NMOC Option to the NMOC Base Program (LINY, NWNJ, PLNJ)

Frequency	Compound	
90-100%	1,2,3-Trimethylbenzene	*n*-Octane
	1,3,5-Trimethylbenzene	*n*-Pentane
	1-Decene	*n*-Undecane
	2,2,4-Trimethylpentane	*o*-Ethyltoluene
	2,2-Dimethylbutane	*o*-Xylene
	2,3,4-Trimethylpentane	*p*-Diethylbenzene
	2,3-Dimethylbutane	*m*-/*p*-Xylene
	2-Methylhexane	Propane
	2-Methylpentane	Propylene
	3-Methylhexane	Toluene
	α-Pinene	*trans*-2-Pentene
	Acetylene	1,2,4-Trimethylbenzene
	Benzene	1-Butene
	cis-2-Butene	1-Undecene
	Ethane	2,2,3-Trimethylpentane
	Ethylbenzene	2-Methyl-2-butene
	Ethylene	2-Methylheptane
	Isobutane	3-Methylpentane
	Isopentane	β-Pinene
	Isoprene	*n*-Propylbenzene
	m-Ethyltoluene	2,4-Dimethylpentane
	Methylcyclohexane	3-Methylheptane
	Methylcyclopentane	4-Methyl-1-pentene
	n-Butane	*n*-Decane
	n-Dodecane	*n*-Nonane
	n-Heptane	*trans*-2-Butene
	n-Hexane	
75-90%	1-Dodecene	*p*-Ethyltoluene
	1-Pentene	Styrene
	2-Methyl-1-butene	1,3-Butadiene
	Cyclohexane	1-Octene
	Cyclopentane	3-Methyl-1-butene
	cis-2-Pentene	
50-75%	Cyclopentene	2,3-Dimethylpentane
	2-Methyl-1-pentene	*cis*-2-Hexene
	Isopropylbenzene	1-Hexene
	trans-2-Hexene	1-Tridecene
25-50%	1-Nonene	*n*-Tridecane
0-25%	Propyne	Isobutene
	2-Ethyl-1-butene	

2.2.1.2 Carbonyl Option to the NMOC Base Program

Ten carbonyl sample cartridges from NWNJ, including two duplicate pairs, and eleven from PLNJ, including one duplicate pair, were selected for sample analysis. Samples were collected concurrently with the NMOC canister sample through the use of a separate sampling and control system. Sixteen carbonyl compounds were targeted for analysis.

Tables 2-3 and 2-4 contain summary data for NWNJ and PLNJ, respectively. The frequencies of occurrence of the 16 carbonyl compounds targeted for analysis ranged from 0% to 100% for both sites. Because the meta, para, and ortho components cannot be separated on the analytical system, tolualdehydes are reported as one compound. One compound, isovaleraldehyde, was not detected in any samples from either site. Formaldehyde, acetaldehyde, acetone, propionaldehyde, and butyr/isobutyraldehyde were found in 100% of all samples from both sites. Tolualdehydes were detected at very low levels in all samples from NWNJ, but in no samples from PLNJ. Aldehydes are ubiquitous in urban air, where they are emitted by a variety of mobile and stationary sources. In addition, formaldehyde and acetaldehyde, the two most abundant species, are formed *in situ* by the oxidation of virtually all hydrocarbons.

2.2.1.3 Speciated NMOC Base Program

Summary data for all five Speciated NMOC base sites (B1AL, B2AL, B3AL, FWTX, and EPTX) are contained in Table 2-5. The first three columns indicate the compound, the number of occurrences in which the compound was detected (out of 394 analyses), and the frequency percent. Duplicate and duplicate/replicate data for a given sample date were averaged and considered as one sample. A total of 439 samples were collected, including 45 duplicate samples. Seventy-eight hydrocarbons were quantified during analysis.

The overall frequency percent of detection of the 78 target compounds ranged from 1.02% (4 occurrences) for isobutene, to 99.75% (393 occurrences) for benzene, isobutane, isopentane, propane, and toluene. None of the 78 target hydrocarbons was found to be ubiquitous or entirely absent. Some of the 78 target hydrocarbons were present in 100% or 0%

of all samples from specific sites as indicated in Table 2-9. Table 2-10 outlines the frequencies of occurrence for each compound broken down into frequency categories: 0-25% (6), 25-50% (5), 50-75% (12), 75-90% (20), and 90-100% (35).

2.2.1.4 Toxics Option to the NMOC and Speciated NMOC Base Program

The toxics option frequency of occurrence values for the 38 targeted compounds at the five sites are summarized in the first three columns of Table 2-6. These indicate the number of occurrences in which a given toxic was detected (out of 40 analyses), along with the frequency percent. In cases where duplicate samples were taken, or replicate analyses were performed, the results of all the analyses were averaged for each sample.

The frequency percent for the toxics ranged from 0% for chloroprene, bromochloromethane, bromodichloromethane, *cis*-1,3-dichloropropene, *trans*-1,3-dichloropropene, 1,1,2-trichloroethane, and dibromochloromethane, to 100% for propylene, chloromethane, methylene chloride, chloroform, 1,1,1-trichloroethane, benzene, carbon tetrachloride, toluene, tetrachloroethylene, ethylbenzene, *m*- and *p*-xylene, styrene, and *o*-xylene.

2.2.2 Historical Comparison Results and Discussion

Comparisons between the results of the 1994 program and previous years' programs at each of the NMOC and Speciated NMOC base sites are given in the following sections. The NMOC concentration is also compared by month to previous years. Speciated NMOC summary data by site appear in Appendix E; the data were compared to previous years.

Table 2-9

Entirely Present and Entirely Absent Compounds for the Speciated NMOC Base Program by Site (B1AL, B2AL, B3AL, FWTX, EPTX)

Site (# of Samples)	100% (Detected in All Samples)		0% (Detected in No Samples)
B1AL (81)	1,2,3-Trimethylbenzene 1-Decene 2,2,4-Trimethylpentane 2,2-Dimethylbutane 2-Methylpentane Acetylene Benzene Isobutane	Isopentane *m*-Ethyltoluene *n*-Butane *n*-Pentane *m*-/*p*-Xylene Propane *trans*-2-Pentene Toluene	None
B2AL (79)	None		None
B3AL (78)	2,2-Dimethylbutane Benzene Isobutane Isopentane	*n*-Butane Propane Toluene	Isobutene
FWTX (77)	1,2,3-Trimethylbenzene 1-Decene 2,2,4-Trimethylpentane 2,2-Dimethylbutane 2,3-Dimethylbutane 2-Methylpentane 3-Methylhexane 3-Methylpentane Benzene Ethane Ethylbenzene	Isobutane Isopentane *m*-Ethyltoluene *n*-Butane *n*-Heptane *n*-Hexane *n*-Pentane *m*-/*p*-Xylene Propane Propylene Toluene	None
EPTX (79)	1,3,5-Trimethylbenzene 1-Decene 2,2,4-Trimethylpentane 2,2-Dimethylbutane 2,3,4-Trimethylpentane 2,3-Dimethylpentane 2-Methylheptane 3-Methylhexane 3-Methylpentane α-Pinene Acetylene Benzene Ethane	Ethylbenzene Ethylene Isobutane Isopentane *m*-Ethyltoluene *n*-Heptane *n*-Nonane *o*-Ethyltoluene *m*-/*p*-Xylene Propane Propylene Toluene	2-Ethyl-1-butene

Table 2-10

Compound Frequencies of Occurrence for the Speciated NMOC Base Sites

Frequency	Compound	
90-100%	Benzene	*m*-Ethyltoluene
	Isobutane	1-Butene
	Isopentane	α-Pinene
	Propane	3-Methylhexane
	Toluene	*o*-Ethyltoluene
	2,2-Dimethylbutane	*o*-Xylene
	n-Butane	2,3-Dimethylbutane
	m-/*p*-Xylene	Acetylene
	1,2,3-Trimethylbenzene	1,2,4-Trimethylbenzene
	1-Decene	Ethylene
	2,2,4-Trimethylpentane	β-Pinene
	n-Pentane	1-Dodecene
	2-Methylpentane	Methylcyclopentane
	Ethane	*n*-Heptane
	n-Hexane	1-Undecene
	3-Methylpentane	*n*-Undecane
	Propylene	2,3,4-Trimethylpentane
	Ethylbenzene	
75-90%	*trans*-2-Pentene	Methylcyclohexane
	n-Dodecane	*n*-Nonane
	2,4-Dimethylpentane	Styrene
	1,3,5-Trimethylbenzene	*p*-Diethylbenzene
	2-Methylhexane	*n*-Octane
	2-Methyl-2-butene	3-Methylheptane
	Isoprene	4-Methyl-1-pentene
	2-Methylheptane	*trans*-2-Butene
	2-Methyl-1-butene	*n*-Propylbenzene
	n-Decane	Cyclohexane
50-75%	*p*-Ethyltoluene	*cis*-2-Butene
	2,2,3-Trimethylpentane	1,3-Butadiene
	Cyclopentane	2-Methyl-1-pentene
	cis-2-Pentene	*trans*-2-Hexene
	2,3-Dimethylpentane	3-Methyl-1-butene
	1-Pentene	1-Octene
25-50%	1-Hexene	*cis*-2-Hexene
	Cyclopentene	1-Nonene
	Isopropylbenzene	
0-25%	1-Tridecene	2-Ethyl-1-butene
	Propyne	Acetylene/Ethane
	n-Tridecane	Isobutene

2.2.2.1 NMOC Monthly Variations

Table 2-11 partitions the NMOC data for the summer of 1994 into groups that correspond to monthly intervals. For this time period, the monthly concentration means and medians of the NMOC sites roughly parallel one another, the lone exception occurring in August. The August value for the median decreases slightly from July, whereas the value of the mean concentration has increased slightly from the July value. Entering into September, both median and mean decrease from the August values. A noticeable increase in both median and mean is observed for the month of October. Figure 2-1 shows a plot of these mean values and illustrates how they compare with program results from previous years, dating to 1988.

Table 2-11

Summary Statistics for 1994 NMOC Sites, by Month (LINY, NWNJ, PLNJ)

Sample Month 1994	NMOC Concentration, ppmC					Cases
	Minimum	Median	Mean	Maximum	Standard Deviation	
July	0.14	0.47	0.48	1.10	0.22	40
August	0.09	0.45	0.51	1.22	0.27	69
September	0.06	0.38	0.48	1.49	0.31	59
October	0.11	0.60	0.87	2.52	0.64	55

The 1994 overall results are comparable with the overall results encountered in previous years. Looking at Figure 2-1, few trends in the data are immediately apparent. Generally, increases and decreases from month to month have occurred randomly, with approximately the same number of increases as decreases. However, the mean of the plotted mean values shows a slight decrease from June to July, a slight increase from July to August, a slight decrease from August to September, and a slight increase from September to October. The 1994 data closely parallel these values, with the exception of October 1994 which was the highest of the three

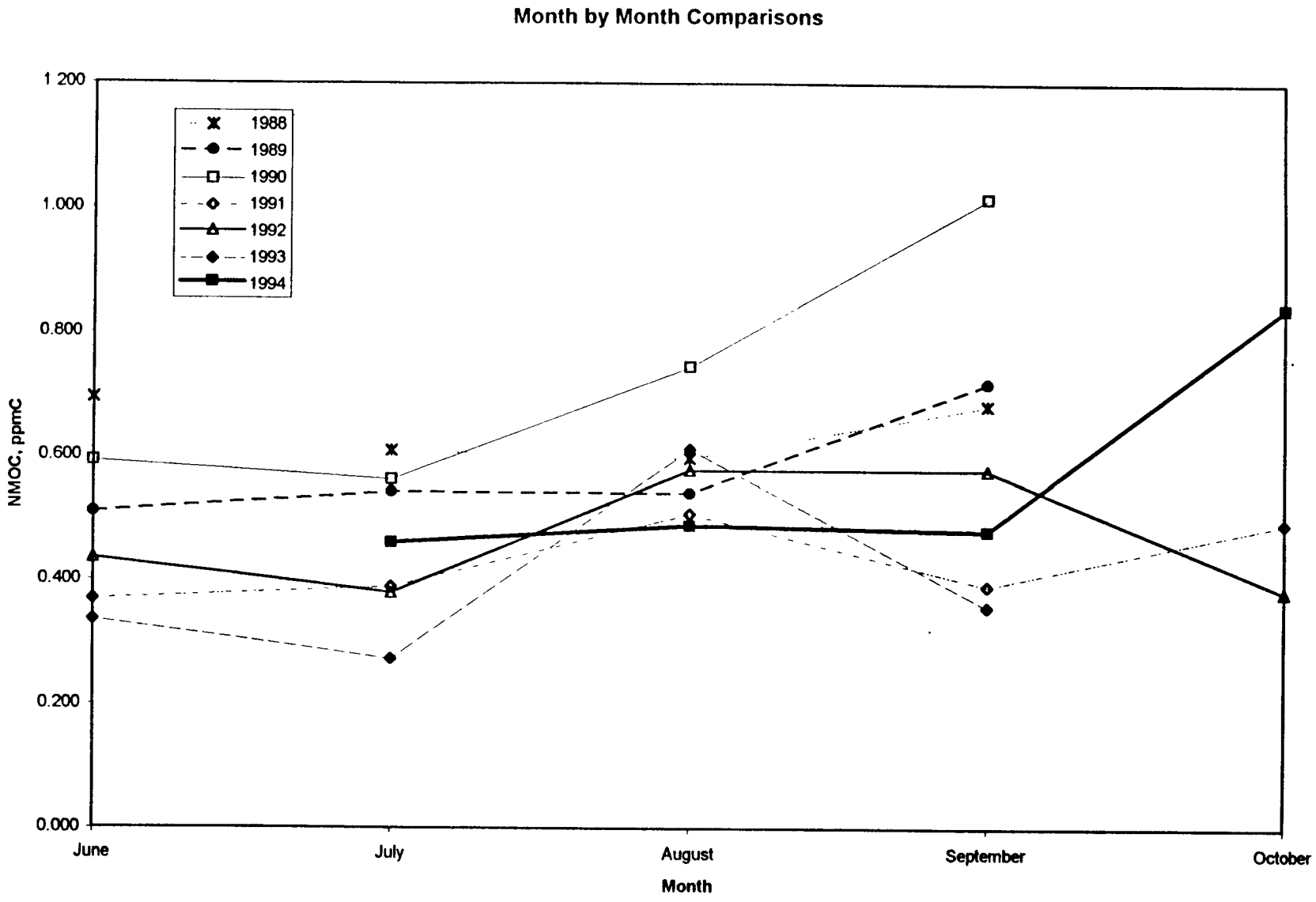


Figure 2-1. NMOC Monthly Variations

values yet observed for that month. The August 1994 value is the lowest of seven values which have been encountered for that month.

2.2.2.2 Birmingham, AL (B1AL)

Speciated NMOC data for B1AL were examined back to the inception of the program at this site in 1992. Average frequencies of occurrence for the 78 target compounds increased slightly in 1994: 1994, 83.4%; 1993, 75.7%; and 1992, 75.2%. In all cases, the frequencies of occurrence for individual compounds ranged from 0% to 100%. Toluene, propane, and isopentane were found to be among the most prevalent compounds and had the highest mean concentrations. Both toluene and isopentane are indicative of mobile source emissions. The highest mean concentrations were: 1994, 26.27 ppbC of isopentane; 1993, 23.60 ppbC of isopentane; and 1992, 29.10 ppbC of isopentane. The highest observed concentrations were: 1994, 133.35 ppbC of propane; 1993, 140.50 ppbC of propane; and 1992, 163.33 ppbC of isopentane. It is possible that the high levels of propane observed at this site are produced by the flare stack of a major coke producing plant located about ½ mile west of the sampling location.

2.2.2.3 Birmingham, AL (B2AL)

Speciated NMOC data for B2AL were examined back to the inception of the program at this site in 1992. Average frequencies of occurrence for the 78 target compounds increased in 1994: 1994, 68.0%; 1993, 59.0%; and 1992, 56.7 percent. In 1992 and 1993, the frequencies of occurrence for individual compounds ranged from 0% to 100 percent. In 1994, the frequencies ranged from 1.3% to 98.7% (present in one sample of 79 and missing in one sample, respectively). Toluene and isopentane, both indicative of mobile source emissions, were found to be among the most prevalent compounds and had the highest mean concentrations. In addition, high levels of *n*-butane and *n*-pentane were present in 1992, high levels of *n*-undecane were present in 1993, and high levels of propane and 1,2,4-trimethylbenzene were present in 1994. Levels of these compounds in other years were not noticeably higher than those of other compounds. The highest mean concentrations were: 1994, 9.04 ppbC of isopentane; 1993, 24.10 ppbC of isopentane; and 1992, 13.93 ppbC of isopentane. The highest observed

concentrations were: 1994, 118.86 ppbC of isopentane; 1993, 668.20 ppbC of isopentane (the standard deviation was also high, indicating large variability among the measured concentrations); and 1992, 137.73 ppbC of isopentane.

2.2.2.4 Birmingham, AL (B3AL)

Speciated NMOC data for B3AL were examined back to the inception of the program at this site in 1992. Average frequencies of occurrence for the 78 target compounds exhibited an increasing trend: 1994, 69.3%; 1993, 63.5%; and 1992, 56.4 percent. In all cases the frequencies of occurrence for individual compounds ranged from 0% to 100 percent. Toluene and isopentane were found to be among the most prevalent compounds and had some of the highest mean concentrations. In addition, high levels of 2,2-dimethylbutane and *n*-propylbenzene were present in 1992, high levels of propane and *n*-butane were present in 1993, and high levels of isobutane, ethane, *n*-butane, *n*-pentane, and propane were present in 1994. The highest mean concentrations were: 1994, 23.53 ppbC of isopentane; 1993, 19.10 ppbC of isopentane; and 1992, 23.42 ppbC of 2,2-dimethylbutane. The highest observed concentrations were: 1994, 369.98 ppbC of isobutane; 1993, 380.10 ppbC of propane; and 1992, 182.16 ppbC of *n*-propylbenzene.

All three of the Birmingham, AL sites exhibited similarities. In each case toluene and isopentane were prevalent. These compounds are generally indicative of mobile emissions. Benzene, acetylene, and ethylene are also produced by mobile emitters, and concentrations of these species were also significant at each of the three sites. Overall frequencies of occurrence were higher at B1AL than at B2AL and B3AL, possibly due to the suburban setting. B2AL and B3AL are located in rural residential and agricultural settings, respectively.

2.2.2.5 El Paso, TX (EPTX)

Speciated NMOC data for EPTX were examined back to the inception of the program at this site in 1991. Average frequencies of occurrence for the 78 target compounds remained relatively constant: 1994, 87.5%; 1993, 84.4%; 1992, 87.2%; and 1991, 83.9 percent. In all cases, the frequencies of occurrence for individual compounds ranged from 0% to 100 percent.

Toluene and propane were found to be among the most prevalent compounds with the highest mean concentrations. In 1994, some abnormally high readings of isopentane, 3-methylpentane, and *n*-hexane were observed in the sample taken on September 14, 1994, with maximum measured concentrations of 3370.75 ppbC *n*-hexane, 2393.21 ppmC of 3-methylpentane, and 2215.17 ppbC of isopentane. These three species also exhibited the highest concentration standard deviations encountered, indicating that large variations in the observed levels were present. A few atypically high readings would account for this. The highest mean concentrations observed were: 1994, 55.21 ppbC of isopentane; 1993, 36.00 ppbC of propane; 1992, 40.81 ppbC of toluene; and 1991, 36.88 ppbC of toluene. The highest observed concentrations were: 1994, 3370.75 ppbC of *n*-hexane; 1993, 305.30 ppbC of propane; 1992, 235.92 ppbC of propane; and 1991, 281.86 ppbC of propane.

This site is located in an urban setting with large numbers of mobile sources, including automobiles and trains, in the immediate vicinity. Because of this close proximity, anomalous readings might be expected as a result of wind conditions.

2.2.2.6 Ft. Worth, TX (FWTX)

Speciated NMOC data for FWTX was examined back to the inception of the program at this site in 1992. Average frequencies of occurrence for the 78 target compounds were lower in 1993 than in either 1992 or 1994: 1994, 79.2%; 1993, 64.6%; and 1992, 71.4 percent. In all cases the frequencies of occurrence for individual compounds ranged from 0% to 100 percent. Toluene and isopentane, both indicative of mobile source emissions, were found to be among the most prevalent compounds and had some of the highest mean concentrations. In addition, high levels of ethane and propane were present in 1992, high levels of propane, ethane, 2,2-dimethylbutane, and *n*-butane were present in 1993, and high levels of 2,2-dimethylbutane, ethane, *n*-butane, and propane were present in 1994. The highest mean concentrations were: 1994, 29.33 ppbC of isopentane; 1993, 18.20 ppbC of isopentane; and 1992, 26.32 ppbC of toluene. The highest observed concentrations were: 1994, 329.44 ppbC of *n*-butane; 1993, 236.60 ppbC of isopentane; and 1992, 218.21 ppbC of toluene.

Some of the highest levels of the heavier hydrocarbons (with carbon number ≥ C_{11}) were found at this site. This is likely a result of its location next to an airport. Jet aircraft use a kerosene based fuel (Jet-A) which has a higher overall molecular weight than automotive fuels. Jet-A fuel may contain significant quantities of species with carbon numbers higher than 14; however, the analytical methods used in this study were not suitable for detection of these species since they focused on gas-phase compounds.

2.3 Precision

The precisions of the analytical and sampling techniques used during the 1994 program were investigated and the results are presented in the following sections. Duplicate samples were collected and analyzed to provide an indication of the sampling and analytical precision of the techniques used. Each of the duplicate samples was analyzed in replicate to provide an indication of the analytical precision of the techniques used. Replicate analyses from a single sample canister are used to determine analytical precision. The first analysis was performed on the day the canister was received from the sample site, and is designated in the table in Appendix F and G by an "I" in the Radian ID# column. The second analysis from the canister was performed at least 24 hours after the first analysis and is designated in the table in the appendix by an "R". This procedure was followed to ensure that sufficient time had elapsed between removal of an aliquot for analysis to allow the canister contents to equilibrate with the canister surfaces and to allow any concentration gradients within the canister to disperse.

2.3.1 NMOC Base Program

The precisions for the NMOC Base Program are presented in the following sections.

2.3.1.1 Sampling and Analytical Precision

A summary of the duplicate analysis results for the 1994 NMOC base program appears in Table 2-12. The raw data is given in Appendix F. Percent differences between canister means ranged from -31.606% to 32.999% and averaged 0.223% overall. The low overall average

percent difference indicates that there was no systematic bias between samples. The absolute percent difference for 1994 averaged 9.42%, which compares favorably to previous years results: 1993, 12.63%; 1992, 15.63%; 1991, 15.77%; 1990, 7.59%; and 1989, 10.62 percent.

Table 2-12

Duplicate Precision for the 1994 NMOC Base Program

	Overall Canister NMOC[A] ppmC	Precision		
		Difference (ppmC)	% Difference	Absolute % Difference
Average	0.394	0.023	0.223	9.420
Standard Deviation	0.268	0.092	13.435	9.416
Minimum	0.083	-0.105	-31.606	0.294
Maximum	1.200	0.402	32.999	32.999

[A]Average of all injections for a sample, including duplicates and replicates.

2.3.1.2 Analytical Precision

Replicate (or repeated) analysis results for the NMOC base program are listed in Table 2-13. The raw data is given in Appendix G.

A total of 52 analyses on 26 canister samples were performed. The percent difference ranged from -18.840% to 15.602%, and averaged -0.569% overall. The low overall average percent difference indicates an insignificant average bias between the first and second analyses and excellent analytical precision.

The overall absolute percent difference was 7.27% for 1994. This compares very favorably with results from previous years: 1993, 22.54%; 1992, 21.61%; 1991, 14.29%; 1990, 7.59%; and 1989, 8.24 percent.

Table 2-13

Analytical Precision for the 1994 NMOC Base Program

	Overall Canister NMOC[A] ppmC	Precision		
		Difference (ppmC)	% Difference	Absolute % Difference
Average	0.415	-0.002	-0.569	7.270
Standard Deviation	0.255	0.035	8.944	5.037
Minimum	0.083	-0.085	-18.840	0.997
Maximum	1.200	0.061	15.602	18.840

[A]Average of the replicate analyses from a single canister.

2.3.2 Speciated NMOC Option to the NMOC Base Program

The precisions for the Speciated NMOC Option are presented in the following sections.

2.3.2.1 Sampling and Analytical Precision

For each of the Speciated NMOC option sites, one duplicate pair of samples was randomly chosen for analysis. Pooled standard deviations for the duplicate samples were calculated as an indication of sampling and analytical precision. The combined data for all sites is presented in Table 2-14. The duplicate pooled standard deviations show similar results for each compound, indicating that the duplicate sampling procedure provided representative ambient air samples. Pooled standard deviations may be thought of as an average of a group of standard deviations: The squares of the standard deviations are averaged, and the square root is taken of that result. This value is the pooled standard deviation.

The overall average absolute percent difference, which is used to indicate precision of two data points, is 25.69 percent. This compares with the values of 22.62% and 13.99% in 1993 and 1992, respectively.

Table 2-14

1994 Duplicate Sample Results for the Speciated NMOC Option Sites

Compound	Cases	Duplicate Pair Statistics			
		Concentration		Average Absolute % Difference	Pooled Standard Deviation
		Median	Average		
1,2,3-Trimethylbenzene	3	2.63	3.36	40.94	1.29
1,2,4-Trimethylbenzene	3	2.19	2.20	62.11	1.28
1,3,5-Trimethylbenzene	3	1.17	1.49	2.87	0.05
1,3-Butadiene	3	0.18	0.20	73.24	0.09
1-Butene	3	2.44	3.42	3.03	0.08
1-Decene	3	3.49	4.64	2.82	0.11
1-Dodecene	3	0.77	0.82	60.10	0.41
1-Hexene	3	0.06	0.34	157.95	0.46
1-Nonene	3	0.00	0.06	6.06	0.00
1-Octene	3	0.00	0.16	2.04	0.00
1-Pentene	3	0.90	0.70	83.54	0.52
1-Tridecene	3	0.00	0.00	0.00	0.00
1-Undecene	3	0.93	0.93	84.32	0.62
2,2,3-Trimethylpentane	3	0.56	0.57	31.33	0.24
2,2,4-Trimethylpentane	3	3.42	4.35	1.88	0.10
2,2-Dimethylbutane	3	4.26	5.94	9.54	0.76
2,3,4-Trimethylpentane	3	1.31	1.56	2.36	0.03
2,3-Dimethylbutane	3	1.77	1.74	18.16	0.23
2,3-Dimethylpentane	3	0.38	0.36	45.25	0.13
2,4-Dimethylpentane	3	0.84	0.96	1.20	0.00
2-Ethyl-1-butene	3	0.00	0.00	0.00	0.00
2-Methyl-1-butene	3	0.97	0.95	9.60	0.04
2-Methyl-1-pentene	3	0.19	0.38	164.81	0.37
2-Methyl-2-butene	3	1.31	1.09	10.20	0.07
2-Methylheptane	3	0.93	1.13	5.37	0.05
2-Methylhexane	3	1.48	1.92	36.27	0.38
2-Methylpentane	3	4.32	5.41	4.20	0.19
3-Methyl-1-butene	3	0.30	0.25	19.75	0.05
3-Methylheptane	3	0.86	0.94	8.49	0.04
3-Methylhexane	3	2.37	2.87	10.04	0.33
3-Methylpentane	3	2.54	3.85	3.95	0.23

Table 2-14

Continued

Compound	Cases	Duplicate Pair Statistics			
		Concentration		Average Absolute % Difference	Pooled Standard Deviation
		Median	Average		
4-Methyl-1-pentene	3	0.23	0.39	119.20	0.26
α-Pinene	3	1.16	2.93	49.60	0.50
Acetylene	3	5.17	6.36	5.06	0.21
Acetylene/Ethane	3	0.00	0.00	0.00	0.00
β-Pinene	3	0.68	0.95	30.78	0.30
Benzene	3	5.27	5.85	3.30	0.12
cis-2-Butene	3	0.62	0.80	3.13	0.00
cis-2-Hexene	3	0.00	0.06	2.99	0.00
cis-2-Pentene	3	0.89	0.83	69.71	0.55
Cyclohexane	3	0.59	1.71	53.22	0.86
Cyclopentane	3	0.37	0.41	13.76	0.07
Cyclopentene	3	0.07	0.05	200.00	0.08
Ethane	3	15.59	20.12	2.81	0.44
Ethylbenzene	3	2.41	3.82	1.89	0.07
Ethylene	3	13.58	14.56	0.78	0.10
Isobutane	3	4.96	6.53	4.26	0.20
Isobutene	3	0.00	0.00	0.00	0.00
Isopentane	3	14.67	17.04	2.12	0.38
Isoprene	3	0.51	0.52	39.31	0.25
Isopropylbenzene	3	0.19	0.16	3.90	0.00
m-Ethyltoluene	3	2.30	2.80	1.74	0.07
m-/*p*-Xylene	3	7.97	11.66	2.57	0.50
Methylcyclohexane	3	0.91	0.99	13.75	0.09
Methylcyclopentane	3	1.99	1.99	3.23	0.04
n-Butane	3	6.02	8.71	7.00	1.01
n-Decane	3	1.11	2.11	9.14	0.13
n-Dodecane	3	0.87	1.26	63.14	0.80
n-Heptane	3	1.27	1.57	13.94	0.16
n-Hexane	3	2.43	2.75	1.83	0.06
n-Nonane	3	0.75	1.22	3.87	0.09
n-Octane	3	0.80	1.18	9.86	0.06

Table 2-14

Continued

Compound	Cases	Duplicate Pair Statistics			
		Concentration		Average Absolute % Difference	Pooled Standard Deviation
		Median	Average		
n-Pentane	3	4.92	5.47	2.14	0.09
n-Propylbenzene	3	0.77	0.75	28.17	0.22
n-Tridecane	3	0.00	0.00	0.00	0.00
n-Undecane	3	1.53	1.75	30.40	0.41
o-Ethyltoluene	3	1.29	2.08	6.47	0.12
o-Xylene	3	2.70	3.78	6.74	0.17
p-Diethylbenzene	3	0.50	0.55	25.51	0.15
p-Ethyltoluene	3	0.75	1.02	6.55	0.08
Propane	3	8.55	19.72	2.84	0.51
Propylene	3	4.13	8.80	3.31	0.20
Propyne	3	0.00	0.00	0.00	0.00
Styrene	3	0.37	0.42	32.38	0.21
trans-2-Butene	3	1.29	1.19	46.87	0.39
trans-2-Hexene	3	0.18	0.14	104.26	0.15
trans-2-Pentene	3	1.19	1.17	9.18	0.08
Toluene	3	14.38	23.58	1.51	0.46

2.3.2.2 Analytical Precision

Each of the duplicate sample pairs was also analyzed in replicate to measure analytical precision. The summary statistics for the option sites in terms of average concentrations, average absolute percent differences, and pooled standard deviations are presented in Table 2-15. The data show an analytical precision with an overall absolute percent difference of 44.78 percent. This compares with the values of 22.15% and 10.92% in 1993 and 1992, respectively.

2.3.3 Carbonyl Option to the Base NMOC Program

The precisions for the NMOC Carbonyl Option are presented in the following sections.

2.3.3.1 Sampling and Analytical Precision

Sampling and analytical precision was measured as the standard deviation and relative standard deviation for the results from field duplicate samples which were analyzed in replicate. The precision results for PLNJ are summarized in Table 2-16 where there was one duplicate pair and those for NWNJ in Table 2-17 where there were two duplicate pairs. The raw data is given in Appendix H. The duplicate analyses were performed on approximately 10% of the samples from each site. The overall average standard deviation for PLNJ was 0.07 ppbv with an overall relative standard deviation of 9.34%, and for NWNJ the overall average standard deviation was 0.14 ppbv with an overall relative standard deviation of 17.11 percent. These values are comparable to those encountered in previous years. PLNJ: 1993, 8.94%; and 1992, 37.27%. NWNJ: 1993, 14.14%; and 1992, 9.78 percent.

Relative standard deviation and absolute percent difference are similar statistics and provide similar information. Often absolute percent difference is used when comparing two data points, whereas relative standard deviation is used when comparing a greater number of data points.

Table 2-15

Replicate Analysis Results for the Speciated NMOC Option Sites

Compound	Cases	Replicate Pair Statistics			
		Concentration		Average Absolute % Difference	Pooled Standard Deviation
		Median	Average		
1,2,3-Trimethylbenzene	5	3.55	3.60	15.43	0.32
1,2,4-Trimethylbenzene	5	2.15	2.32	5.46	0.12
1,3,5-Trimethylbenzene	5	1.16	1.55	4.83	0.05
1,3-Butadiene	5	0.24	0.24	200.00	0.34
1-Butene	5	2.53	3.63	8.94	0.30
1-Decene	5	3.56	4.88	3.81	0.15
1-Dodecene	5	0.76	0.83	51.58	0.25
1-Hexene	5	0.00	0.11	109.76	0.08
1-Nonene	5	0.00	0.07	200.00	0.15
1-Octene	5	0.00	0.20	200.00	0.44
1-Pentene	5	0.38	0.55	132.64	0.38
1-Tridecene	5	0.00	0.00	0.00	0.00
1-Undecene	5	1.07	0.87	60.21	0.23
2,2,3-Trimethylpentane	5	0.51	0.57	47.13	0.36
2,2,4-Trimethylpentane	5	3.44	4.54	4.82	0.13
2,2-Dimethylbutane	5	4.26	6.45	5.08	0.33
2,3,4-Trimethylpentane	5	1.32	1.61	4.90	0.05
2,3-Dimethylbutane	5	2.01	1.78	6.84	0.08
2,3-Dimethylpentane	5	0.35	0.32	161.14	0.41
2,4-Dimethylpentane	5	0.86	0.98	9.59	0.06
2-Ethyl-1-butene	5	0.00	0.00	0.00	0.00
2-Methyl-1-butene	5	0.97	0.95	12.23	0.07
2-Methyl-1-pentene	5	0.37	0.46	127.98	0.44
2-Methyl-2-butene	5	1.39	1.07	19.47	0.13
2-Methylheptane	5	0.99	1.18	5.71	0.06
2-Methylhexane	5	1.85	2.08	71.29	1.56
2-Methylpentane	5	4.35	5.64	5.09	0.40
3-Methyl-1-butene	5	0.24	0.23	160.60	0.30
3-Methylheptane	5	0.82	0.95	13.02	0.08
3-Methylhexane	5	2.42	2.98	4.39	0.10
3-Methylpentane	5	2.58	4.11	3.66	0.17

Table 2-15

Continued

Compound	Cases	Replicate Pair Statistics			
		Concentration		Average Absolute % Difference	Pooled Standard Deviation
		Median	Average		
4-Methyl-1-pentene	5	0.35	0.47	88.27	0.35
α-Pinene	5	1.66	3.25	70.82	1.99
Acetylene	5	5.00	6.57	8.89	0.39
Acetylene/Ethane	5	0.00	0.00	0.00	0.00
β-Pinene	5	0.72	1.01	14.91	0.16
Benzene	5	5.38	5.98	1.45	0.09
cis-2-Butene	5	0.61	0.83	18.64	0.18
cis-2-Hexene	5	0.00	0.07	200.00	0.15
cis-2-Pentene	5	0.58	0.87	68.34	0.34
Cyclohexane	5	0.56	1.93	107.23	1.42
Cyclopentane	5	0.37	0.40	89.53	0.34
Cyclopentene	5	0.00	0.06	200.00	0.13
Ethane	5	15.88	21.09	5.42	0.45
Ethylbenzene	5	2.43	4.10	3.35	0.09
Ethylene	5	13.71	14.77	5.62	0.70
Isobutane	5	5.21	6.89	5.83	0.43
Isobutene	5	0.00	0.00	0.00	0.00
Isopentane	5	14.45	17.47	4.33	0.62
Isoprene	5	0.39	0.54	109.47	0.52
Isopropylbenzene	5	0.19	0.19	104.30	0.17
m-Ethyltoluene	5	2.31	2.95	3.96	0.10
m-/*p*-Xylene	5	8.03	12.41	3.27	0.25
Methylcyclohexane	5	0.92	1.00	9.86	0.06
Methylcyclopentane	5	2.04	2.00	8.02	0.09
n-Butane	5	6.16	9.27	10.84	1.11
n-Decane	5	1.17	2.32	11.47	0.22
n-Dodecane	5	1.12	1.41	121.46	1.92
n-Heptane	5	1.45	1.67	13.05	0.16
n-Hexane	5	2.45	2.82	3.60	0.07
n-Nonane	5	0.74	1.31	16.27	0.14
n-Octane	5	0.80	1.25	63.48	0.25

Table 2-15

Continued

Compound	Cases	Replicate Pair Statistics			
		Concentration		Average Absolute % Difference	Pooled Standard Deviation
		Median	Average		
n-Pentane	5	4.99	5.59	3.55	0.19
n-Propylbenzene	5	0.82	0.78	46.33	0.32
n-Tridecane	5	0.00	0.00	0.00	0.00
n-Undecane	5	1.63	1.94	62.86	0.85
o-Ethyltoluene	5	1.34	2.25	7.09	0.12
o-Xylene	5	2.83	4.02	3.74	0.12
p-Diethylbenzene	5	0.50	0.53	84.26	0.48
p-Ethyltoluene	5	0.75	1.07	6.72	0.07
Propane	5	8.42	21.93	5.71	0.50
Propylene	5	4.01	9.71	5.36	0.22
Propyne	5	0.00	0.00	0.00	0.00
Styrene	5	0.36	0.43	61.55	0.31
trans-2-Butene	5	1.22	1.11	28.53	0.25
trans-2-Hexene	5	0.23	0.17	137.04	0.21
trans-2-Pentene	5	1.24	1.18	9.36	0.09
Toluene	5	14.52	25.44	3.64	0.74

Table 2-16

1994 Plainfield, NJ (PLNJ) Carbonyl Sampling and Analytical Precision Statistics

Compound	Average (ppbv) 9/13/94	Standard Deviation (ppbv) 9/13/94	Relative Standard Deviation (%) 9/13/94
Formaldehyde	3.29	0.05	1.43
Acetaldehyde	2.84	0.05	1.63
Acrolein	NA	NA	NA
Acetone	4.94	0.11	2.18
Propionaldehyde	0.50	0.13	26.88
Crotonaldehyde	0.47	0.04	8.69
Butyr/Isobutyraldehyde	0.33	0.05	15.21
Benzaldehyde	NA	NA	NA
Isovaleraldehyde	NA	NA	NA
Valeraldehyde	NA	NA	NA
Tolualdehydes	NA	NA	NA
Hexanaldehyde	NA	NA	NA
2,5-Dimethylbenzaldehyde	NA	NA	NA
Overall Average	NA	0.07	9.34

NA = Not Applicable because some compounds were not detected in sample.

Table 2-17

1994 Newark, NJ (NWNJ) Carbonyl Sampling and Analytical Precision Statistics

Compound	Average[a] (ppbv)	Pooled Standard Deviation (ppbv)	Relative Standard Deviation (%)
Formaldehyde	2.43	0.07	2.88
Acetaldehyde	2.43	0.19	7.82
Acrolein	0.17[b]	0.01[b]	5.72[b]
Acetone	4.01	0.30	7.48
Propionaldehyde	0.36	0.08	22.22
Crotonaldehyde	NA	NA	NA
Butyr/Isobutyraldehyde	0.41	0.15	36.58
Benzaldehyde	NA	NA	NA
Isovaleraldehyde	NA	NA	NA
Valeraldehyde	0.23[b]	NA	NA
Tolualdehydes	0.73	0.13	17.81
Hexanaldehyde	0.11[b]	0.14[b]	36.36[b]
2,4-Dimethylbenzaldehyde	NA	NA	NA
Overall Average	NA	0.14	17.11

[a]Average of two duplicate pairs.
[b]Compound measured in only one duplicate pair.
NA = Not Applicable because some compounds were not detected in sample.

2.3.3.2 Analytical Precision

The analytical precision was measured as the average standard deviation of the replicate analyses performed on the paired duplicate samples. The analytical precision results for PLNJ and NWNJ are given in Appendix I. The replicate analyses were performed on approximately 10% of the samples from each site. The average standard deviation for PLNJ was 0.08 ppbv with a relative standard deviation of 11.21% (compared to 5.55% in 1993 and 6.83% in 1992) and an absolute percent difference of 15.40 percent. For NWNJ the average standard deviation was 0.14 ppbv with a relative standard deviation of 15.55% (compared to 11.97% in 1993 and 6.16% in 1992) and an absolute percent difference of 22.00 percent. Combining results from all replicate samples at both sites produces an average standard deviation of 0.12 ppbv (compared to 0.17 ppbv in 1993 and 0.27 ppbv in 1992) with a relative standard deviation of 14.54% and an absolute percent difference of 20.43 percent.

2.3.4 Speciated NMOC Base Program

The precisions for the Speciated NMOC Base Program are presented in the following sections.

2.3.4.1 Sampling and Analytical Precision

For each of the five Speciated NMOC base sites eight to nine duplicate sample pairs were collected and analyzed, for a total of 42 samples. Pooled standard deviations for the duplicate samples were calculated as an indication of sampling precision. Appendix J presents the data for all sites. The duplicate pooled standard deviations show similar results for each compound, with an overall average pooled standard deviation of 0.41 ppbC, indicating that the duplicate sampling procedure provided representative ambient air samples. The overall average percent difference is 34.46%, which is higher than those values of 12.70% for 1993 and 13.83% for 1992, likely due to the smaller sample set in 1994.

2.3.4.2 Analytical Precision

For each program site, the duplicate sample pairs were also analyzed in replicate to measure analytical precision. Seven or eight pairs were chosen at each site, for a total of 39 samples. Appendix K summarizes the statistics for the five base sites in terms of average concentrations, average absolute percent differences, and pooled standard deviations. The duplicate pooled standard deviations show similar results for each compound, with an overall average pooled standard deviation of 0.36 ppbC, indicating good results for analytical precision. The overall average percent difference is 35.14%, which is higher than the values of 11.46% and 11.81% for 1993 and 1992, respectively, likely due to the small sample set in 1994.

2.3.5 Toxics Option to the NMOC and Speciated NMOC Base Programs

The precisions for the Toxics Option are presented in the following sections.

2.3.5.1 Sampling and Analytical Precision

For each of the five sites which chose to participate in the Toxics Option program, one duplicate sample pair was collected and analyzed. The minimum, maximum, and mean differences between sample pairs were calculated, as were the standard deviations and absolute percent differences. Table 2-18 contains a summary of the data for only those compounds detected. The overall average standard deviation was 0.097 ppbv, indicating that the duplicate sampling procedure provided representative ambient air samples. The overall average absolute percent difference between duplicate sample analyses was 7.24%, which compares very favorably to the values of 19.21% for 1993 and 16.01% for 1992.

Table 2-18

1994 Toxics Option Duplicate Sample Statistics

Compound	No. Of Occurrences	Minimum Difference (ppbv)	Maximum Difference (ppbv)	Mean Difference (ppbv)	Absolute Percent Difference	Standard Deviation
Acetylene	5	-0.33	3.46	1.094	19.57	1.773
Propylene	5	-0.58	0.56	0.066	21.53	0.434
Chloromethane	5	-0.45	0.20	-0.108	31.15	0.268
1,3-Butadiene	5	-1.27	0.18	-0.203	28.25	0.601
Methylene Chloride	5	-0.04	0.08	0.010	19.47	0.048
trans-1,2-Dichloroethylene	1[a]	0.01	0.01	0.010	16.67	NA
Chloroform	5	-0.01	0.02	0.005	20.04	0.007
1,1,1-Trichloroethane	5	-0.03	0.01	-0.004	6.38	0.017
Benzene	5	-0.08	0.04	-0.007	5.76	0.045
Carbon Tetrachloride	5	-0.02	0.01	-0.003	7.88	0.008
Trichloroethylene	4	0	0.01	0.003	5.88	0.003
Toluene	5	-0.16	0.25	0.060	9.07	0.150
n-Octane	5	-0.02	0.03	0.008	21.73	0.016
Tetrachloroethylene	5	-0.01	0.02	0.002	7.45	0.008
Ethylbenzene	5	-0.03	0.08	0.017	8.17	0.040
m-/*p*-Xylene	5	-0.09	0.19	0.041	7.63	0.101
Styrene	5	-0.01	0.03	0.007	8.83	0.013
o-Xylene	5	-0.04	0.05	0.011	6.47	0.031
p-Dichlorobenzene	5	-0.01	0.01	0.001	16.12	0.007
				Overall	7.24	0.097

[a]One duplicate pair or two observations; standard deviation not determined.

NA = Not applicable.

2.3.5.2 Analytical Precision

For each program site, the duplicate sample pairs were also analyzed in replicate to measure analytical precision. Table 2-19 summarizes the statistics for all sites in terms of minimum, maximum, and mean differences between replicate analyses of each sample, as well as the standard deviations and absolute percent differences. The overall average standard deviation was 0.354 ppbv. The overall average absolute percent difference was 34.69%, for a small number of samples (10 cases) involved. This value compares with values of 20.80% for 1993 (80 cases) and 18.73% for 1992 (76 cases).

2.4 Accuracy Results

In order to measure the accuracy of the 1994 NMOC Program analytical results, Radian analyzed audit samples provided by the EPA and had some samples analyzed by an independent EPA laboratory for comparison purposes. The results of these analyses are presented in the following sections.

2.4.1 External Audit Results

Audit samples were provided to Radian by the EPA through ManTech, Incorporated. Results of the analyses of these samples are presented in the following sections. The EPA audit reports are given in Appendix L.

2.4.1.2 NMOC Audits

Primary measures of accuracy for the NMOC monitoring data were calculated from the results of the analysis of propane audit samples provided by the EPA. Results are reported in terms of percent bias relative to the reference lab concentration value. Two audit samples,

Table 2-19

1994 Toxics Option Replicate Sample Statistics

Compound	No. Of Occurrences	Minimum Difference (ppbv)	Maximum Difference (ppbv)	Mean Difference (ppbv)	Absolute Percent Difference	Standard Deviation
Acetylene	10	-0.38	5.30	1.828	28.73	1.679
Propylene	11	-2.61	0.21	-0.474	26.43	0.839
Chloromethane	10	-0.33	0.47	0.067	28.16	0.224
Vinyl Chloride	1[a]	-0.01	-0.01	-0.010	28.57	NA
1,3-Butadiene	10	-3.88	0.29	-0.627	78.48	1.235
Bromomethane	1[a]	-0.01	-0.01	-0.010	18.18	NA
Chloroethane	2	0.02	0.06	0.040	45.83	0.028
Methylene Chloride	10	-0.23	0.18	-0.034	29.69	0.124
trans-1,2-Dichloroethylene	2	0.01	0.01	0.010	16.78	0.000
Chloroform	10	-0.05	0.05	0.007	45.32	0.027
1,1,1-Trichloroethane	10	-0.3	0.25	0.034	32.02	0.153
Benzene	11	-1.29	1.30	0.009	39.37	0.592
Carbon Tetrachloride	10	-0.03	0.02	0.002	11.55	0.013
Trichloroethylene	8	-0.02	0.01	-0.003	21.81	0.010
Toluene	10	-3.45	0.62	-0.456	32.95	1.139
n-Octane	10	-0.19	0.02	-0.035	49.28	0.062
Tetrachloroethylene	10	-0.08	0.17	0.015	38.42	0.062
Ethylbenzene	10	-0.34	0.49	0.037	38.74	0.211
m-/*p*-Xylene	11	-2.02	1.99	-0.023	43.46	0.932
Styrene	10	-0.22	0.06	-0.025	39.28	0.077
o-Xylene	10	-1.05	0.11	-0.121	30.28	0.336
m-Dichlorobenzene	2	0	0.01	0.005	33.33	0.007
p-Dichlorobenzene	11	-0.05	0.04	-0.001	60.49	0.026
o-Dichlorobenzene	4	-0.01	0.01	0.003	50.00	0.010
				Overall	34.69	0.354

[a]One replicate occurrence or two observations; standard deviation not determined.

NA = Not applicable.

ID 1514 and 1515, were analyzed during the 1994 NMOC program. Table 2-20 presents the concentrations reported by the four Radian NMOC system channels. Samples are analyzed on all four channels (Radian A, B, C, D). The reference lab measured value is provided in the table. The percent bias results were calculated relative to these values. Radian's bias ranged from -0.708% to 1.728%, indicating excellent agreement with the reference lab.

Table 2-20

NMOC External Audit Sample Results

ID Number	Concentration, ppmC					Average % Bias
	Reference Lab Measured Value	Analysis				
		Radian A	Radian B	Radian C	Radian D	
1514	0.78	0.787	0.787	0.802	0.798	1.728
1515	1.06	1.078	1.052	1.040	1.046	-0.708

2.4.1.2 Speciated NMOC Audits

A measurement of accuracy for the speciated NMOC monitoring data was calculated from the results of the analysis of multicomponent audit samples provided by the EPA. Two external audit samples, ID 1517 and 1518, were provided. Sample 1518 contained a full range of Speciated NMOC compounds while 1517 contained a limited subset. Results of the analyses of 1517 and 1518 are contained in Tables 2-21 and 2-22, respectively. The theoretical values are those determined by the external reference laboratory. The spiked values were calculated using dilution factors estimated when the audit samples were prepared by the EPA Auditor. The analyzed values were those determined analytically by the auditing laboratory. The reported average value is the average of the values obtained from replicate analyses by the Radian

Table 2-21

Speciated NMOC External Audit Results, Sample ID 1517

Compound	Theoretical		Reported Average	% Bias[c]	% Bias[e]
	Spiked[a]	Analyzed[b]			
Ethane	9.8	NR	11.65	18.88	NA
Propane	14.9	16.7	18.20	22.15	8.98
Isobutane	19.7	23.1	22.90	16.24	-8.66
n-Butane	20.0	23.0	NR	NA[d]	NA[d]
n-Pentane	25.0	32.1	31.10	24.40	-3.12
2-Methylpentane	29.2	30.5	32.90	12.67	7.87
			Overall Average	18.87	4.79

[a] Theoretical values as calculated.
[b] Theoretical values as measured by the reference lab.
[c] Bias calculated using spiked value.
[d] Misidentified as 1,3-butadiene.
[e] Bias calculated using analyzed value.

NR = Not Reported

Table 2-22

Speciated NMOC External Audit Results, Sample ID 1518

Compound	Theoretical		Reported Average	% Bias[c]	% Bias[d]
	Spiked[a]	Analyzed[b]			
Ethylene	29.5	NR	34.80	17.97	NA
Acetylene	47.2	NR	34.80	-26.27	NA
Ethane	35.2	NR	NR	NA	NA
Propylene	31.9	32.2	34.40	7.84	6.83
Propane	33.3	31.1	35.15	5.56	13.02
Isobutane	32.8	34.5	34.30	4.57	-0.58
1-Butene	32.4	33.8	34.00	4.94	0.59
n-Butane	32.8	34.7	34.30	4.57	-0.12
trans-2-Butene	33.2	33.8	35.05	5.57	3.70
cis-2-Butene	31.9	33.4	34.20	7.21	2.40
Isopropylethylene	31.8	32.6	34.55	8.65	5.98
Isopentane	34.2	35.7	36.75	7.46	2.94
1-Pentene	33.3	34.0	36.35	9.16	6.92
n-Pentene	34.5	37.5	36.30	5.22	-3.20
2-Methyl-1,3-butadiene	23.9	24.3	20.30	-15.06	-16.46
trans-2-Pentene	34.6	34.9	37.35	7.95	7.02
cis-2-Pentene	33.3	35.3	35.10	5.41	-0.57
Trimethylethylene	30.7	31.7	31.40	2.28	-0.95
2,2-Dimethylbutane	35.4	36.5	36.35	2.68	-0.41
Cyclopentene	32.6	33.4	34.60	6.13	3.59
4-Methyl-1-pentene	33.1	34.9	35.20	6.34	0.86
Cyclopentane	34.1	35.3	35.00	2.64	-0.85
2,3-Dimethylbutane	34.2	36.8	36.20	5.85	-1.63
2-Methylpentane	35.4	36.0	36.80	3.95	2.22
3-Methylpentane	34.3	34.2	36.30	5.83	6.14
2-Methyl-1-pentene	31.2	35.6	27.00	-13.46	-24.16
Hexane	34.0	35.1	36.30	6.76	3.42
trans-2-Hexene	32.7	34.4	34.05	4.13	-1.02
cis-2-Hexene	33.8	34.0	36.10	6.80	6.18
Methylcyclopentane	34.3	35.1	35.95	4.81	2.42
2,4-Dimethylpentane	33.5	35.5	34.90	4.18	-1.69
Benzene	33.4	38.8	42.65	27.69	9.92
Cyclohexane	33.7	33.8	34.75	3.12	2.81
2-Methylhexane	33.8	35.5	36.30	7.40	2.25

Table 2-22

Continued

Compound	Theoretical		Reported Average	% Bias[c]	% Bias[e]
	Spiked[a]	Analyzed[b]			
2-Methylhexane	33.8	35.5	36.30	7.40	2.25
2,3-Dimethylpentane	34.2	35.6	34.85	1.90	-2.11
3-Methylhexane	34.1	34.9	36.05	5.72	3.30
Isooctane	34.9	36.1	35.85	2.72	-0.69
Heptane	33.8	35.9	35.55	5.18	-0.97
Methylcyclohexane	33.9	34.4	35.20	3.83	2.32
2,3,4-Trimethylpentane	33.9	35.8	35.15	3.69	-1.82
Toluene	33.6	34.2	35.75	6.40	4.53
2-Methylheptane	34.0	36.4	35.45	4.26	-2.61
3-Methylheptane	34.4	36.5	35.75	3.92	-2.05
Octane	33.7	35.8	35.25	4.60	-1.54
Ethylbenzene	33.2	33.5	35.15	5.87	4.92
p-Xylene	33.8	33.9	35.10	3.85	3.54
Styrene	26.8	27.7	24.75	-7.65	-10.65
o-Xylene	32.9	32.6	36.00	9.42	10.43
Nonane	33.8	36.2	35.10	3.85	-3.04
Cumene	32.4	32.3	34.25	5.71	6.04
n-Propylbenzene	32.1	32.8	33.60	4.67	2.44
1,3,5-Trimethylbenzene	31.7	29.7	33.85	6.78	13.97
1,2,4-Trimethylbenzene	32.2	29.8	NR[d]	NA	NA
Decane	33.0	30.5	33.70	2.12	10.49
Undecane	32.8	24.0	29.65	-9.60	23.54
			Overall Average	4.06	1.68

[a] Theoretical value as calculated.
[b] Theoretical value as measured by the reference lab.
[c] Bias calculated using spiked value.
[d] Misidentified as 1-decene.
[e] Bias calculated using analyzed values.
NR = Not Reported
NA = Not Applicable

Laboratory. The percent bias results were calculated from both the spiked and analyzed theoretical values. The results show good analytical accuracy in both cases. The first audit sample, ID 1517, showed a percent bias ranging from 12.67% for 2-methylpentane, to 24.40% for *n*-pentane, with an average of 18.87% using the spiked value. The range of percent bias was 8.66% for isobutane to 8.98% for propane, with an average of 4.79% using the analyzed reference value. The second audit sample, ID 1518, showed a percent bias ranging from -26.27% for acetylene to 27.69% for benzene, with an average of 4.06% using the spiked value. The range of bias was -24.16% for 2-methyl-1-pentene to 23.54% for undecane, with an average of 1.68 percent.

In each of the audit samples one compound was misidentified. In 1517 *n*-butane was reported as 1,3-butadiene, and in 1518 1,2,4-trimethylbenzene was reported as 1-decene. In addition, in the analysis of 1518, no ethane was recovered or reported for the sample.

2.4.1.3 Carbonyl Audits

Four audit samples, ID 3414, 3415, 3416, and 3417 were analyzed during the 1994 NMOC Carbonyl Option program. In addition, a non-spiked blank cartridge sample, ID 3413, was also analyzed. Three target analytes, formaldehyde, acetaldehyde, and acetone, were quantified. The results are presented in Table 2-23. The theoretical values were those determined by the reference laboratory. Percent bias results were calculated relative to the theoretical values and, for the non-blank samples, ranged from -21.67% for acetaldehyde in sample ID 3415 to 5.00% for acetone in sample ID 3414. The overall average percent bias was -5.02 percent.

Table 2-23

Carbonyl External Audit Sample Results

ID Number	Concentration, ppbv								
	Formaldehyde			Acetaldehyde			Acetone		
	Theoret.[a]	Radian	% Bias	Theoret.[a]	Radian	% Bias	Theoret.[a]	Radian	% Bias
3413[b]	0.09	0.12	33.33	0.05	0.04	20.00	0.33	0.22	-33.33
3414	0.60	0.58	-3.33	1.2	1.08	-10.00	1.2	1.26	5.00
3415	0.60	0.56	-6.67	1.2	0.94	-21.67	1.2	1.16	-3.33
3416	0.9	0.94	4.44	2.0	1.65	-17.50	2.0	2.02	1.00
3417	4.8	4.7	-2.08	3.5	3.18	-9.14	4.0	4.12	3.00

[a] Spiked values from auditing lab.
[b] Non-spiked blank cartridge sample.

2.4.1.4 Toxics Audits

One toxics audit sample was analyzed during the 1994 NMOC and Speciated NMOC Toxics Option program. Table 2-24 contains the results. The theoretical values were those determined by the reference laboratory. The spiked values were calculated using dilution factors estimated when the audit samples were prepared by the EPA Auditor. The analyzed values were those determined analytically by the auditing laboratory. Percent bias results were calculated relative to both the theoretical values. The bias ranged from -40.31% for 1,2-dichloropropane, to 11.55%, for styrene, with an overall average percent bias of -18.54% using the spiked value and -42.12% for 1,2-dichloropropane to 2.23% for dichloromethane with an average of -16.12% using the analyzed value.

2.4.2 Speciated NMOC Comparison Samples

For each of the five Speciated NMOC base sites involved in the 1994 program, two or three randomly selected samples, for a total of 12, were submitted to the EPA National Exposure Research Laboratory for independent analysis. The results of these analyses are contained in

Table 2-24

Toxics External Audit Sample Results

Compound	Theoretical		Radian	% Bias[d]	%Bias[e]
	Spiked[a]	Analyzed[b]			
1,1-Dichloroethene	10	9	7.49	-25.10	-16.78
1,2,4-Trimethylbenzene	10.6	8.8	6.59	-37.83	-25.11
1,3,5-Trimethylbenzene	10.6	8.7	6.8	-35.85	-21.84
Chlorobenzene	9.6	9.1	9.07	-5.52	-0.33
1,2-Dichlorobenzene	9.7	NR	9.65	-0.52	NA
1,3-Dichlorobenzene	9.6	NR	9.75	1.56	NA
Styrene	9.7	12.4	10.82	11.55	-12.74
1,1,1-Trichloroethane	9.8	10.7	8.91	-9.08	-16.72
1,1-Dichloroethane	9.7	10.4	8.29	-14.54	-20.29
Ethylbenzene	9.5	9.1	7.37	-22.42	-19.01
trans-1,2-Dichloroethene	9.7	8.3	7.47	-22.99	-10.00
Benzene	9.4	8.6	5.93	-36.91	-31.04
Carbon Tetrachloride	9.7	8.6	7.36	-24.12	-14.42
Chloroform	9.8	8.8	7.84	-20.00	-10.91
1,2-Dichloroethane	9.7	NR	8.16	-15.88	NA
1,2-Dichloropropane	9.6	9.9	5.73	-40.31	-42.12
Dichloromethane	9.7	8.5	8.69	-10.41	2.23
Tetrachloroethylene	9.6	9.2	7.29	-24.06	-20.76
Toluene	9.6	8.2	6.79	-29.27	-17.20
Vinyl Chloride	9.6	9.5	8.99	-6.35	-5.37
o-Xylene	9.8	11.9	8.48	-13.47	-28.74
p-Xylene	9.4	9.7	6.93	-26.28	-28.56
Decane	9.7	9.6	NR[c]	NA	NA
Dibromomethane	9.6	8.7	NR[c]	NA	NA
			Overall Average	-18.54	-16.12

[a] Theoretical value as calculated.
[b] Theoretical value as measured by the reference lab.
[c] The compounds are not on the Toxics target list.
[d] Bias calculated using spiked value.
[e] Bias calculated using analyzed value.
NR = Not Reported
NA = Not Applicable

Appendix M. A summary of the percent bias by compound is given in Table 2-25. Radian did not analyze for 1-methyl-4-isopropylbenzene; therefore, no results are given for this compound. The bias ranged from -0.68% for propene to 134.29% for 2,2-dimethylbutane with an overall average bias of 7.36 percent. All Radian results for 2,2-dimethylbutane were significantly higher than the reference lab, indicating the presence of a co-eluting compound or possible misidentification. There was fairly good agreement between the results for compounds with concentrations greater than 1.0 ppbC.

The general trend of the Radian results were bias low as can also be seen by comparing the total NMOC values in Table 2-26. Total NMOC bias results ranged from -50.3 to -14.2%, with an overall average of -29.2 percent.

Of all the compounds identified by the reference lab, 14% were reported as not detected by Radian. Of that 14%, 92% had concentrations less than 1 ppbC. This indicates the lower sensitivity of the Radian measurement system.

2.5 Completeness Results by Program

Not all of the samples from the various base programs and their options were collected as scheduled. Completeness results, indicating the percentage of samples that were collected as scheduled, are presented in the following sections.

2.5.1 NMOC Base Program

For the 1994 NMOC program 223 of the scheduled 241 samples were taken on schedule. The 18 missed samples resulted in an overall percent completeness of 92.5 percent. Percent completeness by site ranged from 89.2% at LINY, to 98.7% at NWNJ. Table 2-27 contains data from each of the base sites involved in the program. The overall completeness value for 1994 is comparable to completeness figures for previous years of the program: 1993, 94.5%; 1992, 90.7%; 1991, 94.1%; 1990, 95.8%; 1989, 95.5%; 1988, 93.4%; 1987, 95.0%; 1986, 96.8%; 1985, 95.8%; and 1984, 90.6 percent. Figure 2-2 shows the sampling completeness for

Table 2-25

Percent Bias by Compound

Compound Name	% Bias
α-Pinene	-9.99
β-Pinene	-57.76
1,3,5-Trimethylbenzene	-37.76
1,2,4-Trimethylbenzene	-107.95
1-Pentene	-2.56
2,3,4-Trimethylpentane	-10.53
2,3-Dimethylbutane	10.87
2,3-Dimethylpentane	-74.45
2,4-Dimethylpentane	-14.15
2,2-Dimethylbutane	134.29
2,2,4-Trimethylpentane	-39.47
2-Methyl-1-Pentene	-4.61
2-Methyl-2-Butene	-11.73
2-Methylheptane	-21.69
2-Methylhexane	-47.05
2-Methylpentane	-6.71
3-Methyl-1-Butene	-9.07
3-Methylheptane	-15.74
3-Methylhexane	-31.97
3-Methylpentane	-54.59
4-Methyl-1-Pentene	0.95
Acetylene	-48.83
Benzene	-7.38
cis-2-Butene	-25.75
cis-2-Hexene	0.79
cis-2-Pentene	6.91
Cyclohexane	-35.91
Cyclopentane	-16.58

Table 2-25

Continued

Compound Name	% Bias
Cyclopentene	-13.31
Ethane	9.94
Ethylbenzene	-22.09
Ethylene	-17.16
Isobutane	-13.70
Isopentane	-4.53
Isoprene	-16.87
Isopropylbenzene	-44.97
m-/p-Xylene	-16.88
Methylcyclohexane	-46.36
Methylcyclopentane	-16.47
n-Butane	-18.93
n-Decane	-19.20
n-Dodecane	-20.54
n-Heptane	-33.97
n-Hexane	-10.89
n-Nonane	-3.37
n-Octane	-19.74
n-Pentane	-9.44
n-Propylbenzene	-56.74
n-Undecane	1.47
o-Xylene	-26.07
Propane	-4.61
Propene	-0.68
Styrene	-84.83
Toluene	-19.86
trans-2-Butene	14.77
trans-2-Hexene	-10.37
trans-2-Pentene	3.63
Overall Average	**7.36**

Table 2-26

Speciated NMOC Comparison Results of Total NMOC

Site ID	Total NMOC		Percent Bias
	EPA (ppbC)	Radian (ppbC)	
B3AL 1485	116.40	57.80	-50.34
B2AL 1491	193.67	147.00	-24.10
B3AL 1500	460.29	375.00	-18.53
EPTX 1507	617.48	478.00	-22.59
FWTX 1489	389.75	265.00	-32.08
B1AL 1490	950.21	764.00	-19.60
B3AL 1484	950.21	815.00	-14.23
B2AL 1480	119.13	60.90	-48.88
FWTX 1476	251.79	158.00	-37.25
B1AL 1487	264.96	181.00	-31.69
FWTX 1482	852.63	726.00	-14.85
EPTX 1478	264.68	167.00	-36.90
		Overall Average	-29.25

Table 2-27

1994 NMOC Completeness Results

Site Location	Radian Site Code	Scheduled Sampling Days	Total Scheduled Duplicate Samples	Total Scheduled Canister Analyses	Total Valid Duplicate Samples	Total Valid Samples	Percent Complete
Long Island, NY	L1NY	83	9	92	11	74	89.16
Newark, NJ	NWNJ	79	9	88	9	78	98.73
Plainfield, NJ	PLNJ	79	9	88	9	71	89.87
	Overall	241	27	268	29	223	92.53

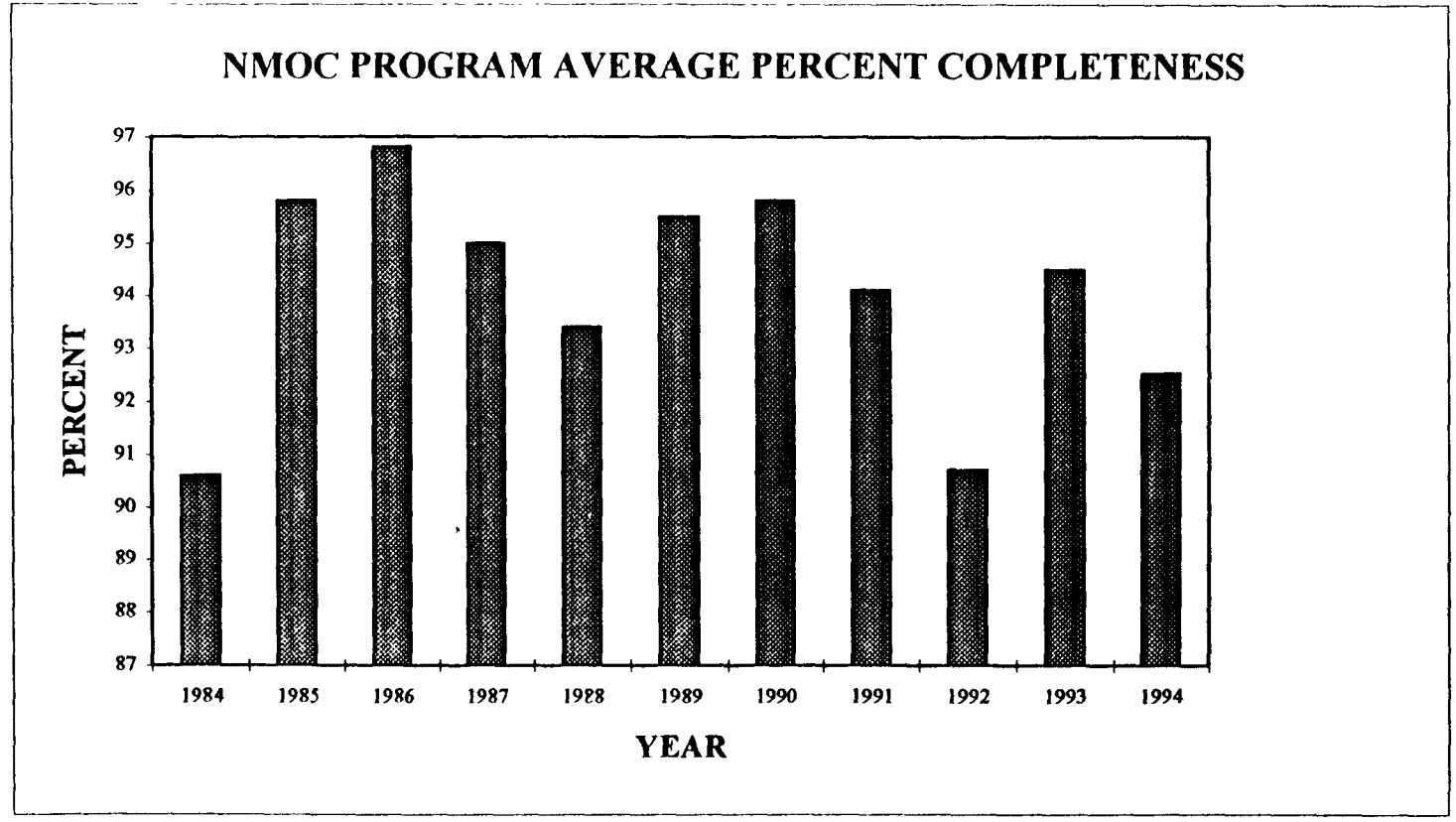


Figure 2-2. Sampling Completeness History for the NMOC Program

the history of the NMOC program. Equipment malfunction was identified as the primary cause of missed samples, producing 53 percent. Operator error contributed 30% of the voids, and laboratory error accounted for 17 percent. Table 2-28 details the invalid samples.

2.5.2 Speciated NMOC Base Program

For the 1994 Speciated NMOC program, 393 of the scheduled 410 samples were taken on schedule. The 17 missed samples resulted in an overall percent completeness of 95.9 percent. Percent completeness by site ranged from 93.8% at FWTX, to 98.8% at EPTX. Table 2-29 contains data from each of the base sites involved in the program. The overall completeness value of 95.9% for the 1994 program compares favorably to that of 93.8% from 1993. Equipment malfunction was identified as the primary cause of missed samples, producing 59 percent. The remaining 41% of the missed samples came about through operator error. Table 2-30 details the invalid samples.

Table 2-28

1994 NMOC Program Invalid Samples by Site

Site	Date	Description	Assigned
PLNJ	7/18/94	Leaking solenoid valve	Equipment
	7/19/94	Leaking solenoid valve	Equipment
	7/20/94	Misinstalled solenoid valve	Equipment/Operator
	7/22/94	Low pressure	Equipment
	7/26/94	Leaking solenoid valve	Equipment
	10/14/94	No sample canister	Lab
	10/21/94	Canister leaked	Equipment
	10/26/94	Canister accidentally vented	Operator
NWNJ	10/21/94	Canister not analyzed by NMOC method	Lab
LINY	7/7/94	Canister valve loose - canister leaked	Equipment
	7/11/94	Timer set in "Manual" mode or "off"	Operator
	7/18/94	Timer set in "Manual" mode or "off"	Operator
	9/6/94	Timer set in "Manual" mode or "off"	Operator
	9/19/94	Pump burned out	Equipment
	9/20/94	Pump burned out	Equipment
	9/27/94	Canister leaked	Equipment
	10/18/94	Canister not analyzed by NMOC method	Lab
	10/25/94	Timer set in "Manual" mode or "off"	Operator

Table 2-29

1994 SNMOC Completeness Results

Site Location	Radian Site Code	Scheduled Sampling Days	Total Scheduled Duplicate Samples	Total Scheduled Canister Analyses	Total Valid Duplicate Samples	Total Valid Samples	Percent Complete
Birmingham, AL (Tarrant)	B1AL	83	9	92	9	81	97.59
Brimingham, AL (Pinson)	B2AL	83	9	92	9	79	95.18
Birmingham, AL (Helena)	B3AL	83	9	92	9	78	93.98
El Paso, TX	EPTX	80	9	89	9	79	98.75
Ft. Worth, TX	FWTX	81	9	90	9	76	93.83
	Overall	410	45	455	45	393	95.85

Table 2-30

1994 Speciated NMOC Program Invalid Samples by Site

Site	Date	Description	Assigned
B1AL	10/18/94	Canister leaked	Equipment
	10/21/94	Canister leaked	Equipment
B2AL	7/15/94	Canister leaked	Equipment
	7/27/94	Canister valve not opened	Operator
	9/15/94	Canister valve not opened	Operator
	10/28/94	Canister leaked	Equipment
B3AL	7/8/94	Canister valve opened prior to sampling	Operator
	7/20/94	Low flow - pressure too low to analyze	Equipment
	8/5/94	Canister leaked	Equipment
	9/12/94	Timer set in "Manual" mode or "off"	Operator
	10/18/94	Timer set in "Manual" mode or "off"	Operator
EPTX	9/8/94	Canister leaked	Equipment
FWTX	7/11/94	Short on manpower - no sample set up	Operator
	7/12/94	Timer set on relay one	Operator
	8/10/94	Pump failure	Equipment
	8/11/94	Pump failure	Equipment
	9/26/94	Canister leaked	Equipment

3.0 AEROMETRIC INFORMATION RETRIEVAL SYSTEM - AIR QUALITY SUBSYSTEM (AIRS-AQS)

The program data was submitted to the Air Quality Subsystem of the Aerometric Information Retrieval System (AIRS), which is a computer-based system for handling the storage and retrieval of information pertaining to airborne pollutants. It is administered by the U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Monitoring and Data Analysis Division, National Air Data Branch (NADB). The AIRS Air Quality Subsystem (AQS) contains data submitted to NADB by state and local agencies and EPA organizations. This data corresponds to that previously handled by the Storage and Retrieval of Aerometric Data (SAROAD) system. It includes descriptions of air monitoring sites and equipment, measured concentrations of air pollutants and related parameters, and calculated summary and statistical information.

All NMOC, Speciated NMOC, toxic, and carbonyl data collected for the 1994 NMOC program were submitted to the AIRS-AQS in the form of transactions. A transaction provides the monitoring information for a particular parameter (compound) for a given day. One line transaction is required for each compound for each sample date. Prior to submittal to AIRS, all data must be formatted to conform to the 80-character per line format required by AIRS and saved as an ASCII text file.

Within a transaction are fields corresponding to specific information. A field or "slot" is a column or set of columns in the 80-character input line where a specific piece of data is placed. Four general types of values are used to code the transactions: codes, dates, numeric data, and alphanumeric data. Codes must be entered exactly as they are stored in the Geo-Common Subsystem of AIRS. For example, a county code is three digits and all three digits of the code must be entered, including any leading zeros. Dates are entered in the YYMMDD format and again, leading zeros must be entered. Numeric values must be entered right-justified and do not have to include leading zeros. Alphanumeric values should be entered left-justified in the field. The structure and placement of the fields in each transaction is specific and must be carefully followed.

All data collected were entered into AIRS. Quantifiable data below the detection limits were entered as the quantified value. The raw data values will be retained within AIRS, but when any summary statistics are generated the system will automatically replace values below the detection limits with a value that is one-half of the detection limit before performing the calculations. Raw data listings will maintain the actual values. If the compound response is below the detection limit and the data are not quantifiable, a concentration value of zero is entered into AIRS. This will indicate to AIRS that the compound of interest was analyzed for but not present at any quantifiable level. If a sample is missed or invalidated for any reason, appropriate null values or validity flags are used.

4.0 CONCLUSIONS AND RECOMMENDATIONS

This section summarizes the conclusions and recommendations from the 1994 NMOC and Speciated NMOC base program.

4.1 Conclusions

The NMOC and Speciated NMOC program result data for 1994 is comparable to historical data collected for the sites participating in previous programs back to 1988. No discernable trends are apparent in the data when compared by month or overall.

Sampling and analytical precision for the overall program compares favorably with previous years. The NMOC base program sampling and analytical precision is more precise than the previous two years. The Speciated NMOC base program precision values are higher than those for 1992 and 1993. The Speciated NMOC option, toxics and carbonyl option sampling and analytical precision is comparable to previous years.

The audit results generated by the methodology used for NMOC, Speciated NMOC, and carbonyl analyses are very good and no significant bias or error is indicated. Bias was determined for both the calculated and measured theoretical values. The audit results from the toxics option analyses indicate an overall average negative bias of -17.33 percent with a maximum bias at -42.12% for 1,2-dichloropropane.

The independent EPA analysis of twelve selected Speciated NMOC samples indicates and overall negative bias both on a compound-specific and total NMOC basis. No sample drying devices were used with either the Radian or EPA analytical system. This discrepancy may be the result of differences in the analytical system sensitivities or calibration gases used; however, the overall Speciated NMOC audit results were good (overall bias of 4.06 and 1.68) and indicates the accuracy of the calibration gases used. The calibration gases are also checked against an National Institute of Standards and Technology (NIST) certified propane standard to verify the accuracy of the calibration gases.

The overall NMOC and Speciated NMOC program completeness was 92.5 and 95.9%, respectively, which compares favorably with past years programs. Equipment malfunction was identified as the primary cause with just over 50% of the invalid samples attributed to this reason. The primary equipment failures were leaking canisters, solenoid valves, and pump failures.

4.2 Recommendations

The following are recommendations for future NMOC and Speciated NMOC programs.

4.2.1 Canister Age

Many of the EPA canisters have been in service since the program's inception in 1984. It is recommended that a subset of the oldest canisters be evaluated to determine the condition of the SUMMA®-passivation and any surface activity conditions that may be present.

4.2.2 Field Audit

It is recommended that a field audit be designed and conducted at the NMOC and Speciated NMOC sites during subsequent monitoring programs. A minimum of one audit should be performed at each site and should consist of the duplicate collection of a humidified standard at known concentration in addition to the collection of a humid zero air field blank sample.

4.2.3 Sampling Equipment

It is recommended that the solenoid valves and pumps be replaced in all samplers deployed for the next sampling effort. Equipment malfunction was identified as the primary cause of invalid samples with just over 50% attributed to solenoid valve and pump failures.

4.2.4 Option Program Sample Selection

Samples for the Speciated NMOC and toxics option programs are currently selected randomly, or when abnormally high levels of total NMOC or speciated NMOC are noted. If unusual samples are included in the sample set, statistical results may be affected. If the purpose of the option program data is to provide more definitive species information, it is recommended that the samples be chosen randomly, not selectively.

5.0 NMOC BASE PROGRAM

5.1 Program Description

Three NMOC base sites participated in the 1994 program, they were located in Long Island, NY (LINY), and Newark and Plainfield, NJ (NWNJ and PLNJ). The NMOC site AIRS codes are given in Table 1-1. The Long Island site has been in the NMOC program since 1990; the Newark site has participated in the program since 1987; and the Plainfield site has participated since 1988. Both NWNJ and PLNJ also included the 3-hour toxics, carbonyl, and speciated NMOC analysis options. LINY chose the Speciated NMOC analysis option. Approximately ten canister samples were selected from each site for the toxics and speciated analysis; both analyses were performed on the same sample. Approximately ten 3-hour carbonyl samples were collected at each site for analysis by Compendium Method TO-11.[5]

The NMOC program consists of several activities that include:

- Sample collection, site coordination, equipment certification, installation, and operator training, and post-sample collection activities, such as equipment recovery and refurbishment, and canister cleanup and archive;
- Sample analysis, data reduction, validation, and reporting;
- Statistical analyses and data characterization; and
- Formatting and submittal of the validated data to the AIRS-AQS.

Sample collection for the 1994 NMOC base program occurred from 6:00 a.m. through 9:00 a.m. local time, Monday through Friday from July 6 through October 31, 1994. Two hundred sixty-eight samples were collected for all sites, which includes 27 duplicate samples. Duplicate sample canisters were analyzed in replicate, except where low pressure precluded a second analysis. Sample analyses were performed in accordance with the Compendium Method TO-12.[2] This methodology incorporates preconcentration direct flame ionization detection (PDFID) gas chromatography and provides a total hydrocarbon measurement without speciation.

5.2 Sample Collection Procedures

This section summarizes the sample collection procedures, which include the sample collection method, equipment preparation and certification, equipment calibration, equipment installation and training, and the sample collection schedule.

5.2.1 Sample Collection Method

The field sampling equipment used to collect ambient air samples for NMOC measurements consisted of three basic components: The sampling manifold, the sampling system, and the sample canister. A schematic diagram is shown in Figure 5-1.

The sampling manifold involved two configurations; a slip stream taken from a constant flow glass manifold (prior to the air monitoring station's NO_x analyzer), or separate but collocated NMOC and NO_x sample inlet lines. Glass tubing or gas-chromatographic-grade stainless steel tubing and stainless steel fittings were the materials of construction for all connections that came in contact with the sample.

The sampling unit drew ambient air through a sintered stainless steel filter, a glass rotameter, a stainless steel fine adjustment metering valve, a Metal Bellows® pump, a solenoid valve, and then finally into a SUMMA® treated stainless-steel canister. The sample collection period was controlled by a programmable timer that operates the pump, the solenoid valve, and an elapsed time meter.

A 6-liter SUMMA® canister with an initial vacuum of about 29 in. Hg was attached to the sampling system. At the completion of the three-hour sampling period, the canister reaches a nominal final pressure of about 12 psig.

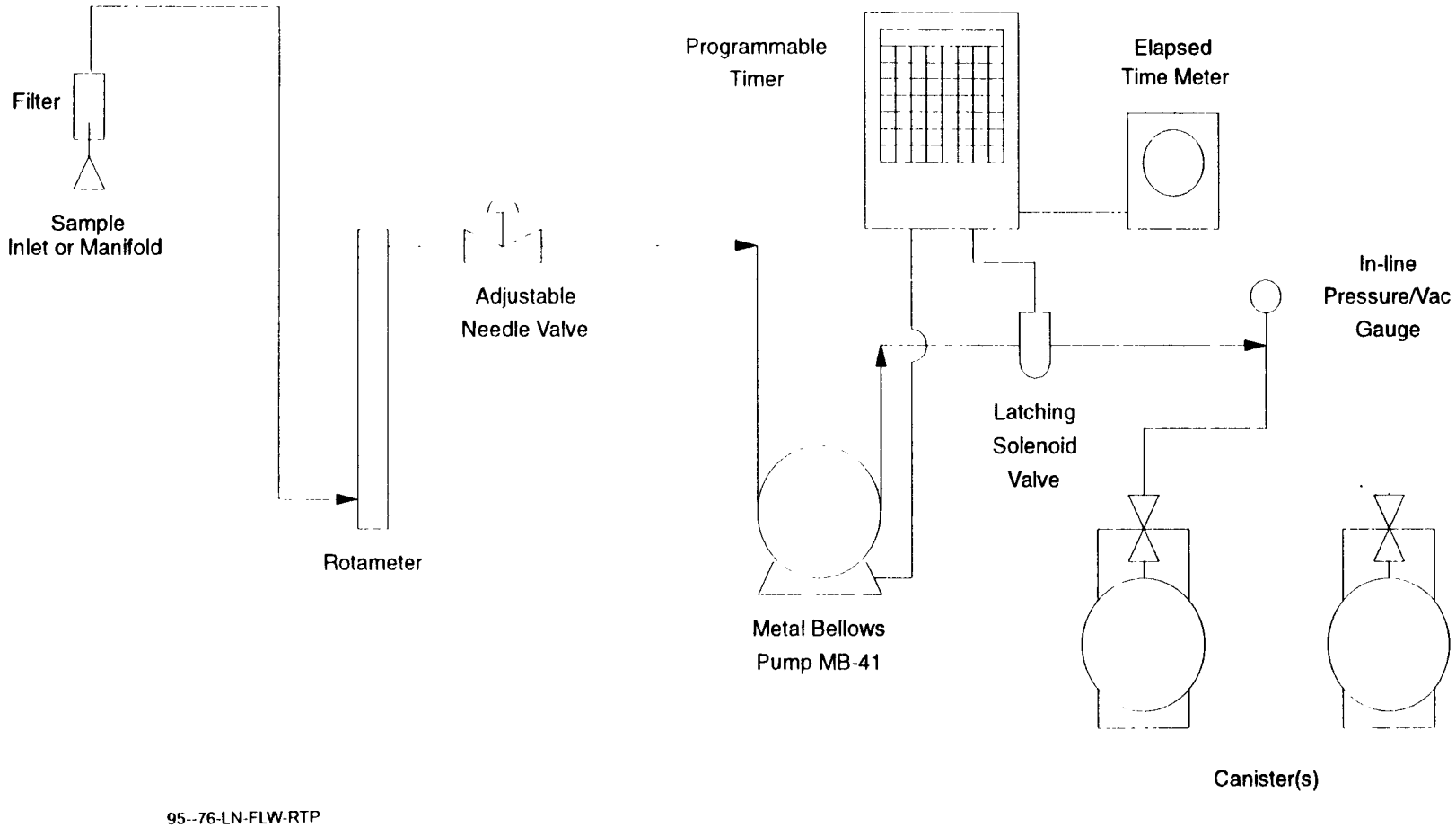


Figure 5-1. Schematic of the NMOC Field Sampling Equipment

5.2.2 Equipment Preparation and Certification

Set procedures were followed when preparing equipment for use and certifying it as ready. These procedures are explained in the following sections. Equipment includes SUMMA® passivated canisters and single event sampling systems.

5.2.2.1 Canister Cleanup System

A canister cleanup system was developed and used to prepare sample canisters for reuse after analysis. A cleanup cycle consisted of first pulling a vacuum of 0.5 mm Hg absolute pressure in the canister, followed by pressurizing the canister to 20 psig with cleaned, dried air that had been humidified. This cycle was repeated two more times during the canister cleanup procedure. The cleanness of the canister was qualified by PDFID analysis. Upon meeting the cleanness criterion of 20 ppbC, the canister was evacuated to 0.5 mm Hg absolute pressure a fourth time, in preparation for shipment to the site.

5.2.2.2 Canister Cleanup Equipment

An oil-free compressor with a 12-gallon reservoir provided source air for the canister cleaning system. The oil-free compressor was chosen to minimize hydrocarbon contamination. A coalescing filter provided water mist and particulate matter removal down to a particle size of one micron. Permeation dryers removed water vapor from the compressor source air. These permeation dryers were followed by moisture indicators to show detectable moisture in the air leaving the dryer. The moisture indicators never showed any water, indicating that the permeation dryers effectively removed all water vapor.

Air was then passed through catalytic oxidizers to destroy residual hydrocarbons. The oxidizers were followed by in-line filters for secondary particulate matter removal and by a cryogenic trap to condense any water formed in the catalytic oxidizers and any organic compound not destroyed by the catalytic oxidizer. A single-stage regulator controlled the final air pressure in the canisters and a metering valve was used to control the flow rate at which the canisters were

filled during each cleanup cycle. The air flow was indicated by a rotameter installed in the clean, dried air line. A shutoff valve was located between the rotameters and the humidifier system. The humidifier system consisted of a SUMMA® treated 6-L canister partially filled with high performance liquid chromatographic-grade (HPLC-grade) water. One flowmeter and flow-control valve routed the cleaned, dried air into the 6-L canister where it was bubbled through the HPLC-grade water. A second flow-control valve and flowmeter allowed air to bypass the canister/bubbler. By setting the flow-control valves separately, the downstream relative humidity was regulated. Since the 1990 study, 80% relative humidity has been used for canister cleaning. Another shutoff valve was located between the humidifier and the 8-port manifold where the canisters were connected for cleanup.

The vacuum system consisted of a Precision Model DD-310 turbomolecular vacuum pump, a cryogenic trap, an absolute pressure gauge, and a bellows valve. The cryogenic trap prevented the sample canisters from being contaminated by back diffusion of hydrocarbons from the vacuum pump into the cleanup system. The bellows valves enabled isolation of the vacuum pump from the system without shutting off the vacuum pump.

5.2.2.3 Canister Cleanup Procedures

After all analyses were completed, a bank of eight canisters was connected to each of the canister manifolds. The valve on each canister was opened, with the shutoff valves and the bellows valves closed. The vacuum pump was started and one of the bellows valves was opened, drawing a vacuum on the canisters connected to the corresponding manifold. After reaching 0.5 mm Hg absolute pressure as indicated by the absolute pressure gauge, the vacuum was maintained for 30 minutes on the eight canisters. The bellows valve was then closed and the cleaned, dried air that had been humidified was introduced into the evacuated canisters until the pressure reached 20 psig. The canisters were filled from the clean air system at the rate of 7.0 L/min. This flow rate was recommended by the manufacturer as the highest flow rate at which the catalytic oxidizers could handle elimination of hydrocarbons with a minimum of 99.7% efficiency.

When the first manifold had completed the evacuation phase and was being pressurized, the second manifold was then subjected to vacuum by opening its bellows valve. After 30 minutes, the second manifold was isolated from the vacuum and connected to the clean, dried air that had been humidified. The first manifold of canisters was then taken through a second cycle of evacuation and pressurization. Each manifold bank of eight canisters was subjected to three cleanup cycles.

During the third cleanup cycle, the canisters were pressurized to 20 psig with clean, dried air that had been humidified. For each bank of eight canisters, the canister having the highest pre-cleanup NMOC concentration was selected for NMOC analysis to determine potential hydrocarbon residues. If the analysis measured less than 0.020 ppmC, then the eight canisters on the manifold were considered to be clean. Finally, the canisters were again evacuated to 0.5 mm Hg pressure absolute, capped under vacuum, and then packed in the containers used for shipping to the field sites.

5.2.2.4 Sampling System

In 1994 all samplers used an OMRON® H5L timer in place of the Dayton® timer used in previous years. The new timer provided greater reliability in the event of a power outage and more accurate timekeeping. In addition to the modifications, all samplers were subjected to a pre-season check to ensure field performance. The in-line rotameters were calibrated against a primary standard (bubble-flow meter) and the linear regression results from the curves used to determine the sampling flow rate settings for each individual sampler. Three flow measurements were taken at three flow settings to encompass the range of operation. The measurements were made under simulated field conditions: the pump running and an evacuated canister filling normally. The calibration information was used to nominally set the flow rates. Actual final canister pressures were used to determine if the flow rate settings needed adjustment.

The samplers were then pressure and vacuum leak checked for 24-hour periods by attaching sample canisters at 12 psig and 29 in. Hg vacuum, respectively, and taking periodic readings of the in-line pressure/vacuum gauge. A vacuum change of 1 inch or less Hg vacuum

and a pressure change of 1 psig or less was considered acceptable. The samplers were also operated at their calculated flow rate to demonstrate valid 3-hour collection.

All samplers were blanked by Compendium Method TO-12[2] to determine initial cleanliness. The blanking procedure consisted of a 50% wet/50% dry zero air purge through the entire sampling system and stainless steel manifold for 24-72 hours, followed by a 30-minute 100% dry zero air purge to "dry" the manifold and samplers, then by a 15-minute 100% wet zero air purge of the manifold only, and a 3-hour collection of 50/50 wet/dry air through the samplers into clean blanked sample canisters. The canisters were analyzed by the PDFID (TO-12) method in the same manner as an NMOC sample. The criteria used to determine sampler cleanliness was the same as the criteria used for canister cleanliness: 0.020 ppmC.

The samplers that were also collecting samples for the air toxics option analyses were challenged with a multi-component standard. Samplers were purged with 100% wet zero air at the maximum sample flow rate for 12 hours. The challenge manifold was then heated to 100% and purged with 100°C wet zero air purge of the manifold and samplers. The manifold and samplers were then conditioned for 15 minutes with 50% dry/50% wet zero air and an additional 15 minutes with the pollutant gas mixture. Samples were collected for 3 hours and analyzed on a multi-detector (FID/PID/ECD) gas chromatograph. The pollutant concentration of the challenge gas was determined by collecting a reference canister directly from the challenge manifold. The results are given in Table 5-1. Satisfactory results are in the 100% ± 30% recovery range. All recoveries fell within the 100% ± 30% range. Samplers were then purged for about 4 days with 50/50 wet/dry air to ensure cleanliness and PDFID blanked for cleanliness.

5.2.3 Sampling Equipment Installation and Training

NMOC sampler installation was performed by, or under the direction of, Radian personnel. The installation requirements included a temperature-controlled environment (70°F to 86°F) located in close proximity to the atmosphere to be sampled, and noncontaminating sampler connections. Site operators were trained on sampler operation, documentation, and sample handling and shipping. A notebook containing operating and shipping instructions was also

Table 5-1

1994 NMOC Sampler Certification Results (percent recovery)

Compound	Sampler ID					Recovery by Compound
	NWNJ A104818	BAL A107563	BAL A104825	BAL A107564	PLNJ A104820	
Butadiene	121	123	125	118	121	122
Isopropanol	113	125	115	127	117	119
Benzene	128	119	121	116	120	121
1,2-Dichloropropane	119	118	119	114	116	117
Toluene	108	108	107	103	105	106
Ethylbenzene	122	123	124	118	121	122
Xylenes	123	123	123	119	121	122
Overall % Recovery	119	120	119	116	117	

provided. In addition to the notebook, a list of troubleshooting instructions and common operator errors were provided to minimize downtime. Field site operators were encouraged to relay sampling and site problems immediately to Radian by telephone. Most sampling problems were handled through these telephone discussions by the Radian Site Coordinator.

5.3 Sample Collection Quality Control

Quality Control procedures relative to calibration data for all of the analytes and daily QC procedures are discussed below. Sampling and analysis precision was determined from the analysis of duplicate field samples and replicate laboratory analyses. Sample custody records were maintained throughout the program. Figure 5-2 shows the field data and custody sheet used for NMOC sampling documentation. The site operator's task involved recognizing problems with sampling equipment and procedures, and notifying Radian personnel so that appropriate corrective action might be taken. All Radian reported analyses were identified by the NMOC identification numbers which were recorded on the preformatted field data sheets when the samples were received. Copies of the field data sheets were kept in a ringbinder for reference. Samples were received and the pertinent information recorded in a sample logbook.

5.4 Calibration and Sample Analysis

The NMOC analysis equipment and procedures used are similar to those described in detail in Compendium Method TO-12.[2] A brief description of the equipment and operating procedures used in this study follows.

5.4.1 Instrument Performance and Daily Calibration

An initial multipoint performance evaluation was conducted on each analytical measurement channel, using propane referenced to a propane NIST CRM No. 1666B. This information is used to determine the instrument performance and dynamic linear range. The concentration of the propane used in the performance assessment ranged from 2.971 to 19.073 ppmC. The "zero" value was determined using cleaned, dried air from the canister

RADIAN CORPORATION

NMOC SAMPLING FIELD DATA FORM

Site Code : _____ SAROAD # : _ _·_ _ _ _·_ _ _·_ _

Site Location : City: _____ State: _____

Sample Collection Date : _____ Sampling Period : _____

Operator : _____ Elapsed Time : _____

Final Canister Pressure (psig) : _____

Sample Canister Number : _____ Side : _____

Sample Duplicate for this Date : Yes☐ No☐

If yes, Duplicate Canister Number : _____

NOx Analyzer Operating? Yes☐ No☐

If yes, Average Reading (ppmv as NOx) : _____

Average Wind Speed : _____ Average Wind Direction : _____

Rotameter Indicated Flow Rate : _____ Orifice Number : _____

Average Barometric Pressure (mm Hg or inches Hg) : _____

Ambient Temperature (°F) : _____ Relative Humidity : _____

THC Model (if available) : _____ Average THC : _____

Sky/Weather Conditions : _____

_____

Site Conditions/Remarks : _____

_____

_____

Canister Number : _____

Initial Canister Vacuum : _____

_____

Received By : _____

Date : _____

Sample Validity : _____

If Invalid, Reason : _____

_____

Figure 5-2. Field Data and Custody Sheet for NMOC Documentation

cleanup system described previously in Section 5.2.2. Table 5-2 summarizes the performance results. The FID responses for multiple concentration propane standards were linear, having coefficients of correlation from 0.99973 to 0.99997. Figures 5-3 through 5-6 show plots of the NMOC performance results for Radian Channels A, B, C, and D, respectively. The plots show the regression line.

Table 5-2

1994 Performance Assessment Summary, Radian Channels

Radian Channel	Cases	Linear Regression Results		
		Intercept	Slope	Coefficient of Correlation
A	15	-72.809	3246.5	0.99994
B	15	-141.981	2998.0	0.99978
C	15	-104.391	3017.8	0.99973
D	15	-17.472	3145.7	0.99997

Radian PDFID channels were tested daily for zero and span. Zero readings were measured using cleaned, dried air. The zero air was supplied by the same system that cleans the air for the canister cleanup system. Span readings used a mixture of about 3.0 ppmC propane in dry air. The daily calibration response factors were used to determine NMOC concentrations for the day. Calibration factors were calculated from the span and zero readings for each measurement channel. Initial calibration factors were determined in the morning before any site samples were analyzed and final calibration factors were determine in the afternoon on randomly selected days after all the ambient air samples had been analyzed. Percent calibration factor drifts were determined based on the initial calibration factor. Figures 5-7 to 5-10 show the daily calibration span data as a function of the 1994 Julian date for Radian Channels A, B, C, and D.

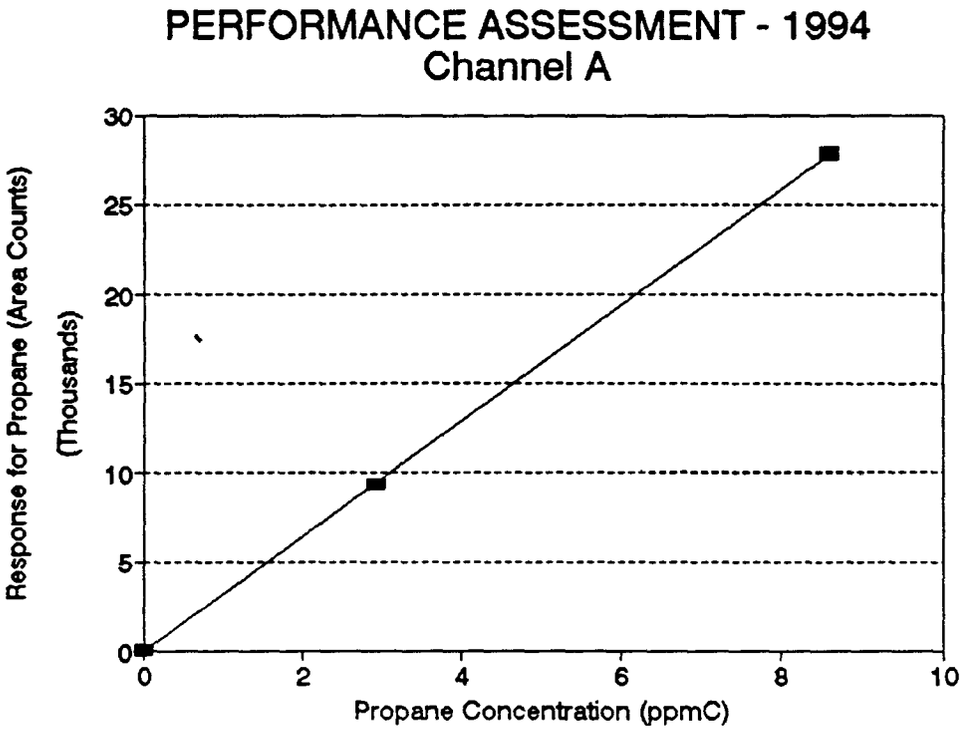


Figure 5-3. NMOC Performance Results, Channel A

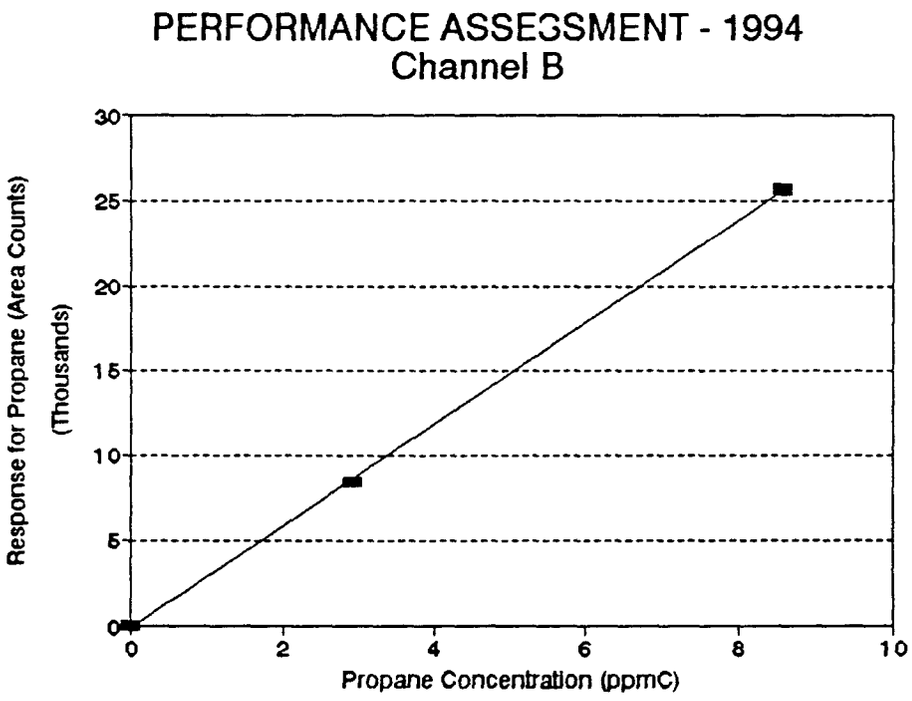


Figure 5-4. NMOC Performance Results, Channel B

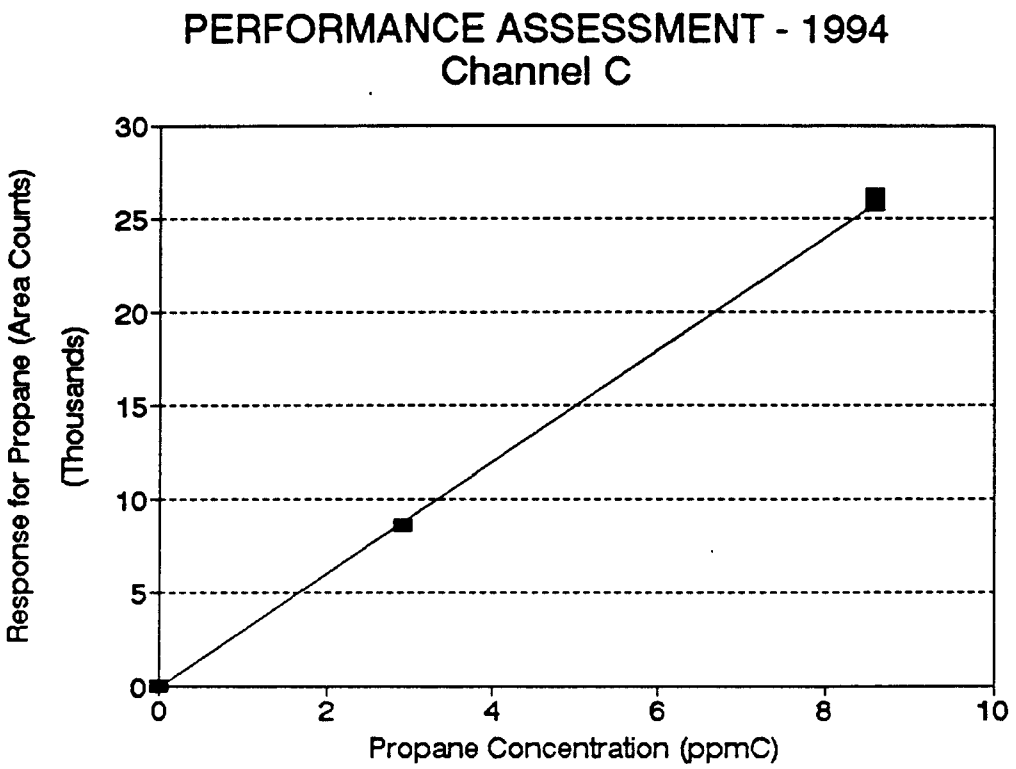


Figure 5-5. NMOC Performance Results, Channel C

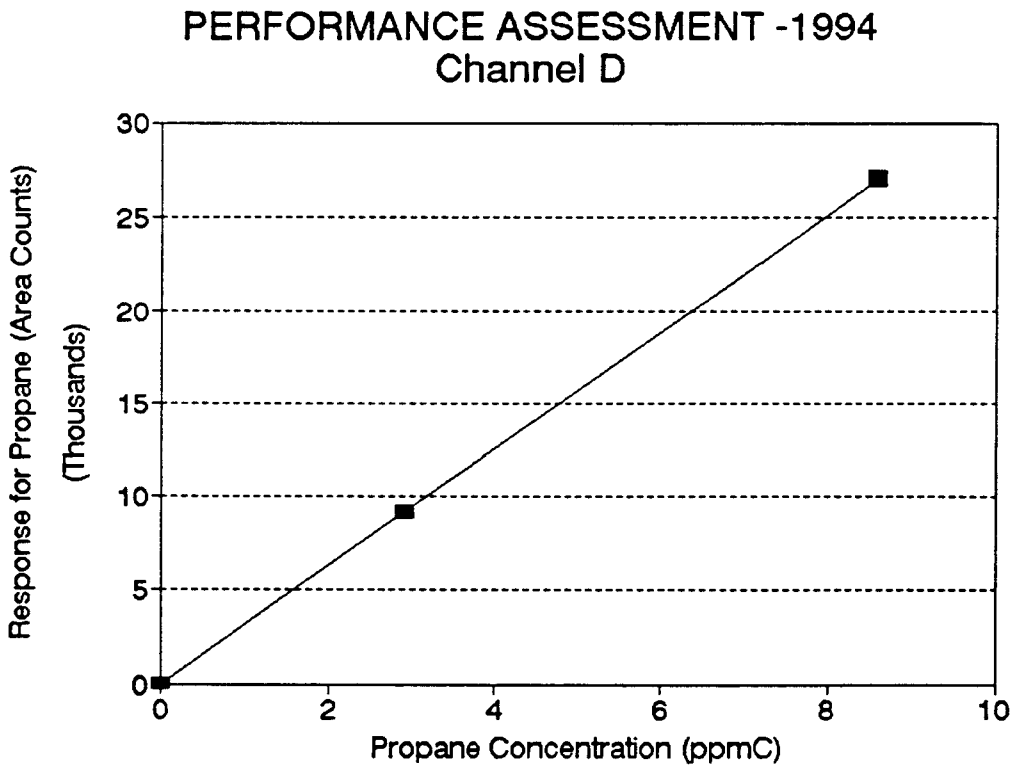


Figure 5-6. NMOC Performance Results, Channel D

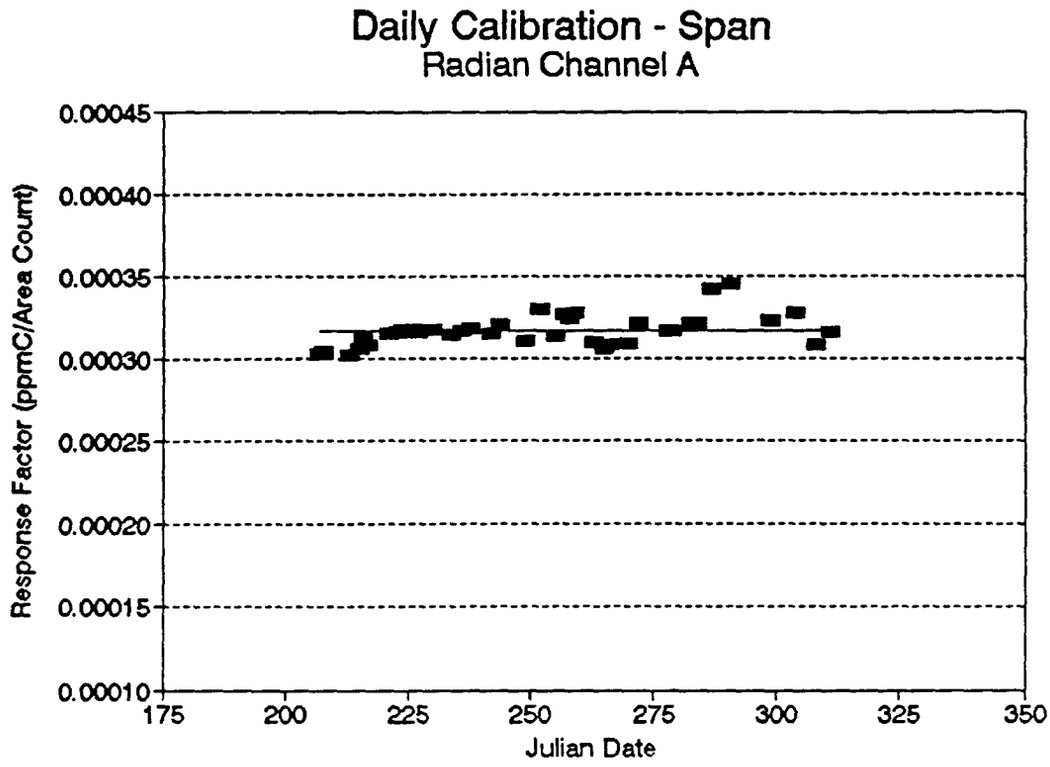


Figure 5-7. Daily Calibration Span, Channel A

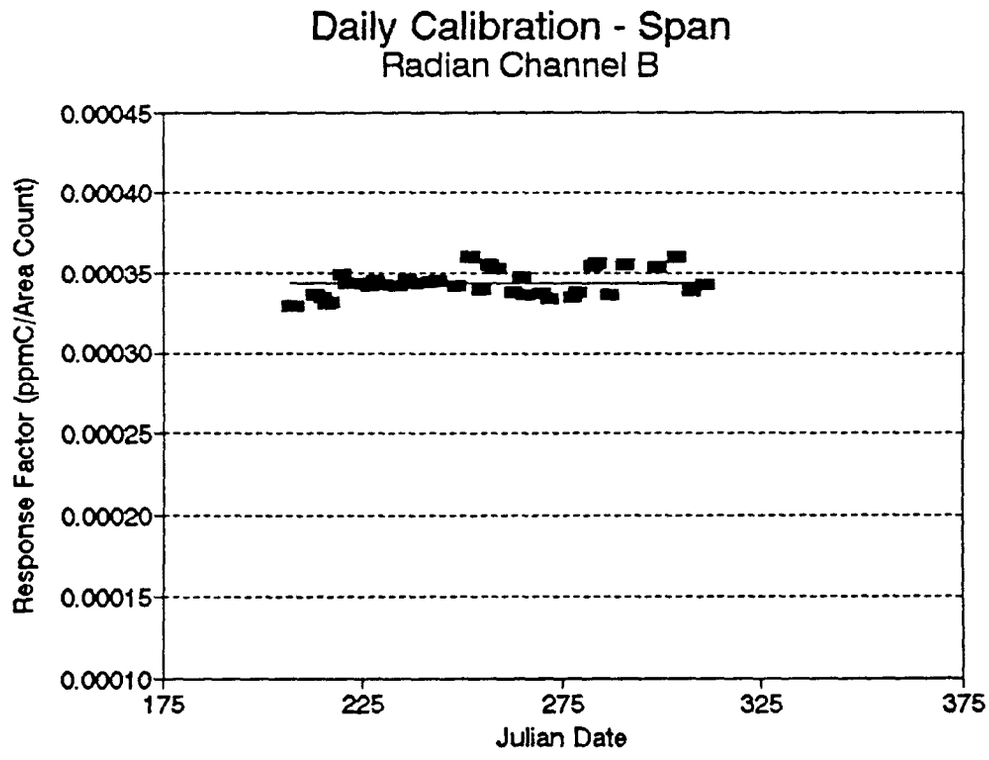


Figure 5-8. Daily Calibration Span, Channel B

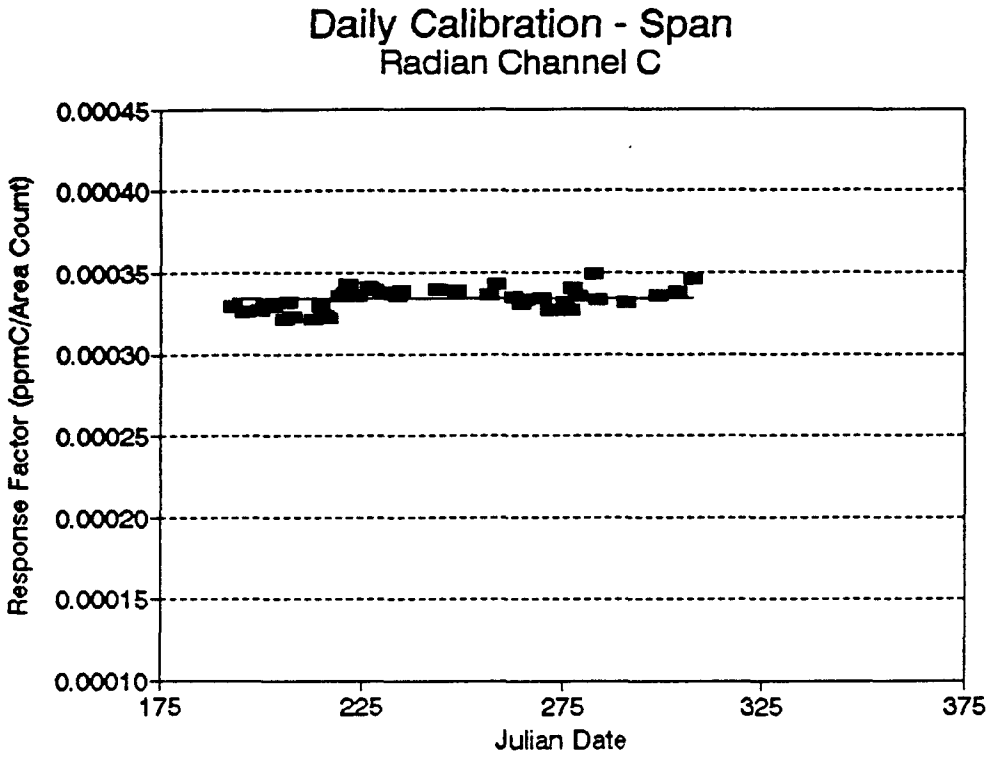


Figure 5-9. Daily Calibration Span, Channel C

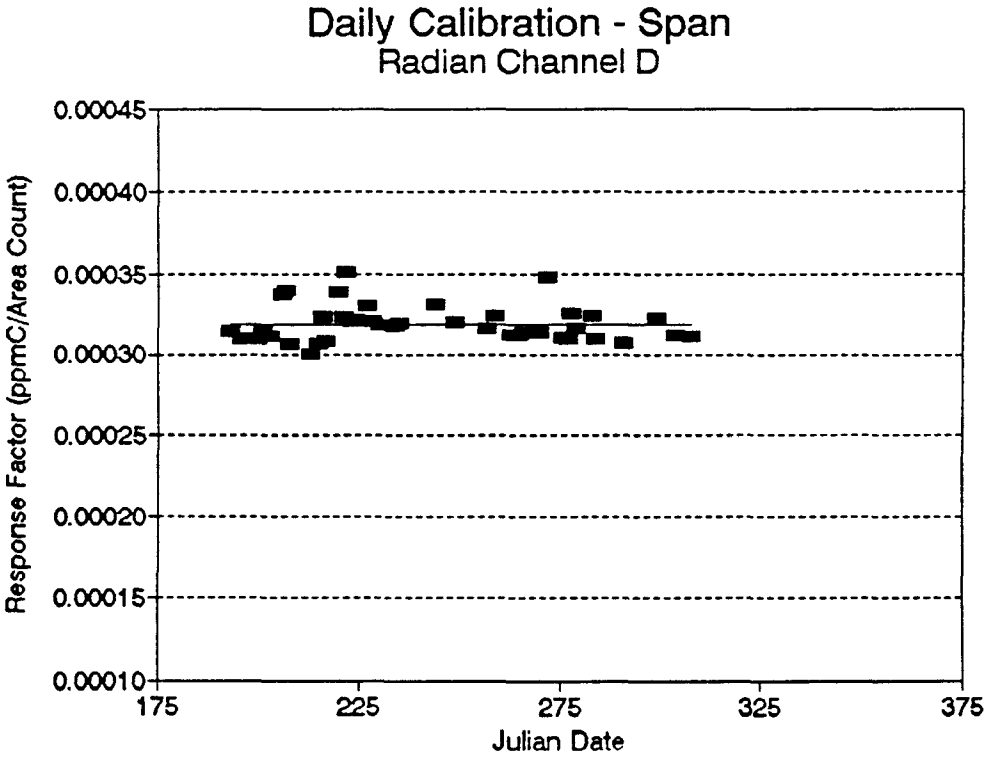


Figure 5-10. Daily Calibration Span, Channel D

5.4.2 Calibration Drift

Summary calibration factor drift data are given in Table 5-3. The table presents calibration factor drift, percent calibration factor drift, and absolute percent calibration factor drift. Calibration factors were calculated from an analysis of propane air mixture whose concentration was known and was referenced to a propane NIST CRM 1666B reference standards as follows:

$$\text{calibration factor} = \frac{\text{concentration of propane standard (ppm)} \times 3\ \text{ppmC/ppm}}{(\text{propane standard response [area counts]} - \text{zero response [area counts]})}$$

5.4.3 Sample Analysis

Two gas chromatographs were used by Radian. Each was a dual-channel Hewlett-Packard Model 5880 (HP-5880) using flame ionization detection (FID). NMOC instrument Channels A and B refer to the two FIDs on one HP-5880 unit, and Channels C and D refer to the two FIDs on the other HP-5880 unit. These chromatographs were configured for PDFID analysis, consistent with methodology described in Compendium Method TO-12.[2]

The sample trap consisted of 30 cm of 1/8-inch outside diameter (o.d.) stainless steel tubing, packed with 60/80 mesh glass beads. Three support gases were used for PDFID analysis: helium, hydrogen, and hydrocarbon-free air. The operating temperatures of the HP-5880 were controlled for the PDFID analysis. The FID and auxiliary zone were controlled at 250°C and 90°C, respectively. The oven temperature was programmed from 30°C to 90°C at a rate of 30°C per minute for 4 minutes, holding at 90°C for the fourth minute. Oven and integration parameters were controlled by Hewlett-Packard HP Level 4 programmable integrators.

Table 5-3

Summary NMOC Calibration Factor Drift Results

Radian Channel	Cases	Calibration Factor Drift ppmC/Area Count x 10^6			Percent Factor Drift			Absolute Percent Factor Drift	
		Minimum	Mean	Maximum	Minimum	Mean	Maximum	Mean	Standard Deviation
A	30	-18.8	1.64	30.2	-6.122	0.436	8.828	2.409	2.096
B	31	-15.6	0.641	20.0	-4.622	0.156	5.551	1.512	1.701
C	26	-43.5	-6.75	13.2	-12.554	-2.017	3.769	2.900	3.668
D	25	-28.7	1.764	37.7	-9.087	0.423	10.800	2.983	3.280
Overall	**112**	**-43.5**	**-0.557**	**37.7**	**-12.554**	**-0.214**	**10.800**	**2.402**	**2.765**

The modified HP-5880, dual-FID chromatographs were operated during the 1994 study according to a project-specific Standard Operating Procedure (SOP). Further description is given below to help explain the analytical apparatus and procedure.

A six-port valve was installed in the auxiliary heated zone of the HP-5880 and was pneumatically actuated using chromatographic valve control signals to apply either compressed air or vacuum to the valve. The sample trap itself was located inside the chromatograph's column oven. A section of 1/8-inch o.d. stainless steel tubing was sized to a length that prevented pressure surges from extinguishing the FID flame. This length was determined experimentally and differs for each chromatograph and for each channel within chromatographs. Although the length of tubing effectively substitutes for the pressure restriction provided by a column, it does not perform the separation function of a column.

During sample trapping, an excess of sample gas flow from the canister was maintained to ensure back diffusion of room air into the trap did not occur. A pressure change of 80 mm Hg in a 1.7-L vacuum reservoir was used to gauge and control the volume of sample gas cryogenically trapped. After the trapping cycle was complete, the HP-5880 program was initiated. When the program triggered a horn emitting an audible beep, the cryogen was removed from the trap and the oven door was closed. The chromatographic program then assumed control of raising the oven temperature, at the preset rate, to release the trapped sample to the FID, and set up the integration parameters.

5.4.4 Data Reduction and Validation

Secondary backup disks were updated daily on 20 megabyte hard disks. At the completion of the sampling and analysis phase, 10% of the data base was checked to verify its validity. Items checked included original data sheets, checks of all the calculations, and data transfers. In making the calculations for the final report and other reports, corrections were made to the data base as errors or omissions were encountered.

A total of 256 NMOC concentration measurements were performed by Radian from July through October 1994. This included 223 sample analyses, 29 repeated analyses, and 2 audit samples (4 analyses each).

Ten percent of the data base was validated according to the procedure outlined below:

- Calibration factors were checked.
  - The area count from the strip chart that was used to determine the calibration factor was examined to verify that the data had been properly transferred to the calibration form.
  - The calibration form was examined to verify that the calculations had been correctly made.
  - Each datum on the disk was compared to the corresponding datum on the calibration sheet for accuracy.
- Analysis data were checked.
  - Area counts were verified from the appropriate strip chart.
  - Calculations were reverified on the analysis forms.
  - Each datum on the disk was compared to the corresponding item on the analysis form.
- Field data sheet was checked.
  - Each datum on the disk was compared to the corresponding datum on the field data sheet.

The error rate was calculated in terms of the number of items transferred from the original data sources. For each NMOC value in the 1994 data set, 36 items were transferred from original sources to the magnetic disks. In the data validation study each item on the disk was compared with the corresponding value on the original source of data. One error was found (and corrected) for an expected error percentage of 0.007 percent.

Each time the data file was opened and a suspected error found, the error was checked against the original archived documents, and corrected where appropriate.

6.0 SPECIATED NMOC BASE AND OPTION PROGRAM

6.1 Program Description

Five Speciated NMOC base sites participated in the 1994 program and were located in Birmingham, AL (B1AL, B2AL, and B3AL), Fort Worth, TX (FWTX), and El Paso, TX (EPTX). The Speciated NMOC site AIRS codes are given in Table 1-1 and AIRS site description inventories detailing with the site characteristics are given in Appendix A. All sites have participated in the Speciated NMOC program since 1992, except for EPTX which started in 1991. Three of these sites (B1AL, B2AL, and B3AL) also included the 3-hour toxics analysis option in their programs. The same procedures were used for the Speciated NMOC option sites (LINY, NWNJ, PLNJ).

The Speciated NMOC program consists of several activities that include:

- Sample collection, site coordination, equipment certification, installation, and operator training, and post-sample collection activities, such as equipment recovery and refurbishment, and canister cleanup and archive;
- Sample analysis, data reduction, validation, and reporting;
- Statistical analyses and data characterization; and
- Formatting and submittal of the validated data to the AIRS-AQS.

From July 5 through October 31, 1994, 439 samples were collected for all sites, which includes forty-five duplicate samples. One-half of all duplicate pairs were analyzed in replicate. Sample analyses were performed in accordance with the research protocol for analysis of C_2 through C_{12} hydrocarbons in ambient air.[3] This methodology incorporates the use of gas chromatography with dual capillary columns and flame ionization detectors (FIDs). Seventy-eight hydrocarbons were quantitated during analysis. Chlorinated and oxygenated species were not identified or quantified using this procedure.

6.2 Sample Collection Procedures

The sample collection procedures, which include the sample collection method, equipment preparation and certification, equipment calibration, equipment installation and training, sample collection schedule, and sample collection quality control are identical to those used for the NMOC base program. Refer to Section 4.2 for a description of the procedures.

6.3 Calibration and Sample Analysis

Standardized techniques were followed during sample analysis. Calibration standards were prepared for propane and benzene only, instruments were calibrated on schedule or when required, samples were analyzed following published procedures, and data were examined for accuracy. These procedures are explained in the following sections.

6.3.1 Calibration Standard Preparation

Certified high pressure stock standards from Scott® Specialty Gases were used to prepare propane and benzene analytical calibration standards across the measurement range of the analytical system. Standards used to establish retention time information were prepared from stock standards made using neat liquid compounds injected into cleaned, evacuated canisters, or from certified gaseous stock standards. Standards used to gather retention time information and set up a reference database using relative retention times referenced to toluene were prepared and analyzed. These relative retention times were used to identify the target compounds in the ambient air samples.

All calibration and daily calibration check standards were made from certified standard gases. Gas-tight syringes were used to inject an aliquot of the certified standard into cleaned, evacuated SUMMA® canisters. The canisters were pressurized with nitrogen to approximately 25 psig using a canister dilution system that consists of a precision vacuum/pressure gauge and a high-pressure nitrogen tank.

6.3.2 Monthly and Daily Instrument Calibration

The analytical system was calibrated monthly by analyzing three hydrocarbon standards and a system blank of cleaned, humidified air. The three calibration standards were prepared from a Scott® Specialty Gases certified standard to levels of 5, 15, and 50 ppbv benzene and propane. This calibration range is based on the expected levels of target compound concentrations in ambient air, based on historical information.

The calibration standards were analyzed in order of increasing concentration, and followed by the system blank analysis to ensure no carryover after analysis of the high level standard. For the primary column (1 μm phase thickness), which is used to quantitate the C_4 through C_{13} compounds, the benzene area count recorded by the FID was correlated to nanoliters of benzene by a least squares linear regression. For the secondary column (5 μm phase thickness), used to quantitate the C_2 and C_3 compounds, the propane area count recorded by the FID was correlated to nanoliters of propane by a least squares linear regression. The calibration was considered representative if the coefficient of correlation for the four points was greater than or equal to 0.995 for each column/detector. The slopes of the regression lines were then used to calculate monthly response factors.

The benzene response factor was divided by 6 (carbons/molecule of benzene) to calculate a per carbon response factor for the primary column/detector. The propane response factor was divided by 3 (carbons/molecule of propane) to calculate a per carbon response factor for the secondary column/detector. These response factors were then used to calculate sample concentrations for the following month. Monthly calibration information is summarized in Table 6-1.

Daily, prior to sample analysis, a QC standard, prepared from a Scott® Specialty Gases certified standard, was analyzed to ensure the validity of the current monthly response factors. This standard had an approximate concentration of 10 ppbv propane and benzene. This level was considered representative of the majority of concentrations expected in ambient air samples.

Table 6-1

Summary of Monthly Benzene and Propane Calibration Curves - 1994

Calibration Date	Primary Column		Secondary Column	
	Coefficient of Determination (R^2)	Benzene Response Factor (AC/nl-C)	Coefficient of Determination (R^2)	Propane Response Factor (AC/nl-C)
Manual Interface System				
07/11/94	1.0000	1844.7	0.9999	1405.97
08/10/94	0.9999	1932.0	0.9999	1475.9
09/08/94	1.0000	1876.2	1.0000	1430.1
10/10/94	0.9999	2006.2	1.0000	1557.4
11/10/94	0.9992	2300.0	0.9989	1818.3
Automated Interface System				
08/16/94	1.0000	2223.2	1.0000	1735.0

The load volume (in liters), benzene area count from the primary detector, and propane area count from the secondary detector were entered into a computer spreadsheet and the current monthly response factors were used to calculate the benzene and propane concentrations. These concentrations were compared to the calculated theoretical concentrations of the QC standard. A concentration percent bias of less than or equal to 30% was considered to be acceptable and the analytical system was in control.

If the daily QC standard did not meet the 30% criterion a second QC standard was prepared and analyzed. If the second QC standard met the criterion, the analytical system was considered in control. If the second QC check did not pass, a leak test and system maintenance were performed, and a third QC standard analysis was performed. If the criterion was met by the third analysis, the analytical system was considered in control. If the maintenance caused a change in system response, a new calibration curve was required. For the 1994 program the 30%

criterion was met on the first standard analysis for every sample analysis day on both analytical systems.

A system blank of cleaned, humidified air was analyzed after the daily QC standard analysis and prior to sample analyses. The system was considered in control if the total NMOC concentration for the system blank was less than or equal to 20 ppbC. This criterion was met for every sample analysis day on both analytical systems. A summary of the Speciated NMOC QC procedures is given in Table 6-2.

6.3.3 Sample Analysis

The sample analysis method follows the general guidelines of EPA's "Research Protocol Method for Analysis of C_2 through C_{12} Hydrocarbons in Ambient Air by Gas Chromatography with Cryogenic Concentration".[3] The Speciated NMOC target compounds are listed in Table 6-3 along with the Chemical Abstract Service (CAS) numbers and AIRS Parameter Code. Two analytical systems were used for the 1994 Speciated NMOC analyses. One system uses a manual sampling interface, the other an automated sampling interface, to concentrate and transfer the sample aliquot from stainless steel canisters to the GC.

The GCs connected to these sample introduction systems each contained two fused-silica capillary columns each connected to a FID. The sample is split between the columns in a 1:1 ratio with a 3-way press tight glass union. Each column has a J&W DB-1® phase. One column has a phase thickness of 1 μm to separate C_4 through C_{13} hydrocarbons effectively. The other has a phase thickness of 5 μm to separate C_2 and C_3 hydrocarbons.

Each system was characterized by analyzing hydrocarbon standards and the operating conditions were determined so that the chromatography would be comparable between systems. Each GC oven temperature was programmed so the sample is refocused on the GC column at subambient conditions, then the temperature increases to chromatographically separate the target compounds. Table 6-4 indicates the operating conditions for these analytical systems.

Table 6-2

Summary of Speciated NMOC QC Procedures

QC Check	Frequency	Acceptance Criteria	Corrective Action
System Blank Analysis	Daily, following calibration check, prior to analysis	20 ppbC total	1) Repeat analysis 2) Check system for leaks 3) Clean system with wet air
Multiple point calibration (3 points minimum). Propane/benzene bracketing the expected sample concentration	Prior to analysis and monthly	Correlation Coefficient ≥ 0.995	1) Repeat individual sample analysis 2) Repeat linearity check 3) Prepare new calibration standards and repeat
Calibration check using mid-point of calibration curve	Daily on the days of sample analysis	Response for propane and benzene within ± 30% difference of calibration curve slope	1) Repeat check 2) Repeat calibration curve

Table 6-3

1994 Speciated NMOC Target Compounds

Compound	CAS Number	AIRS Parameter Code
Ethylene	74-86-1	43203
Acetylene	74-86-2	43206
Ethane	74-84-0	43202
Propyne	77-99-7	43144
Isobutane	75-28-5	43214
1-Butene	106-98-9	43280
Isobutene	115-11-7	43270
Propylene	115-07-1	43205
1,3-Butadiene	106-99-0	43218
n-Butane	106-97-8	43212
Propane	74-98-6	43204
trans-2-Butene	624-64-6	43216
cis-2-Butene	590-18-1	43217
3-Methyl-1-butene	563-45-1	43282
Isopentane	78-78-4	43221
1-Pentene	109-67-1	43224
2-Methyl-1-butene	563-46-2	43225
n-Pentane	109-66-0	43220
Isoprene	78-79-5	43243
trans-2-Pentene	646-04-8	43226
cis-2-Pentene	627-20-3	43227
2-Methyl-2-butene	513-35-9	43228
2,2-Dimethylbutane	75-83-2	43244
Cyclopentene	142-29-0	43283
4-Methyl-1-pentene	691-37-2	43234
Cyclopentane	287-92-3	43242
2,3-Dimethylbutane	79-29-8	43284
2-Methylpentane	107-83-5	43285
3-Methylpentane	96-14-0	43230
2-Methyl-1-pentene	763-29-1	43246
1-Hexene	592-41-6	43245

Table 6-3

Continued

Compound	CAS Number	AIRS Parameter Code
2-Ethyl-1-butene	760-21-4	43236
n-Hexane	110-54-3	43231
trans-2-Hexene	4050-45-7	43289
cis-2-Hexene	7688-21-3	43290
Methylcyclopentane	96-37-7	43262
2,4-Dimethylpentane	108-08-7	43247
Benzene	71-43-2	45201
Cyclohexane	110-82-7	43248
2,3-Dimethylpentane	565-59-3	43291
2-Methylhexane	591-76-4	43263
3-Methylhexane	589-34-4	43249
2,2,4-Trimethylpentane	540-84-1	43250
n-Heptane	142-82-5	43232
Methylcyclohexane	108-87-2	43261
1-Heptene	592-76-7	43328
2,2,3-Trimethylpentane	564-02-3	43292
2,3,4-Trimethylpentane	565-75-3	43252
Toluene	108-88-3	45202
2-Methylheptane	592-27-8	43960
3-Methylheptane	589-81-1	43253
1-Octene	111-66-0	43145
n-Octane	111-65-9	43233
Ethylbenzene	100-41-4	45203
m-/*p*-Xylene	NA	45109
Styrene	100-42-5	45220
o-Xylene	95-47-6	45204
1-Nonene	124-11-8	43279
n-Nonane	111-84-2	43235
Isopropylbenzene	98-82-8	45210
α-Pinene	80-56-8	43256
n-Propylbenzene	103-65-1	45209

Table 6-3

Continued

Compound	CAS Number	AIRS Parameter Code
m-Ethyltoluene	620-14-4	45212
p-Ethyltoluene	622-96-8	45228
1,3,5-Trimethylbenzene	108-67-8	45207
o-Ethyltoluene	611-14-3	45211
β-Pinene	127-91-3	43257
1-Decene	872-05-9	43298
1,2,4-Trimethylbenzene	95-63-6	45208
n-Decane	124-18-5	43238
1,2,3-Trimethylbenzene	526-73-8	45225
p-Diethylbenzene	105-05-5	45219
1-Undecene	821-95-4	43299
n-Undecane	1120-21-4	43954
1-Dodecene	112-41-4	43330
n-Dodecane	112-40-3	43141
1-Tridecene	2437-56-1	43142
n-Tridecane	629-59-5	43143

Table 6-4

1994 Speciated NMOC GC/FID Operating Conditions

Parameter	Operating Value	
	Manual Interface System	Automated Interface System
Sample Volume	≈ 800 mL	≈ 800 mL
J&W DB-1® Capillary Columns		
Column A:		
Film Thickness	1 µm	1 µm
Length	60 m	60 m
Inside Diameter	0.32 mm	0.32 mm
Column B:		
Film Thickness	5 µm	5 µm
Length	60 m	60 m
Inside Diameter	0.32 mm	0.32 mm
Oven Temperature Program	-60° for 5 min. Then: 6°C/min. to 150°C, then 20°C/min. to 180°C. and hold for 4 min.	-60° for 5 min. Then: 6°C/min. to 150°C, then 20°C/min. to 180°C. and hold for 7 min.
Analysis Time	45 min.	50 min.
Detector Temperatures		
2 FIDs	300°C	300°C
Gas Flow Rates		
Helium Carrier Gas	4 mL/min.	2 mL/min.
Helium Make-Up	30 mL/min.	30 mL/min.
H_2 to FID	30 mL/min.	30 mL/min.
Air to FID	300 mL/min.	300 mL/min.

One analytical system consisted of a manual sampling interface, a Varian® 3400 dual FID GC, and a Nelson® 2600 data acquisition system. The second analytical system consisted of an automated sampling interface, a Varian® 3600 dual FID GC, and a Nelson® 2600 data acquisition system.

The automated system is capable of automatically concentrating a series of 16 air samples. In between sample loading, the sample pathway is continuously purged with humidified air provided by the laboratory clean air generation system. The automated system uses a vacuum pump to pull the sample into the cryogenic trap. The sample flow path consists of a mass flow controller (MFC) which provides a signal used to electronically integrate the total sample volume and a Nafion® dryer to remove water from the sample. The sample is cryogenically concentrated in a nickel trap filled with nonsilanized glass beads. Injection of the sample on the GC column occurs when the cryotrap is rapidly heated to vaporize any condensed organics, and helium carrier gas sweeps the sample to the head of the GC column.

6.3.4 Data Reduction and Data Validation

A PE Nelson® 2600 Chromatography Data System consisting of a 900 Series Intelligent Interface and a PC system containing the 2600 software was used to acquire, integrate and store the analytical data. A chromatogram and area count report from each detector were printed for each analysis. Electronic copies of the data were stored on 20 Mb disk cartridges, and a compressed backup disk was also made.

The data were processed using Radian Peak Identification Program (RPIP) software. The RPIP used a database containing relative retention time information for all compounds of interest and applicable response factors to process the data files. A preliminary report was generated containing possible peak identifications and quantitations based on the carbon response factor in effect at the time of analysis.

A data reviewer compared the RPIP report to the chromatogram to determine proper peak identifications. A second data reviewer checked for items which may have been overlooked

on the first pass. After the data was reviewed twice, a final RPIP report was processed and reviewed for completeness. Final report versions containing information on all quantitated peaks were printed and filed with the analysis chromatogram printout and preliminary RPIP report. Electronic copies of all RPIP reports were also kept on file.

7.0 3-HOUR TOXIC OPTION TO THE NMOC AND SPECIATED NMOC BASE PROGRAMS

7.1 Program Description

Two NMOC (PLNJ and NWNJ) and three Speciated NMOC (B1AL, B2AL, and B3AL) base sites chose the toxics option to their programs. Refer to Table 1-1 for the program description. The toxic option program provides for subsequent toxics analysis on nine of the samples collected for each of the two NMOC and three Speciated NMOC base sites. Of the nine samples, one pair is a duplicate which is analyzed in replicate. The samples are analyzed using the same procedures as used for the Urban Air Toxics Monitoring Program (UATMP). The methodology employed is performed in accordance with Compendium Method TO-14.[6]

The toxic option program consists of:

- Sample analysis by GC/MSD-FID, data reduction, validation, and reporting;
- Statistical analysis and data characterization; and
- Formatting and submittal of the validated data to the AIRS-AQS.

7.2 Sample Collection Procedures

The NMOC/Speciated NMOC monitoring program samples were used for the 3-hour air toxics samples. See Section 5.2 for a discussion of the procedures used for sampling system preparation, certification, calibration, installation and training, and quality control. The original sample was collected as an integrated ambient air sample from 6:00 a.m. to 9:00 a.m., local time, with a final sample pressure of approximately 15 psig. After NMOC or speciated NMOC analysis was completed, the canister was then analyzed by GC/MSD-FID for the UATMP target analytes.

7.3 Calibration and Sample Analysis

Standardized techniques were followed during sample analysis. Calibration standards were prepared for each of the toxics option target compounds, the GC/MSD-FID instrumentation was calibrated, detection limits were determined, samples were analyzed following published procedures, and data were statistically analyzed and examined for accuracy. These procedures are explained in the following sections.

7.3.1 Calibration Standard Preparation

A monthly calibration of the target compounds was performed by analyzing humidified standards prepared at levels of approximately 0.5, 1, 5, 10, and 15 ppbv from Scott® Specialty Gases certified standards. A standard prepared at a level of approximately 5 ppbv from a Scott® Specialty Gases certified standard was used for a daily quality control check. These standards were prepared using the dynamic flow dilution system. The gases were mixed in a SUMMA®-treated mixing sphere and bled into evacuated canisters. One dilution air stream was routed through a SUMMA®-treated bubbler containing HPLC-grade water to humidify, and the other stream was not humidified. The dilution air streams were brought together to mix with the streams for the certified cylinders. Flow rates from all five streams (four from the certified cylinders and one from the dilution cylinder) were gauged and controlled by mass flow controllers. The split air dilution streams were metered by "wet" and "dry" rotameters from the humidified and non-humidified dilution air streams, respectively. The system was evacuated with a vacuum pump while the closed canister was connected. A precision absolute pressure gauge measured the canister pressure before and after filling. The lines leading to the canister and to the mixing sphere were flushed for at least 15 minutes with standard gas before being connected to the canister for filling.

7.3.2 GC/MSD-FID Calibration

Initial and monthly calibration curve standards were made at approximately 0.5, 1, 5, 10, and 15 ppbv for each of the target compounds. A linear regression was performed for each of the

compounds with the objective that the correlation coefficient be 0.995 or better (for 5 or 6 points) for selected compounds on the detector used for quantitation. The zero air used for canister cleaning and for standards dilution was analyzed at the time of calibration, but the results were not used in the calibration curve. Daily calibration was done with standards made from the certified gases with an average concentration of approximately 5 ppbv.

The calibration standard concentrations and area counts for each compound were entered into a spreadsheet. The resulting response factors of each of the compound's concentrations were compared to the monthly calibration curve's average response factor. An absolute value of less than or equal to 30% relative percent difference was tracked for the quantitated compounds. This was not a criteria for calibration acceptance, but was monitored in addition to the correlation coefficient criteria.

Prior to sample analysis, the MSD was tuned using bromofluorobenzene (BFB). The criteria for acceptance is given in Table 7-1. Following successful tuning, the approximately 5 ppbv standard was analyzed to ensure the validity of the current monthly response factor. This daily check was at the middle range of the calibration curve to show consistency with the monthly calibration curve. The daily standard area counts for each compound were entered into a spreadsheet. The resulting concentrations (conc. = response factor x area counts) of each compound were compared to the true value on the monthly calibration curve. An absolute value of less than or equal to 30% relative percent difference was the guideline for the quantitated compounds. After acceptance of the daily standard, a wet zero was analyzed. Resulting concentrations for target amounts of less than 0.2 ppbv was the objective except for known detector interferences. If more than a 0.2 ppbv concentration was found, a second wet zero was run. If a second wet zero failed, system maintenance was performed.

7.3.3 GC/MS Calibration Results

Four calibration curves were used during the analysis period. All of the compounds were within the 0.995 criteria for linear regression. The 30% objective was exceeded by two of the 38 compounds. They ranged from 37.16 to 53.94 percent.

Table 7-1

Acceptance Criteria for Bromofluorobenzene (BFB)

Target Mass	Relative to Mass	Lower Limit %	Upper Limit %
50	95	15	40
75	95	30	60
95	95	100	100
96	95	5	9
173	174	0	2
174	95	50	100
175	174	5	9
176	174	95	101
177	176	5	9

In the second calibration curve, one compound coefficient (0.989) was less than 0.995. The 30% objective was exceed by six of the 38 compounds. They ranged from 31.32 to 48.49 percent.

In the third calibration curve, two compound coefficients were less than the 0.995 criteria. One was at 0.992 and the other at 0.991. The 30% objective was exceeded by six of the 38 compounds. They ranged from 30.92 to 49.92 percent.

In the fourth calibration curve, all of the compounds were within the 0.995 criteria for linear regression. The 30% objective was exceeded by 13 of the 38 compounds, ranging from 31.63 to 183.99 percent.

7.3.4 Detection Limits

Instrument detection limits for the 38 target toxic target compounds are given in Table 7-2. The detection limits were determined by performing seven replicate analyses of a standard that was at a concentration near the expected practical quantitation limit, which follows the method listed in the Federal Register, Appendix B, Part 136.[7] The detection limit for acetylene was determined from the FID and is also given in Table 7-2.

7.3.5 Sample Analysis

The analytical system consisted of a Nutech sample concentration system and a Hewlett-Packard GC/MSD-FID. Figure 7-1 shows the analytical system including the sample interface system, analytical system, and data system. When the sampling valve was in the sample load mode, the sample interface served to cryogenically preconcentrate a measurable sample volume. In the sample inject mode, the cryogenically-focused water and organic compounds were thermally desorbed and swept by helium carrier gas to the cryogenic focusing unit located before the head of the GC column. The focusing unit was used to concentrate the desorbed sample into a narrow band where it was then desorbed onto the head of the GC column where the compounds were then chromatographically separated.

The Hewlett-Packard 5890 Series II gas chromatograph system contained a FID and a Hewlett-Packard 5971 MSD. The system used one column (J & W DB-1®, 60 m x 0.32 mm, and 1 μm film thickness) followed by a 1:3 splitter. Two-thirds of the effluent goes to the MSD and the remainder goes to the FID. Compounds were identified based on a combination of retention time, the MSD library, and the analyst's experience and judgment. Quantitation was performed using the FID response for acetylene, with the remainder of the target compounds quantitated using the MSD. The sample concentrations were calculated using the monthly calibration curve average response factor.

Table 7-2

Estimated Minimum Detection Limits for TO-14 Compounds

Compound	Minimum Detection Limit (MDL)	Compound	Minimum Detection Limit (MDL)
Acetylene	0.12	Trichloroethylene	0.05
Propylene	0.09	*cis*-1,3-Dichloropropene	0.05
Chloromethane	0.39	*trans*-1,3-Dichloropropene	0.08
Vinyl Chloride	0.11	1,1,2-Trichloroethane	0.05
1,3-Butadiene	0.15	Toluene	0.04
Bromomethane	0.18	Dibromochloromethane	0.05
Chloroethane	0.18	*n*-Octane	0.05
Methylene Chloride	0.16	Tetrachloroethylene	0.04
trans-1,2-Dichloroethylene	0.22	Chlorobenzene	0.06
1,1-Dichloroethane	0.06	Ethylbenzene	0.08
Chloroprene	0.05	*m*-/*p*-Xylene	0.11
Bromochloromethane	0.07	Bromoform	0.08
Chloroform	0.06	Styrene	0.08
1,2-Dichloroethane	0.26	1,1,2,2-Tetrachloroethane	0.16
1,1,1-Trichloroethane	0.33	*o*-Xylene	0.06
Benzene	0.24	*m*-Dichlorobenzene	0.07
Carbon Tetrachloride	0.07	*p*-Dichlorobenzene	0.06
1,2-Dichloropropane	0.04	*o*-Dichlorobenzene	0.08
Bromodichloromethane	0.09		

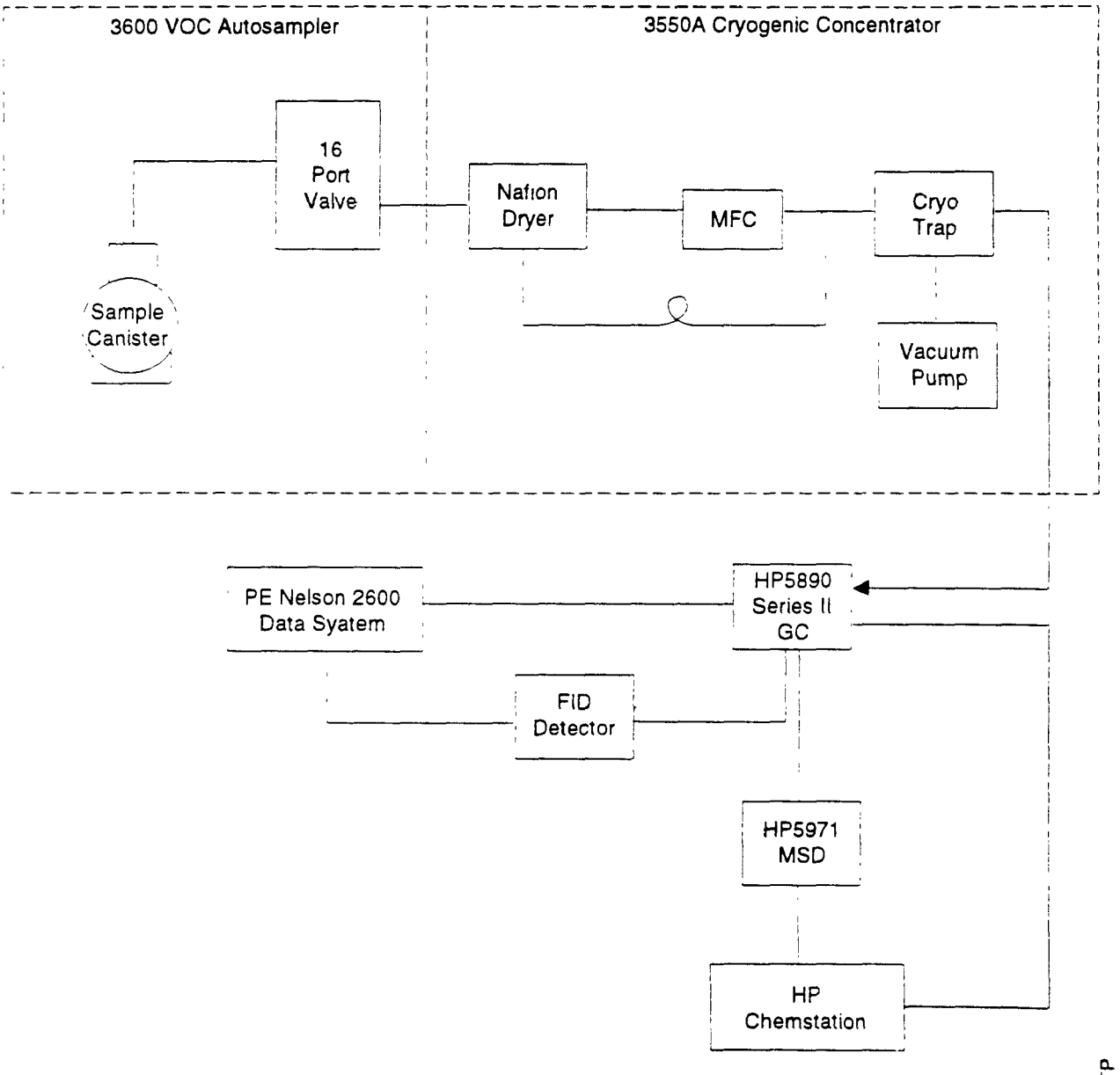


Figure 7-1. Schematic of Toxics Analytical System

950296-LN-DRTP

8.0 CARBONYL OPTION TO THE NMOC BASE PROGRAM

8.1 Program Description

Two NMOC base sites participated in the 1994 carbonyl option program. The base sites were Plainfield, NJ (PLNJ) and Newark, NJ (NWNJ). See Section 3.0 for a description of the NMOC base program and the AIRS site codes and AIRS site description inventories dealing with the site characteristics. Approximately ten carbonyl sample cartridges, including a duplicate pair, were selected from each site for sample analysis.

A total of three DNPH cartridges were shipped to each site for each sampling event. Two cartridges were used to collect duplicate samples, while the third tube, a trip blank, was used to assess the potential for field contamination. The trip blank cartridge accompanied the duplicate sample cartridges, but at no time was exposed to ambient air. Duplicate field samples were collected on duplicate cartridges during each sampling event. One set of field duplicates from each site was selected and analyzed in replicate to determine both the sampling and analytical precision.

The carbonyl option program consists of several activities that include:

- Sample collection, site coordination, equipment installation and operator training, and post-sample collection activities, such as equipment recovery and refurbishment;
- Sample analysis by HPLC, data reduction, validation, and reporting;
- Statistical analyses and data characterization; and
- Formatting and submittal of the validated data to the AIRS-AQS.

8.2 Sample Collection Procedures

A schematic diagram of the 3-hour carbonyl sampling sub-system is shown in Figure 8-1. The 3-hour carbonyl sampling subsystem collects a separate sample concurrent with the collection of the NMOC canister sample through the use of a common sampling control system.

Ambient air was drawn from a glass manifold, through an ozone scrubber, and then through the carbonyl sample cartridges. The ozone scrubber was maintained at 200°F to prevent moisture condensation. Carbonyl samples were collected in duplicate parallel cartridges during each sample collection period. The carbonyl cartridges used were commercially available (Waters Co.) silica gel DNPH-coated Sep-Pak® cartridges.

The carbonyl cartridges were installed in the sampling sub-system one day prior to the scheduled sample collection. A 3-hour sample collection period, concurrent with the NMOC canister collection, was utilized.

The flow rates through each of the duplicate carbonyl samples were controlled by flow restrictors (or critical orifices). The collection flow rates were quantified and the rotameters calibrated before the sampling sub-systems were shipped to the sites. The volume of ambient air actually sampled through each cartridge was calculated based on the rotameter setting and the field-recorded sampling duration. Typical sampling flowrates were 800-10,000 mL/min.

8.3 Sample Collection Quality Control

Quality assurance procedures relative to calibration data for all of the analytes and daily QC procedures are discussed below. Sampling and analysis precision was determined from the analysis of duplicate field samples and replicate laboratory analyses. Sample custody records were maintained throughout the program. Figure 8-2 shows the field data and custody sheet used for carbonyl sampling documentation. The site operator's task involved recognizing problems with sampling equipment and procedures, and notifying Radian personnel so that appropriate corrective action might be taken. All Radian-reported analyses were identified by the NMOC

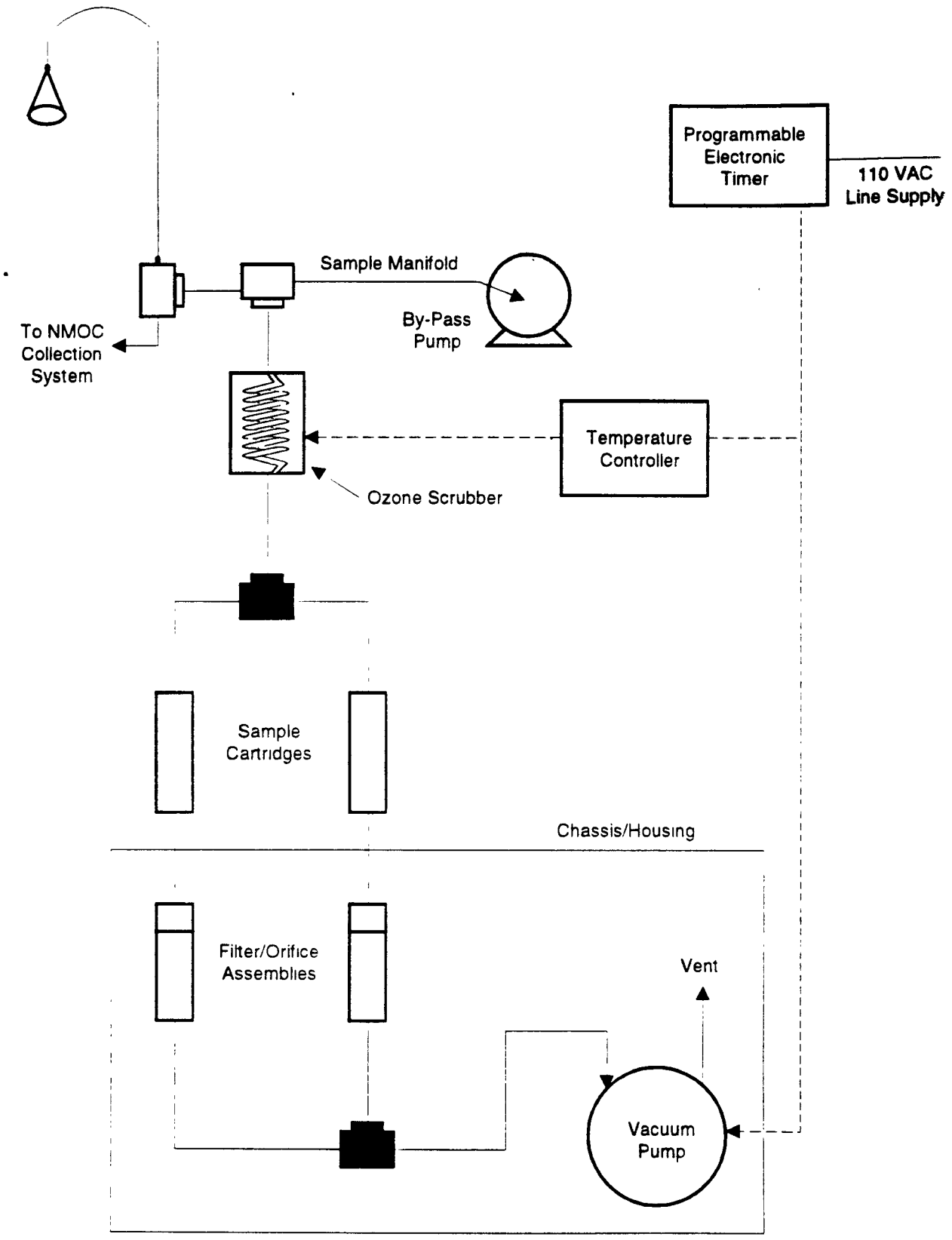


Figure 8-1. Schematic of the Carbonyl Sampling Sub-System

950182D-la-RTP

RADIAN CORPORATION

URBAN AIR TOXICS MONITORING PROGRAM

Aldehyde Data Sheet

City _____ Sample Date _____

SAROAD No. __ __·__ __ __ __·__ __ __·A05 Sampler No. _____

Cartridge	Port A (red)	Port B (green)	(blank)
Tube No.	_____	_____	_____
Lot No.	_____	_____	_____

Rotameter No. _____

Rotameter Reading[1] _____ / _____ (before)

Rotameter Reading[1] _____ / _____ (after)

Sampling Time/Duration _____ (hours)

Sampling Volume[3] _____ (liters)

Flow Rate[2]	LPM
Before	_____
After	_____
Average	_____

Average Ambient Temperature _____ (C° or F°)

Average Barometric Pressure _____ (mm Hg)

Site Operator _____

Comments/Remarks _____

Sample Control Copy

[1] Rotameter reading center of black ball.
[2] Calculated from calibration curve by the laboratory.
[3] Calculated by laboratory.

0870477R

Figure 8-2. Field Data and Custody Sheet for Carbonyl Sampling Documentation

program identification numbers which were recorded on the preformatted field data sheets when the samples were received.

8.4 Calibration and Sample Analysis

Various standard techniques were followed during sample analysis. Instrumentation was calibrated, detection limits were determined, samples were analyzed following published procedures, and data were examined for accuracy and statistically analyzed. These procedures are explained in the following sections.

8.4.1 Calibration Procedures and HPLC System Performance

The data quality objectives used for the carbonyl option program are given in Table 8-1. Initial and daily calibration and other system performance criteria are given in this table, along with the frequency, acceptance criteria, and corrective action.

The HPLC was calibrated from 0.5 to 20 µg/ml nominal concentration of the derivatized targeted compounds contained in a solution of acetonitrile. The calibration curve consisted of five concentration levels between 0.5 and 20 µg/ml, and each was analyzed in replicate. A standard linear regression analysis was performed on the data for each analyte with the acceptance criteria being that the correlation coefficient must be greater than or equal to 0.995 and the relative error for each calibration level against the calibration curve within 20 percent. A summary of the calibration curve information is given in Table 8-2.

As a QC procedure on the analytical results for all of the quantitated analytes, a second source QC (SSQC) sample solution containing 11 target carbonyl compounds at a known concentration was obtained from the Radian Austin, TX office. The following SSQC samples were analyzed after every 10 samples:

- Formaldehyde;
- Acetaldehyde;

Table 8-1

Data Quality Objectives

Parameter	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
HPLC Column Efficiency	Analyze second source QC sample (SSQC)	At setup and 1 per sample batch	Resolution between acetone and propionaldehyde ≥ 1.0	Eliminate dead volume, backflush, or replace column
Linearity Check	Run a 5-point calibration curve	At setup or when SSQC calibration check is out of acceptance criteria	Correlation coefficient ≥ 0.995, relative error for each level against calibration curve ± 20% or less	Check integration, reintegrate or recalibrate
Retention Time	Evaluate SSQC	1 per 10 vials	Within retention time window established by determining 3σ of calibration retention time standards	Check system for plug, regulate column temperature, check gradient and solvents, reanalyze samples not bracketed by acceptable SSQC
Calibration Check	Analyze SSQC	1 per 10 vials with a minimum of 2 per sample set	85-115% recovery	Check integration, recalibrate or remake SSQC, reanalyze samples not bracketed by acceptable SSQC
System Blank	Analyze acetonitrile	Bracket sample batch, 1 at beginning and 1 at end of batch	Measured concentration ≤ 5 times the MDL	Locate contamination and document levels of contamination in file
Replicate Analyses	Replicate injections	Duplicate samples only	≤ 10% RPD of concentrations within the calibration range	Check integration, check instrument function, reanalyze duplicate samples
Method Spike/Method Spike Duplicate (MS/MSD)	Analyze MS/MSD	5% of sample batch with a minimum of 1 MS/MSD per sample set	80-120% recovery	Check calibration, check extraction procedures

Table 8-2

1994 NMOC Carbonyl Calibration Curve Summary

Analyte	Slope	Intercept	R	R_2	Relative Error, %				
					0.5 µg/ml	1.0 µg/ml	6.0 µg/ml	12 µg/ml	20 µg/ml
Formaldehyde	124403.79	-16818 84	0.99993	0.99986	11.66	-4.94	2.49	-0.28	-0.09
Acetaldehyde	135229 50	-3127.72	0.99990	0.99980	2.59	6.43	1.57	-0.27	0.25
Acrolein	159439.11	-3036.82	0.99993	0.99987	5.49	5.55	1.09	-0.29	-0.19
Acetone	122723.01	-1355.36	0.99994	0 99988	5.09	0.30	2.55	-0.25	-0.19
Propionaldehyde	107616.48	-4213.70	0.99996	0 99992	0.37	-0.97	2.43	0.17	-0.19
Crotonaldehyde	127759.25	-9396.25	0 99979	0.99959	19.07	7.19	0.41	-1.44	0.48
Butyr/Iosbutyraldehyde	106494.51	-3731.64	0.99996	0.99992	2.09	4.41	0.73	-0.45	0.29
Benzaldehyde	151715.31	-12335.04	0.99989	0.99978	14.37	4.67	-0.83	0.38	-0.27
Isovaleraldehye	86002.16	75.86	0.99995	0.99991	9.78	4.26	0.41	-0.56	-0.01
Valeraldehyde	109259.51	-1654.99	0.99993	0.99986	17.76	1.57	1.07	-0.72	0.09
Tolualdehydes	105076.56	-7701.50	0.99988	0.99977	4.20	2.57	-0.81	-0.36	0.03
Hexanaldehyde	83849.25	-1055.32	0.99993	0.99986	1.11	4.97	1.15	-0.93	0.14
2,5-Dimethylbenzaldehyde	107337.12	-3068.16	0.99996	0.99993	6.45	-0.43	1.11	0.07	-0.48

- Acrolein;
- Acetone;
- Propionaldehyde;
- Crotonaldehyde;
- Butyraldehyde;
- Benzaldehyde;
- Valeraldehyde;
- *m*-Tolualdehyde; and
- Hexanaldehyde.

8.4.2 Detection Limits

Instrument detection limits are given in Table 8-3 for the target carbonyl compounds in this study. The detection limits were determined by performing nine replicate analyses of a standard that was half the concentration of the lowest calibration standard, which follows the method listed in the Federal Register, Appendix B, Part 136.[7]

8.4.3 Sample Analysis

The analytical procedures for carbonyls are given below. Sample preparation and analyses were performed at the Radian RTP laboratory. The preparation procedures of the cartridge samples are as follows:

- Remove cartridge from its shipping container.
- Attach cartridge to the end of a 10-mL luer-lock glass syringe, with the plunger removed.
- Add 4 milliliters of HPLC-grade acetonitrile to the syringe and catch drainage in a graduated glass centrifuge tube.
- After the syringe has finished draining, add acetonitrile to the graduated centrifuge tube until the total volume is 4 mL, and mix the solution.
- Transfer the solution in the graduated centrifuge tube to a 4-mL glass sample vial fitted with a Teflon®-lined self-sealing septum.
- Store the vial containing the solution in a refrigerator until analysis.

Table 8-3

Estimated Instrument Detection Limits for Target Carbonyl Compounds

Carbonyl	Underivatized Instrument Detection Limit (ppbv)[a]	CAS Number	AIRS Parameter Code
Formaldehyde	0.19	50-00-0	43502
Acetaldehyde	0.37	75-07-0	43503
Acrolein	0.29	107-02-8	43505
Acetone	0.27	67-64-1	43551
Propionaldehyde	0.29	123-38-6	43504
Crotonaldehyde	0.16	123-73-9	43516
Butyr/Isobutyraldehyde	0.20	NA	43329
Benzaldehyde	0.14	100-52-7	45501
Isovaleraldehyde	0.14	590-86-3	43513
Valeraldehyde	0.14	100-62-3	43518
Tolualdehydes	0.30	1334-78-7	45504
Hexanaldehyde	0.08	66-25-1	43517
2,5-Dimethylbenzaldehyde	0.16	5779-94-2	45503

[a]Detection limit is based upon an average sample volume of 200L.

The EPA Method TO-11[5] high pressure liquid chromatography (HPLC) column and elution solvents used for this analysis were modified to decrease analysis time, as shown in the following gradient elution, at a flow rate of 0.9 mL/min:

Time (Min.)	% Water	% Acetonitrile	% Methanol
0.0	40	20	40
12	25	5	70
18	23	5	72
28	15	10	75
32	40	20	40
40	40	20	40

For the analysis, 25 μl samples are injected with an automatic sampling injector. Compound separation is accomplished using a 25 cm x 4.6 mm C18 5-micron particle size analytical HPLC column. Output signals from a multi-wavelength ultraviolet (UV) detector are collected for 40 minutes at 360 nanometers (nm).

Chromatographic peaks for targeted compounds were determined by retention time, the area of the integrated peak, and concentrations calculated using calibration curves.

Target carbonyl compounds detected were formaldehyde, acetone, acetaldehyde, acrolein, propionaldehyde, crotonaldehyde, butyraldehyde, isobutyraldehyde, benzaldehyde, isovaleraldehyde, valeraldehyde, ortho-, meta-, and para-tolualdehyde, hexanaldehyde, and 2,5-dimethylbenzaldehyde. All measured concentrations were reported in ppbv. The results for any field blanks were also reported in ppbv, assumed using the same sample volume as the accompanying samples.

One trip blank cartridge from each site was analyzed for the target carbonyl analytes. The carbonyl sample results presented in this report are not blank corrected.

8.4.4 Data Reduction and Data Validation

A Perkin-Elmer Nelson® Turbochrom Chromatography Data System consisting of a 900 Series Intelligent Interface and a PC system containing the Turbochrom software was used to acquire, integrate, and store the analytical data. A chromatogram and area count report are printed for each analysis. Electronic copies of the data were stored on 1.44 Mb disks, and a compressed backup disk was also made.

The data were processed using the Turbochrom software. This software contains retention time information for all compounds of interest and applicable response factors required to process the data files. The analyst confirmed the proper peak identifications and quantifications. A preliminary report was generated containing the peaks identified and the quantitations based on the response factors.

A data reviewer compared the report to the chromatogram to check for items which may have been overlooked by the analyst. A final report was processed and reviewed for completeness. Final report versions containing information on all quantitated peaks were printed and filed with the analysis chromatogram printout and preliminary report. Electronic copies of all reports were also kept on file.

9.0 STATISTICS AND DATA CHARACTERIZATION PROCEDURES

Statistical parameters calculated for all data included maximum, minimum, median, and mean concentrations. Standard deviation, skewness, and kurtosis were also calculated. In addition, the Shapiro-Wilk statistic was used to test the normality of the NMOC base program data. Duplicate and duplicate/replicate data for a given sample date were averaged and considered as one sample. Non-detect results were treated as missing values.

Standard deviation is the square root of the variance and is often written as σ. Standard deviation provides information concerning the variability of the data in the same units as the data. The larger the standard deviation, the more variable the data; the smaller the standard deviation, the less variable the data.

Skewness, kurtosis, and the Shapiro-Wilk statistic are all values which measure the normality of a data distribution. Skewness is an indication of the symmetry of the data. Data from a normal distribution have a skewness value of zero. Normal distribution, also often referred to as *Gaussian* distributions, results from the random scatter of data bout some true value, often represented as the mean. If some effect aside from randomness is acting on the data, the resulting distribution will be nonnormal. Skewness values which depart significantly from zero indicate nonnormal distributions. Skewness values greater than zero apply to distributions having a longer tail to the right.

Kurtosis is another method of determining if a distribution is normal or nonnormal. A population which is normally distributed would have a kurtosis value of 3.0, whereas a distribution more peaked or pointed would have a value greater than 3.0. All kurtosis values presented in this report are zero centered, meaning that 3.0 has been subtracted from the fourth moment to give a reported kurtosis of 0.0 for a normal distribution. The Shapiro-Wilk test was conducted on only the NMOC base program and is discussed in detail in the following section.

9.1 Statistics: NMOC Base Program

Data obtained from the 1994 NMOC program were analyzed statistically for various parameters. Values for the arithmetic averages of the NMOC concentrations at each site, as well as the standard deviation, skewness, kurtosis, and the Shapiro-Wilk statistic are presented. Results are summarized in Table 9-1.

Three NMOC base sites participated in the 1994 NMOC program: Long Island, NY (LINY) and Newark and Plainfield, NJ (NWNJ and PLNJ, respectively). Sample collection for the program occurred from 6:00 a.m. through 9:00 a.m. local time, Monday through Friday from July 6 to October 31, 1994. During this period, a total of 268 samples were collected, including 27 duplicate samples. Analytical results from each of the sites are contained in Appendix B.

The NMOC data for the summer of 1994 are partitioned in Table 2-11 into groups that correspond to monthly intervals. For this time period, the monthly concentration means and medians of the NMOC sites roughly parallel one another, the lone exception occurring in August. The August value for the median decreases slightly from July, whereas the value of the mean concentration has increased slightly from the July value. Entering into September, both median and mean decrease from the August values. A dramatic increase in both median and mean is observed in the month of October, although it is unclear why this should occur. In addition, the data become increasingly variable near the end of the program, and again, the reason is unclear. The effect is readily apparent in Figures 9-1 to 9-3, although the variability for LINY is less extreme than that for PLNJ and NWNJ. Results by individual analysis channel have been examined and the channel has no, or only very minimal, effect on the detected level of NMOC.

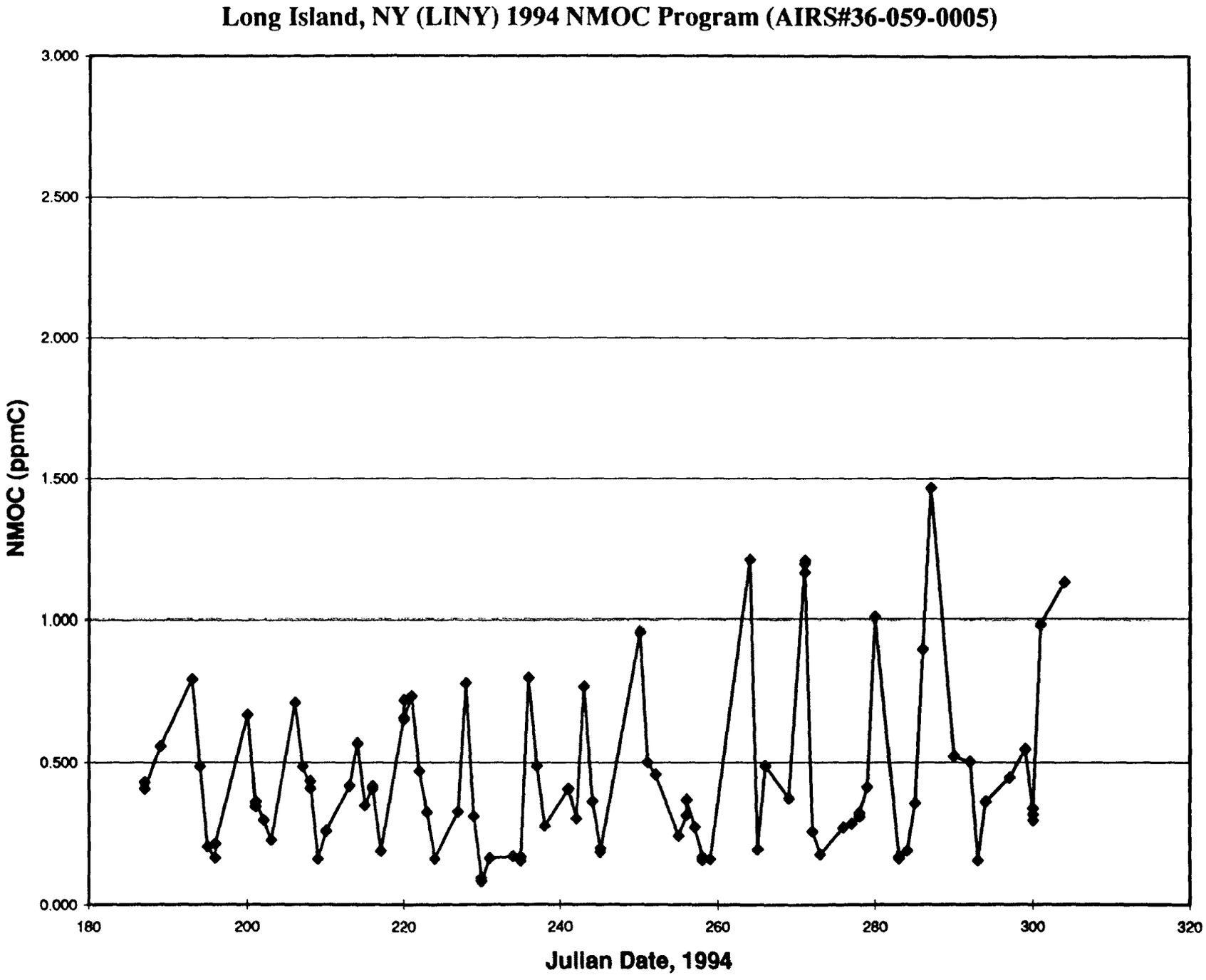
Overall, PLNJ was found to have the highest mean concentration level of NMOC (0.663 ppmC), followed by NWNJ (0.641 ppmC) and LINY (0.451 ppmC). Maximum concentrations were found to also follow this trend: PLNJ, 2.524 ppmC; NWNJ, 2.508 ppmC; and LINJ, 1.465 ppmC. The largest standard deviation of concentration was 0.539 for PLNJ, and the mean concentration would often be presented as 0.663 ± 0.539 ppmC. PLNJ has the highest

Table 9-1

NMOC Overall Statistics, By Site

Site	Cases	Minimum Conc (ppmC)	Maximum Conc (ppmC)	Median Conc (ppmC)	Mean Conc (ppmC)	Standard Deviation	Skewness	Kurtosis	W[a]
LINY	74	0.088	1.465	0.363	0.451	0.292	1.394	1.700	0.860
NWNJ	78	0.231	2.508	0.549	0.641	0.397	2.162	6.614	0.808
PLNJ	71	0.055	2.524	0.496	0.663	0.539	1.630	2.301	0.817
OVERALL	223	0.055	2.524	0.465	0.585	0.428	1.979	4.823	0.810

[a] Shapiro-Wilk statistic to test for data normality


Long Island, NY (LINY) 1994 NMOC Program (AIRS#36-059-0005)
NMOC (ppmC)
3.000
2.500
2.000
1.500
1.000
0.500
0.000
180
200
220
240
260
280
300
320
Julian Date, 1994

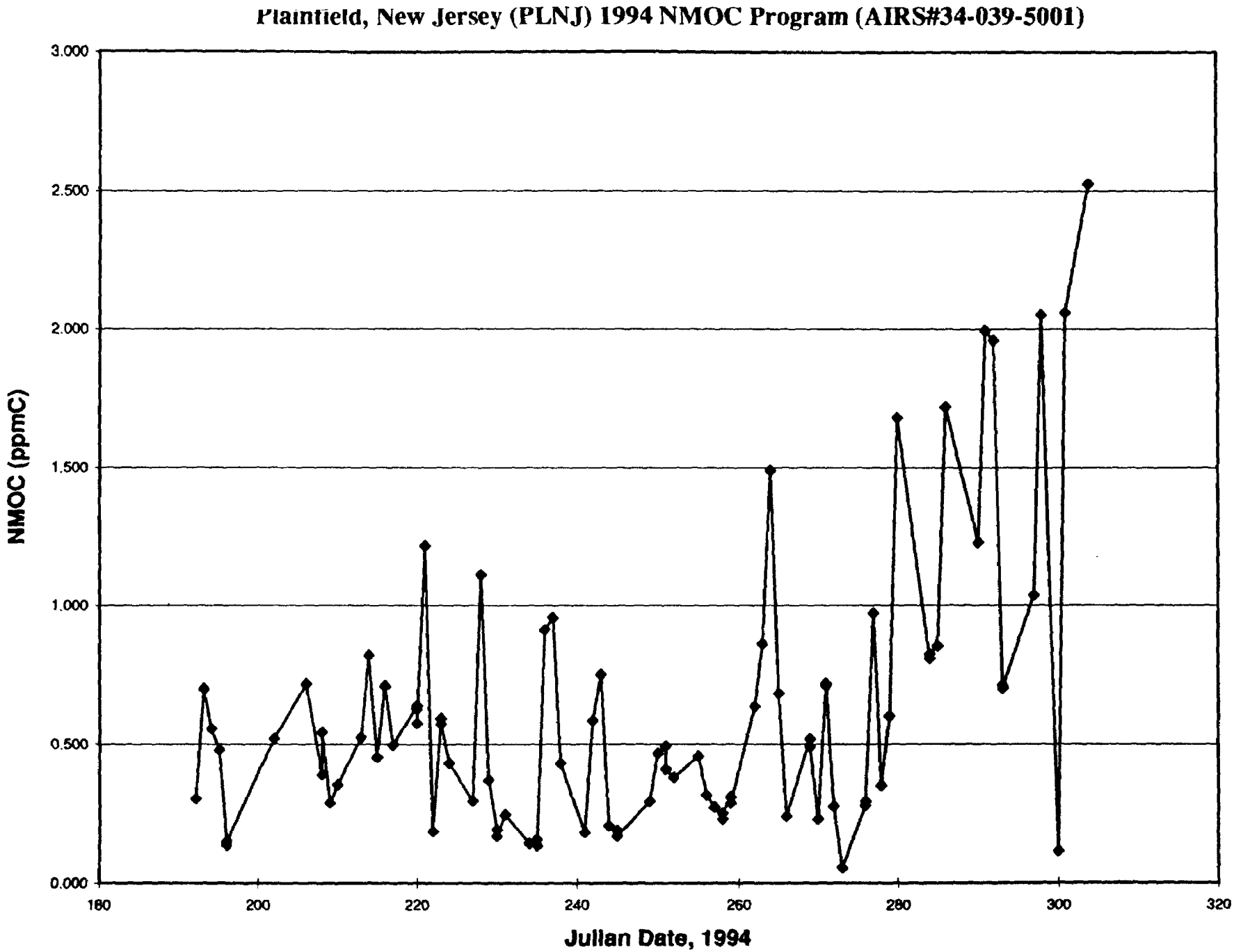


Figure 9-2. 1994 NMOC Program, Plainfield, NJ (PLNJ)

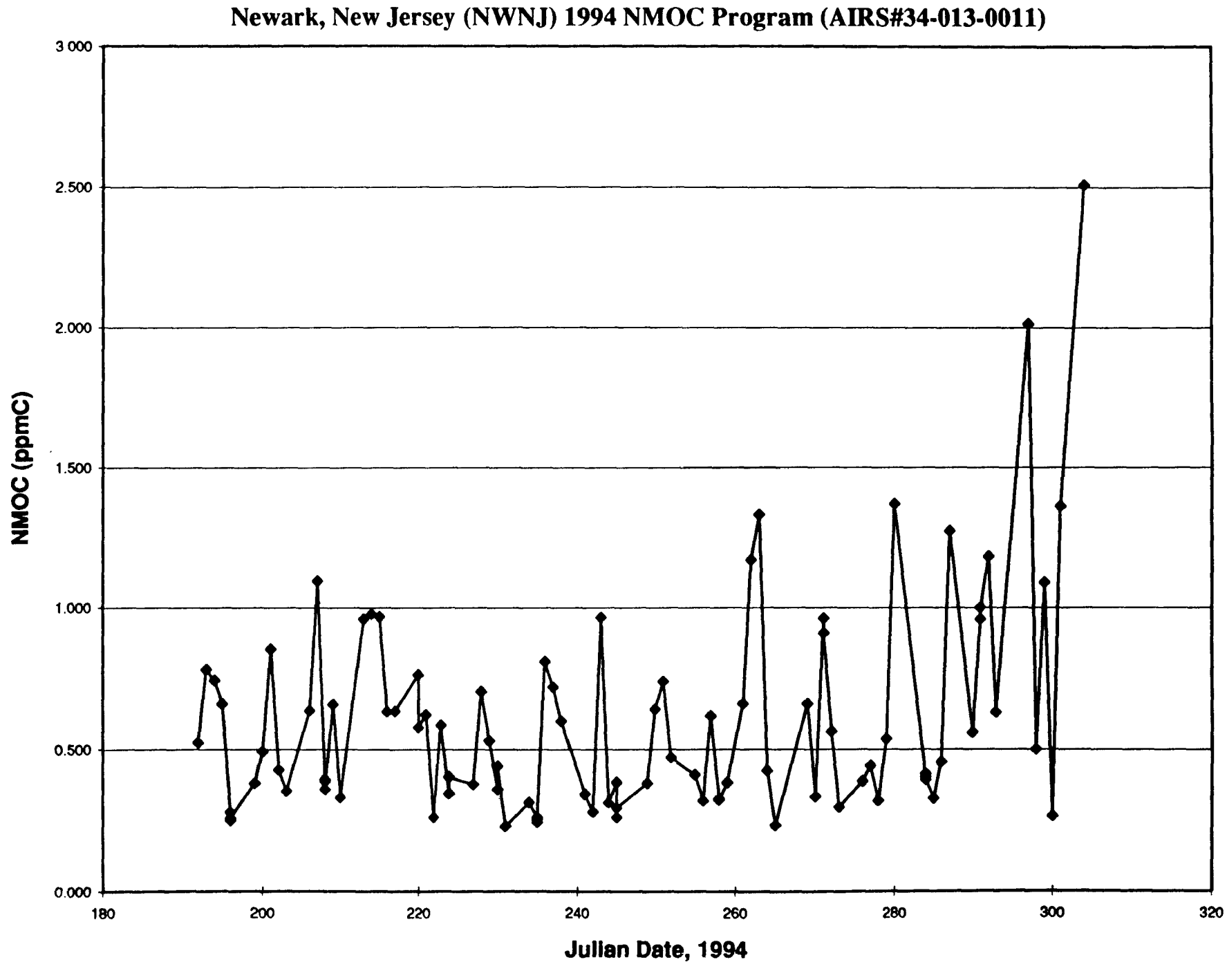


Figure 9-6. 1994 NMOC Program, Newark, NJ (NWNJ)

standard deviation indicated that the NMOC sample concentrations collected from PLNJ over the course of the program varied over a wider range than did those of NWNJ ($\sigma = 0.397$) or LINJ ($\sigma = 0.292$).

The overall skewness value of 1.979 for the NMOC base sites indicates that the distribution of the data is not normal, and is therefore being influenced by some external factor or factors. The overall kurtosis value of 4.893 for the NMOC base sites indicates that the distribution of the data is not normal. Zero centered kurtosis values greater than 0.0 indicate a more peaked distribution than a normal distribution.

The Shapiro-Wilk statistic (W) tests the normality of a data set and ranges in value from zero to one. The closer this value is to one, the better the fit of the data to normality. The overall value of W for the NMOC base sites is 0.810 and indicates that the data is nonnormally distributed.

Stem-and-leaf plots are often used to provide a graphic representation of a distribution. Figure 9-4 gives a stem-and-leaf plot of the 1994 NMOC data along with related statistics. It is immediately apparent when viewing Figure 9-4 that the NMOC data is nonnormally distributed. The plot shows the actual NMOC concentration truncated to two decimal points. The digits on the left of the vertical open space are called *stems* and those to the right are called *leaves*. The data are sorted from the smallest value at the top of the figure to largest at the bottom. The minimum NMOC value measured was 0.055 ppmC, and is shown as "0 5" on the first row at the top of the plot. The maximum NMOC concentration measured was 2.524 ppmC, and is shown as "25 0 2" in the bottom row of the chart (0 indicates that the second highest reading was 2.50 ppmC). The plot shows 223 leaves, one for each site datum in the 1994 NMOC program. The H's to the left of the plot locate the seam and leaf for the upper and lower *hinges*, and the M locates the seam and leaf for the median. The median separates the sorted NMOC concentrations into two equal halves, while the hinges (or *quartiles*) separate each half into halves. The H *spread*, or interquartile range, is the difference between the NMOC values of the two hinges. These values provide us with a measure of dispersion if the median is used as a measure of central tendency. Fifty percent of the data lie within the H spread.

```
    0  58
    1  13445 66666 66777 78889 999
    2  00233 33444 55666 67777 78888 99999
(H) 3  00111 11122 22223 33445 55555 66777 77888 88
(M) 4  00001 11122 22344 45555 66677 88889 9
    5  00001 22233 45566 68889
    6  01122 33334 56666 6789
(H) 7  00001 11334 46789 9
    8  11155 69
    9  13555 66777 8
   10  0389
   11  12688
   12  0127
   13  3
   13  67
   14  68
   16  7
   17  1
   19  59
   20  155
   25  02
```

NMOC, ppmC

Cases:	223
Minimum:	0.055
Maximum:	2.524
Mean:	0.585
Standard Deviation:	0.428
Standard Error:	0.029
Skewness:	1.979
Kurtosis:	4.823
Lower Hinge (H):	0.302
Median (M):	0.456
Upper Hinge (H):	0.716
W:	0.810
Probability < W:	0.0001

Figure 9-4. Stem-and-leaf Plot of the 1994 NMOC Data

Statistics shown for NMOC in Figure 9-4 are the number of cases, minimum value, maximum value, mean value, median value, standard deviation, standard error, skewness, kurtosis, and the two hinges. Each NMOC determination is the average of two or three injections of the site samples. In the case of replicates, each NMOC determination is the average of the original and repeated analysis concentrations. In the case of duplicates, the NMOC sample determinations were averaged to represent the NMOC concentration for the sample date.

The standard error is the standard deviation divided by the square root of the number of cases. This value allows comparison between standard deviations of different sample sizes, much as percentages allow comparisons to be made between items or groups of different sizes.

A positive value for skewness characterizes a tail to the right of the mean value. A normal *Gaussian* distribution has a skewness of zero. The skewness of 1.979 for the 1994 NMOC data suggests a nonnormal frequency distribution. In addition, the high value for kurtosis (zero centered) of 4.823 indicates a substantial deviation from normal distribution.

Figure 9-5 is a stem-and-leaf plot of the natural logarithms of the 1994 NMOC data. This ln(NMOC), or LNMOC, plot shows a very nearly symmetrical distribution with a skewness of 0.055. The kurtosis of 0.044 indicates a distribution just slightly more pointed than a normal distribution.

The shapes of the two stem-and-leaf plots suggest that the 1994 NMOC data re present as a lognormal distribution, as has generally been found to be the case for ambient air studies. Table 9-2 summarizes the LNMOC data using the definitions that characterize a lognormal distribution, overall and by site. MU (μ) and SIGMA (σ) are the mean and standard deviation respectively, of the logarithm of NMOC to the base e. These values represent the mean of the logarithm of NMOC and the standard deviation of the logarithm of NMOC in units of log(NMOC).

The geometric mean is e raised to the power MU (e^{μ}) and the geometric standard deviation is e raised to the power SIGMA (e^{σ}). These functions provide information for

```
    -2  9
    -2  4
    -2
    -2  1
    -1  99988 88888
    -1  77777 76666 66
    -1  55444 44444
    -1  33333 33322 22222 22222
(H) -1  11111 11111 11111 00000 00000 00
    -0  99999 99999 99988 88888 88888 8
(M) -0  77777 77777 77777 66666 66666 6
    -0  55555 55555 44444 44444 44444
(H) -0  33333 33333 33322 22222 22
    -0  11110 00000 00000
     0  00001 11111 1
     0  22233 33
     0  55
     0  66677
     0  99
```

LNMOC, ln(ppmC)

Cases:	223
Minimum:	-2.900
Maximum:	0.926
Mean:	-0.756
Standard Deviation:	0.661
Standard Error:	0.044
Skewness:	0.055
Kurtosis:	0.044
Lower Hinge (H):	-1.197
Median (M):	-0.785
Upper Hinge (H):	-0.334
W:	0.986
Probability < W:	0.745

Figure 9-5. Stem-and-leaf Plot of the Natural Logarithms of the 1994 NMOC Data

Table 9-2

1994 LMNOC[a] Overall Statistics, By Site

Site	Cases	Concentration, ppmC					Concentration, ln(ppmc)		W[e]
		Minimum	Maximum	Median	Mean[b]	Mode	MU[c]	SIGMA[d]	
LINY	74	0 088	1 465	0 363	0 451	0 162	-0.981	0.609	0 971
NWNJ	78	0 231	2 508	0 549	0 635	0 660	-0.592	0.523	0.959
PLNJ	71	0 055	2 524	0 496	0 673	0 055	-0.701	0.781	0 984
OVERALL	223	0 055	2 524	0 465	0 584	0 378	-0.756	0.661	0.986

[a] LNMOC = ln(NMOC), when NMOC is in ppmC.
[b] Mean = exp(MU + SIGMA^2/2).
[c] MU is the mean of ln(NMOC) e^{MU} is the geometric mean.
[d] SIGMA is the standard deviation of ln(NMOC). e^{SIGMA} is called the geometric standard deviation
[e] Shapiro-Wilk statistic to test normality of data

lognormal functions which is similar to that provided by the mean and standard deviation for arithmetic functions, such as normal distributions.

The mode is the most frequently occurring NMOC value for a continuous probability distribution function. This value indicates which value of NMOC concentration appears most often in the database.

The above data suggest that the NMOC data fit a lognormal distribution, rather than a normal distribution. This reflects that the majority of the data points are small values, which some extraneous large values. To properly statistically analyze the NMOC base data, lognormal functions should be used, such as the geometric mean rather than the arithmetic mean. However, due to the added complexity of performing the calculations, arithmetic functions have been used in data analysis through this report. The arithmetic and geometric values usually exhibit good agreement.

9.2 Statistics: Speciated NMOC Base and Option Program

Data obtained from the 1994 Speciated NMOC program were analyzed statistically for various parameters. Summary data for all Speciated NMOC base sites are contained in Table 9-3. Summary data for the NMOC sites which chose the speciated NMOC option (LINY, NWNJ, and PLNJ) are contained in Table 9-4. The number of cases in which a given compound was detected (out of 394 analyses) is presented, along with the frequency percent. Minimum and maximum concentrations are listed, as are the medium and average concentrations and the standard deviation. Finally, the skewness and kurtosis values for all of the data points for each compound are included.

A total of 439 samples, included 45 duplicate samples, were collected during the sampling period from the five Speciated NMOC base sites. Seventy-eight hydrocarbons were quantified during analysis. Summary data for each of the individual sites involved in the Speciated NMOC base study are contained in Appendix E.

Table 9-3

Speciated NMOC Base Program Statistics (B1AL, B2AL, B3AL, FWTX, EPTX)

Compound	No. Of Occurrences	Freq (%)	ppbC					Skewness	Kurtosis
			Min	Max	Median	Avg	Std Dev		
1,2,3-Trimethylbenzene	391	99	0.28	18.57	2.72	3.22	2.01	2.872	16.366
1,2,4-Trimethylbenzene	373	95	0.28	21.96	2.07	3.41	3.75	2.628	8.096
1,3,5-Trimethylbenzene	345	88	0.23	11.74	1.22	1.77	1.55	2.391	9.318
1,3-Butadiene	247	63	0.17	5.79	0.69	0.97	0.75	2.230	8.046
1-Butene	380	96	0.30	17.15	2.46	3.28	2.63	1.837	5.073
1-Decene	391	99	0.24	28.92	3.27	4.69	4.22	1.919	5.219
1-Dodecene	368	93	0.22	7.54	0.79	1.22	1.17	2.160	5.587
1-Hexene	181	46	0.17	4.65	0.81	0.98	0.68	1.918	5.902
1-Nonene	100	25	0.18	1.72	0.48	0.60	0.36	1.515	1.951
1-Octene	202	51	0.17	3.46	0.47	0.69	0.58	2.346	5.795
1-Pentene	262	67	0.22	33.55	1.13	1.82	2.66	7.489	79.958
1-Tridecene	85	22	0.23	1.77	0.39	0.46	0.25	2.647	9.417
1-Undecene	363	92	0.22	9.25	1.01	1.45	1.28	3.016	11.134
2,2,3-Trimethylpentane	287	73	0.22	5.15	0.66	0.93	0.73	1.993	5.591
2,2,4-Trimethylpentane	390	99	0.33	36.70	3.51	5.24	4.80	2.234	7.683
2,2-Dimethylbutane	392	99	0.53	79.55	6.51	9.32	9.40	2.870	13.071
2,3,4-Trimethylpentane	358	91	0.23	14.86	1.33	2.02	1.86	2.402	8.834
2,3-Dimethylbutane	374	95	0.28	204.15	1.69	2.82	10.60	18.490	351.914
2,3-Dimethylpentane	272	69	0.17	15.88	0.94	1.72	1.94	3.134	14.564
2,4-Dimethylpentane	346	88	0.20	54.05	1.02	1.74	3.22	12.760	202.892
2-Ethyl-1-butene	16	4	0.28	1.93	0.89	0.94	0.52	0.578	-0.544
2-Methyl-1-butene	333	85	0.16	20.86	1.40	1.91	1.92	4.313	32.242
2-Methyl-1-pentene	218	55	0.23	4.16	1.04	1.18	0.69	1.372	2.592
2-Methyl-2-butene	340	86	0.24	29.77	1.37	2.35	2.77	4.466	32.759
2-Methylheptane	335	85	0.23	7.82	0.92	1.29	1.04	1.977	6.039
2-Methylhexane	344	87	0.21	19.67	1.19	1.95	2.19	3.421	17.182
2-Methylpentane	389	99	0.30	1557.17	4.22	10.33	78.87	19.547	384.348
3-Methyl-1-butene	211	54	0.21	4.87	0.51	0.66	0.54	3.725	20.987
3-Methylheptane	306	78	0.16	6.90	0.80	1.14	0.92	2.042	6.554

Table 9-3

Continued

Compound	No. Of Occurrences	Freq (%)	pptC					Skewness	Kurtosis
			Min	Max	Median	Avg	Std Dev		
3-Methylhexane	379	96	0.23	16.38	2.40	3.13	2.31	1.719	4.505
3-Methylpentane	384	97	0.27	2393.21	2.84	10.76	121.98	19.554	382.902
4-Methyl-1-pentene	300	76	0.19	3.15	0.64	0.84	0.56	1.548	2.208
α-Pinene	380	96	0.25	20.84	1.94	2.74	2.64	3.154	14.375
Acetylene	374	95	0.40	51.82	5.67	8.72	8.51	2.099	5.352
Acetylene/Ethane[a]	4	1	1.98	4.63	3.21	3.26	1.22	0.134	-3.484
β-Pinene	370	94	0.26	6.33	0.99	1.12	0.64	3.691	23.608
Benzene	393	100	0.68	52.77	5.55	7.89	7.05	2.275	7.724
cis-2-Butene	258	65	0.21	8.81	0.79	1.09	1.13	3.283	14.464
cis-2-Hexene	142	36	0.17	1.79	0.49	0.56	0.28	1.650	3.772
cis-2-Pentene	284	72	0.18	13.27	0.77	1.20	1.28	4.307	30.799
Cyclohexane	296	75	0.20	48.92	1.10	2.35	4.17	6.351	57.650
Cyclopentane	287	73	0.22	34.15	0.77	1.29	2.42	10.041	125.218
Cyclopentene	171	43	0.17	4.31	0.54	0.67	0.52	3.744	20.283
Ethane	386	98	0.43	109.15	9.41	13.76	13.78	3.597	17.751
Ethylbenzene	383	97	0.25	24.75	2.29	3.49	3.16	2.091	7.069
Ethylene	371	94	0.36	75.09	8.52	11.91	10.22	1.941	5.878
Isobutane	393	100	0.48	988.86	3.95	9.58	53.55	16.496	292.149
Isobutene	4	1	1.10	11.90	3.23	4.86	4.88	1.579	2.438
Isopentane	393	100	0.99	2215.17	13.21	28.72	114.85	17.807	337.576
Isoprene	338	86	0.22	16.27	1.26	2.12	2.27	2.458	7.923
Isopropylbenzene	155	39	0.16	2.19	0.42	0.50	0.27	3.182	15.154
m-Ethyltoluene	381	97	0.23	16.74	2.16	2.95	2.42	1.880	4.770
Methylcyclohexane	327	83	0.17	9.18	0.96	1.42	1.25	2.411	8.604
Methylcyclopentane	368	93	0.19	814.70	1.70	5.02	42.42	19.049	364.54
n-Butane	392	99	0.58	329.43	7.84	14.21	24.65	7.835	83.50
n-Decane	332	84	0.17	22.35	1.05	1.98	2.46	3.707	20.93
n-Dodecane	347	88	0.15	23.80	0.74	1.24	2.12	7.199	63.56
n-Heptane	367	93	0.21	15.28	1.37	2.05	1.83	2.226	8.434

Table 9-3

Continued

Compound	No. Of Occurrences	Freq (%)	ppbC					Skewness	Kurtosis
			Min	Max	Median	Avg	Std Dev		
n-Hexane	385	98	0.32	3370.75	2.81	13.79	171.62	19.591	384.202
n-Nonane	317	80	0.21	20.02	0.74	1.20	1.54	7.377	79.164
n-Octane	307	78	0.18	8.72	0.86	1.10	0.93	3.269	18.452
n-Pentane	390	99	0.71	467.02	6.56	11.52	26.12	14.031	239.205
n-Propylbenzene	297	75	0.18	4.90	0.74	0.99	0.77	1.824	4.180
n-Tridecane	51	13	0.23	1.74	0.33	0.51	0.36	2.134	4.419
n-Undecane	359	91	0.23	26.07	1.18	1.84	2.58	5.767	41.635
o-Ethyltoluene	375	95	0.24	10.49	1.41	1.82	1.35	1.816	5.387
o-Xylene	375	95	0.26	24.98	2.78	3.91	3.53	1.930	5.385
p-Diethylbenzene	309	78	0.21	5.56	0.71	0.97	0.77	2.150	6.469
p-Ethyltoluene	295	75	0.16	7.46	0.82	1.15	0.93	2.104	7.935
m-/*p*-Xylene	392	99	0.55	71.93	7.25	10.88	10.06	1.936	5.350
Propane	393	100	1.08	377.44	10.24	19.41	29.50	6.085	58.662
Propylene	384	97	0.34	31.71	3.68	5.20	4.59	2.009	5.382
Propyne	58	15	0.25	1.51	0.64	0.67	0.27	0.581	0.332
Styrene	311	79	0.16	6.58	0.73	0.94	0.74	3.062	14.915
trans-2-Butene	298	76	0.22	9.77	1.00	1.40	1.33	2.844	11.334
trans-2-Hexene	214	54	0.19	2.81	0.58	0.72	0.48	1.661	3.538
trans-2-Pentene	354	90	0.27	25.53	1.35	2.12	2.60	5.179	38.782
Toluene	393	100	0.95	130.37	13.19	18.88	17.44	2.338	8.091

[a]These compounds coeluted in some cases on the analytical system used.

Table 9-4

NMOC Speciated Option Statistics (LINY, NWNJ, PLNJ)

Compound	No. Of Occurrences	Freq (%)	ppbC					Skewness	Kurtosis
			Min	Max	Median	Avg	Std Dev		
1,2,3-Trimethylbenzene	26	100	1.26	14.96	4.25	4.52	2.91	1.961	5.712
1,2,4-Trimethylbenzene	25	96	0.36	5.49	1.82	2.09	1.43	1.030	0.227
1,3,5-Trimethylbenzene	26	100	0.57	6.99	2.01	2.55	1.84	1.209	0.751
1,3-Butadiene	21	81	0.34	2.66	0.91	0.96	0.56	1.454	3.079
1-Butene	25	96	2.07	58.95	7.14	11.01	12.70	2.731	8.310
1-Decene	26	100	2.01	21.25	6.37	7.60	5.31	1.327	1.003
1-Dodecene	23	88	0.24	6.39	1.23	1.70	1.66	1.980	3.675
1-Hexene	13	50	0.23	4.60	0.71	1.01	1.17	2.713	8.215
1-Nonene	10	38	0.28	1.00	0.49	0.52	0.24	1.131	0.657
1-Octene	21	81	0.31	3.06	0.74	1.02	0.83	1.474	1.251
1-Pentene	23	88	0.33	27.85	1.09	2.68	5.63	4.417	20.363
1-Tridecene	13	50	0.21	0.86	0.37	0.44	0.19	1.300	1.257
1-Undecene	25	96	0.28	2.80	1.14	1.19	0.69	0.895	0.488
2,2,3-Trimethylpentane	25	96	0.32	3.63	0.96	1.28	0.90	1.217	0.915
2,2,4-Trimethylpentane	26	100	1.73	24.97	5.97	7.40	5.81	1.595	2.427
2,2-Dimethylbutane	26	100	2.97	34.99	9.96	11.83	8.05	1.781	2.821
2,3,4-Trimethylpentane	26	100	0.62	9.38	2.08	2.73	2.22	1.608	2.437
2,3-Dimethylbutane	26	100	0.66	9.00	2.18	2.76	1.95	1.807	3.277
2,3-Dimethylpentane	17	65	0.34	3.60	1.19	1.49	1.06	0.707	-0.720
2,4-Dimethylpentane	24	92	0.43	7.39	1.56	2.18	1.85	1.499	1.732
2-Ethyl-1-butene	1	4	0.80	0.80	0.80	0.80	0.00	0.000	0.000
2-Methyl-1-butene	23	88	0.45	8.40	1.90	2.54	2.14	1.462	1.504
2-Methyl-1-pentene	18	69	0.26	2.90	0.84	1.08	0.71	1.382	1.375
2-Methyl-2-butene	25	96	0.51	14.55	2.15	4.23	4.06	1.348	0.750
2-Methylheptane	25	96	0.50	6.73	1.46	2.00	1.54	1.748	3.129
2-Methylhexane	26	100	0.54	20.77	2.55	3.51	3.92	3.646	15.904
2-Methylpentane	26	100	2.16	25.10	10.54	10.65	6.82	0.555	-0.406
3-Methyl-1-butene	21	81	0.23	2.18	0.71	0.83	0.55	1.071	0.304
3-Methylheptane	24	92	0.33	5.64	1.27	1.71	1.31	1.731	2.928

Table 9-4

Continued

Compound	No. Of Occurrences	Freq (%)	ppbC					Skewness	Kurtosis
			Min	Max	Median	Avg	Std Dev		
3-Methylhexane	26	100	1.30	11.62	3.59	4.53	2.88	0.961	-0.093
3-Methylpentane	25	96	1.11	25.68	6.92	7.64	6.18	1.297	1.681
4-Methyl-1-pentene	24	92	0.31	3.79	0.87	1.03	0.76	2.280	7.031
α-Pinene	26	100	0.29	12.19	2.65	4.24	3.62	1.098	-0.064
Acetylene	26	100	2.66	229.05	9.92	25.68	47.56	3.581	14.083
Acetylene/Ethane[a]	0	0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
β-Pinene	25	96	0.35	2.95	1.16	1.34	0.71	0.795	0.001
Benzene	26	100	2.80	34.09	8.37	10.79	8.00	1.536	1.967
cis-2-Butene	26	100	0.34	6.60	1.60	1.97	1.60	1.347	1.696
cis-2-Hexene	17	65	0.28	1.78	0.51	0.65	0.44	1.551	1.748
cis-2-Pentene	22	85	0.38	6.00	1.27	1.82	1.49	1.411	1.553
Cyclohexane	23	88	0.35	13.84	3.62	4.03	3.52	1.040	0.999
Cyclopentane	23	88	0.31	5.58	1.24	1.60	1.39	1.724	2.455
Cyclopentene	19	73	0.29	2.52	0.56	0.85	0.68	1.424	1.158
Ethane	26	100	5.63	147.40	22.38	31.57	34.02	2.306	5.263
Ethylbenzene	26	100	1.29	15.15	4.94	5.30	3.52	1.107	1.209
Ethylene	26	100	4.97	133.21	18.43	28.92	31.27	2.201	4.847
Isobutane	26	100	2.24	48.85	8.87	13.63	12.49	1.493	1.494
Isobutene	1	4	8.40	8.40	8.40	8.40	0.00	0.000	0.000
Isopentane	26	100	6.37	94.21	27.37	33.09	25.82	1.034	-0.148
Isoprene	26	100	0.30	3.89	1.11	1.52	1.12	0.910	-0.407
Isopropylbenzene	18	69	0.23	1.33	0.39	0.49	0.28	1.908	4.077
m-Ethyltoluene	26	100	1.15	12.94	3.85	4.84	3.38	1.039	0.174
Methylcyclohexane	26	100	0.43	7.36	1.54	2.00	1.59	1.833	4.096
Methylcyclopentane	26	100	0.69	13.88	2.75	3.60	3.02	1.931	4.301
n-Butane	26	100	3.15	90.36	14.96	22.86	23.87	1.957	3.139
n-Decane	24	92	0.57	8.68	2.61	3.23	2.36	1.043	0.204
n-Dodecane	26	100	0.30	5.58	1.16	1.49	1.20	2.344	5.853
n-Heptane	26	100	0.45	8.01	2.20	2.84	2.15	1.151	0.384

Table 9-4

Continued

Compound	No. Of Occurrences	Freq (%)	ppbC					Skewness	Kurtosis
			Min	Max	Median	Avg	Std Dev		
n-Hexane	26	100	1.12	35.26	4.32	6.36	7.18	2.899	10.255
n-Nonane	24	92	0.32	4.56	1.63	1.82	1.21	0.881	0.356
n-Octane	26	100	0.38	5.30	0.97	1.59	1.44	1.480	1.416
n-Pentane	26	100	1.80	54.36	8.79	12.51	12.46	1.950	4.050
n-Propylbenzene	25	96	0.35	3.23	1.02	1.28	0.81	0.976	0.048
n-Tridecane	7	27	0.13	0.64	0.31	0.33	0.17	0.947	1.233
n-Undecane	26	100	0.27	9.93	2.35	2.67	2.09	2.104	5.383
o-Ethyltoluene	26	100	0.73	8.57	2.29	2.95	1.97	1.227	1.261
o-Xylene	26	100	1.53	18.29	6.02	6.85	4.58	0.884	0.060
p-Diethylbenzene	26	100	0.26	5.88	0.87	1.33	1.30	2.495	6.628
p-Ethyltoluene	22	85	0.45	4.39	1.25	1.65	1.09	1.034	0.220
m-/*p*-Xylene	26	100	3.77	51.37	16.32	17.84	12.14	1.124	1.113
Propane	26	100	3.01	52.51	18.23	21.10	14.36	0.742	-0.493
Propylene	26	100	2.50	35.77	8.96	10.88	8.28	1.298	1.903
Propyne	6	23	0.46	1.47	0.84	0.96	0.43	0.349	-2.048
Styrene	22	85	0.28	3.78	0.80	1.11	0.92	1.669	2.530
trans-2-Butene	24	92	0.64	9.51	2.11	2.99	2.53	1.583	1.745
trans-2-Hexene	18	69	0.28	6.06	0.66	1.17	1.42	2.813	8.596
trans-2-Pentene	26	100	0.34	11.04	2.05	3.25	2.79	1.410	1.200
Toluene	26	100	6.82	118.11	25.46	35.00	29.16	1.683	2.713

[a]These compounds coeluted in some cases on the analytical system used.

The overall percent frequency of occurrence for the 78 target compounds ranged from a low of 1.02% (indicative of 4 detects) for the acetylene/ethane coeluting pair and isobutene, to a high of 99.75% (393 detects) for benzene, isobutane, isopentane, propane, and toluene. None of the 78 target hydrocarbons was found to be entirely present or entirely absent, although some were present in 100% or 0% of all samples from specific sites. Overall average concentrations ranged from a low of 0.464 ppbC for 1-tridecene, to a high of 28.723 ppbC for isopentane. The highest level of a target compound encountered was 3370.75 ppbC for *n*-hexane at EPTX. The largest standard deviation of concentration for the NMOC Base program, was 171.62 for *n*-hexane.

Skewness values for the overall data ranged from 0.134 for acetylene/ethane, to 19.591 for *n*-hexane. A normal *Gaussian* distribution has a skewness of zero. A positive value for skewness characterizes a tail to the right of the mean value. Kurtosis values ranged from -3.484 for acetylene/ethane, to 384.348 for 2-methylpentane. The general trend evident here is for nonnormal distributions which tail to the right.

In addition to the five base sites involved in the Speciated NMOC study, three NMOC base sites (LINY, NWNJ, and PLNJ) chose the Speciated NMOC option to the NMOC base program and had a limited number of their NMOC samples speciated using the same procedures as the Speciated NMOC base program. A total of 26 samples were analyzed and summary data for the option are contained in Table 9-4. Summary data for each of the individual sites that were involved are included in Appendix C.

For the three option sites the overall frequency percent of detection of the 78 target chemicals ranged from a low of 3.9% (1 detect) for 2-ethyl-1-butene and isobutene, to a high of 100% for 38 different compounds. Overall detected average concentrations ranged from a low of 0.33 ppbC for *n*-tridecene, to a high of 35.00 ppbC for toluene. The highest level of a target compound encountered was 229.05 ppbC for acetylene at PLNJ. The largest standard deviation of concentration for the speciated option the NMOC base program was 47.56 for acetylene.

Skewness values for the overall data ranged from 0.555 for 2-methylpentane, to 4.417 for 1-pentene. These positive values for skewness characterize a tail to the right of the mean value. Kurtosis values ranged from -2.048 for propyne, to 20.363 for 1-pentene. The general trend is nonnormal distributions which tail to the right.

9.3 Statistics: 3-Hour Toxics Option

Data obtained from the toxics option of the 1994 NMOC and Speciated NMOC programs were analyzed statistically for various parameters. Table 9-5 summarizes the combined data from all sites and indicates the number of cases in which a given toxic compound was detected (out of 40 analyses), along with the frequency percent. Also listed are the maximum, minimum, median, and average concentrations for each of the 38 toxics of interest. Calculated values for the standard deviation, skewness, and kurtosis are presented. Appendix D contains the same data broken down by individual sites.

Two NMOC (PLNJ and NWNJ) and three Speciated NMOC (B1AL, B2AL, and B3AL) base sites chose the toxics option as part of their program. Nine of the samples collected at each site were used. Of the nine samples, one pair was a duplicate which was analyzed in replicate. A total of 38 compound were targeted.

The frequency percent of detection of the toxics compounds given in Table 9-5 ranged from 0% for chloroprene, bromochloromethane, bromodichloromethane, *cis*-1,3-dichloropropene, *trans*-1,3-dichloropropene, 1,1,2-trichloroethane, and dibromochloromethane, to 100% for propylene, chloromethane, methylene chloride, chloroform, 1,1,1-trichloroethane, benzene, carbon tetrachloride, toluene, tetrachloroethylene, ethylbenzene, *m*- and *p*-xylene, styrene, and *o*-xylene. Average concentrations ranged from 0.01 ppbv for 1,1-dichloroethane, to 13.16 ppbv for acetylene. The highest level encountered was 197.78 ppbv for acetylene at PLNJ. The largest standard deviation of concentration, that for acetylene, was calculated to be 33.65 ppbv.

Overall skewness values for the 38 toxics compounds ranged from a low of 0.192 for *trans*-1,2-dichloroethylene, to a high of 4.892 for methylene chloride, likely indicative of a

Table 9-5

1994 Toxics Option Statistics

Compound	No. Of Occurrences	Freq (%)	ppbv					Skewness	Kurtosis
			Min.	Max.	Median	Avg.	Std. Dev.		
Acetylene	39	98	0.38	197.78	3.59	13.16	33.65	4.835	25.328
Propylene	40	100	0.18	8.74	0.93	1.72	1.86	2.153	4.931
Chloromethane	40	100	0.33	1.31	0.57	0.59	0.17	1.922	7.408
Vinyl Chloride	3	8	0.04	0.07	0.04	0.05	0.02	1.597	0.000
1,3-Butadiene	39	98	0.02	3.45	0.19	0.52	0.81	2.419	5.408
Bromomethane	12	30	0.01	0.07	0.03	0.03	0.02	1.309	1.592
Chloroethane	8	20	0.03	0.36	0.08	0.11	0.11	2.339	5.936
Methylene Chloride	40	100	0.05	10.74	0.18	0.70	1.79	4.892	26.508
trans-1,2-Dichloroethylene	12	30	0.01	0.14	0.07	0.06	0.05	0.192	-1.383
1,1-Dichloroethane	5	13	0.01	0.02	0.01	0.01	0.01	0.609	-3.333
Chloroprene	0	NA	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	0	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	40	100	0.01	0.15	0.03	0.04	0.03	2.307	6.196
1,2-Dichloroethane	7	18	0.01	0.38	0.07	0.12	0.14	1.160	0.129
1,1,1-Trichloroethane	40	100	0.13	1.16	0.23	0.33	0.22	1.809	3.922
Benzene	40	100	0.13	4.22	0.52	0.82	0.84	2.754	8.161
Carbon Tetrachloride	40	100	0.05	0.11	0.07	0.07	0.01	0.559	-0.298
1,2-Dichloropropane	1	3	0.06	0.06	0.06	0.06	0.00	0.000	0.000
Bromodichloromethane	0	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethylene	31	78	0.01	0.53	0.03	0.07	0.11	3.003	10.111
cis-1,3-Dichloropropene	0	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	0	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	0	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	40	100	0.27	12.45	1.32	2.12	2.49	2.913	9.176
Dibromochloromethane	0	NA	NA	NA	NA	NA	NA	NA	NA
n-Octane	38	95	0.02	0.47	0.05	0.10	0.09	2.154	6.032
Tetrachloroethylene	40	100	0.01	2.20	0.08	0.17	0.35	5.078	28.983
Chlorobenzene	11	28	0.01	0.04	0.02	0.02	0.01	0.856	-0.260
Ethylbenzene	40	100	0.05	2.05	0.21	0.36	0.37	2.818	10.254

Table 9-5

Continued

Compound	No. Of Occurrences	Freq (%)	ppbv					Skewness	Kurtosis
			Min.	Max.	Median	Avg.	Std. Dev.		
m-/p-Xylene	40	100	0.18	5.55	0.69	1.07	1.07	2.389	7.152
Bromoform	1	3	0.03	0.03	0.03	0.03	0.00	0.000	0.000
Styrene	40	100	0.03	0.61	0.10	0.13	0.11	2.729	9.008
1,1,2,2-Tetrachloroethane	7	18	0.01	0.06	0.02	0.02	0.02	2.215	5.299
o-Xylene	40	100	0.09	2.32	0.32	0.50	0.48	2.024	4.677
m-Dichlorobenzene	17	43	0.01	0.14	0.01	0.02	0.03	3.667	14.137
p-Dichlorobenzene	38	95	0.01	0.33	0.03	0.05	0.07	2.775	8.355
o-Dichlorobenzene	25	63	0.01	0.07	0.02	0.02	0.01	2.139	4.739

lognormal distribution. Kurtosis values ranged from a low of -3.333 for 1,1-dichloroethane, indicating a less pointed or peaked distribution than normal, to a high of 28.983 for tetrachloroethylene, indicative of a distribution considerably more pointed or peaked than normal.

9.4 Statistics: Carbonyl Option

Data obtained from the carbonyl sampling option of the 1994 NMOC program were analyzed statistically for various parameters. Tables 9-6 and 9-7 summarize data from the two sites involved in the study (NWNJ and PLNJ) and contain the maximum, minimum, and mean concentrations found for each of the 16 carbonyls of interest. Also included are the values for the standard deviation of the concentrations and frequency of occurrence of detectable levels of each compound. The statistical results for the carbonyl option should be used with caution since sampling populations were small.

Two NMOC base sites participated in the 1994 carbonyl option program (PLNJ and NWNJ). Ten or eleven carbonyl sample cartridges, including a duplicate pair, were selected from each site for sample analysis. Samples were collected concurrently with the NMOC canister sample through the use of a separate sampling system. Sixteen carbonyl compounds were targeted for analysis.

For NWNJ, the mean concentrations of the carbonyl compounds ranged from 0.14 ppbv for valeraldehyde, to a high of 5.64 ppbv for formaldehyde (isovaleraldehyde was not detected). For PLNJ, the values ranged from 0.27 ppbv for hexanaldehyde, up to 5.28 ppbv for acetone (non-detects were encountered for acrolein, isovaleraldehyde, valeraldehyde, tolualdehydes, and 2,5-dimethylbenzaldehyde). Frequency of occurrence for both sites ranged from 0% to 100 percent. Formaldehyde, acetaldehyde, acetone, propionaldehyde, and butyr-isobutyraldehyde were found in 100% of all samples from both sites. Tolualdehydes were detected in all samples from NWNJ, but in no samples from PLNJ. The highest level detected was 38.22 ppbv for formaldehyde at NWNJ. The largest standard deviation of concentration, that for formaldehyde at NWNJ, was 10.91 ppbv.

Table 9-6

1994 NMOC Newark, New Jersey Site Summary

Analyte	No. Of Occurrences	Frequency (%)	Mean Conc. (ppbv)	Maximum Conc. (ppbv)	Minimum Conc. (ppbv)	Standard Deviation
Formaldehyde	10	100	7.64	38.22	2.13	10.91
Acetaldehyde	10	100	5.73	21.07	1.13	5.96
Acrolein	1	10	0.17	0.17	0.17	NA[a]
Acetone	10	100	5.64	12.56	3.20	3.16
Propionaldehyde	10	100	0.81	4.01	0.20	1.15
Crotonaldehyde	5	50	0.85	1.39	0.53	0.36
Butyr/Isobutyraldehyde	10	100	0.54	1.85	0.24	0.47
Benzaldehyde	4	40	0.37	0.70	0.21	0.22
Isovaleraldehyde	0	NA	NA	NA	NA	NA
Valeraldehyde	4	40	0.14	0.23	0.06	0.07
Tolualdehydes	10	100	1.01	2.05	0.38	0.57
Hexanaldehyde	6	60	0.22	0.51	0.11	0.16
2,5-Dimethylbenzaldehyde	3	30	0.18	0.28	0.10	0.09

NA = Not Applicable

Table 9-7

1994 NMOC Plainfield, New Jersey Site Summary

Analyte	Occurrences	Frequency (%)	Mean Conc. (ppbv)	Maximum Conc. (ppbv)	Minimum Conc. (ppbv)	Standard Deviation
Formaldehyde	11	100	3.35	4.86	2.77	0.74
Acetaldehyde	11	100	4.99	27.24	1.60	7.45
Acrolein	0	NA	NA	NA	NA	NA
Acetone	11	100	5.28	7.20	3.81	1.07
Propionaldehyde	11	100	0.53	0.87	0.40	0.13
Crotonaldehyde	8	73	0.40	0.47	0.26	0.07
Butyr/Isobutyraldehyde	11	100	0.47	0.79	0.31	0.14
Benzaldehyde	4	36	0.33	0.50	0.26	0.12
Isovaleraldehyde	0	NA	NA	NA	NA	NA
Valeraldehyde	0	NA	NA	NA	NA	NA
Tolualdehydes	0	NA	NA	NA	NA	NA
Hexanaldehyde	2	18	0.27	0.35	0.18	0.12
2,5-Dimethylbenzaldehyde	0	NA	NA	NA	NA	NA

NA = Not Applicable

10.0 REFERENCES

1. "The Air Toxic Problem in the United States: An Analysis of Cancer Risks for Selected Pollutants." U.S. Environmental Protection Agency, Internal Publication. May 1985.

2. Compendium Method TO-12, "Determination of Non-Methane Organic Compounds (NMOC) in Ambient Air Using Cryogenic Pre-Concentration and Direct Flame Ionization Detection (PDFID)." Quality Assurance Division, Environmental Monitoring Systems Laboratory, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. May 1988.

3. Lonneman, W. A. and R. L. Seila. "Research Protocol Method for Analysis of C_2 through C_{12} Hydrocarbons in Ambient Air by Gas Chromatography with Cryogenic Concentration, in Determination of C_2 to C_{12} Ambient Air Hydrocarbons in 39 U.S. Cities from 1984 Through 1986." EPA/600/3-89-058, March 1989.

4. Grosjean, E., E. L. Williams, II, and D. Grosjean. "Ambient Levels of Formaldehyde and Acetaldehyde in Atlanta, Georgia." *J. Air Waste Manage. Assoc.* 43:469-474, 1993.

5. Compendium Method TO-11. "Determination of Formaldehyde in Ambient Air Using Adsorbent Cartridge Followed by High Performance Liquid Chromatography." Atmospheric Research and Exposure Assessment Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, Research Triangle Park, NC, 27711.

6. Compendium Method TO-14. "The Determination of Volatile Organic Compounds (VOCs) in Ambient Air Using SUMMA® Passivated Canister Sampling and Gas Chromatographic Analysis." Quality Assurance Division, Environmental Monitoring Systems Laboratory, U.S. Environmental Protection Agency, Research Triangle Park, NC, 27711.

7. 49 FR, Appendix B to Part 136, "Definition and Procedure for the Determination of the Method Detection Limit." Page 198, October 26, 1984.

APPENDIX A

Aerometric Information Retrieval System - Air Quality Subsystem (AIRS-AQS) Site Description Inventory

AIR QUALITY SUBSYSTEM
SITE DESCRIPTION INVENTORY

EPA REGION: 02 STATE (36): NEW YORK

SITE ID: 36-059-0005 ADDRESS: EISENHOWER PARK,MERRICK AV&OLD COUNTRY R STATE/LOCAL ID:
CITY POPULATION : 1 CITY (00000): NOT IN A CITY DIST CITY: 033 K UTM ZONE : 18
AQCR POPULATION : 16,525,701 COUNTY (059): NASSAU CO DIFF GMT : 05 UTM NORTH: 4511200
DATE ESTABLISHED: 1971/01/01 ELEV MSL : 27 M UTM EAST : 619300
MET SITE: DATE TERMINATED : / / COMP SECT: E LATITUDE : +40:44:41
SITE ID : - - DATE LAST UPDATE: 1995/07/03 LONGITUDE: -073:35:13
DISTANCE SITE : M HQ EVAL DATE : / /
DIRECTION SITE: REGN EVAL DATE : / /
TYPE SITE (1): ON-SITE MET EQUIP

AQCR (043): NEW JERSEY-NEW YORK-CONNECTICUT
CMSA LOCATED IN (0070): NY-N.NJ-L.IS,NY-NJ-CT-PA
LAND USE (2): COMMERCIAL
LOCATION SETTING (2): SUBURBAN
MSA LOCATED IN (5380): NASSAU-SUFFOLK, NY
SITE COMMENT 1 : NYS #2950-10 START SO2,CO,O3,NO2,TSP'71,PB'72;NECRMP'80,NO,NO2,O3
SITE COMMENT 2 : O3-#334105002F01 12/82,MIDDLE SCALE,MEETS SITING,NO2-2-025 - 12/86
SUPPORTING AGENCY (001): NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVA
URBAN AREA REPRESENTED (5601): NEW YORK, NY-NORTHEASTERN NEW JERSEY

EPA REGION: 02 STATE (34): NEW JERSEY

SITE ID: 34-013-0011 ADDRESS: ST. CHARLES BETWEEN KOSSUTH & KAMERON ST STATE/LOCAL ID:

CITY POPULATION : 329,248
AQCR POPULATION : 16,525,701

CITY (51000): NEWARK
COUNTY (013): ESSEX CO
DATE ESTABLISHED: 1985/01/01
DATE TERMINATED : / /
DATE LAST UPDATE: 1995/10/12
HQ EVAL DATE : / /
REGN EVAL DATE : 1986/05/06

DIST CITY: 015 K
DIFF GMT : 05
ELEV MSL : 3 M
COMP SECT: SW

UTM ZONE : 18
UTM NORTH: 4508570
UTM EAST : 572280
LATITUDE : +40:43:36
LONGITUDE: -074:08:39

MET SITE:
SITE ID : - -
DISTANCE SITE : M
DIRECTION SITE:
TYPE SITE ( ):

AQCR (043): NEW JERSEY-NEW YORK-CONNECTICUT
CMSA LOCATED IN (0070): NY-N.NJ-L.IS,NY-NJ-CT-PA
LAND USE (3): INDUSTRIAL
LOCATION SETTING (1): URBAN AND CENTER CITY
MSA LOCATED IN (5640): NEWARK, NJ
SITE COMMENT 1 : NJ #07142,START 1/1/85,RELOC.FROM 340130008, SITTING CRITERIA?
SITE COMMENT 2 : PM10,DICHOT,START 3/15/86,ELEV.16';O3 DOWN 5/16/86-3/25/87
SUPPORTING AGENCY (001): NEW JERSEY STATE DEPARTMENT OF ENVIRONMENTAL PROTEC
URBAN AREA REPRESENTED (5601): NEW YORK, NY-NORTHEASTERN NEW JERSEY

TANGENT STREET:

STREET #	TRAFFIC FLOW	YR TRAFFIC	DIR	STREET NAME	TYPE ROAD
1	71000				(2): EXPRESSWAY
2	2000				(6): LOCAL ST OR HY

EPA REGION: 02 STATE (34): NEW JERSEY

34-039-0008
SITE ID: 34-039-5001 ADDRESS: WEST THIRD AND BERGEN STREETS STATE/LOCAL ID:
CITY POPULATION : 45,555 CITY (59190): PLAINFIELD DIST CITY: 042 K UTM ZONE : 18
AQCR POPULATION : 16,525,701 COUNTY (039): UNION CO DIFF GMT : 05 UTM NORTH: 4494399
DATE ESTABLISHED: 1980/05/01 ELEV MSL : 18 M UTM EAST : 547218
MET SITE: DATE TERMINATED : / / COMP SECT: SW LATITUDE : +40:36:03
SITE ID : - - DATE LAST UPDATE: 1995/10/12 LONGITUDE: -074:26:31
DISTANCE SITE : M HQ EVAL DATE : / /
DIRECTION SITE: REGN EVAL DATE : 1990/07/06
TYPE SITE ( ):

AQCR (043): NEW JERSEY-NEW YORK-CONNECTICUT
CMSA LOCATED IN (0070): NY-N.NJ-L.IS,NY-NJ-CT-PA
LAND USE (1): RESIDENTIAL
LOCATION SETTING (2): SUBURBAN
MSA LOCATED IN (5640): NEWARK, NJ
SITE COMMENT 1 : NJ #20121, SLAMS-N02,03 1980 NE OXIDANT STUDY;03,S02,NOX
SITE COMMENT 2 : FORMERLY CODED 340351001
SUPPORTING AGENCY (001): NEW JERSEY STATE DEPARTMENT OF ENVIRONMENTAL PROTEC
URBAN AREA REPRESENTED (5601): NEW YORK, NY-NORTHEASTERN NEW JERSEY

TANGENT STREET:

STREET #	TRAFFIC FLOW	YR TRAFFIC	DIR	STREET NAME	TYPE ROAD
1	1000				(6): LOCAL ST OR HY
2	500				(6): LOCAL ST OR HY

AIR QUALITY SUBSYSTEM

SITE DESCRIPTION INVENTORY

SITE ID: 01-073-6002 ADDRESS: TARRANT, ELEM. SCH., 1269 PORTLAND STREE STATE/LOCAL ID:
CITY POPULATION : 8,148 CITY (75000): TARRANT CITY DIST CITY: 013 K UTM ZONE : 16
AQCR POPULATION : 1,168,098 COUNTY (073): JEFFERSON CO DIFF GMT : 06 UTM NORTH: 3715234
DATE ESTABLISHED: / / ELEV MSL : 171 M UTM EAST : 520984
MET SITE: DATE TERMINATED : / / COMP SECT: NE LATITUDE : +33:34:42
SITE ID : - - DATE LAST UPDATE: 1995/10/12 LONGITUDE: -086:46:26
DISTANCE SITE : M HQ EVAL DATE : 1980/07/17
DIRECTION SITE: REGN EVAL DATE : / /
TYPE SITE ( ):

AQCR (004): METROPOLITAN BIRMINGHAM
CMSA LOCATED IN (0000): ** DESCRIPTION UNKNOWN **
LAND USE (1): RESIDENTIAL
LOCATION SETTING (2): SUBURBAN
MSA LOCATED IN (1000): BIRMINGHAM, AL
SITE COMMENT 1 : TARRANT ELEM. SCH. NEAR TENNIS COURTS BEHIND SCHOOL
SITE COMMENT 2 : NAMS TSP AND OZONE
SUPPORTING AGENCY (012): JEFFERSON COUNTY DEPARTMENT OF HEALTH

URBAN AREA REPRESENTED (1000): BIRMINGHAM, AL

EPA REGION: 04 STATE (01): ALABAMA

SITE ID: 01-073-6002
TANGENT STREET:

STREET #	TRAFFIC FLOW	YR TRAFFIC	DIR	STREET NAME	TYPE ROAD
1	2000				(6): LOCAL ST OR HY
2	300				(6): LOCAL ST OR HY
3	1500				(4): MAJ ST OR HY
4	80000				(4): MAJ ST OR HY

AIR QUALITY SUBSYSTEM
SITE DESCRIPTION INVENTORY

EPA REGION: 04 STATE (01): ALABAMA

SITE ID: 01-073-5002 ADDRESS: PINSON, HIGH SCH., BOX 360 HWY 75 NORTH STATE/LOCAL ID:
CITY POPULATION : 1 CITY (00000): NOT IN A CITY DIST CITY: 032 K UTM ZONE : 16
AQCR POPULATION : 1,168,098 COUNTY (073): JEFFERSON CO DIFF GMT : 06 UTM NORTH: 3729242
DATE ESTABLISHED: / / ELEV MSL : 201 M UTM EAST : 530684
MET SITE: DATE TERMINATED : / / COMP SECT: NE LATITUDE : +33:42:16
SITE ID : - - DATE LAST UPDATE: 1995/10/12 LONGITUDE: -086:40:08
DISTANCE SITE : M HQ EVAL DATE : 1980/07/17
DIRECTION SITE: REGN EVAL DATE : / /
TYPE SITE ( ):

AQCR (004): METROPOLITAN BIRMINGHAM
CMSA LOCATED IN (0000): ** DESCRIPTION UNKNOWN **
LAND USE (1): RESIDENTIAL
LOCATION SETTING (3): RURAL
MSA LOCATED IN (1000): BIRMINGHAM, AL
SITE COMMENT 1 : PINSON VALLEY HIGH SCHOOL BY TENNIS COURTS IN FRONT OF SCHOOL
SITE COMMENT 2 : NAMS OZONE
SUPPORTING AGENCY (012): JEFFERSON COUNTY DEPARTMENT OF HEALTH
URBAN AREA REPRESENTED (1000): BIRMINGHAM, AL

TANGENT STREET:

STREET #	TRAFFIC FLOW	YR TRAFFIC	DIR	STREET NAME	TYPE ROAD
1	13000				(5): THRU ST OR HY

EPA REGION: 04 STATE (01): ALABAMA

SITE ID: 01-117-0004 ADDRESS: BEARDEN FARM STATE/LOCAL ID:

CITY POPULATION : 1
AQCR POPULATION : 1,168,098

CITY (00000): NOT IN A CITY
COUNTY (117): SHELBY CO
DATE ESTABLISHED: 1983/01/01
DATE TERMINATED : / /
DATE LAST UPDATE: 1995/10/12
HQ EVAL DATE : / /
REGN EVAL DATE : / /

DIST CITY: K
DIFF GMT :
ELEV MSL : 600 M
COMP SECT:

UTM ZONE : 16
UTM NORTH: 3686270
UTM EAST : 516280
LATITUDE : +33:19:01
LONGITUDE: -086:49:30

MET SITE:
SITE ID : - -
DISTANCE SITE : M
DIRECTION SITE:
TYPE SITE ( ):

AQCR (004): METROPOLITAN BIRMINGHAM
CMSA LOCATED IN (0000): ** DESCRIPTION UNKNOWN **
LAND USE (4): AGRICULTURAL
LOCATION SETTING (3): RURAL
MSA LOCATED IN (1000): BIRMINGHAM, AL
SUPPORTING AGENCY (011): AL DEPT. OF ENV. MGT.
URBAN AREA REPRESENTED (1000): BIRMINGHAM, AL

TANGENT STREET:

STREET #	TRAFFIC FLOW	YR TRAFFIC	DIR	STREET NAME	TYPE ROAD
1	1000				(6): LOCAL ST OR HY
2	20				(6): LOCAL ST OR HY

AIR QUALITY SUBSYSTEM
SITE DESCRIPTION INVENTORY

SITE ID: 48-439-1002 ADDRESS: 3317 ROSS AVE. STATE/LOCAL ID:
CITY POPULATION : 385,164 CITY (27000): FORT WORTH DIST CITY: 006 K UTM ZONE : 14
AQCR POPULATION : 3,257,903 COUNTY (439): TARRANT CO DIFF GMT : 06 UTM NORTH: 3630682
DATE ESTABLISHED: 1975/01/01 ELEV MSL : 204 M UTM EAST : 654304
MET SITE: DATE TERMINATED : / / COMP SECT: N LATITUDE : +32:48:17
SITE ID : - - DATE LAST UPDATE: 1995/07/03 LONGITUDE: -097:21:07
DISTANCE SITE : M HQ EVAL DATE : 1980/10/28 METHOD (MAP): MAP INTERPOLATION, VIA D
DIRECTION SITE: REGN EVAL DATE : 1980/08/01 SCALE (24000A): 7.5' X 7.5' (1:24,000)
TYPE SITE (1): ON-SITE MET EQUIP DATUM (00): DATUM UNKNOWN
EST OF ACCURACY : 5.00000SEC

AQCR (215): METROPOLITAN DALLAS-FORT WORTH
CMSA LOCATED IN (0031): DALLAS-FORT WORTH, TX
LAND USE (2): COMMERCIAL
LOCATION SETTING (1): URBAN AND CENTER CITY
MSA LOCATED IN (2800): FORT WORTH-ARLINGTON, TX
SITE COMMENT 1 : CONTINUOUS MONITRING STATION
SUPPORTING AGENCY (001): TEXAS NATURAL RESOURCES CONSERVATION COMMISSION
URBAN AREA REPRESENTED (1922): DALLAS-FORT WORTH, TX

TANGENT STREET:

STREET #	TRAFFIC FLOW	YR TRAFFIC	DIR	STREET NAME	TYPE ROAD
1	100	1992	S	ROSS AVE	(6): LOCAL ST OR HY

DATE 11/28/95
AMP380

EPA AEROMETRIC INFORMATION RETRIEVAL SYSTEM (AIRS)
AIR QUALITY SUBSYSTEM
SITE DESCRIPTION INVENTORY

EPA REGION: 06 STATE (48): TEXAS

SITE ID: 48-141-0027 ADDRESS: 500 NORTH CAMPBELL ST. STATE/LOCAL ID:
CITY POPULATION : 425,259 CITY (24000): EL PASO DIST CITY: K UTM ZONE :
AQCR POPULATION : 660,806 COUNTY (141): EL PASO CO DIFF GMT : 07 UTM NORTH:
DATE ESTABLISHED: 1973/01/01 ELEV MSL : 1140 M UTM EAST : 359179
MET SITE: DATE TERMINATED : / / COMP SECT: LATITUDE :
SITE ID : - - DATE LAST UPDATE: 1995/09/29 LONGITUDE: -
DISTANCE SITE : M HQ EVAL DATE : / /
DIRECTION SITE: REGN EVAL DATE : / /
TYPE SITE ( ):
AQCR (153): EL PASO-LAS CRUCES-ALAMOGORDO
CMSA LOCATED IN (0000): ** DESCRIPTION UNKNOWN **
LAND USE (2): COMMERCIAL
LOCATION SETTING (1): URBAN AND CENTER CITY
MSA LOCATED IN (2320): EL PASO, TX
SITE COMMENT 1 : SIP MONITOR
SITE COMMENT 2 : ACTIVE 11/73
SUPPORTING AGENCY (001): TEXAS NATURAL RESOURCES CONSERVATION COMMISSION
URBAN AREA REPRESENTED (2320): EL PASO, TX-NM
TANGENT STREET:

STREET #	TRAFFIC FLOW	YR TRAFFIC	DIR	STREET NAME	TYPE ROAD
1	20000	1979	S	CAMPBELL STREET	(5): THRU ST OR HY
2	25000	1979	SE	FRANKLIN STREET	(4): MAJ ST OR HY
3	25000	1979	NW	MISSOURI STREET	(4): MAJ ST OR HY
4	160040	1992	NE	IH-10	(3): FREEWAY

SITE TYPE:

SITE LOCATION TYPE	MSA OR CMSA REPRESENTED	
(1): UPWIND BACKGROUND	2320	EL PASO, TX

APPENDIX B

NMOC Base Program Results by Site

Table B-1

NMOC Base Program Results for LINY

Site Code	Collection Date	Julian Date	Can #	Radian ID #	Duplicate (Y/N)	Radian Analysis Channel	NMOC (ppmC)
LINY	07/06/94	187	640	1009	Y	C	0.430
LINY	07/06/94	187	830	1010	Y	D	0.408
LINY	07/08/94	189	681	1006	N	C	0.555
LINY	07/12/94	193	860	1029	N	D	0.791
LINY	07/13/94	194	875	1023	N	D	0.486
LINY	07/14/94	195	720	1050	N	D	0.204
LINY	07/15/94	196	37	1048	Y	C	0.165
LINY	07/15/94	196	183	1047	Y	C	0.214
LINY	07/19/94	200	93	1078	N	A	0.667
LINY	07/20/94	201	690	1074	N	B	0.346
LINY	07/20/94	201	690	1074	N	B	0.361
LINY	07/21/94	202	166	1081	N	A	0.298
LINY	07/22/94	203	706	1097	N	D	0.228
LINY	07/25/94	206	7	1102	N	C	0.709
LINY	07/26/94	207	902	1118	N	C	0.485
LINY	07/27/94	208	177	1116	Y	A	0.410
LINY	07/27/94	208	406	1117	Y	A	0.435
LINY	07/28/94	209	834	1130	N	B	0.163
LINY	07/29/94	210	761	1131	N	B	0.258
LINY	07/29/94	210	761	1131	N	B	0.262
LINY	08/01/94	213	869	1146	N	B	0.418
LINY	08/02/94	214	730	1147	N	A	0.565
LINY	08/03/94	215	916	1170	N	B	0.350
LINY	08/04/94	216	629	1173	N	B	0.417
LINY	08/04/94	216	629	1173	N	B	0.408
LINY	08/05/94	217	83	1184	N	D	0.190
LINY	08/08/94	220	724	1183	Y	C	0.656
LINY	08/08/94	220	724	1183	Y	C	0.717
LINY	08/08/94	220	22	1182	Y	C	0.649
LINY	08/09/94	221	705	1204	N	B	0.733
LINY	08/10/94	222	690	1207	N	D	0.468
LINY	08/11/94	223	919	1232	N	C	0.327
LINY	08/12/94	224	154	1230	N	D	0.162
LINY	08/15/94	227	856	1227	N	D	0.328
LINY	08/16/94	228	681	1252	N	D	0.779
LINY	08/17/94	229	812	1250	N	B	0.312
LINY	08/18/94	230	401	1274	Y	A	0.094

Table B-1

(Continued)

Site Code	Collection Date	Julian Date	Can #	Radian ID #	Duplicate (Y/N)	Radian Analysis Channel	NMOC (ppmC)
LINY	08/18/94	230	916	1275	Y	A	0.000
LINY	08/18/94	230	916	1275	Y	A	0.084
LINY	08/19/94	231	705	1283	N	B	0.164
LINY	08/22/94	234	680	1279	N	A	0.170
LINY	08/23/94	235	19	1289	Y	B	0.155
LINY	08/23/94	235	181	1288	Y	B	0.169
LINY	08/24/94	236	143	1305	N	A	0.797
LINY	08/25/94	237	702	1307	N	B	0.487
LINY	08/26/94	238	102	1328	N	A	0.277
LINY	08/29/94	241	862	1338	N	B	0.406
LINY	08/30/94	242	607	1353	N	D	0.302
LINY	08/31/94	243	868	1358	N	B	0.767
LINY	09/01/94	244	19	1357	N	B	0.364
LINY	09/02/94	245	183	1382	Y	A	0.199
LINY	09/02/94	245	680	1383	Y	A	0.186
LINY	09/07/94	250	809	1387	N	B	0.956
LINY	09/08/94	251	52	1396	N	C	0.500
LINY	09/09/94	252	143	1399	N	B	0.456
LINY	09/12/94	255	676	1411	N	A	0.242
LINY	09/13/94	256	177	1415	N	D	0.315
LINY	09/13/94	256	177	1415	N	D	0.368
LINY	09/14/94	257	36	1436	N	A	0.274
LINY	09/15/94	258	703	1431	Y	C	0.169
LINY	09/15/94	258	189	1432	Y	C	0.157
LINY	09/15/94	258	189	1432	Y	C	0.166
LINY	09/16/94	259	93	1474	N	C	0.161
LINY	09/21/94	264	870	1473	N	A	1.209
LINY	09/22/94	265	707	1479	N	A	0.194
LINY	09/23/94	266	807	1499	N	A	0.487
LINY	09/26/94	269	107	1506	N	C	0.374
LINY	09/28/94	271	726	1528	Y	A	1.194
LINY	09/28/94	271	726	1528	Y	A	1.206
LINY	09/28/94	271	761	1529	Y	A	1.163
LINY	09/29/94	272	680	1523	N	B	0.258
LINY	09/30/94	273	183	1545	N	D	0.000
LINY	10/03/94	276	920	1543	N	A	0.272
LINY	10/04/94	277	605	1568	N	C	0.285
LINY	10/05/94	278	149	1573	N	C	0.310

Table B-1

(Continued)

Site Code	Collection Date	Julian Date	Can #	Radian ID #	Duplicate (Y/N)	Radian Analysis Channel	NMOC (ppmC)
LINY	10/05/94	278	149	1573	N	C	0.322
LINY	10/06/94	279	694	1569	N	D	0.413
LINY	10/07/94	280	28	1593	N	B	1.006
LINY	10/10/94	283	762	1589	Y	A	0.167
LINY	10/10/94	283	89	1590	Y	A	0.169
LINY	10/10/94	283	89	1590	Y	A	0.162
LINY	10/11/94	284	38	1597	N	A	0.190
LINY	10/12/94	285	822	1607	N	C	0.357
LINY	10/13/94	286	185	1609	N	A	0.897
LINY	10/14/94	287	833	1632	N	D	1.465
LINY	10/17/94	290	803	1637	N	D	0.521
LINY	10/19/94	292	690	1654	N	B	0.501
LINY	10/20/94	293	816	1658	N	D	0.156
LINY	10/21/94	294	858	1656	N	C	0.362
LINY	10/24/94	297	823	1697	N	B	0.446
LINY	10/26/94	299	629	1693	N	A	0.546
LINY	10/27/94	300	51	1691	Y	C	0.319
LINY	10/27/94	300	653	1692	Y	D	0.296
LINY	10/27/94	300	653	1692	Y	D	0.339
LINY	10/28/94	301	797	1695	N	A	0.980
LINY	10/31/94	304	618	1710	N	B	1.128

Table B-2

NMOC Base Program Results for PLNJ

Site Code	Collection Date	Julian Date	Can #	Radian ID #	Duplicate (Y/N)	Radian Analysis Channel	NMOC (ppmC)
PLNJ	07/11/94	192	914	1019	N	C	0.302
PLNJ	07/12/94	193	109	1025	N	C	0.699
PLNJ	07/13/94	194	16	1044	N	D	0.555
PLNJ	07/14/94	195	157	1043	N	C	0.478
PLNJ	07/15/94	196	903	1040	Y	C	0.136
PLNJ	07/15/94	196	761	1041	Y	C	0.149
PLNJ	07/21/94	202	43	1077	N	D	0.519
PLNJ	07/25/94	206	401	1103	N	D	0.716
PLNJ	07/27/94	208	109	1123	Y	D	0.389
PLNJ	07/27/94	208	57	1124	Y	D	0.543
PLNJ	07/28/94	209	500	1127	N	A	0.288
PLNJ	07/29/94	210	903	1142	N	A	0.353
PLNJ	08/01/94	213	37	1145	N	A	0.524
PLNJ	08/02/94	214	302	1150	N	A	0.818
PLNJ	08/03/94	215	882	1158	N	D	0.451
PLNJ	08/04/94	216	157	1185	N	C	0.709
PLNJ	08/05/94	217	668	1190	N	D	0.496
PLNJ	08/08/94	220	812	1199	Y	B	0.638
PLNJ	08/08/94	220	181	1198	Y	B	0.626
PLNJ	08/08/94	220	181	1198	Y	B	0.574
PLNJ	08/09/94	221	57	1203	N	D	1.217
PLNJ	08/10/94	222	885	1218	N	D	0.184
PLNJ	08/11/94	223	816	1219	N	A	0.593
PLNJ	08/11/94	223	816	1219	N	A	0.574
PLNJ	08/12/94	224	302	1220	N	C	0.431
PLNJ	08/15/94	227	37	1239	N	C	0.295
PLNJ	08/16/94	228	862	1255	N	D	1.112
PLNJ	08/17/94	229	854	1251	N	A	0.370
PLNJ	08/18/94	230	778	1269	Y	B	0.192
PLNJ	08/18/94	230	46	1270	Y	B	0.166
PLNJ	08/19/94	231	97	1282	N	A	0.245
PLNJ	08/22/94	234	668	1286	N	A	0.143
PLNJ	08/23/94	235	89	1292	Y	B	0.134
PLNJ	08/23/94	235	686	1293	Y	B	0.155

Table B-2

(Continued)

Site Code	Collection Date	Julian Date	Can #	Radian ID #	Duplicate (Y/N)	Radian Analysis Channel	NMOC (ppmC)
PLNJ	08/23/94	235	686	1293	Y	B	0.134
PLNJ	08/24/94	236	166	1302	N	A	0.000
PLNJ	08/25/94	237	107	1309	N	B	0.000
PLNJ	08/26/94	238	621	1316	N	C	0.000
PLNJ	08/29/94	241	130	1327	N	D	0.180
PLNJ	08/30/94	242	796	1334	N	C	0.585
PLNJ	08/31/94	243	84	1359	N	A	0.748
PLNJ	09/01/94	244	914	1374	N	A	0.205
PLNJ	09/02/94	245	927	1377	Y	B	0.188
PLNJ	09/02/94	245	778	1378	Y	B	0.167
PLNJ	09/06/94	249	916	1373	N	A	0.294
PLNJ	09/07/94	250	859	1388	N	B	0.465
PLNJ	09/08/94	251	162	1390	N	D	0.491
PLNJ	09/08/94	251	162	1390	N	D	0.407
PLNJ	09/09/94	252	683	1404	N	A	0.378
PLNJ	09/12/94	255	80	1412	N	A	0.454
PLNJ	09/13/94	256	171	1428	N	B	0.316
PLNJ	09/14/94	257	686	1443	N	A	0.271
PLNJ	09/15/94	258	500	1440	Y	C	0.230
PLNJ	09/15/94	258	649	1441	Y	C	0.251
PLNJ	09/16/94	259	796	1462	N	C	0.310
PLNJ	09/16/94	259	796	1462	N	C	0.287
PLNJ	09/19/94	262	183	1457	N	B	0.635
PLNJ	09/20/94	263	84	1465	N	C	0.860
PLNJ	09/21/94	264	186	1463	N	A	1.488
PLNJ	09/22/94	265	71	1483	N	A	0.682
PLNJ	09/23/94	266	52	1493	N	A	0.239
PLNJ	09/26/94	269	82	1492	N	C	0.518
PLNJ	09/26/94	269	82	1492	N	C	0.489
PLNJ	09/27/94	270	690	1520	N	D	0.230
PLNJ	09/28/94	271	842	1525	Y	D	0.710
PLNJ	09/28/94	271	812	1526	Y	D	0.717
PLNJ	09/29/94	272	728	1540	N	B	0.275
PLNJ	09/30/94	273	184	1535	N	B	0.055
PLNJ	10/03/94	276	108	1562	N	D	0.279
PLNJ	10/03/94	276	108	1562	N	D	0.293
PLNJ	10/04/94	277	796	1560	N	D	0.970
PLNJ	10/05/94	278	875	1564	N	A	0.351

Table B-2

(Continued)

Site Code	Collection Date	Julian Date	Can #	Radian ID #	Duplicate (Y/N)	Radian Analysis Channel	NMOC (ppmC)
PLNJ	10/06/94	279	46	1566	N	B	0.601
PLNJ	10/07/94	280	77	1592	N	B	1.678
PLNJ	10/11/94	284	105	1604	Y	A	0.805
PLNJ	10/11/94	284	407	1605	Y	A	0.822
PLNJ	10/12/94	285	86	1620	N	D	0.851
PLNJ	10/13/94	286	659	1624	N	C	1.718
PLNJ	10/17/94	290	807	1645	N	C	1.227
PLNJ	10/18/94	291	658	1638	N	A	1.994
PLNJ	10/19/94	292	108	1648	N	A	1.959
PLNJ	10/20/94	293	153	1652	N	C	0.711
PLNJ	10/20/94	293	153	1652	N	C	0.701
PLNJ	10/24/94	297	77	1681	N	D	1.036
PLNJ	10/25/94	298	56	1680	N	B	2.051
PLNJ	10/27/94	300	665	1698	N	A	0.114
PLNJ	10/28/94	301	885	1703	N	B	2.058
PLNJ	10/31/94	304	129	1708	N	D	2.524

Table B-3

NMOC Base Program Results for NWNJ

Site Code	Collection Date	Julian Date	Can #	Radian ID #	Duplicate (Y/N)	Radian Analysis Channel	NMOC (ppmC)
NWNJ	07/11/94	192	834	1017	N	D	0.524
NWNJ	07/12/94	193	119	1024	N	C	0.782
NWNJ	07/13/94	194	89	1042	N	D	0.744
NWNJ	07/14/94	195	155	1046	N	D	0.660
NWNJ	07/15/94	196	845	1055	Y	C	0.280
NWNJ	07/15/94	196	845	1055	Y	C	0.251
NWNJ	07/15/94	196	873	1054	Y	C	0.260
NWNJ	07/18/94	199	848	1070	N	D	0.382
NWNJ	07/19/94	200	843	1073	N	D	0.492
NWNJ	07/20/94	201	777	1087	N	C	0.853
NWNJ	07/21/94	202	705	1089	N	D	0.428
NWNJ	07/22/94	203	716	1101	N	A	0.354
NWNJ	07/25/94	206	816	1104	N	D	0.636
NWNJ	07/26/94	207	156	1128	N	C	1.095
NWNJ	07/27/94	208	775	1120	Y	B	0.395
NWNJ	07/27/94	208	878	1119	Y	B	0.390
NWNJ	07/27/94	208	878	1119	Y	B	0.361
NWNJ	07/28/94	209	628	1135	N	C	0.659
NWNJ	07/29/94	210	16	1140	N	A	0.334
NWNJ	08/01/94	213	89	1147	N	A	0.959
NWNJ	08/02/94	214	618	1169	N	D	0.977
NWNJ	08/03/94	215	71	1165	N	C	0.968
NWNJ	08/04/94	216	860	1178	N	B	0.633
NWNJ	08/05/94	217	920	1189	N	D	0.635
NWNJ	08/08/94	220	830	1201	Y	D	0.762
NWNJ	08/08/94	220	780	1200	Y	D	0.577
NWNJ	08/09/94	221	810	1205	N	B	0.622
NWNJ	08/10/94	222	864	1217	N	A	0.262
NWNJ	08/11/94	223	845	1214	N	D	0.586
NWNJ	08/12/94	224	74	1241	N	B	0.346
NWNJ	08/12/94	224	74	1241	N	B	0.403
NWNJ	08/15/94	227	500	1242	N	D	0.378
NWNJ	08/16/94	228	730	1257	N	B	0.703
NWNJ	08/17/94	229	305	1258	N	B	0.530
NWNJ	08/18/94	230	22	1267	Y	A	0.361
NWNJ	08/18/94	230	50	1268	Y	A	0.441
NWNJ	08/19/94	231	868	1273	N	B	0.231

Table B-3

(Continued)

Site Code	Collection Date	Julian Date	Can #	Radian ID #	Duplicate (Y/N)	Radian Analysis Channel	NMOC (ppmC)
NWNJ	08/22/94	234	762	1285	N	B	0.316
NWNJ	08/23/94	235	771	1312	Y	B	0.262
NWNJ	08/23/94	235	93	1311	Y	B	0.245
NWNJ	08/23/94	235	93	1311	Y	B	0.256
NWNJ	08/24/94	236	162	1313	N	A	0.810
NWNJ	08/25/94	237	814	1317	N	A	0.719
NWNJ	08/26/94	238	794	1325	N	B	0.599
NWNJ	08/29/94	241	189	1345	N	B	0.344
NWNJ	08/30/94	242	301	1342	N	C	0.283
NWNJ	08/31/94	243	37	1366	N	A	0.965
NWNJ	09/01/94	244	836	1386	N	A	0.314
NWNJ	09/02/94	245	929	1375	Y	A	0.384
NWNJ	09/02/94	245	807	1376	Y	A	0.262
NWNJ	09/02/94	245	807	1376	Y	A	0.297
NWNJ	09/06/94	249	166	1389	N	B	0.381
NWNJ	09/07/94	250	880	1406	N	C	0.641
NWNJ	09/08/94	251	797	1403	N	D	0.738
NWNJ	09/09/94	252	788	1407	N	B	0.471
NWNJ	09/12/94	255	1	1429	N	A	0.409
NWNJ	09/13/94	256	782	1423	N	A	0.320
NWNJ	09/14/94	257	814	1445	N	C	0.617
NWNJ	09/15/94	258	607	1447	Y	D	0.328
NWNJ	09/15/94	258	102	1448	Y	D	0.324
NWNJ	09/16/94	259	4	1451	N	A	0.383
NWNJ	09/19/94	261	191	1471	N	D	0.660
NWNJ	09/20/94	262	50	1469	N	B	1.169
NWNJ	09/21/94	263	927	1470	N	A	1.332
NWNJ	09/22/94	264	9	1488	N	B	0.424
NWNJ	09/23/94	265	788	1494	N	A	0.235
NWNJ	09/26/94	269	618	1509	N	C	0.660
NWNJ	09/27/94	270	83	1532	N	D	0.335
NWNJ	09/28/94	271	910	1521	Y	C	0.962
NWNJ	09/28/94	271	702	1522	Y	C	0.910
NWNJ	09/29/94	272	151	1556	N	B	0.562
NWNJ	09/30/94	273	631	1551	N	D	0.298
NWNJ	10/03/94	276	816	1555	N	A	0.388
NWNJ	10/04/94	277	788	1561	N	C	0.443
NWNJ	10/05/94	278	814	1572	N	B	0.321

Table B-3

(Continued)

Site Code	Collection Date	Julian Date	Can #	Radian ID #	Duplicate (Y/N)	Radian Analysis Channel	NMOC (ppmC)
NWNJ	10/06/94	279	846	1578	N	A	0.537
NWNJ	10/07/94	280	885	1591	N	B	1.370
NWNJ	10/11/94	284	52	1601	Y	B	0.402
NWNJ	10/11/94	284	809	1600	Y	B	0.414
NWNJ	10/11/94	284	809	1600	Y	B	0.392
NWNJ	10/12/94	285	155	1615	N	B	0.329
NWNJ	10/13/94	286	633	1627	N	B	0.454
NWNJ	10/14/94	287	875	1629	N	A	1.273
NWNJ	10/17/94	290	761	1639	N	D	0.560
NWNJ	10/18/94	291	723	1646	N	C	0.958
NWNJ	10/18/94	291	723	1646	N	C	1.001
NWNJ	10/19/94	292	135	1662	N	B	1.183
NWNJ	10/20/94	293	38	1655	N	A	0.629
NWNJ	10/24/94	297	189	1677	N	A	2.013
NWNJ	10/25/94	298	916	1683	N	A	0.500
NWNJ	10/26/94	299	914	1688	N	B	1.089
NWNJ	10/27/94	300	46	1699	N	B	0.267
NWNJ	10/28/94	301	172	1707	N	A	1.362
NWNJ	10/31/94	304	178	1709	N	C	2.508

APPENDIX C

Speciated NMOC Option to the NMOC Base Program Statistics by Site

Table C-1

Speciated NMOC Option of the NMOC Base Program Statistics for LINY

Compound	Cases	Freq (%)	ppbC					Skewness	Kurtosis
			Min	Max	Median	Avg	Std Dev		
1,2,3-Trimethylbenzene	9	100.0	1.26	14.96	2.99	4.68	4.33	1.991	4.219
1,2,4-Trimethylbenzene	8	88.9	0.70	4.62	2.05	2.25	1.32	0.745	-0.013
1,3,5-Trimethylbenzene	9	100.0	0.57	6.89	1.93	2.61	2.11	1.053	0.667
1,3-Butadiene	7	77.8	0.36	1.27	1.07	0.89	0.37	-0.622	-1.635
1-Butene	9	100.0	2.07	58.95	6.13	14.47	18.99	2.028	3.817
1-Decene	9	100.0	2.01	18.80	6.22	7.27	5.69	1.154	0.749
1-Dodecene	9	100.0	0.33	6.39	1.98	2.25	1.88	1.399	2.370
1-Hexene	5	55.6	0.23	1.30	0.37	0.56	0.43	1.811	3.339
1-Nonene	4	44.4	0.28	1.00	0.43	0.54	0.34	1.198	0.460
1-Octene	6	66.7	0.40	2.84	1.10	1.20	0.90	1.398	2.243
1-Pentene	8	88.9	0.33	27.85	2.00	5.03	9.28	2.763	7.721
1-Tridecene	4	44.4	0.28	0.74	0.36	0.44	0.21	1.727	3.084
1-Undecene	9	100.0	0.61	1.96	1.46	1.34	0.56	-0.318	-1.750
2,2,3-Trimethylpentane	8	88.9	0.32	2.27	1.12	1.13	0.76	0.328	-1.457
2,2,4-Trimethylpentane	9	100.0	1.73	17.28	5.26	6.53	5.41	1.117	0.400
2,2-Dimethylbutane	9	100.0	4.26	34.99	11.00	15.05	10.53	1.336	0.534
2,3,4-Trimethylpentane	9	100.0	0.62	6.13	1.81	2.32	1.97	1.055	0.086
2,3-Dimethylbutane	9	100.0	0.66	6.19	2.03	2.73	1.93	0.852	-0.708
2,3-Dimethylpentane	7	77.8	0.34	3.60	1.16	1.43	1.20	1.041	0.442
2,4-Dimethylpentane	8	88.9	0.43	6.05	1.60	2.15	1.93	1.290	1.482
2-Ethyl-1-butene	1	11.1	0.80	0.80	0.80	0.80	0.00	0.000	0.000
2-Methyl-1-butene	7	77.8	0.45	6.10	1.21	2.37	2.22	1.043	-0.542
2-Methyl-1-pentene	7	77.8	0.26	2.18	0.74	0.89	0.64	1.615	3.028
2-Methyl-2-butene	8	88.9	0.51	14.55	3.94	5.00	4.84	1.197	1.035
2-Methylheptane	8	88.9	0.50	5.36	1.45	2.02	1.69	1.239	1.029
2-Methylhexane	9	100.0	0.54	5.76	1.94	2.50	1.96	0.569	-1.312
2-Methylpentane	9	100.0	2.26	25.02	12.93	11.06	7.86	0.368	-0.669
3-Methyl-1-butene	7	77.8	0.23	1.77	0.71	0.91	0.63	0.295	-2.041
3-Methylheptane	8	88.9	0.33	4.55	1.19	1.69	1.46	1.203	0.866
3-Methylhexane	9	100.0	1.43	9.49	3.32	4.09	2.82	1.082	0.111
3-Methylpentane	9	100.0	1.11	18.08	5.73	6.64	6.16	0.956	-0.238
4-Methyl-1-pentene	8	88.9	0.31	3.79	0.75	1.15	1.16	2.064	4.653
α-Pinene	9	100.0	1.16	4.55	1.85	2.30	1.14	1.190	0.531
Acetylene	9	100.0	3.17	35.05	9.33	11.98	10.49	1.503	2.139
Acetylene/Ethane[a]	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
β-Pinene	9	100.0	0.58	2.83	1.07	1.34	0.76	1.045	0.185

TECHNICAL REPORT DATA

(PLEASE READ INSTRUCTIONS ON THE REVERSE BEFORE COMPLETING)

RT NO. 454/R-99-013	2.	3. RECIPIENT'S ACCESSION NO.
AND SUBTITLE Nonmethane Organic Compound And Speciated Nonmethane nic Compounds Monitoring Program		5. REPORT DATE 1/1/96 6. PERFORMING ORGANIZATION CODE
)R(S) :n Corporation arch Triangle Park, NC 27709		8. PERFORMING ORGANIZATION REPORT NO.
)RMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT NO. 11. CONTRACT/GRANT NO. 68-D3-0095
SORING AGENCY NAME AND ADDRESS Of Air Quality Planning And Standards Environmental Protection Agency rch Triangle Park, N. C. 27711		13. TYPE OF REPORT AND PERIOD COVERED 14. SPONSORING AGENCY CODE

LEMENTARY NOTES

RACT

RTAIN AREAS OF THE COUNTRY WHERE THE NATIONAL AMBIENT AIR QUALITY STANDARD (NAAQS))ZONE IS BEING EXCEEDED, ADDITIONAL MEASUREMENTS OF AMBIENT NONMETHANE ORGANIC OUNDS (NMOC) ARE NEEDED TO ASSIST THE AFFECTED STATES IN DEVELOPING REVISED OZONE ROL STRATEGIES. BECAUSE OF PREVIOUS DIFFICULTY IN OBTAINING ACCURATE NMOC JREMENTS, THE U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA) HAS PROVIDED MONITORING NALYTICAL ASSISTANCE TO THESE STATES, BEGINNING IN 1984 AND CONTINUING THROUGH THE MOC MONITORING PROGRAM.

KEY WORDS AND DOCUMENT ANALYSIS

)TORS Control Strategies al Ambient Air Quality Standards thane Organic Compound ring Analysis MOC Monitoring Program	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI FIELD/GROUP
BUTION STATEMENT TED		21. NO. OF PAGES 296 22. PRICE

Table C-1

(Continued)

Compound	Cases	Freq (%)	ppbC					Skewness	Kurtosis
			Min	Max	Median	Avg	Std Dev		
Styrene	7	77.8	0.28	3.78	0.81	1.21	1.24	1.828	3.454
trans-2-Butene	8	88.9	0.64	9.51	1.73	3.09	3.09	1.566	2.000
trans-2-Hexene	5	55.6	0.31	1.78	1.41	1.12	0.61	-0.531	-1.787
trans-2-Pentene	9	100.0	0.34	8.08	2.06	3.44	3.06	0.713	-1.470
Toluene	9	100.0	8.83	60.55	23.66	27.40	20.62	0.872	-0.676

[a] These compounds coeluted in some cases on the analytical system used.

Table C-2

Speciated NMOC Option of the NMOC Base Program Statistics for NWNJ

Compound	Cases	Freq (%)	ppbC					Skewness	Kurtosis
			Min	Max	Median	Avg	Std Dev		
1,2,3-Trimethylbenzene	9	100.0	1.39	6.08	4.15	4.11	1.42	-0.625	0.473
1,2,4-Trimethylbenzene	9	100.0	0.36	5.49	1.22	2.01	1.74	1.240	0.606
1,3,5-Trimethylbenzene	9	100.0	0.91	3.51	2.09	2.06	0.77	0.664	0.630
1,3-Butadiene	8	88.9	0.34	1.69	0.88	0.89	0.47	0.461	-0.465
1-Butene	8	88.9	2.53	13.68	7.58	7.94	3.56	0.264	-0.178
1-Decene	9	100.0	2.56	9.03	6.51	6.15	2.01	-0.339	-0.271
1-Dodecene	8	88.9	0.24	1.65	0.98	0.85	0.49	0.154	-0.934
1-Hexene	5	55.6	0.28	1.74	0.71	0.86	0.64	0.617	-1.504
1-Nonene	3	33.3	0.33	0.53	0.49	0.45	0.11	-1.458	0.000
1-Octene	8	88.9	0.31	2.44	0.76	0.86	0.70	1.899	4.242
1-Pentene	8	88.9	0.56	1.37	0.77	0.83	0.27	1.243	1.653
1-Tridecene	6	66.7	0.21	0.86	0.37	0.44	0.23	1.652	3.282
1-Undecene	8	88.9	0.28	1.27	0.63	0.73	0.40	0.352	-1.875
2,2,3-Trimethylpentane	9	100.0	0.40	3.09	0.96	1.15	0.82	1.862	4.160
2,2,4-Trimethylpentane	9	100.0	2.74	8.32	6.60	5.74	2.16	-0.369	-1.636
2,2-Dimethylbutane	9	100.0	2.97	16.39	10.01	10.09	4.42	-0.075	-0.825
2,3,4-Trimethylpentane	9	100.0	0.97	3.60	2.36	2.13	0.88	0.144	-0.904
2,3-Dimethylbutane	9	100.0	1.05	2.72	2.07	1.99	0.58	-0.260	-1.179
2,3-Dimethylpentane	5	55.6	0.42	2.81	1.19	1.34	0.92	1.186	1.585
2,4-Dimethylpentane	9	100.0	0.57	4.81	1.47	1.68	1.27	2.194	5.723
2-Ethyl-1-butene	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
2-Methyl-1-butene	9	100.0	0.62	2.86	1.90	1.77	0.80	-0.248	-1.089
2-Methyl-1-pentene	5	55.6	0.74	1.40	0.84	0.94	0.26	1.995	4.224
2-Methyl-2-butene	9	100.0	0.77	10.70	2.05	2.94	3.05	2.506	6.734
2-Methylheptane	9	100.0	0.66	2.42	1.46	1.57	0.66	-0.238	-1.379
2-Methylhexane	9	100.0	1.31	6.69	2.72	3.15	1.81	1.006	0.392
2-Methylpentane	9	100.0	2.88	13.77	9.42	9.01	4.24	-0.373	-1.569
3-Methyl-1-butene	7	77.8	0.38	0.89	0.61	0.64	0.18	-0.081	-0.639
3-Methylheptane	9	100.0	0.53	1.86	1.26	1.29	0.45	-0.346	-0.837
3-Methylhexane	9	100.0	1.65	7.79	3.22	3.76	1.81	1.406	2.586
3-Methylpentane	9	100.0	1.45	9.54	7.32	6.10	2.76	-0.973	-0.137
4-Methyl-1-pentene	9	100.0	0.36	1.68	0.85	0.87	0.41	0.778	0.947
α-Pinene	9	100.0	4.72	12.19	8.79	8.44	2.88	-0.082	-1.780
Acetylene	9	100.0	4.21	20.04	10.39	10.11	4.98	0.714	0.766
Acetylene/Ethane[a]	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
β-Pinene	9	100.0	0.35	2.43	1.06	1.19	0.69	0.475	-0.414

Table C-2

(Continued)

Compound	Cases	Freq (%)	ppbC Min	Max	Median	Avg	Std Dev	Skewness	Kurtosis
Benzene	9	100.0	4.04	12.84	8.07	8.09	2.61	0.348	0.223
cis-2-Butene	9	100.0	0.39	2.99	1.70	1.64	0.89	-0.027	-1.041
cis-2-Hexene	7	77.8	0.28	0.57	0.37	0.42	0.13	0.243	-2.305
cis-2-Pentene	8	88.9	0.41	1.60	1.12	1.06	0.41	-0.330	-1.128
Cyclohexane	9	100.0	0.92	8.44	6.47	5.74	2.48	-0.815	0.246
Cyclopentane	9	100.0	0.42	1.39	0.89	0.85	0.34	0.224	-1.029
Cyclopentene	7	77.8	0.29	0.78	0.49	0.50	0.17	0.520	-0.365
Ethane	9	100.0	7.29	39.15	24.51	22.59	9.59	-0.241	0.598
Ethylbenzene	9	100.0	1.84	7.58	5.00	5.09	1.84	-0.585	-0.246
Ethylene	9	100.0	7.06	25.35	20.21	17.86	6.97	-0.752	-0.773
Isobutane	9	100.0	3.51	30.77	10.96	11.58	7.96	1.949	4.965
Isobutene	1	11.1	8.40	8.40	8.40	8.40	0.00	0.000	0.000
Isopentane	9	100.0	7.99	40.59	27.02	24.43	10.90	-0.119	-1.027
Isoprene	9	100.0	0.30	1.45	0.84	0.82	0.38	0.227	-0.333
Isopropylbenzene	7	77.8	0.23	0.62	0.38	0.40	0.13	0.665	0.215
m-Ethyltoluene	9	100.0	1.49	7.44	3.74	3.98	1.81	0.715	0.334
m-/*p*-xylene	9	100.0	6.79	24.88	16.49	16.86	5.95	-0.422	-0.702
Methylcyclohexane	9	100.0	0.50	4.09	1.54	1.73	1.02	1.656	3.883
Methylcyclopentane	9	100.0	1.28	3.50	2.67	2.58	0.70	-0.646	-0.107
n-Butane	9	100.0	8.43	28.72	17.12	17.55	6.64	0.116	-0.264
n-Decane	9	100.0	0.57	5.65	2.62	2.99	1.43	0.366	1.069
n-Dodecane	9	100.0	0.30	5.58	1.23	1.62	1.54	2.581	7.307
n-Heptane	9	100.0	0.74	4.76	2.20	2.42	1.21	0.824	0.658
n-Hexane	9	100.0	1.42	5.27	4.21	3.80	1.35	-0.870	-0.351
n-Nonane	9	100.0	0.41	3.20	1.91	1.82	0.77	-0.021	1.317
n-Octane	9	100.0	0.53	5.17	1.59	2.06	1.57	1.075	0.404
n-Pentane	9	100.0	2.84	12.43	9.07	8.29	3.13	-0.777	-0.105
n-Propylbenzene	9	100.0	0.49	2.37	0.90	1.07	0.59	1.482	2.316
n-Tridecane	4	44.4	0.20	0.64	0.31	0.37	0.19	1.532	2.838
n-Undecane	9	100.0	0.69	9.93	2.38	2.99	2.68	2.647	7.604
o-Ethyltoluene	9	100.0	0.90	3.84	2.25	2.34	0.90	0.171	-0.238
o-Xylene	9	100.0	2.26	13.09	6.85	7.26	3.50	0.567	-0.126
p-Diethylbenzene	9	100.0	0.26	2.14	0.96	1.04	0.66	0.579	-1.135
p-Ethyltoluene	8	88.9	0.55	2.97	1.25	1.44	0.74	1.334	2.317
Propane	9	100.0	6.99	44.13	21.22	22.20	10.68	0.747	1.683
Propylene	9	100.0	3.07	19.73	11.78	10.96	5.45	-0.135	-0.571
Propyne	2	22.2	0.46	0.67	0.57	0.57	0.15	0.000	0.000

Table C-2

(Continued)

Compound	Cases	Freq (%)	ppbC					Skewness	Kurtosis
			Min	Max	Median	Avg	Std Dev		
Styrene	8	88.9	0.41	1.46	0.79	0.85	0.32	0.786	1.148
trans-2-Butene	8	88.9	1.12	4.25	2.04	2.18	1.02	1.239	1.745
trans-2-Hexene	7	77.8	0.28	0.96	0.47	0.55	0.25	0.832	-0.573
trans-2-Pentene	9	100.0	0.85	3.67	2.04	2.20	0.94	0.272	-1.024
Toluene	9	100.0	10.59	46.52	25.63	29.45	12.74	0.195	-1.225

[a] These compounds coeluted in some cases on the analytical system used.

Table C-3

Speciated NMOC Option of the NMOC Base Program Statistics for PLNJ

Compound	Cases	Freq (%)	ppbC					Skewness	Kurtosis
			Min	Max	Median	Avg	Std Dev		
1,2,3-Trimethylbenzene	8	100.0	2.12	8.30	4.89	4.81	2.46	0.339	-1.323
1,2,4-Trimethylbenzene	8	100.0	0.62	4.94	1.78	2.04	1.34	1.573	3.163
1,3,5-Trimethylbenzene	8	100.0	0.61	6.99	1.98	3.03	2.40	0.733	-1.140
1,3-Butadiene	6	75.0	0.47	2.66	0.76	1.13	0.85	1.477	1.592
1-Butene	8	100.0	2.47	31.95	5.98	10.18	10.05	1.769	3.019
1-Decene	8	100.0	3.51	21.25	6.22	9.61	7.17	0.755	-1.284
1-Dodecene	6	75.0	0.60	6.16	1.43	2.01	2.09	2.168	4.961
1-Hexene	3	37.5	0.73	4.60	0.79	2.04	2.22	1.731	0.000
1-Nonene	3	37.5	0.39	0.84	0.49	0.57	0.24	1.390	0.000
1-Octene	7	87.5	0.35	3.06	0.55	1.06	0.99	1.761	2.595
1-Pentene	7	87.5	0.47	5.04	1.20	2.11	1.90	1.039	-0.907
1-Tridecene	3	37.5	0.30	0.54	0.47	0.44	0.12	-1.127	0.000
1-Undecene	8	100.0	0.58	2.80	1.20	1.50	0.85	0.960	-0.526
2,2,3-Trimethylpentane	8	100.0	0.54	3.63	1.09	1.57	1.14	1.067	-0.100
2,2,4-Trimethylpentane	8	100.0	2.23	24.97	7.45	10.25	8.24	0.932	-0.344
2,2-Dimethylbutane	8	100.0	3.61	28.74	7.64	10.17	7.87	2.331	5.961
2,3,4-Trimethylpentane	8	100.0	0.79	9.38	2.68	3.85	3.18	0.911	-0.576
2,3-Dimethylbutane	8	100.0	1.21	9.00	2.50	3.67	2.69	1.383	1.131
2,3-Dimethylpentane	5	62.5	0.58	3.25	1.66	1.74	1.18	0.288	-2.150
2,4-Dimethylpentane	7	87.5	0.85	7.39	2.00	2.86	2.41	1.253	1.069
2-Ethyl-1-butene	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
2-Methyl-1-butene	7	87.5	0.97	8.40	2.58	3.69	2.92	0.776	-1.005
2-Methyl-1-pentene	6	75.0	0.44	2.90	1.19	1.43	0.97	0.655	-1.106
2-Methyl-2-butene	8	100.0	1.34	12.79	2.85	4.89	4.38	1.107	-0.175
2-Methylheptane	8	100.0	0.88	6.73	1.59	2.45	2.06	1.543	1.943
2-Methylhexane	8	100.0	1.30	20.77	2.98	5.06	6.51	2.559	6.820
2-Methylpentane	8	100.0	2.16	25.10	10.63	12.03	8.33	0.410	-1.334
3-Methyl-1-butene	7	87.5	0.31	2.18	0.86	0.96	0.72	0.876	-0.416
3-Methylheptane	7	87.5	0.75	5.64	1.59	2.26	1.79	1.334	1.184
3-Methylhexane	8	100.0	1.30	11.62	5.77	5.90	3.69	0.249	-1.441
3-Methylpentane	7	87.5	2.55	25.68	9.46	10.92	8.62	0.764	-0.375
4-Methyl-1-pentene	7	87.5	0.35	2.13	0.87	1.09	0.60	0.695	0.114
α-Pinene	8	100.0	0.29	3.01	1.63	1.68	0.91	-0.013	-0.911
Acetylene	8	100.0	2.66	229.05	26.04	58.61	78.31	1.767	3.131
Acetylene/Ethane[a]	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
β-Pinene	7	87.5	0.69	2.95	1.30	1.52	0.75	1.260	1.665

Table C-3

(Continued)

Compound	Cases	Freq (%)	ppbC Min	Max	Median	Avg	Std Dev	Skewness	Kurtosis
Benzene	8	100.0	2.80	34.09	9.87	13.79	11.05	1.013	-0.024
cis-2-Butene	8	100.0	0.44	6.60	1.77	2.57	2.25	0.968	-0.301
cis-2-Hexene	6	75.0	0.29	1.78	0.52	0.78	0.60	1.209	0.119
cis-2-Pentene	7	87.5	0.59	6.00	2.52	2.55	1.98	0.860	-0.056
Cyclohexane	7	87.5	0.58	13.84	2.34	4.18	4.85	1.635	2.395
Cyclopentane	7	87.5	0.59	5.58	1.46	2.59	2.05	0.491	-1.950
Cyclopentene	7	87.5	0.29	2.52	0.71	1.07	0.95	0.889	-1.145
Ethane	8	100.0	12.82	147.40	38.90	58.38	51.50	0.765	-0.871
Ethylbenzene	8	100.0	1.29	15.15	4.69	6.53	5.10	0.786	-0.839
Ethylene	8	100.0	9.45	133.21	35.27	52.42	46.60	0.844	-0.702
Isobutane	8	100.0	4.06	48.85	8.85	16.78	15.93	1.357	1.237
Isobutene	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Isopentane	8	100.0	6.37	94.21	24.05	41.20	34.54	0.626	-1.683
Isoprene	8	100.0	0.37	3.89	2.89	2.38	1.44	-0.502	-1.657
Isopropylbenzene	5	62.5	0.26	1.33	0.44	0.61	0.43	1.640	2.686
m-Ethyltoluene	8	100.0	2.00	12.94	3.55	5.67	4.33	0.825	-1.049
m-/*p*-Xylene	8	100.0	3.77	51.37	15.64	21.93	17.52	0.776	-0.870
Methylcyclohexane	8	100.0	0.43	7.36	1.56	2.45	2.29	1.664	2.762
Methylcyclopentane	8	100.0	1.82	13.88	3.56	5.31	4.22	1.390	1.457
n-Butane	8	100.0	3.15	90.36	10.90	24.52	29.29	1.987	4.100
n-Decane	7	87.5	1.09	7.98	2.74	3.99	2.93	0.489	-1.876
n-Dodecane	8	100.0	0.52	4.54	0.83	1.35	1.33	2.499	6.509
n-Heptane	8	100.0	0.96	8.01	2.55	3.49	2.74	0.728	-1.079
n-Hexane	8	100.0	1.71	35.26	4.78	9.97	11.41	1.874	3.663
n-Nonane	7	87.5	0.52	4.56	1.57	1.99	1.53	0.767	-0.657
n-Octane	8	100.0	0.40	5.30	0.91	1.36	1.63	2.580	6.941
n-Pentane	8	100.0	1.80	54.36	8.44	18.39	18.95	1.116	0.184
n-Propylbenzene	8	100.0	0.35	3.23	1.12	1.48	1.08	0.679	-1.143
n-Tridecane	1	12.5	0.44	0.44	0.44	0.44	0.00	0.000	0.000
n-Undecane	8	100.0	0.27	7.21	1.49	2.37	2.29	1.622	2.408
o-Ethyltoluene	8	100.0	0.73	6.58	2.61	3.32	2.18	0.415	-1.593
o-Xylene	8	100.0	2.74	18.29	5.39	8.00	6.12	0.848	-0.911
p-Diethylbenzene	8	100.0	0.42	1.94	0.80	0.96	0.58	0.835	-0.732
p-Ethyltoluene	7	87.5	0.71	4.39	1.54	2.06	1.48	0.603	-1.353
Propane	8	100.0	5.01	52.51	15.64	23.27	18.30	0.703	-1.342
Propylene	8	100.0	2.50	35.77	9.26	13.50	11.95	1.101	0.183
Propyne	2	25.0	0.67	1.46	1.07	1.07	0.56	0.000	0.000

Table C-3

(Continued)

Compound	Cases	Freq (%)	ppbC					Skewness	Kurtosis
			Min	Max	Median	Avg	Std Dev		
Styrene	7	87.5	0.33	2.90	0.78	1.30	1.06	0.615	-1.658
trans-2-Butene	8	100.0	1.00	9.19	2.59	3.69	3.03	1.067	-0.108
trans-2-Hexene	6	75.0	0.36	6.06	0.73	1.92	2.30	1.542	1.553
trans-2-Pentene	8	100.0	1.01	11.04	2.62	4.22	3.69	1.088	0.027
Toluene	8	100.0	6.82	118.11	30.68	49.80	44.73	0.788	-1.198

[a] These compounds coeluted in some cases on the analytical system used.

APPENDIX D

Toxics Option of the NMOC and Speciated NMOC Base Program Statistics by Site

Table D-1

Toxics Option of the Speciated NMOC Base Program
Statistics for B1AL

Compound	Cases	Freq (%)	ppbC					Skewness	Kurtosis
			Min	Max	Median	Avg	Std Dev		
Acetylene	8	100.0	0.38	15.67	3.35	6.75	6.38	0.647	-1.835
Propylene	8	100.0	0.18	3.14	0.75	1.24	1.06	0.943	-0.404
Chloromethane	8	100.0	0.44	0.80	0.53	0.57	0.12	1.337	1.371
Vinyl Chloride	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
1,3-Butadiene	7	87.5	0.04	0.33	0.17	0.17	0.10	0.307	-0.884
Bromomethane	5	62.5	0.02	0.04	0.03	0.03	0.01	0.512	-0.612
Chloroethane	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Methylene Chloride	8	100.0	0.05	0.22	0.14	0.13	0.07	-0.013	-2.229
trans-1,2-Dichloroethylene	7	87.5	0.06	0.14	0.09	0.10	0.03	0.433	0.122
1,1-Dichloroethane	2	25.0	0.01	0.02	0.02	0.02	0.01	0.000	0.000
Chloroprene	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Bromochloromethane	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Chloroform	8	100.0	0.01	0.05	0.03	0.03	0.02	0.259	-1.951
1,2-Dichloroethane	1	12.5	0.12	0.12	0.12	0.12	0.00	0.000	0.000
1,1,1-Trichloroethane	8	100.0	0.13	0.53	0.25	0.30	0.13	0.702	-0.462
Benzene	8	100.0	0.13	3.41	0.44	0.93	1.10	2.060	4.350
Carbon Tetrachloride	8	100.0	0.06	0.11	0.06	0.07	0.02	1.646	1.825
1,2-Dichloropropane	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Bromodichloromethane	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Trichloroethylene	5	62.5	0.01	0.06	0.03	0.03	0.02	0.472	-0.581
cis-1,3-Dichloropropene	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
trans-1,3-Dichloropropene	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
1,1,2-Trichloroethane	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Toluene	8	100.0	0.27	3.86	1.05	1.58	1.27	0.918	-0.369
Dibromochloromethane	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
n-Octane	7	87.5	0.03	0.22	0.05	0.09	0.07	1.254	0.798
Tetrachloroethylene	8	100.0	0.01	0.10	0.03	0.04	0.03	0.698	-0.961
Chlorobenzene	3	37.5	0.01	0.03	0.02	0.02	0.01	0.000	0.000
Ethylbenzene	8	100.0	0.05	0.84	0.22	0.32	0.27	1.149	0.637
m-/*p*-Xylene	8	100.0	0.18	2.39	0.59	0.99	0.85	0.989	-0.686
Bromoform	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Styrene	8	100.0	0.03	0.28	0.10	0.13	0.09	0.758	-0.687
1,1,2,2-Tetrachloroethane	1	12.5	0.02	0.02	0.02	0.02	0.00	0.000	0.000
o-Xylene	8	100.0	0.09	1.16	0.30	0.47	0.38	0.960	-0.317
m-Dichlorobenzene	3	37.5	0.01	0.04	0.01	0.02	0.02	1.732	0.000
p-Dichlorobenzene	7	87.5	0.01	0.06	0.05	0.04	0.02	-0.362	-2.363
o-Dichlorobenzene	4	50.0	0.01	0.05	0.02	0.02	0.02	1.659	2.616

Table D-2

Toxics Option of the Speciated NMOC Base Program Statistics for B2AL

Compound	Cases	Freq (%)	ppbC					Skewness	Kurtosis
			Min	Max	Median	Avg	Std Dev		
Acetylene	7	87.5	0.68	3.59	2.38	2.52	1.09	-0.684	-0.492
Propylene	8	100.0	0.33	1.27	0.78	0.77	0.28	0.257	0.520
Chloromethane	8	100.0	0.41	0.79	0.63	0.65	0.13	-0.482	-0.235
Vinyl Chloride	2	25.0	0.04	0.07	0.06	0.06	0.02	0.000	0.000
1,3-Butadiene	8	100.0	0.02	3.45	0.23	0.72	1.18	2.228	4.908
Bromomethane	2	25.0	0.03	0.07	0.05	0.05	0.03	0.000	0.000
Chloroethane	1	12.5	0.08	0.08	0.08	0.08	0.00	0.000	0.000
Methylene Chloride	8	100.0	0.05	0.18	0.08	0.10	0.04	1.138	0.271
trans-1,2-Dichloroethylene	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
1,1-Dichloroethane	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Chloroprene	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Bromochloromethane	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Chloroform	8	100.0	0.02	0.03	0.02	0.02	0.00	2.494	6.857
1,2-Dichloroethane	1	12.5	0.01	0.01	0.01	0.01	0.00	0.000	0.000
1,1,1-Trichloroethane	8	100.0	0.13	0.19	0.14	0.15	0.02	1.419	1.180
Benzene	8	100.0	0.17	0.99	0.50	0.53	0.26	0.668	0.253
Carbon Tetrachloride	8	100.0	0.06	0.09	0.08	0 08	0.01	0.068	-1.455
1,2-Dichloropropane	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Bromodichloromethane	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Trichloroethylene	4	50.0	0.01	0.01	0.01	0.01	0.00	0.000	0.000
cis-1,3-Dichloropropene	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
trans-1,3-Dichloropropene	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
1,1,2-Trichloroethane	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Toluene	8	100.0	0.59	1.62	0.88	0.98	0.41	0.845	-0.842
Dibromochloromethane	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
n-Octane	8	100.0	0.03	0.07	0.04	0.04	0.01	1.802	4.345
Tetrachloroethylene	8	100.0	0.01	0.05	0.02	0.02	0.01	2.117	5.167
Chlorobenzene	2	25.0	0.01	0.01	0.01	0.01	0.00	0.000	0.000
Ethylbenzene	8	100.0	0.10	0.36	0.17	0.18	0.08	1.460	2.663
m-/*p*-Xylene	8	100.0	0.22	0.94	0.51	0.54	0.23	0.479	-0.151
Bromoform	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Styrene	8	100.0	0.04	0.17	0.09	0.09	0.04	0.729	0.263
1,1,2,2-Tetrachloroethane	3	37.5	0.01	0.01	0.01	0.01	0.00	0.000	0.000
o-Xylene	8	100.0	0.10	0.41	0.25	0.24	0.10	0.244	-0.190
m-Dichlorobenzene	6	75.0	0.01	0.03	0.01	0.01	0.01	2.308	5.394
p-Dichlorobenzene	8	100.0	0.01	0.04	0.02	0.02	0.01	1.137	0.425
o-Dichlorobenzene	7	87.5	0.01	0.04	0.01	0.02	0.01	1.996	4.111

Table D-3

Toxics Option of the Speciated NMOC Base Program Statistics for B3AL

Compound	Cases	Freq (%)	ppbC					Skewness	Kurtosis
			Min	Max	Median	Avg	Std Dev		
Acetylene	8	100.0	0.87	4.47	2.60	2.59	1.20	0.131	-0.497
Propylene	8	100.0	0.46	1.05	0.61	0.69	0.23	0.707	-1.229
Chloromethane	8	100.0	0.44	0.76	0.60	0.60	0.09	0.142	1.455
Vinyl Chloride	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
1,3-Butadiene	8	100.0	0.04	0.28	0.13	0.14	0.09	0.524	-0.945
Bromomethane	2	25.0	0.02	0.06	0.04	0.04	0.02	0.000	0.000
Chloroethane	3	37.5	0.04	0.07	0.06	0.06	0.02	-0.935	0.000
Methylene Chloride	8	100.0	0.08	0.24	0.13	0.13	0.05	1.057	1.393
trans-1,2-Dichloroethylene	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
1,1-Dichloroethane	1	12.5	0.02	0.02	0.02	0.02	0.00	0.000	0.000
Chloroprene	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Bromochloromethane	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Chloroform	8	100.0	0.02	0.05	0.04	0.03	0.01	-0.094	-1.170
1,2-Dichloroethane	1	12.5	0.01	0.01	0.01	0.01	0.00	0.000	0.000
1,1,1-Trichloroethane	8	100.0	0.16	0.36	0.20	0.22	0.06	1.947	4.301
Benzene	8	100.0	0.32	0.66	0.47	0.45	0.11	0.738	0.709
Carbon Tetrachloride	8	100.0	0.05	0.09	0.07	0.07	0.01	0.228	-0.840
1,2-Dichloropropane	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Bromodichloromethane	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Trichloroethylene	7	87.5	0.01	0.04	0.02	0.02	0.01	0.682	-1.099
cis-1,3-Dichloropropene	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
trans-1,3-Dichloropropene	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
1,1,2-Trichloroethane	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Toluene	8	100.0	0.55	1.36	0.91	0.93	0.30	0.289	-1.139
Dibromochloromethane	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
n-Octane	7	87.5	0.02	0.05	0.04	0.04	0.01	-0.351	-1.569
Tetrachloroethylene	8	100.0	0.04	0.47	0.20	0.22	0.14	0.571	0.003
Chlorobenzene	1	12.5	0.02	0.02	0.02	0.02	0.00	0.000	0.000
Ethylbenzene	8	100.0	0.09	0.31	0.16	0.16	0.07	1.401	2.605
m-/*p*-Xylene	8	100.0	0.23	0.75	0.48	0.46	0.16	0.358	0.179
Bromoform	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Styrene	8	100.0	0.05	0.14	0.09	0.09	0.03	0.649	-0.790
1,1,2,2-Tetrachloroethane	1	12.5	0.02	0.02	0.02	0.02	0.00	0.000	0.000
o-Xylene	8	100.0	0.13	0.32	0.22	0.21	0.07	0.330	-1.244
m-Dichlorobenzene	3	37.5	0.01	0.02	0.01	0.01	0.01	0.935	0.000
p-Dichlorobenzene	7	87.5	0.01	0.05	0.01	0.02	0.02	1.723	2.360
o-Dichlorobenzene	3	37.5	0.01	0.02	0.02	0.02	0.01	0.000	0.000

Table D-4

Toxics Option of the NMOC Base Program
Statistics for NWNJ

Compound	Cases	Freq (%)	ppbC Min	Max	Median	Avg	Std Dev	Skewness	Kurtosis
Acetylene	8	100.0	1.48	13.33	7.01	6.79	3.69	0.393	0.235
Propylene	8	100.0	0.55	4.87	2.15	2.39	1.46	0.437	-0.495
Chloromethane	8	100.0	0.35	0.70	0.53	0.52	0.13	-0.042	-1.762
Vinyl Chloride	1	12.5	0.04	0.04	0.04	0.04	0.00	0.000	0.000
1,3-Butadiene	8	100.0	0.06	2.60	0.21	0.70	0.91	1.613	2.130
Bromomethane	2	25.0	0.01	0.02	0.02	0.02	0.01	0.000	0.000
Chloroethane	2	25.0	0.12	0.12	0.12	0.12	0.00	0.000	0.000
Methylene Chloride	8	100.0	0.13	1.33	0.45	0.57	0.38	1.319	1.408
trans-1,2-Dichloroethylene	2	25.0	0.01	0.02	0.02	0.02	0.01	0.000	0.000
1,1-Dichloroethane	1	12.5	0.01	0.01	0.01	0.01	0.00	0.000	0.000
Chloroprene	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Bromochloromethane	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Chloroform	8	100.0	0.01	0.08	0.04	0.04	0.03	0.697	-0.531
1,2-Dichloroethane	1	12.5	0.01	0.01	0.01	0.01	0.00	0.000	0.000
1,1,1-Trichloroethane	8	100.0	0.16	0.78	0.48	0.48	0.22	0.065	-0.898
Benzene	8	100.0	0.36	0.98	0.81	0.72	0.23	-0.532	-1.432
Carbon Tetrachloride	8	100.0	0.05	0.09	0.06	0.06	0.02	0.582	-0.821
1,2-Dichloropropane	1	12.5	0.06	0.06	0.06	0.06	0.00	0.000	0.000
Bromodichloromethane	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Trichloroethylene	8	100.0	0.02	0.53	0.05	0.13	0.18	2.014	3.792
cis-1,3-Dichloropropene	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
trans-1,3-Dichloropropene	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
1,1,2-Trichloroethane	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Toluene	8	100.0	0.75	3.57	2.38	2.26	0.88	-0.474	0.196
Dibromochloromethane	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
n-Octane	8	100.0	0.03	0.18	0.14	0.13	0.04	-1.921	4.817
Tetrachloroethylene	8	100.0	0.02	2.20	0.09	0.36	0.75	2.790	7.833
Chlorobenzene	2	25.0	0.01	0.03	0.02	0.02	0.01	0.000	0.000
Ethylbenzene	8	100.0	0.14	0.87	0.42	0.44	0.23	0.775	1.138
m-/*p*-Xylene	8	100.0	0.42	2.83	1.38	1.38	0.73	0.931	1.585
Bromoform	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Styrene	8	100.0	0.05	0.14	0.12	0.11	0.03	-1.276	0.353
1,1,2,2-Tetrachloroethane	1	12.5	0.02	0.02	0.02	0.02	0.00	0.000	0.000
o-Xylene	8	100.0	0.21	1.27	0.64	0.68	0.33	0.615	0.721
m-Dichlorobenzene	2	25.0	0.01	0.02	0.02	0.02	0.01	0.000	0.000
p-Dichlorobenzene	8	100.0	0.01	0.08	0.04	0.04	0.02	0.813	-0.168
o-Dichlorobenzene	5	62.5	0.01	0.02	0.02	0.02	0.00	-1.714	2.664

Table D-5

Toxics Option of the NMOC Base Program
Statistics for PLNJ

Compound	Cases	Freq (%)	ppbC					Skewness	Kurtosis
			Min	Max	Median	Avg	Std Dev		
Acetylene	8	100.0	1.83	197.78	20.23	45.80	67.35	2.044	4.224
Propylene	8	100.0	0.38	8.74	2.75	3.53	3.01	0.730	-0.709
Chloromethane	8	100.0	0.33	1.31	0.53	0.63	0.30	2.030	4.831
Vinyl Chloride	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
1,3-Butadiene	8	100.0	0.08	2.81	0.34	0.80	0.95	1.608	2.397
Bromomethane	1	12.5	0.03	0.03	0.03	0.03	0.00	0.000	0.000
Chloroethane	2	25.0	0.03	0.36	0.20	0.20	0.23	0.000	0.000
Methylene Chloride	8	100.0	0.22	10.74	1.19	2.57	3.55	2.144	4.983
trans-1,2-Dichloroethylene	3	37.5	0.01	0.03	0.02	0.02	0.01	0.000	0.000
1,1-Dichloroethane	1	12.5	0.01	0.01	0.01	0.01	0.00	0.000	0.000
Chloroprene	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Bromochloromethane	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Chloroform	8	100.0	0.01	0.15	0.05	0.06	0.05	1.019	-0.306
1,2-Dichloroethane	3	37.5	0.07	0.38	0.26	0.24	0.16	-0.657	0.000
1,1,1-Trichloroethane	8	100.0	0.20	1.16	0.42	0.49	0.31	1.557	2.858
Benzene	8	100.0	0.18	4.22	1.05	1.48	1.34	1.352	1.715
Carbon Tetrachloride	8	100.0	0.05	0.09	0.07	0.07	0.02	0.167	-1.648
1,2-Dichloropropane	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Bromodichloromethane	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Trichloroethylene	7	87.5	0.01	0.29	0.13	0.11	0.10	0.950	0.786
cis-1,3-Dichloropropene	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
trans-1,3-Dichloropropene	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
1,1,2-Trichloroethane	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Toluene	8	100.0	0.36	12.45	3.14	4.82	4.49	0.857	-0.759
Dibromochloromethane	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
n-Octane	8	100.0	0.02	0.47	0.16	0.18	0.15	0.975	0.566
Tetrachloroethylene	8	100.0	0.02	0.46	0.15	0.21	0.18	0.499	-1.800
Chlorobenzene	3	37.5	0.01	0.04	0.02	0.02	0.02	0.935	0.000
Ethylbenzene	8	100.0	0.06	2.05	0.47	0.69	0.65	1.433	2.045
m-/*p*-Xylene	8	100.0	0.20	5.55	1.38	2.00	1.77	1.240	1.253
Bromoform	1	12.5	0.03	0.03	0.03	0.03	0.00	0.000	0.000
Styrene	8	100.0	0.03	0.61	0.15	0.23	0.20	1.010	0.102
1,1,2,2-Tetrachloroethane	1	12.5	0.06	0.06	0.06	0.06	0.00	0.000	0.000
o-Xylene	8	100.0	0.10	2.32	0.67	0.92	0.76	0.896	-0.109
m-Dichlorobenzene	3	37.5	0.01	0.14	0.01	0.05	0.08	1.732	0.000
p-Dichlorobenzene	8	100.0	0.01	0.33	0.11	0.14	0.11	0.739	-0.193
o-Dichlorobenzene	6	75.0	0.01	0.07	0.02	0.03	0.02	1.459	1.693

APPENDIX E

Speciated NMOC Base Program Statistics by Site

Table E-1

Speciated NMOC Base Statistics for B1AL

Compound	Cases	Freq (%)	ppbC					Skewness	Kurtosis
			Min	Max	Median	Avg	Std Dev		
1,2,3-Trimethylbenzene	81	100.0	0.55	7.22	3.44	3.64	1.65	0.410	-0.637
1,2,4-Trimethylbenzene	79	97.5	0.34	16.22	3.32	3.98	2.41	2.040	7.391
1,3,5-Trimethylbenzene	79	97.5	0.30	11.74	1.51	2.26	1.90	2.080	6.977
1,3-Butadiene	60	74.1	0.28	3.64	0.76	1.06	0.75	1.284	1.450
1-Butene	79	97.5	0.54	17.15	3.88	4.45	2.57	1.935	6.902
1-Decene	81	100.0	0.34	19.93	4.17	6.05	4.67	1.073	0.510
1-Dodecene	77	95.1	0.25	4.57	0.75	0.96	0.75	2.697	8.829
1-Hexene	39	48.1	0.17	2.97	0.73	1.04	0.74	0.860	-0.291
1-Nonene	21	25.9	0.24	0.95	0.45	0.53	0.22	0.428	-1.032
1-Octene	58	71.6	0.26	2.85	0.65	0.97	0.74	1.290	0.602
1-Pentene	53	65.4	0.27	12.74	1.13	1.60	1.89	4.334	23.707
1-Tridecene	36	44.4	0.24	0.80	0.42	0.45	0.16	0.676	-0.491
1-Undecene	76	93.8	0.28	5.03	0.97	1.15	0.73	2.987	11.821
2,2,3-Trimethylpentane	67	82.7	0.26	2.87	0.90	1.08	0.67	0.924	0.157
2,2,4-Trimethylpentane	81	100.0	0.68	20.44	4.73	6.65	4.74	0.959	0.217
2,2-Dimethylbutane	81	100.0	1.40	49.03	10.78	11.35	6.54	2.751	13.268
2,3,4-Trimethylpentane	80	98.8	0.32	7.81	1.81	2.51	1.85	0.973	0.241
2,3-Dimethylbutane	78	96.3	0.39	7.02	2.01	2.60	1.73	0.737	-0.350
2,3-Dimethylpentane	66	81.5	0.17	4.99	0.98	1.45	1.02	1.207	1.557
2,4-Dimethylpentane	75	82.6	0.20	5.87	1.28	1.91	1.39	0.861	-0.077
2-Ethyl-1-butene	8	9.9	0.55	1.93	1.12	1.21	0.46	0.461	-0.436
2-Methyl-1-butene	75	92.6	0.16	6.19	1.38	1.88	1.40	0.997	0.544
2-Methyl-1-pentene	45	55.6	0.23	2.71	0.94	1.07	0.60	0.931	0.597
2-Methyl-2-butene	78	96.3	0.30	9.50	1.72	2.59	2.09	1.124	0.996
2-Methylheptane	74	91.4	0.24	4.39	1.25	1.51	0.97	0.891	0.170
2-Methylhexane	75	92.6	0.21	13.03	1.37	2.25	2.40	2.952	10.456
2-Methylpentane	81	100.0	0.45	22.64	4.85	7.29	5.54	0.813	-0.393
3-Methyl-1-butene	49	60.5	0.22	1.70	0.70	0.65	0.34	0.812	0.940
3-Methylheptane	72	88.9	0.16	3.53	1.08	1.31	0.84	0.859	-0.088
3-Methylhexane	79	97.5	0.77	8.93	2.52	3.57	2.19	0.738	-0.599
3-Methylpentane	80	98.8	0.36	19.29	4.54	5.97	4.73	0.810	-0.227
4-Methyl-1-pentene	68	84.0	0.24	2.90	0.85	1.12	0.72	0.798	-0.519

Table E-1

(Continued)

Compound	Cases	Freq (%)	ppbC					Skewness	Kurtosis
			Min	Max	Median	Avg	Std Dev		
α-Pinene	80	98.8	0.32	5.71	1.48	1.79	1.17	1.364	2.041
Acetylene	81	100.0	1.21	47.97	7.93	12.74	10.73	1.180	0.896
β-Pinene	80	98.8	0.34	2.32	1.13	1.19	0.41	0.589	0.181
Benzene	81	100.0	0.76	43.88	7.60	9.70	7.61	1.940	5.856
cis-2-Butene	68	84.0	0.23	7.57	1.02	1.28	1.14	3.195	14.321
cis-2-Hexene	42	51.9	0.25	1.08	0.57	0.58	0.25	0.398	-0.867
cis-2-Pentene	67	82.7	0.18	4.45	0.97	1.32	0.95	1.176	1.203
Cyclohexane	68	84.0	0.25	22.43	1.49	3.80	4.77	1.998	4.065
Cyclopentane	65	80.2	0.22	17.23	0.83	1.20	2.09	7.235	56.005
Cyclopentene	42	51.9	0.25	1.50	0.65	0.67	0.31	0.675	0.173
Ethane	80	98.8	2.21	81.60	11.37	15.39	11.96	2.512	10.883
Ethylbenzene	80	98.8	0.59	12.75	3.47	4.39	2.96	0.776	-0.175
Ethylene	80	98.8	0.53	47.84	11.03	14.97	11.01	0.851	0.081
Isobutane	81	100.0	1.17	77.97	4.16	6.97	10.07	5.307	33.492
Isobutene	1	1.2	2.14	2.14	2.14	2.14	0.00	0.000	0.000
Isopentane	81	100.0	3.25	120.75	16.48	26.27	22.14	1.609	3.522
Isoprene	79	97.5	0.23	8.12	1.93	2.27	1.67	1.144	1.267
Isopropylbenzene	37	45.7	0.24	0.90	0.40	0.45	0.16	1.065	1.189
m-Ethyltoluene	81	100.0	0.51	12.06	2.71	3.80	2.78	1.063	0.480
m-/*p*-Xylene	81	100.0	1.47	44.93	11.53	15.29	10.61	0.748	-0.238
Methylcyclohexane	73	90.1	0.17	7.82	1.00	1.43	1.15	2.594	11.909
Methylcyclopentane	80	98.8	0.24	8.81	2.08	2.84	2.18	0.760	-0.420
n-Butane	81	100.0	1.86	69.39	8.19	12.20	11.63	2.499	8.386
n-Decane	76	93.8	0.22	11.03	1.40	1.94	1.73	2.225	8.756
n-Dodecane	80	98.8	0.27	11.95	0.93	1.45	1.85	4.253	20.771
n-Heptane	79	97.5	0.21	7.57	1.51	2.07	1.48	1.077	1.135
n-Hexane	80	98.8	0.62	23.73	2.98	6.13	5.86	1.304	1.071
n-Nonane	68	84.0	0.26	20.02	1.15	1.63	2.44	6.611	49.436
n-Octane	68	84.0	0.27	4.15	1.15	1.33	0.79	0.905	0.932
n-Pentane	81	100.0	1.09	55.38	6.33	9.85	8.64	2.249	8.605
n-Propylbenzene	71	87.7	0.18	3.46	0.91	1.13	0.72	1.201	1.237
n-Tridecane	17	21.0	0.26	0.98	0.32	0.36	0.17	3.573	13.668

Table E-1

(Continued)

Compound	Cases	Freq (%)	ppbC					Skewness	Kurtosis
			Min	Max	Median	Avg	Std Dev		
n-Undecane	78	96.3	0.41	16.49	1.54	2.24	2.53	3.736	17.240
o-Ethyltoluene	80	98.8	0.36	6.46	1.69	2.28	1.55	0.888	-0.142
o-Xylene	80	98.8	0.62	15.48	4.25	5.27	3.62	0.842	-0.077
p-Diethylbenzene	76	93.8	0.26	4.53	0.96	1.30	0.98	1.314	1.411
p-Ethyltoluene	71	87.7	0.16	4.24	0.95	1.31	0.92	1.175	1.084
Propane	81	100.0	1.87	133.35	16.95	23.46	24.88	2.351	6.725
Propylene	80	98.8	0.82	25.94	4.55	7.15	5.73	1.146	0.843
Propyne	20	24.7	0.31	1.51	0.87	0.84	0.28	0.192	0.817
Styrene	70	86.4	0.16	3.12	0.80	0.95	0.56	1.134	2.016
trans-2-Butene	70	86.4	0.22	5.67	1.04	1.30	0.93	1.747	5.806
trans-2-Hexene	59	72.8	0.25	1.91	0.79	0.79	0.46	0.579	-0.768
trans-2-Pentene	81	100.0	0.31	25.39	1.62	2.57	3.07	5.357	38.475
Toluene	81	100.0	2.98	107.40	17.73	23.18	17.68	1.760	5.248

Table E-2

Speciated NMOC Base Statistics for B2AL

Compound	Cases	Freq (%)	ppbC					Skewness	Kurtosis
			Min	Max	Median	Avg	Std Dev		
1,2,3-Trimethylbenzene	78	98.7	0.90	18.28	2.06	2.51	2.16	5.365	37.185
1,2,4-Trimethylbenzene	73	92.4	0.32	21.96	6.68	8.21	5.34	1.227	0.561
1,3,5-Trimethylbenzene	56	70.9	0.23	4.00	0.72	0.84	0.55	3.688	19.829
1,3-Butadiene	41	51.9	0.21	1.99	0.50	0.63	0.40	1.923	3.632
1-Butene	75	94.9	0.30	5.96	1.42	1.49	0.97	2.042	6.467
1-Decene	78	98.7	0.24	11.73	1.85	2.18	1.82	3.165	13.737
1-Dodecene	72	91.1	0.24	3.38	0.58	0.77	0.58	2.486	7.217
1-Hexene	27	34.2	0.26	1.74	0.72	0.77	0.41	0.708	-0.033
1-Nonene	4	5.1	0.18	0.50	0.29	0.31	0.16	0.488	-3.219
1-Octene	30	38.0	0.21	1.28	0.32	0.40	0.20	3.287	13.416
1-Pentene	49	62.0	0.25	4.59	0.93	1.16	0.90	2.232	5.828
1-Tridecene	8	10.1	0.29	1.77	0.56	0.75	0.52	1.387	1.146
1-Undecene	69	87.3	0.29	7.13	0.93	1.16	0.92	4.451	26.004
2,2,3-Trimethylpentane	42	53.2	0.25	1.62	0.39	0.43	0.22	4.267	22.964
2,2,4-Trimethylpentane	78	98.7	0.42	10.42	2.12	2.24	1.42	2.586	13.154
2,2-Dimethylbutane	77	97.5	0.53	18.30	1.37	1.70	2.19	6.623	46.885
2,3,4-Trimethylpentane	59	74.7	0.23	3.99	0.84	0.93	0.54	3.228	17.217
2,3-Dimethylbutane	72	91.1	0.28	4.06	1.10	1.15	0.58	2.009	8.165
2,3-Dimethylpentane	49	62.0	0.25	2.39	0.53	0.58	0.32	3.771	19.991
2,4-Dimethylpentane	59	74.7	0.30	4.35	0.63	0.73	0.54	5.398	36.013
2-Ethyl-1-butene	1	1.3	1.58	1.58	1.58	1.58	0.00	0.000	0.000
2-Methyl-1-butene	55	69.6	0.25	3.82	0.90	1.20	0.90	1.362	1.083
2-Methyl-1-pentene	40	50.6	0.25	2.66	1.14	1.19	0.48	0.652	1.545
2-Methyl-2-butene	56	70.9	0.32	5.39	0.89	1.08	0.78	3.424	16.846
2-Methylheptane	54	68.4	0.23	2.71	0.51	0.60	0.37	3.751	19.354
2-Methylhexane	58	73.4	0.25	4.75	0.70	0.80	0.66	4.267	23.162
2-Methylpentane	77	97.5	0.30	13.93	2.36	2.57	1.86	3.207	17.598
3-Methyl-1-butene	24	30.4	0.21	0.83	0.30	0.34	0.14	2.424	6.471
3-Methylheptane	50	63.3	0.25	2.33	0.44	0.52	0.35	3.623	16.423
3-Methylhexane	71	89.9	0.27	8.12	1.54	1.77	1.43	2.918	10.310
3-Methylpentane	73	92.4	0.27	15.89	1.52	1.79	1.93	5.638	40.048
4-Methyl-1-pentene	43	54.4	0.22	1.08	0.47	0.49	0.22	0.913	0.341

Table E-2

(Continued)

Compound	Cases	Freq (%)	ppbC					Skewness	Kurtosis
			Min	Max	Median	Avg	Std Dev		
α-Pinene	73	92.4	0.35	12.39	3.09	3.54	2.33	1.298	2.293
Acetylene	72	91.1	0.71	23.15	3.94	4.33	3.08	3.369	18.843
Acetylene/Ethane[a]	2	2.5	2.52	3.90	3.21	3.21	0.98	0.000	0.000
β-Pinene	74	93.7	0.42	6.33	0.76	1.01	0.89	4.654	24.268
Benzene	78	98.7	0.68	13.38	3.74	4.17	2.58	1.714	3.709
cis-2-Butene	34	43.0	0.23	1.36	0.33	0.41	0.23	2.730	8.631
cis-2-Hexene	9	11.4	0.17	0.89	0.34	0.41	0.25	1.369	0.766
cis-2-Pentene	42	53.2	0.27	2.56	0.46	0.52	0.36	4.751	26.706
Cyclohexane	42	53.2	0.21	24.83	0.72	1.63	3.81	5.812	35.840
Cyclopentane	39	49.4	0.22	1.45	0.40	0.44	0.21	3.245	14.731
Cyclopentene	18	22.8	0.22	1.12	0.31	0.44	0.28	1.484	0.851
Ethane	76	96.2	1.21	27.63	5.37	6.46	4.56	2.748	9.977
Ethylbenzene	75	94.9	0.25	8.48	1.40	1.56	1.10	3.566	20.430
Ethylene	72	91.1	0.40	29.98	6.58	7.22	5.48	1.894	4.885
Isobutane	78	98.7	0.90	118.86	3.90	6.09	13.23	8.251	70.995
Isobutene	1	1.3	11.90	11.90	11.90	11.90	0.00	0.000	0.000
Isopentane	78	98.7	0.99	44.50	8.05	9.04	6.39	2.647	11.674
Isoprene	68	86.1	0.22	8.83	2.23	2.62	2.18	1.037	0.261
Isopropylbenzene	4	5.1	0.29	0.55	0.36	0.39	0.11	1.412	2.032
m-Ethyltoluene	73	92.4	0.27	7.21	1.38	1.52	1.02	2.742	12.965
m-/*p*-Xylene	78	98.7	0.68	30.38	4.06	4.88	3.90	3.869	23.163
Methylcyclohexane	49	62.0	0.25	2.73	0.50	0.58	0.36	4.593	26.788
Methylcyclopentane	67	84.8	0.19	8.02	0.91	1.05	0.98	5.674	40.126
n-Butane	78	98.7	0.68	27.72	3.24	4.52	4.01	3.363	15.406
n-Decane	43	54.4	0.17	17.17	0.40	1.48	3.27	3.724	14.611
n-Dodecane	59	74.7	0.21	6.58	0.61	1.02	1.09	3.092	12.151
n-Heptane	61	77.2	0.24	5.89	0.84	0.96	0.74	4.998	32.597
n-Hexane	76	96.2	0.44	25.88	1.39	1.99	2.98	7.108	56.767
n-Nonane	48	60.8	0.21	2.15	0.38	0.43	0.28	5.061	30.522
n-Octane	49	62.0	0.18	2.49	0.40	0.55	0.41	3.447	13.407
n-Pentane	78	98.7	0.94	19.20	3.13	3.80	2.81	2.842	12.179
n-Propylbenzene	50	63.3	0.25	1.76	0.43	0.48	0.25	3.065	12.978

Table E-2

(Continued)

Compound	Cases	Freq (%)	ppbC					Skewness	Kurtosis
			Min	Max	Median	Avg	Std Dev		
n-Tridecane	8	10.1	0.27	1.74	0.51	0.80	0.62	0.965	-0.898
n-Undecane	64	81.0	0.23	8.91	0.59	1.04	1.29	4.212	22.470
o-Ethyltoluene	70	88.6	0.24	3.94	0.89	1.01	0.62	2.003	6.735
o-Xylene	73	92.4	0.26	9.95	1.57	1.79	1.47	3.293	14.953
p-Diethylbenzene	55	69.6	0.21	5.56	0.40	0.56	0.72	6.407	44.542
p-Ethyltoluene	47	59.5	0.22	2.13	0.42	0.49	0.29	4.224	22.923
Propane	78	98.7	1.08	45.34	6.61	7.63	6.10	3.495	18.626
Propylene	75	94.9	0.46	16.27	2.86	3.23	2.59	2.913	11.359
Propyne	6	7.6	0.25	0.85	0.31	0.44	0.25	1.218	-0.139
Styrene	55	69.6	0.27	6.58	0.49	0.72	0.94	5.233	29.985
trans-2-Butene	54	68.4	0.23	9.23	0.59	1.03	1.32	4.772	28.176
trans-2-Hexene	23	29.1	0.19	1.29	0.32	0.42	0.25	2.441	6.384
trans-2-Pentene	60	75.9	0.27	4.65	0.78	0.89	0.61	4.101	24.355
Toluene	78	98.7	2.11	42.52	8.01	8.72	5.67	2.989	15.557

[a] These compounds coeluted in some cases on the analytical system used.

Table E-3

Speciated NMOC Base Statistics for B3AL

Compound	Cases	Freq (%)	ppbC					Skewness	Kurtosis
			Min	Max	Median	Avg	Std Dev		
1,2,3-Trimethylbenzene	77	98.7	1.02	5.03	1.94	2.13	0.84	1.260	1.765
1,2,4-Trimethylbenzene	71	91.0	0.36	6.80	1.01	1.15	0.82	4.831	32.156
1,3,5-Trimethylbenzene	56	71.8	0.29	2.22	0.63	0.75	0.41	1.522	2.901
1,3-Butadiene	27	34.6	0.17	0.79	0.45	0.44	0.16	0.441	-0.236
1-Butene	72	92.3	0.31	3.08	1.13	1.26	0.64	0.748	0.126
1-Decene	76	97.4	0.30	6.69	1.63	1.95	1.33	1.374	2.264
1-Dodecene	71	91.0	0.22	3.12	0.55	0.68	0.49	2.882	10.923
1-Hexene	37	47.4	0.29	2.47	0.75	0.93	0.54	0.951	0.417
1-Nonene	4	5.1	0.20	0.39	0.27	0.28	0.09	0.465	-2.950
1-Octene	24	30.8	0.17	0.72	0.37	0.38	0.13	0.872	1.380
1-Pentene	55	70.5	0.28	6.76	0.97	1.53	1.45	2.102	4.266
1-Tridecene	8	10.3	0.27	0.67	0.35	0.41	0.15	1.023	-0.370
1-Undecene	72	92.3	0.40	2.76	0.83	0.96	0.42	1.694	4.498
2,2,3-Trimethylpentane	41	52.6	0.23	1.01	0.42	0.50	0.21	0.886	-0.193
2,2,4-Trimethylpentane	75	96.2	0.33	8.03	2.05	2.56	1.75	1.139	0.902
2,2-Dimethylbutane	78	100.0	1.14	9.85	4.84	5.03	1.86	0.642	0.287
2,3,4-Trimethylpentane	64	82.1	0.23	2.38	0.75	0.94	0.56	1.122	0.520
2,3-Dimethylbutane	70	89.7	0.38	7.19	1.32	1.67	1.13	2.097	7.114
2,3-Dimethylpentane	51	65.4	0.27	2.20	0.64	0.75	0.44	1.385	2.079
2,4-Dimethylpentane	66	84.6	0.23	2.83	0.60	0.79	0.54	1.650	2.864
2-Ethyl-1-butene	6	7.7	0.29	0.86	0.57	0.57	0.23	0.057	-1.748
2-Methyl-1-butene	61	78.2	0.21	7.11	1.38	1.78	1.40	1.644	3.358
2-Methyl-1-pentene	38	48.7	0.27	2.17	1.05	1.08	0.57	0.455	-0.875
2-Methyl-2-butene	59	75.6	0.24	14.18	1.04	1.72	2.33	3.637	15.706
2-Methylheptane	55	70.5	0.25	1.25	0.46	0.55	0.25	0.821	-0.198
2-Methylhexane	60	76.9	0.26	3.06	0.74	0.82	0.50	2.047	6.134
2-Methylpentane	76	97.4	0.32	16.39	2.89	3.71	2.98	1.810	4.278
3-Methyl-1-butene	37	47.4	0.22	1.67	0.43	0.51	0.31	2.004	4.940
3-Methylheptane	42	53.8	0.20	1.08	0.49	0.53	0.22	0.536	-0.406
3-Methylhexane	73	93.6	0.23	3.79	1.58	1.75	0.92	0.229	-0.760
3-Methylpentane	75	96.2	0.29	8.94	1.77	2.31	1.77	1.538	2.718
4-Methyl-1-pentene	53	67.9	0.19	1.52	0.59	0.63	0.31	0.998	0.617

Table E-3

(Continued)

Compound	Cases	Freq (%)	ppbC					Skewness	Kurtosis
			Min	Max	Median	Avg	Std Dev		
α-Pinene	75	96.2	0.29	20.84	3.71	4.60	4.38	1.919	3.976
Acetylene	69	88.5	0.40	9.10	3.09	3.45	2.03	0.896	0.462
Acetylene/Ethane[a]	2	2.6	1.98	4.63	3.31	3.31	1.87	0.000	0.000
β-Pinene	73	93.6	0.26	2.02	0.75	0.88	0.41	0.958	0.492
Benzene	78	100.0	0.94	9.52	3.18	3.66	1.94	0.803	0.100
cis-2-Butene	39	50.0	0.24	2.66	0.48	0.63	0.45	2.704	9.987
cis-2-Hexene	12	15.4	0.22	0.75	0.40	0.41	0.15	1.049	1.796
cis-2-Pentene	44	56.4	0.25	4.10	0.64	0.88	0.73	2.493	8.013
Cyclohexane	40	51.3	0.20	4.25	0.48	0.70	0.75	3.451	13.663
Cyclopentane	44	56.4	0.23	2.62	0.57	0.68	0.49	2.207	5.709
Cyclopentene	20	25.6	0.17	1.26	0.46	0.48	0.24	1.855	5.238
Ethane	74	94.9	0.43	79.25	6.15	7.24	8.95	7.336	59.349
Ethylbenzene	72	92.3	0.27	3.40	1.17	1.39	0.78	0.740	-0.149
Ethylene	69	88.5	0.37	14.34	4.81	5.18	3.03	0.570	0.025
Isobutane	78	100.0	0.48	369.98	2.60	8.73	41.79	8.615	75.306
Isobutene	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Isopentane	78	100.0	1.14	413.00	11.37	23.53	48.57	6.949	55.065
Isoprene	66	84.6	0.24	16.27	2.29	3.34	3.40	1.788	3.231
Isopropylbenzene	4	5.1	0.16	0.35	0.28	0.27	0.09	-0.325	-3.719
m-Ethyltoluene	71	91.0	0.23	4.86	1.34	1.43	0.89	1.483	3.069
m-/*p*-Xylene	77	98.7	0.55	11.56	3.56	4.20	2.72	0.885	0.198
Methylcyclohexane	54	69.2	0.22	1.66	0.53	0.63	0.34	1.188	0.813
Methylcyclopentane	67	85.9	0.26	4.35	1.11	1.35	0.93	1.382	1.787
n-Butane	78	100.0	0.58	60.58	6.08	10.32	11.29	2.332	6.141
n-Decane	63	80.8	0.24	14.79	0.68	1.06	1.96	6.118	41.046
n-Dodecane	65	83.3	0.15	21.29	0.54	1.19	2.69	6.774	50.382
n-Heptane	71	91.0	0.23	2.85	0.83	0.89	0.53	1.619	3.148
n-Hexane	74	94.9	0.32	6.49	1.65	1.98	1.35	1.401	1.951
n-Nonane	56	71.8	0.24	5.14	0.45	0.60	0.66	6.223	43.109
n-Octane	49	62.8	0.25	4.94	0.63	0.72	0.71	4.827	27.708
n-Pentane	76	97.4	0.71	29.65	4.57	6.49	6.24	2.216	5.221
n-Propylbenzene	35	44.9	0.26	1.18	0.37	0.45	0.20	2.003	4.503

Table E-3

(Continued)

Compound	Cases	Freq (%)	ppbC					Skewness	Kurtosis
			Min	Max	Median	Avg	Std Dev		
n-Tridecane	7	9.0	0.29	0.81	0.33	0.45	0.20	1.076	0.186
n-Undecane	68	87.2	0.26	22.12	0.79	1.36	2.71	6.956	53.015
o-Ethyltoluene	70	89.7	0.27	4.13	0.95	1.13	0.75	1.786	3.951
o-Xylene	68	87.2	0.26	4.47	1.36	1.57	0.97	1.055	0.839
p-Diethylbenzene	43	55.1	0.25	1.09	0.43	0.47	0.19	1.270	1.533
p-Ethyltoluene	40	51.3	0.22	1.04	0.47	0.50	0.20	1.065	0.991
Propane	78	100.0	1.27	16.59	6.45	6.76	3.04	0.917	1.327
Propylene	73	93.6	0.34	5.53	2.01	2.26	1.26	0.675	-0.398
Propyne	2	2.6	0.78	0.79	0.79	0.79	0.01	0.000	0.000
Styrene	48	61.5	0.21	4.32	0.52	0.61	0.59	5.673	36.128
trans-2-Butene	48	61.5	0.22	3.71	0.68	1.00	0.81	1.895	3.141
trans-2-Hexene	26	33.3	0.20	1.80	0.44	0.53	0.34	2.435	7.286
trans-2-Pentene	65	83.3	0.30	7.98	1.11	1.52	1.33	2.475	8.412
Toluene	78	100.0	0.95	42.68	7.25	9.39	7.39	2.142	6.676

[a] These compounds coeluted in some cases on the analytical system used.

Table E-4

Speciated NMOC Base Statistics for FWTX

Compound	Cases	Freq (%)	ppbC					Skewness	Kurtosis
			Min	Max	Median	Avg	Std Dev		
1,2,3-Trimethylbenzene	77	100.0	0.69	10.73	2.88	3.48	1.89	1.377	2.745
1,2,4-Trimethylbenzene	74	96.1	0.28	7.83	1.59	1.96	1.42	1.850	4.306
1,3,5-Trimethylbenzene	75	97.4	0.26	8.24	1.23	1.75	1.42	1.965	5.135
1,3-Butadiene	51	66.2	0.26	3.82	0.69	0.89	0.71	2.071	5.174
1-Butene	76	98.7	0.69	16.69	3.56	4.38	2.93	1.659	3.615
1-Decene	77	100.0	0.64	26.78	3.78	5.52	4.55	2.014	5.491
1-Dodecene	71	92.2	0.27	7.54	2.60	2.59	1.64	0.670	0.691
1-Hexene	30	39.0	0.25	3.99	0.81	1.01	0.83	2.077	5.274
1-Nonene	13	16.9	0.23	0.58	0.37	0.38	0.11	0.365	-0.800
1-Octene	39	50.6	0.23	2.72	0.40	0.60	0.47	2.711	9.999
1-Pentene	45	58.4	0.22	12.10	1.70	2.03	2.05	3.107	12.999
1-Tridecene	13	16.9	0.26	1.20	0.38	0.50	0.32	1.761	2.021
1-Undecene	68	88.3	0.33	2.72	1.02	1.13	0.42	1.470	3.646
2,2,3-Trimethylpentane	64	83.1	0.22	5.15	0.72	1.12	0.91	1.881	4.988
2,2,4-Trimethylpentane	77	100.0	0.34	36.70	5.16	6.73	5.83	2.360	8.295
2,2-Dimethylbutane	77	100.0	0.55	79.55	14.84	18.48	14.07	1.977	4.860
2,3,4-Trimethylpentane	76	98.7	0.47	14.86	1.81	2.64	2.36	2.441	8.815
2,3-Dimethylbutane	77	100.0	0.52	13.19	2.11	2.81	2.36	2.172	5.671
2,3-Dimethylpentane	27	35.1	0.24	4.43	0.63	1.02	0.96	2.225	5.661
2,4-Dimethylpentane	68	88.3	0.26	6.12	0.80	1.29	1.10	1.925	4.753
2-Ethyl-1-butene	1	1.3	0.28	0.28	0.28	0.28	0.00	0.000	0.000
2-Methyl-1-butene	68	88.3	0.31	20.86	1.48	2.42	3.23	3.673	16.827
2-Methyl-1-pentene	44	57.1	0.30	4.16	1.05	1.33	0.89	1.594	2.816
2-Methyl-2-butene	71	92.2	0.32	29.77	1.30	2.94	4.46	4.056	20.208
2-Methylheptane	73	94.8	0.30	5.95	1.07	1.40	1.05	1.853	4.347
2-Methylhexane	73	94.8	0.30	19.67	2.17	3.19	3.21	2.468	8.834
2-Methylpentane	77	100.0	1.11	43.01	5.43	8.13	7.45	2.222	6.410
3-Methyl-1-butene	40	51.9	0.22	4.87	0.72	1.01	0.96	2.371	6.432
3-Methylheptane	65	84.4	0.28	5.34	0.84	1.21	0.96	1.845	4.496
3-Methylhexane	77	100.0	0.54	14.78	2.63	3.61	2.51	1.759	4.304
3-Methylpentane	77	100.0	0.76	29.51	3.55	5.62	5.43	2.120	5.431
4-Methyl-1-pentene	67	87.0	0.24	3.15	0.95	1.02	0.62	1.009	0.933

Table E-4

(Continued)

Compound	Cases	Freq (%)	ppbC					Skewness	Kurtosis
			Min	Max	Median	Avg	Std Dev		
α-Pinene	73	94.8	0.25	7.01	1.16	1.36	0.99	3.236	15.176
Acetylene	73	94.8	0.43	48.30	5.44	7.72	7.28	2.835	12.472
β-Pinene	66	85.7	0.32	5.89	0.87	0.99	0.68	5.955	42.229
Benzene	77	100.0	0.93	32.92	4.90	6.91	5.17	2.160	7.415
cis-2-Butene	46	59.7	0.21	8.81	0.90	1.53	1.79	2.314	5.755
cis-2-Hexene	30	39.0	0.27	1.65	0.56	0.62	0.34	1.781	3.175
cis-2-Pentene	58	75.3	0.21	13.27	0.90	1.61	2.17	3.484	15.029
Cyclohexane	68	88.3	0.29	5.87	0.78	1.09	0.98	3.046	11.120
Cyclopentane	66	85.7	0.24	5.92	0.90	1.25	1.14	2.290	6.150
Cyclopentene	36	46.8	0.29	3.62	0.59	0.82	0.66	2.693	8.820
Ethane	77	100.0	4.42	109.15	15.87	19.90	16.51	3.672	16.888
Ethylbenzene	77	100.0	0.44	16.23	2.45	3.46	2.81	1.927	4.893
Ethylene	71	92.2	0.36	55.03	8.31	10.81	8.61	2.423	9.135
Isobutane	77	100.0	1.50	44.84	4.82	7.16	7.25	3.043	11.095
Isobutene	1	1.3	1.10	1.10	1.10	1.10	0.00	0.000	0.000
Isopentane	77	100.0	3.99	190.52	17.41	29.33	33.77	2.834	9.421
Isoprene	54	70.1	0.24	9.54	1.00	1.29	1.34	4.628	27.299
Isopropylbenzene	52	67.5	0.20	1.45	0.45	0.50	0.24	1.990	5.231
m-Ethyltoluene	77	100.0	0.44	14.39	2.31	3.43	2.53	1.734	3.764
m-/*p*-Xylene	77	100.0	1.47	57.85	8.10	11.70	9.88	2.030	5.573
Methylcyclohexane	74	96.1	0.44	6.53	1.19	1.65	1.19	1.982	4.691
Methylcyclopentane	76	98.7	0.42	14.09	1.93	2.85	2.41	1.925	5.398
n-Butane	77	100.0	2.53	329.43	11.30	24.59	47.05	4.924	27.103
n-Decane	72	93.5	0.30	5.33	1.04	1.30	0.95	2.020	5.167
n-Dodecane	67	87.0	0.24	23.80	0.67	1.13	2.84	7.903	63.823
n-Heptane	77	100.0	0.41	8.33	1.78	2.44	1.82	1.220	0.746
n-Hexane	77	100.0	0.82	28.01	3.81	5.57	4.52	2.179	7.187
n-Nonane	66	85.7	0.25	2.81	0.65	0.85	0.56	1.440	2.335
n-Octane	63	81.8	0.25	8.72	0.78	1.20	1.25	3.915	21.065
n-Pentane	77	100.0	1.65	68.92	8.26	12.92	13.70	2.623	7.760
n-Propylbenzene	68	88.3	0.27	4.90	0.75	1.07	0.84	1.976	5.408
n-Tridecane	10	13.0	0.23	1.39	0.35	0.52	0.40	1.642	1.705

Table E-4

(Continued)

Compound	Cases	Freq (%)	ppbC					Skewness	Kurtosis
			Min	Max	Median	Avg	Std Dev		
n-Undecane	71	92.2	0.34	26.07	1.09	1.66	3.04	7.627	61.764
o-Ethyltoluene	76	98.7	0.35	7.37	1.37	1.87	1.34	1.721	3.247
o-Xylene	76	98.7	0.47	21.07	2.81	4.21	3.61	2.020	5.575
p-Diethylbenzene	58	75.3	0.25	2.78	0.92	0.98	0.55	0.866	0.821
p-Ethyltoluene	59	76.6	0.25	4.97	0.79	1.15	0.92	1.773	4.031
Propane	77	100.0	3.78	111.67	15.02	18.86	16.28	3.467	16.255
Propylene	77	100.0	0.58	22.49	3.25	4.55	3.59	2.217	7.366
Propyne	15	19.5	0.30	1.15	0.64	0.64	0.25	0.399	-0.453
Styrene	60	77.9	0.23	4.16	0.66	0.86	0.67	2.513	9.265
trans-2-Butene	53	68.8	0.22	9.77	1.15	1.83	2.00	2.179	4.944
trans-2-Hexene	39	50.6	0.24	2.81	0.66	0.82	0.62	1.841	3.766
trans-2-Pentene	71	92.2	0.29	25.53	1.64	2.77	3.78	3.866	19.346
Toluene	77	100.0	2.32	95.78	13.51	20.23	16.67	1.958	4.909

Table E-5

Speciated NMOC Base Statistics for EPTX

Compound	Cases	Freq (%)	ppbC					Skewness	Kurtosis
			Min	Max	Median	Avg	Std Dev		
1,2,3-Trimethylbenzene	78	98.7	0.28	18.57	3.69	4.30	2.38	3.141	16.333
1,2,4-Trimethylbenzene	76	96.2	0.29	6.94	1.45	1.76	1.23	1.913	4.811
1,3,5-Trimethylbenzene	79	100.0	0.69	11.22	2.32	2.66	1.52	2.743	12.444
1,3-Butadiene	68	86.1	0.26	5.79	1.19	1.36	0.87	2.476	9.694
1-Butene	78	98.7	1.38	16.07	4.30	4.61	2.54	1.785	5.034
1-Decene	79	100.0	1.96	28.92	6.34	7.59	4.08	2.489	9.570
1-Dodecene	77	97.5	0.28	4.51	0.97	1.15	0.84	1.846	4.389
1-Hexene	48	60.8	0.28	4.65	0.90	1.07	0.75	2.640	10.499
1-Nonene	58	73.4	0.25	1.72	0.57	0.72	0.41	1.117	0.349
1-Octene	51	64.6	0.26	3.46	0.61	0.75	0.57	2.816	10.043
1-Pentene	60	75.9	0.30	33.55	1.35	2.66	4.60	5.477	35.355
1-Tridecene	20	25.3	0.23	0.70	0.33	0.37	0.13	1.344	1.148
1-Undecene	78	98.7	0.22	9.25	2.28	2.73	2.00	1.231	1.502
2,2,3-Trimethylpentane	73	92.4	0.30	4.37	0.97	1.16	0.74	1.859	4.578
2,2,4-Trimethylpentane	79	100.0	1.68	32.35	6.50	7.87	5.15	2.057	6.230
2,2-Dimethylbutane	79	100.0	0.78	26.57	9.98	9.98	5.91	0.485	-0.430
2,3,4-Trimethylpentane	79	100.0	0.53	11.55	2.16	2.63	1.90	2.217	6.642
2,3-Dimethylbutane	77	97.5	1.03	204.15	2.69	5.68	23.00	8.680	75.866
2,3-Dimethylpentane	79	100.0	0.69	15.88	2.71	3.51	2.60	2.227	6.825
2,4-Dimethylpentane	78	98.7	0.56	54.05	2.30	3.53	6.18	7.355	59.901
2-Ethyl-1-butene	0	0.0	0.00	0.00	0.00	0.00	0.00	0.000	0.000
2-Methyl-1-butene	74	93.7	0.34	9.14	1.77	2.10	1.54	2.057	5.779
2-Methyl-1-pentene	51	64.6	0.26	3.21	0.91	1.21	0.80	1.177	0.516
2-Methyl-2-butene	76	96.2	0.44	13.20	2.49	2.97	2.18	2.093	6.151
2-Methylheptane	79	100.0	0.39	7.82	1.70	1.95	1.18	2.157	7.393
2-Methylhexane	78	98.7	0.52	8.82	1.78	2.21	1.47	1.960	5.074
2-Methylpentane	78	98.7	2.40	1557.17	8.00	29.76	175.33	8.810	77.737
3-Methyl-1-butene	61	77.2	0.24	2.18	0.51	0.64	0.37	1.865	4.114
3-Methylheptane	77	97.5	0.39	6.90	1.39	1.65	1.06	2.265	7.912
3-Methylhexane	79	100.0	1.78	16.38	4.00	4.71	2.44	2.039	6.362
3-Methylpentane	79	100.0	1.44	2393.21	5.18	36.90	268.55	8.883	78.941
4-Methyl-1-pentene	69	87.3	0.26	2.46	0.63	0.75	0.39	1.911	4.987

Table E-5

(Continued)

Compound	Cases	Freq (%)	ppbC					Skewness	Kurtosis
			Min	Max	Median	Avg	Std Dev		
α-Pinene	79	100.0	0.39	7.85	2.30	2.45	1.25	1.414	3.613
Acetylene	79	100.0	2.79	51.82	12.08	14.11	8.81	1.855	4.704
β-Pinene	77	97.5	0.52	3.12	1.37	1.48	0.55	0.712	0.306
Benzene	79	100.0	4.27	52.77	13.50	14.84	8.30	1.851	5.350
cis-2-Butene	71	89.9	0.31	5.00	0.96	1.21	0.87	2.147	5.495
cis-2-Hexene	49	62.0	0.27	1.79	0.50	0.57	0.29	2.077	5.747
cis-2-Pentene	73	92.4	0.27	5.54	1.09	1.35	0.99	1.740	3.751
Cyclohexane	78	98.7	0.66	48.92	2.26	3.42	5.65	7.047	56.093
Cyclopentane	73	92.4	0.37	34.15	1.39	2.23	4.07	6.972	54.138
Cyclopentene	55	69.6	0.23	4.31	0.52	0.72	0.62	4.019	20.559
Ethane	79	100.0	6.06	99.93	14.39	19.25	16.41	3.107	11.257
Ethylbenzene	79	100.0	1.75	24.75	5.18	6.34	3.72	2.297	7.857
Ethylene	79	100.0	4.98	75.09	18.13	19.97	11.55	2.146	7.097
Isobutane	79	100.0	1.67	988.86	4.97	18.93	110.65	8.858	78.636
Isobutene	1	1.3	4.31	4.31	4.31	4.31	0.00	0.000	0.000
Isopentane	79	100.0	3.27	2215.17	19.87	55.21	247.34	8.758	77.409
Isoprene	71	89.9	0.27	10.33	0.69	1.00	1.25	6.216	45.160
Isopropylbenzene	58	73.4	0.22	2.19	0.47	0.55	0.34	3.115	12.126
m-Ethyltoluene	79	100.0	1.12	16.74	3.50	4.28	2.45	2.321	8.366
m-/*p*-Xylene	79	100.0	4.30	71.93	15.00	17.97	11.10	2.206	7.360
Methylcyclohexane	77	97.5	0.61	9.18	1.88	2.28	1.48	2.150	6.538
Methylcyclopentane	78	98.7	1.26	814.70	4.70	15.94	91.70	8.806	77.696
n-Butane	78	98.7	3.55	127.55	13.73	19.65	19.09	3.107	13.290
n-Decane	78	98.7	0.38	22.35	2.93	3.68	3.02	3.302	18.188
n-Dodecane	76	96.2	0.34	10.67	0.92	1.32	1.68	4.508	21.583
n-Heptane	79	100.0	0.98	15.28	2.94	3.53	2.25	2.379	8.897
n-Hexane	78	98.7	2.34	3370.75	7.54	52.45	380.66	8.827	77.947
n-Nonane	79	100.0	0.55	12.39	1.84	2.03	1.50	4.457	28.703
n-Octane	78	98.7	0.40	6.43	1.12	1.40	0.90	3.002	12.999
n-Pentane	78	98.7	3.98	467.02	13.66	24.49	53.65	7.546	61.972
n-Propylbenzene	73	92.4	0.27	4.36	1.12	1.38	0.83	1.523	2.680
n-Tridecane	9	11.4	0.27	1.00	0.59	0.55	0.24	0.500	0.109

Table E-5

(Continued)

Compound	Cases	Freq (%)	ppbC					Skewness	Kurtosis
			Min	Max	Median	Avg	Std Dev		
n-Undecane	78	98.7	0.49	18.99	2.02	2.68	2.61	4.550	24.646
o-Ethyltoluene	79	100.0	0.70	10.49	2.30	2.62	1.35	2.854	14.145
o-Xylene	78	98.7	1.52	24.98	5.24	6.26	3.83	2.223	7.506
p-Diethylbenzene	77	97.5	0.37	3.27	0.98	1.20	0.65	1.240	0.935
p-Ethyltoluene	78	98.7	0.37	7.46	1.50	1.73	0.98	2.969	14.672
Propane	79	100.0	5.97	377.44	21.01	39.93	51.90	4.064	22.698
Propylene	79	100.0	2.43	31.71	7.26	8.44	4.80	2.183	7.259
Propyne	15	19.0	0.32	0.86	0.49	0.55	0.13	0.886	1.176
Styrene	78	98.7	0.30	4.43	1.18	1.34	0.70	2.119	6.481
trans-2-Butene	73	92.4	0.28	6.56	1.46	1.75	1.20	1.705	3.452
trans-2-Hexene	67	84.8	0.24	2.71	0.65	0.77	0.46	1.806	4.317
trans-2-Pentene	77	97.5	0.64	14.79	1.97	2.51	2.06	3.445	16.710
Toluene	79	100.0	8.14	130.37	26.80	32.58	21.16	2.213	6.498

APPENDIX F

Duplicate Sample Results for the NMOC Base Program by Site

Table F-1

Duplicate Sample Results for the NMOC Program by Site

Collection Date	Radian ID#	Inj. 1 NMOC (ppmC)	Inj. 2 NMOC (ppmC)	Average NMOC (ppmC)	Overall Canister NMOC* (ppmC)	Duplicates		
						Diff (ppmC)	% Diff	Abs % Diff
LINY								
07/06/94	1009	0.425	0.434	0.430	0.430	-0.021	-5.118	5.118
07/06/94	1010	0.416	0.400	0.408	0.408			
07/15/94	1047	0.234	0.194	0.214	0.214	-0.049	-26.026	26.026
07/15/94	1048	0.190	0.139	0.165	0.165			
07/27/94	1116	0.399	0.421	0.410	0.410	0.025	5.895	5.895
07/27/94	1117	0.433	0.436	0.435	0.435			
08/08/94	1182	0.631	0.667	0.649	0.649	0.038	5.710	5.710
08/08/94	1183I	0.655	0.658	0.656	0.687			
08/08/94	1183R	0.698	0.736	0.717				
08/18/94	1274	0.107	0.082	0.094	0.094	-0.012	-13.358	13.358
08/18/94	1275I	0.093	0.070	0.081	0.083			
08/18/94	1275R	0.070	0.097	0.084				
08/23/94	1288	0.179	0.159	0.169	0.169	-0.014	-8.729	8.729
08/23/94	1289	0.161	0.148	0.155	0.155			
09/02/94	1382	0.214	0.183	0.199	0.199	-0.013	-6.792	6.792
09/02/94	1383	0.187	0.185	0.186	0.186			
09/15/94	1431	0.168	0.169	0.169	0.169	-0.007	-4.191	4.191
09/15/94	1432I	0.151	0.164	0.157	0.162			
09/15/94	1432R	0.166	0.166	0.166				
09/28/94	1528I	1.196	1.192	1.194	1.200	-0.037	-3.142	3.142
09/28/94	1528R	1.182	1.229	1.206				
09/28/94	1529	1.156	1.169	1.163	1.163			
10/10/94	1589	0.156	0.178	0.167	0.167	-0.002	-1.021	1.021
10/10/94	1590I	0.175	0.163	0.169	0.165			

Table F-1

(Continued)

Collection Date	Radian ID#	Inj. 1 NMOC (ppmC)	Inj. 2 NMOC (ppmC)	Average NMOC (ppmC)	Overall Canister NMOC* (ppmC)	Duplicates		
						Diff (ppmC)	% Diff	Abs % Diff
10/10/94	1590R	0.156	0.167	0.162				
10/27/94	1691	0.314	0.323	0.318	0.318	-0.001	-0.403	0.403
10/27/94	1692I	0.291	0.300	0.296	0.317			
10/27/94	1692R	0.327	0.350	0.339				
NWNJ								
07/15/94	1054	0.240	0.280	0.260	0.260	0.006	2.246	2.246
07/15/94	1055I	0.277	0.284	0.280	0.266			
07/15/94	1055R	0.251		0.251				
07/27/94	1119I	0.345	0.376	0.361	0.375	0.020	5.144	5.144
07/27/94	1119R	0.399	0.380	0.390				
07/27/94	1120	0.392	0.398	0.395	0.395			
08/08/94	1200	0.564	0.590	0.577	0.577	0.185	27.686	27.686
08/08/94	1201	0.752	0.772	0.762	0.762			
08/18/94	1267	0.368	0.353	0.361	0.361	0.080	19.973	19.973
08/18/94	1268	0.425	0.456	0.441	0.441			
08/23/94	1311I	0.243	0.247	0.245	0.250	0.012	4.555	4.555
08/23/94	1311R	0.265	0.247	0.256				
08/23/94	1312	0.272	0.253	0.262	0.262			
09/02/94	1375	0.378	0.390	0.384	0.384	-0.105	-31.606	31.606
09/02/94	1376I	0.270	0.254	0.262	0.279			
09/02/94	1376R	0.305	0.288	0.297				
09/15/94	1447	0.314	0.343	0.328	0.328	-0.004	-1.141	1.141
09/15/94	1448	0.322	0.327	0.324	0.324			
09/28/94	1521	0.956	0.968	0.962	0.962	-0.052	-5.601	5.601
09/28/94	1522	0.921	0.899	0.910	0.910			

Table F-1

(Continued)

Collection Date	Radian ID#	Inj. 1 NMOC (ppmC)	Inj. 2 NMOC (ppmC)	Average NMOC (ppmC)	Overall Canister NMOC* (ppmC)	Duplicates		
						Diff (ppmC)	% Diff	Abs % Diff
10/11/94	1600I	0.436	0.393	0.414	0.403	0.402	-0.294	0.294
10/11/94	1600R	0.396	0.388	0.392				
10/11/94	1601	0.410	0.394	0.402	0.402			
PLNJ								
07/15/94	1040	0.133	0.138	0.136	0.136	0.014	9.525	9.525
07/15/94	1041	0.148	0.150	0.149	0.149			
07/27/94	1123	0.388	0.390	0.389	0.389	0.154	32.999	32.999
07/27/94	1124	0.550	0.535	0.543	0.543			
08/08/94	1198I	0.623	0.630	0.626	0.600	0.038	6.164	6.164
08/08/94	1198R	0.574		0.574				
08/08/94	1199	0.624	0.653	0.638	0.638			
08/18/94	1269	0.210	0.174	0.192	0.192	-0.026	-14.240	14.240
08/18/94	1270	0.158	0.175	0.166	0.166			
08/23/94	1292	0.131	0.136	0.134	0.134	0.011	8.162	8.162
08/23/94	1293I	0.151	0.160	0.155	0.145			
08/23/94	1293R	0.128	0.141	0.134				
09/02/94	1377	0.208	0.168	0.188	0.188	-0.021	-11.696	11.696
09/02/94	1378	0.156	0.179	0.167	0.167			
09/15/94	1440	0.245	0.214	0.230	0.230	0.021	8.762	8.762
09/15/94	1441	0.253	0.249	0.251	0.251			
09/28/94	1525	0.722	0.698	0.710	0.710	0.007	0.911	0.911
09/28/94	1526	0.744	0.690	0.717	0.717			
10/11/94	1604	0.822	0.788	0.805	0.805	0.017	2.079	2.079
10/11/94	1605	0.820	0.824	0.822	0.822			

Table F-1

(Continued)

Collection Date	Radian ID#	Inj. 1 NMOC (ppmC)	Inj. 2 NMOC (ppmC)	Average NMOC (ppmC)	Overall Canister NMOC* (ppmC)	Duplicates		
						Diff (ppmC)	% Diff	Abs % Diff
				Count	58	29	29	29
				Average	0.394	0.023	0.223	9.420
				Standard Deviation	0.268	0.092	13.435	9.416
				Minimum	0.083	-0.105	-31.606	0.294
				Maximum	1.200	0.402	32.999	32.999

* The average of all injections for a sample, including duplicates and replicates.

I = Initial Analysis.
R = Replicate Analysis.

APPENDIX G

Replicate Analysis Results for the NMOC Base Program by Site

Table G-1

Replicate Analysis Results for the NMOC Base Program by Site

Collection Date	Radian ID #	Inj. 1 NMOC (ppmC)	Inj. 2 NMOC (ppmC)	Average NMOC (ppmC)	Overall Canister NMOC* (ppmC)	Replicates		
						Diff (ppmC)	% Diff	Abs % Diff
LINY								
07/20/94	1074I	0.359	0.364	0.361	0.354	-0.016	-4.464	4.464
07/20/94	1074R	0.345	0.347	0.346				
07/29/94	1131I	0.250	0.273	0.262	0.260	-0.003	-1.235	1.235
07/29/94	1131R	0.248	0.269	0.258				
08/04/94	1173I	0.413	0.403	0.408	0.412	0.009	2.127	2.127
08/04/94	1173R	0.422	0.412	0.417				
08/08/94	1183I	0.655	0.658	0.656	0.687	0.061	8.887	8.887
08/08/94	1183R	0.698	0.736	0.717				
08/18/94	1275I	0.093	0.070	0.081	0.083	0.002	2.612	2.612
08/18/94	1275R	0.070	0.097	0.084				
09/13/94	1415I	0.316	0.313	0.315	0.341	0.053	15.602	15.602
09/13/94	1415R	0.360	0.376	0.368				
09/15/94	1432I	0.151	0.164	0.157	0.162	0.009	5.525	5.525
09/15/94	1432R	0.166	0.166	0.166				
09/28/94	1528I	1.196	1.192	1.194	1.200	0.012	0.997	0.997
09/28/94	1528R	1.182	1.229	1.206				
10/05/94	1573I	0.313	0.307	0.310	0.316	0.013	3.987	3.987
10/05/94	1573R	0.309	0.336	0.322				
10/10/94	1590I	0.175	0.163	0.169	0.165	-0.008	-4.547	4.547
10/10/94	1590R	0.156	0.167	0.162				
10/27/94	1692I	0.291	0.300	0.296	0.317	0.043	13.494	13.494
10/27/94	1692R	0.327	0.350	0.339				

Table G-1

(Continued)

Collection Date	Radian ID #	Inj. 1 NMOC (ppmC)	Inj. 2 NMOC (ppmC)	Average NMOC (ppmC)	Overall Canister NMOC* (ppmC)	Replicates		
						Diff (ppmC)	% Diff	Abs % Diff
NWNJ								
07/15/94	1055I	0.277	0.284	0.280	0.266	-0.029	-11.063	11.063
07/15/94	1055R	0.251		0.251				
07/27/94	1119I	0.345	0.376	0.361	0.375	0.029	7.794	7.794
07/27/94	1119R	0.399	0.380	0.390				
08/12/94	1241I	0.407	0.400	0.403	0.375	-0.057	-15.220	15.220
08/12/94	1241R	0.348	0.344	0.346				
08/23/94	1311I	0.243	0.247	0.245	0.250	0.011	4.484	4.484
08/23/94	1311R	0.265	0.247	0.256				
09/02/94	1376I	0.270	0.254	0.262	0.279	0.034	12.334	12.334
09/02/94	1376R	0.305	0.288	0.297				
10/11/94	1600I	0.436	0.393	0.414	0.403	-0.022	-5.410	5.410
10/11/94	1600R	0.396	0.388	0.392				
10/18/94	1646I	0.960	0.956	0.958	0.980	0.042	4.317	4.317
10/18/94	1646R	1.018	0.983	1.001				
PLNJ								
08/08/94	1198I	0.623	0.630	0.626	0.600	-0.052	-8.691	8.691
08/08/94	1198R	0.574		0.574				
08/11/94	1219I	0.610	0.577	0.593	0.583	-0.020	-3.362	3.362
08/11/94	1219R	0.583	0.564	0.574				
08/23/94	1293I	0.151	0.160	0.155	0.145	-0.021	-14.497	14.497
08/23/94	1293R	0.128	0.141	0.134				
09/08/94	1390I	0.495	0.488	0.491	0.449	-0.085	-18.840	18.840
09/08/94	1390R	0.422	0.392	0.407				
09/16/94	1462I	0.302	0.317	0.310	0.298	-0.023	-7.616	7.616

Table G-1

(Continued)

Collection Date	Radian ID #	Inj. 1 NMOC (ppmC)	Inj. 2 NMOC (ppmC)	Average NMOC (ppmC)	Overall Canister NMOC* (ppmC)	Replicates		
						Diff (ppmC)	% Diff	Abs % Diff
09/16/94	1462R	0.306	0.268	0.287				
09/26/94	1492I	0.505	0.530	0.518	0.503	-0.028	-5.635	5.635
09/26/94	1492R	0.501	0.477	0.489				
10/03/94	1562I	0.271	0.287	0.279	0.286	0.014	4.946	4.946
10/03/94	1562R	0.308	0.278	0.293				
10/20/94	1652I	0.722	0.699	0.711	0.706	-0.009	-1.325	1.325
10/20/94	1652R	0.710	0.692	0.701				
				Count	26	26	26	26
				Average	0.415	-0.002	-0.569	7.270
				Standard Deviation	0.255	0.035	8.944	5.037
				Min	0.083	-0.085	-18.840	0.997
				Max	1.200	0.061	15.602	18.840

* The average of the replicate analyses from a single canister.

I = Initial Analysis.
R = Replicate Analysis.

APPENDIX H

Duplicate Sample Results for the Carbonyl Option Sites to the NMOC Base Program

Table H-1

Plainfield, NJ (PLNJ) Duplicate Sample Results for the Carbonyl Option to the NMOC Base Program

Sample ID	9-13-94 03206	9-13-94 03206	9-13-94 DUP	9-13-94 DUP	Average (ppbv)	Standard Deviation (ppbv)	Relative Standard Deviation (%)
	1ST INJECTION	2ND INJECTION	1ST INJECTION	2ND INJECTION			
Data File ID	J4KV006	J4KV007	J4KV008	J4KV009			
Sample Volume (L)	146.35	146.35	128.45	128.45			
Date Analyzed	11-21/22-94	11-21/22-94	11-21/22-94	11-21/22-94			
	ppbv	ppbv	ppbv	ppbv			
Formaldehyde	3.27	3.36	3.27	3.26	3.29	0.05	1.43
Acetaldehyde	2.90	2.86	2.80	2.81	2.84	0.05	1.63
Acrolein	ND[a]	ND	ND	ND	NA[b]	NA	NA
Acetone	5.00	5.04	4.90	4.80	4.94	0.11	2.18
Propionaldehyde	0.61	0.61	0.39	0.37	0.50	0.13	26.88
Crotonaldehyde	0.43	0.43	0.50	0.50	0.47	0.04	8.69
Butyr/Isobutyraldehyde	0.36	0.39	0.29	0.29	0.33	0.05	15.21
Benzaldehyde	ND	ND	ND	ND	NA	NA	NA
Isovaleraldehyde	ND	ND	ND	ND	NA	NA	NA
Valeraldehyde	ND	ND	ND	ND	NA	NA	NA
Tolualdehydes	ND	ND	ND	ND	NA	NA	NA
Hexanaldehyde	ND	ND	ND	ND	NA	NA	NA
2,5-Dimethylbenzaldehyde	ND	ND	ND	ND	NA	NA	NA
					Average	0.07	9.34

[a] ND = Not Detected.
[b] NA = Not Applicable.

Table H-2

Newark, NJ (NWNJ) Duplicate Sample Results for the Carbonyl Option to the NMOC Base Program

Sample ID	9-23-94	9-23-94	9-23-94 DUP	9-23-94 DUP	Average (ppbv)	Standard Deviation (ppbv)	Relative Standard Deviation (%)
	1ST INJECTION	2ND INJECTION	1ST INJECTION	2ND INJECTION			
Data File ID	J5CI008	J5CI009	J5CI010	J5CI011			
Sample Volume (L)	140.38	140.38	136.4	136.4			
Date Analyzed	3/9/95	3-9-95	3-9-95	3-9-95			
	ppbv	ppbv	ppbv	ppbv			
Formaldehyde	2.07	2.06	2.11	2.26	2.13	0.09	4.36
Acetaldehyde	3.56	3.6	3.79	3.98	3.73	0.19	5.17
Acrolein	0.18	0.17	0.16	0.16	0.17	0.01	5.72
Acetone	3.95	3.84	4.52	4.52	4.21	0.36	8.64
Propionaldehyde	0.36	0.35	0.46	0.55	0.43	0.09	21.90
Crotonaldehyde	ND[a]	ND	ND	ND	NA[b]	NA	NA
Butyr/Isobutyraldehyde	0.33	0.5	0.71	0.26	0.45	0.20	44.56
Benzaldehyde	ND	ND	ND	ND	NA	NA	NA
Isovaleraldehyde	ND	ND	ND	ND	NA	NA	NA
Valeraldehyde	ND	ND	0.23	ND	0.23	NA	NA
Tolualdehydes	1.18	0.97	0.72	0.97	0.96	0.19	19.60
Hexanaldehyde	0.08	0.08	0.16	0.10	0.11	0.04	36.36
2,5-Dimethylbenzaldehyde	ND	ND	ND	ND	NA	NA	NA
					Average	0.15	18.29

Table H-2

(Continued)

Sample ID	9-30-94	9-30-94	9-30-94 DUP	9-30-94 DUP	Average (ppbv)	Standard Deviation (ppbv)	Relative Standard Deviation (%)
	1ST INJECTION	2ND INJECTION	1ST INJECTION	2ND INJECTION			
Data File ID	J5CI018	J5CI019	J5CI020	J5CI021			
Sample Volume (L)	142.37	142.37	136.4	136.4			
Date Analyzed	3/9/95	3-9-95	3-9-95	3-9-95			
	ppbv	ppbv	ppbv	ppbv			
Formaldehyde	2.70	2.72	2.75	2.78	2.74	0.04	1.28
Acetaldehyde	1.29	1.29	0.90	1.03	1.13	0.20	17.29
Acrolein	ND	ND	ND	ND	NA	NA	NA
Acetone	4.07	3.88	3.58	3.69	3.81	0.22	5.67
Propionaldehyde	0.38	0.21	0.29	0.31	0.30	0.07	23.51
Crotonaldehyde	ND	ND	ND	ND	NA	NA	NA
Butyr/Isobutyraldehyde	0.42	0.43	0.33	0.30	0.37	0.06	17.52
Benzaldehyde	ND	ND	ND	ND	NA	NA	NA
Isovaleraldehyde	ND	ND	ND	ND	NA	NA	NA
Valeraldehyde	ND	ND	ND	ND	NA	NA	NA
Tolualdehydes	0.50	0.52	0.49	0.48	0.50	0.02	3.43
Hexanaldehyde	ND	ND	ND	ND	NA	NA	NA
2,5-Dimethylbenzaldehyde	ND	ND	ND	ND	NA	NA	NA
					Average	0.10	11.45
					Overall	0.13	15.36

[a] ND = Not Detected.
[b] NA = Not Applicable.

APPENDIX I

Replicate Analysis Results for the Carbonyl Option Sites to the NMOC Base Program

Table I-1

Plainfield, NJ (PLNJ) Replicate Analytical Results for the Carbonyl Option to the NMOC Base Program

Sample ID	9-13-94 03206	9-13-94 DUP	Average (ppbv)	Absolute Percent Difference (%)	Standard Deviation (ppbv)	Relative Standard Deviation (%)
	1ST INJECTION	1ST INJECTION				
Data File ID	J4KV006	J4KV008				
Sample Volume (L)	146.35	128.45				
Date Analyzed	11-21/22-94	11-21/22-94				
	ppbv	ppbv				
Formaldehyde	3.27	3.27	3.27	0.00	0.00	0.00
Acetaldehyde	2.90	2.80	2.85	3.51	0.07	2.46
Acrolein	ND[a]	ND	NA[b]	NA	NA	NA
Acetone	5.00	4.90	4.95	2.02	0.07	1.41
Propionaldehyde	0.61	0.39	0.50	44.00	0.16	32.00
Crotonaldehyde	0.43	0.50	0.47	14.89	0.05	10.64
Butyr/Isobutyraldehyde	0.36	0.29	0.33	21.21	0.05	15.15
Benzaldehyde	ND	ND	NA	NA	NA	NA
Isovaleraldehyde	ND	ND	NA	NA	NA	NA
Valeraldehyde	ND	ND	NA	NA	NA	NA
Tolualdehydes	ND	ND	NA	NA	NA	NA
Hexanaldehyde	ND	ND	NA	NA	NA	NA
2,5-Dimethylbenzaldehyde	ND	ND	NA	NA	NA	NA
			Average	14.27	0.07	10.28

Table I-1

(Continued)

Sample ID	9-13-94 03206	9-13-94 DUP	Average (ppbv)	Absolute Percent Difference (%)	Standard Deviation (ppbv)	Relative Standard Deviation (%)
	2ND INJECTION	2ND INJECTION				
Data File ID	J4KV007	J4KV009				
Sample Volume (L)	146.35	128.45				
Date Analyzed	11-21/22-94	11-21/22-94				
	ppbv	ppbv				
Formaldehyde	3.36	3.26	3.31	3.02	0.07	2.11
Acetaldehyde	2.86	2.81	2.84	1.76	0.04	1.41
Acrolein	ND	ND	NA	NA	NA	NA
Acetone	5.04	4.80	4.92	4.88	0.17	3.46
Propionaldehyde	0.61	0.37	0.49	48.98	0.17	34.69
Crotonaldehyde	0.43	0.50	0.47	14.89	0.05	10.64
Butyr/Isobutyraldehyde	0.39	0.29	0.34	25.64	0.07	20.59
Benzaldehyde	ND	ND	NA	NA	NA	NA
Isovaleraldehyde	ND	ND	NA	NA	NA	NA
Valeraldehyde	ND	ND	NA	NA	NA	NA
Tolualdehydes	ND	ND	NA	NA	NA	NA
Hexanaldehyde	ND	ND	NA	NA	NA	NA
2,5-Dimethylbenzaldehyde	ND	ND	NA	NA	NA	NA
			Average	16.53	0.10	12.15
			Overall	15.40	0.08	11.21

[a] ND = Not Detected.
[b] NA = Not Applicable

Table I-2

Newark, NJ (NWNJ) Replicate Analytical Results for the Carbonyl Option to the NMOC Base Program

Sample ID	9-23-94	9-23-94 DUP	Average (ppbv)	Absolute Percent Difference (%)	Standard Deviation (ppbv)	Relative Standard Deviation (%)
	1ST INJECTION	1ST INJECTION				
Data File ID	J5CI008	J5CI010				
Sample Volume (L)	140.38	136.40				
Date Analyzed	3-9-95	3-9-95				
	ppbv	ppbv				
Formaldehyde	2.07	2.11	2.09	1.91	0.03	1.35
Acetaldehyde	3.56	3.79	3.675	6.26	0.16	4.43
Acrolein	0.18	0.16	0.17	11.76	0.01	8.32
Acetone	3.95	4.52	4.235	13.46	0.40	9.52
Propionaldehyde	0.36	0.46	0.41	24.39	0.07	17.25
Crotonaldehyde	ND	ND	NA	NA	NA	NA
Butyr/Isobutyraldehyde	0.33	0.71	0.52	73.08	0.27	51.67
Benzaldehyde	ND	ND	NA	NA	NA	NA
Isovaleraldehyde	ND	ND	NA	NA	NA	NA
Valeraldehyde	ND	0.23	0.23	NA	NA	NA
Tolualdehydes	1.18	0.72	0.95	48.42	0.33	34.24
Hexanaldehyde	0.08	0.16	0.12	66.67	0.06	47.14
2,5-Dimethylbenzaldehyde	ND	ND	NA	NA	NA	NA
			Average	30.74	0.17	21.74

Table I-2

(Continued)

Sample ID	9-23-94	9-23-94 DUP	Average (ppbv)	Absolute Percent Difference (%)	Standard Deviation (ppbv)	Relative Standard Deviation (%)
	2ND INJECTION	2ND INJECTION				
Data File ID	J5CI009	J5CI011				
Sample Volume (L)	140.38	136.4				
Date Analyzed	3-9-95	3-9-95				
	ppbv	ppbv				
Formaldehyde	2.06	2.26	2.16	9.26	0.14	6.55
Acetaldehyde	3.6	3.98	3.79	10.03	0.27	7.09
Acrolein	0.17	0.16	0.165	6.06	0.01	4.29
Acetone	3.84	4.52	4.18	16.27	0.48	11.50
Propionaldehyde	0.35	0.55	0.45	44.44	0.14	31.43
Crotonaldehyde	ND	ND	NA	NA	NA	NA
Butyr/Isobutyraldehyde	0.5	0.26	0.38	63.16	0.17	44.66
Benzaldehyde	ND	ND	NA	NA	NA	NA
Isovaleraldehyde	ND	ND	NA	NA	NA	NA
Valeraldehyde	ND	ND	NA	NA	NA	NA
Tolualdehydes	0.97	0.97	0.97	0.00	0.00	0.00
Hexanaldehyde	0.08	0.1	0.09	22.22	0.01	15.71
2,5-Dimethylbenzaldehyde	ND	ND	NA	NA	NA	NA
			Average	21.43	0.15	15.15

Table I-2

(Continued)

Sample ID	9-30-94	9-30-94 DUP	Average (ppbv)	Absolute Percent Difference (%)	Standard Deviation (ppbv)	Relative Standard Deviation (%)
	1ST INJECTION	1ST INJECTION				
Data File ID	J5CI018	J5CI020				
Sample Volume (L)	142.37	136.4				
Date Analyzed	3-9-95	3-9-95				
	ppbv	ppbv				
Formaldehyde	2.70	2.75	2.73	1.83	0.04	1.30
Acetaldehyde	1.29	0.9	1.10	35.62	0.28	25.18
Acrolein	ND	ND	NA	NA	NA	NA
Acetone	4.07	3.58	3.83	12.81	0.35	9.06
Propionaldehyde	0.38	0.29	0.34	26.87	0.06	19.00
Crotonaldehyde	ND	ND	NA	NA	NA	NA
Butyr/Isobutyraldehyde	0.42	0.33	0.38	24.00	0.06	16.97
Benzaldehyde	ND	ND	NA	NA	NA	NA
Isovaleraldehyde	ND	ND	NA	NA	NA	NA
Valeraldehyde	ND	ND	NA	NA	NA	NA
Tolualdehydes	0.50	0.49	0.50	2.02	0.01	1.43
Hexanaldehyde	ND	ND	NA	NA	NA	NA
2,5-Dimethylbenzaldehyde	ND	ND	NA	NA	NA	NA
			Average	17.19	0.13	12.16

Table I-2

(Continued)

Sample ID	9-30-94	9-30-94 DUP	Average (ppbv)	Absolute Percent Difference (%)	Standard Deviation (ppbv)	Relative Standard Deviation (%)
	2ND INJECTION	2ND INJECTION				
Data File ID	J5CI019	J5CI021				
Sample Volume (L)	142.37	136.4				
Date Analyzed	3-9-95	3-9-95				
	ppbv	ppbv				
Formaldehyde	2.72	2.78	2.75	2.18	0.04	1.54
Acetaldehyde	1.29	1.03	1.16	22.41	0.18	15.85
Acrolein	ND	ND	NA	NA	NA	NA
Acetone	3.88	3.69	3.79	5.02	0.13	3.55
Propionaldehyde	0.21	0.31	0.26	38.46	0.07	27.20
Crotonaldehyde	ND	ND	NA	NA	NA	NA
Butyr/Isobutyraldehyde	0.43	0.3	0.37	35.62	0.09	25.18
Benzaldehyde	ND	ND	NA	NA	NA	NA
Isovaleraldehyde	ND	ND	NA	NA	NA	NA
Valeraldehyde	ND	ND	NA	NA	NA	NA
Tolualdehydes	0.52	0.48	0.50	8.00	0.03	5.66
Hexanaldehyde	ND	ND	NA	NA	NA	NA
2,5-Dimethylbenzaldehyde	ND	ND	NA	NA	NA	NA
			Average	18.62	0.09	13.16
			Overall	22.00	0.14	15.55

[a] ND = Not Detected.
[b] NA = Not Applicable.

APPENDIX J

Duplicate Sample Results for the Speciated NMOC Base Program

Table J-1

Duplicate Sample Results for the Speciated NMOC Base Program

Compound	Cases	Duplicate Pair Statistics			
		Concentration		Average Absolute % Difference	Pooled Standard Deviation
		Median	Average		
1,2,3-Trimethylbenzene	42	2.41	3.03	28.88	1.34
1,2,4-Trimethylbenzene	42	1.36	1.58	44.14	0.54
1,3,5-Trimethylbenzene	42	1.02	1.54	15.58	0.19
1,3-Butadiene	42	0.43	0.68	56.21	0.19
1-Butene	42	2.04	3.00	9.99	0.26
1-Decene	42	3.06	4.65	4.54	0.20
1-Dodecene	42	0.80	1.09	58.85	0.66
1-Hexene	42	0.25	0.62	77.03	0.27
1-Nonene	42	0.00	0.11	107.96	0.08
1-Octene	42	0.16	0.33	86.50	0.17
1-Pentene	42	0.88	1.50	86.07	0.93
1-Tridecene	42	0.00	0.10	125.50	0.13
1-Undecene	42	1.01	1.34	59.10	0.96
2,2,3-Trimethylpentane	42	0.47	0.65	13.14	0.05
2,2,4-Trimethylpentane	42	3.10	5.02	5.24	0.18
2,2-Dimethylbutane	42	3.73	5.13	8.06	0.23
2,3,4-Trimethylpentane	42	1.07	1.77	6.56	0.05
2,3-Dimethylbutane	42	1.47	2.35	21.81	0.31
2,3-Dimethylpentane	42	0.61	1.28	44.80	0.55
2,4-Dimethylpentane	42	0.88	1.47	22.72	0.13
2-Ethyl-1-butene	42	0.00	0.00	0.00	0.00
2-Methyl-1-butene	42	0.93	2.10	30.76	0.55
2-Methyl-1-pentene	42	0.55	0.74	89.83	0.48
2-Methyl-2-butene	42	1.11	2.58	15.42	0.15
2-Methylheptane	42	0.78	1.15	23.25	0.11
2-Methylhexane	42	1.03	1.79	27.85	0.61
2-Methylpentane	42	4.11	6.85	5.29	0.26
3-Methyl-1-butene	42	0.16	0.44	75.25	0.10
3-Methylheptane	42	0.57	0.88	21.93	0.15
3-Methylhexane	42	2.36	3.04	20.41	0.37
3-Methylpentane	42	2.46	4.47	16.43	0.31

Table J-1

(Continued)

Compound	Cases	Duplicate Pair Statistics			
		Concentration		Average Absolute % Difference	Pooled Standard Deviation
		Median	Average		
4-Methyl-1-pentene	42	0.50	0.58	56.34	0.14
α-Pinene	42	1.83	2.38	41.68	0.47
Acetylene	42	5.09	7.97	27.87	1.13
β-Pinene	42	0.95	0.99	45.60	0.46
Benzene	42	5.60	8.57	8.20	0.60
cis-2-Butene	42	0.40	0.82	32.77	0.17
cis-2-Hexene	42	0.00	0.23	56.06	0.06
cis-2-Pentene	42	0.48	1.09	15.24	0.06
Cyclohexane	42	0.61	1.90	40.18	0.51
Cyclopentane	42	0.48	0.91	28.07	0.11
Cyclopentene	42	0.00	0.32	82.31	0.15
Ethane	42	10.37	15.56	15.54	1.96
Ethylbenzene	42	2.16	3.56	7.56	0.28
Ethylene	42	8.54	12.05	20.75	2.64
Isobutane	42	3.48	6.14	6.90	0.56
Isobutene	42	0.00	0.00	0.00	0.00
Isopentane	42	12.69	25.10	3.87	1.05
Isoprene	42	0.93	1.63	16.20	0.23
Isopropylbenzene	42	0.00	0.17	77.16	0.08
m-Ethyltoluene	42	1.88	2.75	7.49	0.21
m-/*p*-Xylene	42	6.33	11.11	9.76	0.54
Methylcyclohexane	42	0.82	1.32	27.13	0.13
Methylcyclopentane	42	1.73	2.98	10.70	0.23
n-Butane	42	7.31	20.50	8.38	0.85
n-Decane	42	0.82	1.84	29.87	0.29
n-Dodecane	42	0.71	1.15	64.46	1.14
n-Heptane	42	1.37	2.21	20.15	0.29
n-Hexane	42	3.22	5.55	4.52	0.21
n-Nonane	42	0.61	1.11	28.62	0.24
n-Octane	42	0.67	0.95	36.25	0.29
n-Pentane	42	6.63	11.52	8.60	0.49

Table J-1

(Continued)

Compound	Cases	Duplicate Pair Statistics			
		Concentration		Average Absolute % Difference	Pooled Standard Deviation
		Median	Average		
n-Propylbenzene	42	0.55	0.75	23.77	0.11
n-Tridecane	42	0.00	0.04	182.63	0.20
n-Undecane	42	0.92	1.71	48.32	1.07
o-Ethyltoluene	42	1.21	1.65	14.06	0.15
o-Xylene	42	2.17	3.76	16.42	0.18
p-Diethylbenzene	42	0.44	0.60	39.79	0.23
p-Ethyltoluene	42	0.62	0.93	25.94	0.11
Propane	42	12.03	28.30	5.56	1.06
Propylene	42	3.56	4.98	8.42	0.34
Propyne	42	0.00	0.08	122.83	0.14
Styrene	42	0.63	0.80	25.38	0.27
trans-2-Butene	42	0.80	1.41	56.08	1.15
trans-2-Hexene	42	0.10	0.41	39.89	0.07
trans-2-Pentene	42	1.12	2.37	26.90	0.28
Toluene	42	11.88	18.76	4.21	0.90

APPENDIX K

Replicate Analysis Results for the Speciated NMOC Base Program

Table K-1

Replicate Analysis Results for the Speciated NMOC Base Program

Compound	Cases	Replicate Pair Statistics			
		Concentration		Average Absolute % Difference	Pooled Standard Deviation
		Median	Average		
1,2,3-Trimethylbenzene	39	2.43	2.82	20.25	0.46
1,2,4-Trimethylbenzene	39	1.45	1.45	27.11	0.33
1,3,5-Trimethylbenzene	39	0.85	1.43	13.09	0.14
1,3-Butadiene	39	0.42	0.67	52.42	0.29
1-Butene	39	1.96	3.20	7.13	0.27
1-Decene	39	2.68	4.45	5.87	0.23
1-Dodecene	39	0.84	1.11	49.57	0.53
1-Hexene	39	0.15	0.67	86.58	0.28
1-Nonene	39	0.00	0.10	126.25	0.14
1-Octene	39	0.15	0.30	76.37	0.23
1-Pentene	39	0.93	1.58	84.89	0.63
1-Tridecene	39	0.00	0.11	133.51	0.13
1-Undecene	39	1.02	1.24	63.59	0.88
2,2,3-Trimethylpentane	39	0.42	0.67	21.64	0.08
2,2,4-Trimethylpentane	39	2.81	5.12	4.35	0.19
2,2-Dimethylbutane	39	4.40	5.17	5.76	0.16
2,3,4-Trimethylpentane	39	0.94	1.82	10.69	0.08
2,3-Dimethylbutane	39	1.34	2.54	35.33	0.36
2,3-Dimethylpentane	39	0.37	1.08	71.70	0.90
2,4-Dimethylpentane	39	0.73	1.44	15.87	0.21
2-Ethyl-1-butene	39	0.00	0.00	0.00	0.00
2-Methyl-1-butene	39	0.87	2.54	31.98	0.43
2-Methyl-1-pentene	39	0.55	0.60	101.39	0.44
2-Methyl-2-butene	39	0.96	3.43	7.46	0.12
2-Methylheptane	39	0.71	1.04	43.70	0.18
2-Methylhexane	39	1.13	2.00	40.36	1.39
2-Methylpentane	39	3.81	7.24	4.75	0.29
3-Methyl-1-butene	39	0.14	0.57	48.45	0.07
3-Methylheptane	39	0.54	0.82	23.06	0.31
3-Methylhexane	39	2.23	3.05	12.21	0.20

Table K-1

(Continued)

Compound	Cases	Replicate Pair Statistics			
		Concentration		Average Absolute % Difference	Pooled Standard Deviation
		Median	Average		
3-Methylpentane	39	2.43	4.83	11.90	0.53
4-Methyl-1-pentene	39	0.37	0.60	53.48	0.17
α-Pinene	39	1.60	2.21	32.43	0.70
Acetylene	39	4.66	8.02	22.55	1.18
β-Pinene	39	0.91	0.96	24.64	0.19
Benzene	39	4.23	7.68	13.02	0.36
cis-2-Butene	39	0.38	1.06	51.94	0.18
cis-2-Hexene	39	0.00	0.28	25.76	0.07
cis-2-Pentene	39	0.39	1.43	28.66	0.08
Cyclohexane	39	0.91	2.15	35.03	0.35
Cyclopentane	39	0.60	1.00	38.17	0.16
Cyclopentene	39	0.00	0.45	52.01	0.17
Ethane	39	10.84	12.60	13.57	1.18
Ethylbenzene	39	1.75	3.21	4.96	0.13
Ethylene	39	7.18	11.25	24.72	1.42
Isobutane	39	2.99	6.10	6.66	0.31
Isobutene	38	0.00	0.00	0.00	0.00
Isopentane	39	13.27	28.69	3.52	0.72
Isoprene	39	1.03	2.01	28.50	0.34
Isopropylbenzene	39	0.00	0.14	60.91	0.08
m-Ethyltoluene	39	1.80	2.66	8.15	0.21
m-/*p*-Xylene	39	6.05	10.33	3.75	0.40
Methylcyclohexane	39	0.88	1.15	25.21	0.10
Methylcyclopentane	39	1.24	2.89	12.93	0.40
n-Butane	39	8.28	26.14	6.35	0.87
n-Decane	39	0.60	1.30	37.41	0.19
n-Dodecane	39	0.64	1.15	54.58	0.51
n-Heptane	39	1.12	2.06	31.04	0.44
n-Hexane	39	2.88	5.60	4.24	0.23
n-Nonane	39	0.46	0.82	63.55	0.16

Table K-1

(Continued)

Compound	Cases	Replicate Pair Statistics			
		Concentration		Average Absolute % Difference	Pooled Standard Deviation
		Median	Average		
n-Octane	39	0.57	0.77	40.98	0.18
n-Pentane	39	4.84	11.90	6.17	0.39
n-Propylbenzene	39	0.54	0.74	37.06	0.12
n-Tridecane	39	0.00	0.03	170.97	0.08
n-Undecane	39	0.66	1.33	50.80	0.55
o-Ethyltoluene	39	1.02	1.55	12.52	0.10
o-Xylene	39	2.07	3.58	14.62	0.23
p-Diethylbenzene	39	0.40	0.61	35.98	0.24
p-Ethyltoluene	39	0.51	0.80	32.39	0.14
Propane	39	11.19	20.72	5.12	1.77
Propylene	39	3.37	4.82	6.44	0.24
Propyne	39	0.00	0.11	138.62	0.22
Styrene	39	0.52	0.70	42.56	0.15
trans-2-Butene	39	0.58	1.48	63.08	0.57
trans-2-Hexene	39	0.12	0.51	50.66	0.11
trans-2-Pentene	39	0.90	2.97	24.23	0.20
Toluene	39	10.53	17.52	3.76	0.63

APPENDIX L

EPA Audit Reports

PERFORMANCE EVALUATION SAMPLE SUMMARY

System:	HP5890A GC/FID			Operator:	G. Jones		
Sample Handling system:	Room temp collection/Cryofocus						
GC Parameters:	Rtx-1, 0.32 x 60m, 1u film			Date:	9/26/94		
	ti=-50(2),ramp 8/min, tf=200(5)						
Detection Parameters:	FID						
Sample Volume:	Loop Collection (approximately 0.5 ml)						
Units	ppmC						
				Sample Data -Propane			
Sample ID:	Radian ID 1514				Radian ID 1515		
	Can # A107450/409				Can # 882486/116		
Analysis date:	9/26/94				9/26/94		
Compound Name *	Spike Value	Found	% Difference		Spike Value	Found	% Difference
Propane	0.78	0.76	2.56		1.06	1.00	5.66

*note - other compounds may be detected, however they are not certified and therefore not listed here

Analyst

QA Review

RADPRO.XLS

PERFORMANCE EVALUATION SAMPLE SUMMARY

System: HP5890A GC/HP 5970 MS
Operator: R. [illegible]
Sample Handling system: Nafion Dryer, Glass bead trap/Cryotrap
GC Parameters: DB-624, 0.32 x 60m, 1µ film
Date: 9/29/94
70=60(7) ramp 6min, IP 200(5)
Detection Parameters: Scan
Sample Volume: 325 mLs
Units: ppbC

Sample Data Specified NMOC

Sample ID:	Radian ID 1618					Radian ID 1617		
	Can # A10742[illegible]600					Can # A108[illegible]/12"		
Analysis date:	9/29/94					9/29/94		
				Alternate Calibration				
Compound Name*	Spike Value	Found	% Difference	Found	% Difference	Spike Value	Found	% Difference
Ethylene	29.5	NA	NA					
Acetylene	47.2	NA	NA					
Ethane	35.2	NA	NA			8.8	NA	NA
Propylene	31.9	32.2	0.9	26.7	-18.4			
Propane	33.3	31.1	-6.6			14.8	16.7	12.08
Isobutane	32.8	34.5	5.2	28.8	-12.2	19.7	23.1	17.26
1-Butene	32.4	33.8	4.3					
n-Butane	32.8	34.7	5.8	29.1	-11.3	20.5	23.0	15.00
1,3-Butene	33.2	33.8	1.8					
c-2-Butene	31.9	33.4	4.7	29.4	-7.8			
Isoprenylethylene	31.8	32.6	2.5	29.5	-7.3			
Isopentane	34.2	35.7	4.4	31.4	-8.2			
1-Pentene	33.3	34.0	2.1					
n-Pentane	34.5	37.5	8.7			25.0	32.1	28.40
2-Methyl-1,3-butadiene	25.9	24.3	6.7					
t-2-Pentene	34.6	34.5	0.3	32.2	-6.9			
c-2-Pentene	33.3	32.3	6.0					
Trimethylethylene	35.7	31.7	9.3	29.5	-17.5			
2,3-Dimethylbutane	35.4	36.5	3.1					
Cyclopentene	32.6	33.4	2.5	32.4	-0.6			
4-Methyl-1-pentene	35.1	34.9	0.4					
Cyclopentane	34.1	38.3	3.5	30.7	-10.0			
2,3-Dimethylbutene	34.2	36.8	7.6					
2-Methylpentane	36.4	36.0	1.7	32.1	-9.3			
3-Methylpentane	34.3	34.2	-0.3	33.0	-3.8	29.2	30.5	4.45
2-Methyl-1-pentene	31.2	35.6	14.1	20.0	-35.9			
Hexane	34.0	35.1	3.2					
t-2-Hexene	32.7	32.4	0.2	31.0	-5.2			
c-2-Hexene	33.8	34.0	0.6	32.0	-5.3			
Methylcyclopentane	32.3	36.1	2.3					
2,4-Dimethylpentane	33.5	36.5	6.0					
Benzene	33.4	34.8	18.2	37.5	10.8			
Cyclohexane	33.7	33.8	0.3	32.9	-2.4			
2-Methylhexane	33.8	35.5	5.0					
2,3-Dimethylpentane	34.2	35.6	4.1					
3-Methylhexane	34.1	34.9	2.3	31.7	-7.0			
Isooctane	34.9	36.1	3.4	32.9	-5.7			
Heptane	33.8	36.9	9.2	32.6	-3.6			
Methylcyclohexane	33.9	34.4	1.5					
2,3,4-Trimethylpentane	33.9	35.8	5.6					
Toluene	33.6	34.2	1.8	36.7	9.2			
2-Methylheptane	34.0	36.4	7.1	32.1	-5.6			
3-Methylheptane	34.4	36.5	6.1	35.9	4.4			
Octane	33.7	36.6	8.2	33.0	-2.1			
Ethylbenzene	33.2	33.5	0.9	37.1	11.7			
p-Xylene	33.5	33.9	0.3					
Styrene	26.8	27.7	3.4	24.9	-7.1			
o-Xylene	32.9	32.6	-0.9					
Nonane	35.8	38.3	7.1	35.4	4.7			
Cumene	32.4	32.3	-0.3					
n-Propylbenzene	32.1	32.8	2.2	38.3	22.4			
1,3,5-Trimethylbenzene	31.7	29.7	-6.3					
1,2,4-Trimethylbenzene	32.2	29.8	-7.5	48.3	49.7			
Decane	35.0	30.5	-7.5					
Undecane	32.8	24.0	-26.8					

NA = Not found using current GC/MS conditions.

*note - other compounds may be detected, however they are not certified and therefore not listed here

Analyst: [illegible]

QA Review: [illegible]

RADERSCL.XLS

TOTAL P.02

PERFORMANCE EVALUATION SAMPLE SUMMARY

System:	HP5890A GC/HP 5970 MS			Operator:	F. Mbason
Sample Handling system:	Nafion Dryer, Glass bead trap/Cryofocus				
GC Parameters:	DB-5, 0.32 x 60m, 1u film			Date:	9/28/94
	ti=-50(2),ramp 8/min, tf=200(5)				
Detection Parameters:	Scan				
Sample Volume:	525 mls				
Units	ppbV				

Sample Data

Sample ID:	Radian ID 1516	
	Can # 771	
Analysis date:	9/28/94	

Compound Name *	Spike Value	Found	% Difference
Benzene	9.4	8.6	-8.79
Carbon tetrachloride	9.7	9.1	-6.41
Chlorobenzene	9.6	8.8	-8.30
Chloroform	9.8	9.6	-1.69
Decane	9.7	8.7	-9.94
Dibromomethane	9.6	NA	NA
1,2-Dichlorobenzene	9.7	NA	NA
1,3-Dichlorobenzene	9.6	NA	NA
1,1-Dichloroethane	9.7	10.4	7.66
1,2-Dichloroethane	9.7	NA	NA
1,1-Dichloroethene	10.0	9	-9.96
1,2-Dichloropropane	9.6	9.9	3.61
Ethylbenzene	9.5	9.1	-3.92
t-1,2-Dichloroethene	9.7	8.3	-14.45
Methylene chloride	9.7	8.5	-12.39
Styrene	9.7	12.4	27.81
Tetrachloroethylene	9.6	9.2	-4.14
Toluene	9.6	8.2	-14.56
1,1,1-Trichloroethane	9.8	10.7	9.58
1,2,4-Trimethylbenzene	10.6	8.8	-17.35
1,3,5-Trimethylbenzene	10.6	8.7	-17.64
Vinyl chloride	9.6	9.5	-1.44
o-Xylene	9.8	11.9	21.60
p-Xylene	9.4	9.7	2.87

NA= Not available in calibration materials.

*note - other compounds may be detected, however they are not certified and therefore not listed here

Analyst

QA Review

	PERFORMANCE EVALUATION SAMPLE SUMMARY				
System:	Manual spiking of carbonyls on cartridges.			Operator:	R. Harrell
Sample Handling system:	Summary of spiked values and referee results.				
GC Parameters:	NA			Date:	9/29/94
Detection Parameters:	NA				
Sample Volume:	NA				
Units	ug/cartridge				
Cartridge Lot ID	METI ID	RADIAN ID	Formaldehyde	Acetaldehyde	Acetone
T4236B2	RAD1	3413	Blank	Blank	Blank
P4109A3	RAD6 (non-spiked)		0.09	0.05	0.33
P4109A4	RAD14(spiked with acetonitrile)		0.12	0.09	0.40
T4236B6	RAD2	3414	0.60	1.20	1.20
T4236B7	RAD3	3415	0.60	1.20	1.20
P4109A3	RAD7		0.71	1.11	1.75
T4236B10	RAD4	3416	0.90	2.00	2.00
P4109A3	RAD8		1.16	1.93	2.52
T4236B13	RAD5	3417	4.80	3.50	4.00
P4109A3	RAD9		5.59	3.55	4.82
Analyst	[redacted]				
QA Review	[redacted] R. M. Harrell				

RADCBNYL.XLS

APPENDIX M

Speciated NMOC Base Sample Comparison Results

Table M-1

Speciated NMOC Base Comparison Results for Sample B1AL 1487

Compound	GKPRB* Conc. (ppbC)	Radian Conc. (ppbC)	Relative % Difference
1,2,4-TriMethylbenzene	6.83	2.09	106.28
1,3,5-TriMethylbenzene	1.15	0.94	20.10
1-Pentene	0.36	0.28	25.00
2,2,4-TriMethylpentane	3.41	2.89	16.51
2,2-DiMethylbutane	0.60	8.04	172.22
2,3,4-TriMethylpentane	1.31	1.12	15.64
2,3-DiMethylbutane	1.18	1.07	9.78
2,3-DiMethylpentane	1.44	0.59	83.74
2,4-DiMethylpentane	0.91	0.69	27.50
2-Methyl-1-Pentene	0.56	0.59	5.22
2-Methyl-2-Butene	1.03	0.67	42.35
2-Methylheptane	1.33	0.66	67.34
2-Methylhexane	1.36	0.79	53.02
2-Methylpentane	3.17	2.81	12.04
3-Methyl-1-Butene	0.21	0.22	4.65
3-Methylheptane	0.66	0.50	27.59
3-Methylhexane	2.62	1.95	29.32
3-Methylpentane	3.24	1.60	67.77
Acetylene	7.70	5.53	32.80
β-Pinene	1.22	0.91	29.11
Benzene	4.43	0.42	5.33
c-2-Butene	0.51	0.25	68.42
c-2-Hexene	0.15	ND	NA
c-2-Pentene	0.48	0.57	17.14
CycloPentane	0.31	0.28	10.17
CycloPentene	0.17	ND	NA
Ethane	5.20	0.53	1.90
Ethylbenzene	2.30	1.91	18.53
Ethylene	7.04	6.02	15.62
isoButane	1.94	1.67	14.96
isoPentane	9.11	8.69	4.72
Isoprene	0.52	0.44	16.67
isoPr opylbenzene	0.43	ND	NA
m-/*p*-Xylene	7.62	6.40	17.40
MethylCyclohexane	1.22	0.50	83.72
MethylCyclopentane	1.13	0.82	31.79
n-Butane	3.71	3.15	16.33

Table M-1

(Continued)

Compound	GKPRB* Conc. (ppbC)	Radian Conc. (ppbC)	Relative % Difference
n-Decane	0.58	0.54	-7.14
n-Dodecane	3.28	0.41	155.56
n-Heptane	1.40	0.74	61.68
n-Hexane	1.79	1.50	17.63
n-Nonane	0.39	0.42	7.41
n-Octane	0.52	0.45	14.43
n-Pentane	3.73	3.17	16.23
n-Propylbenzene	0.78	0.55	34.59
n-Undecane	0.85	0.65	26.67
o-Xylene	2.68	2.20	19.67
Propane	4.04	3.94	2.51
Propene	2.98	2.85	4.46
Styrene	2.56	0.33	154.33
t-2-Butene	0.47	0.43	8.89
t-2-Hexene	0.36	0.25	36.07
t-2-Pentene	2.66	0.82	105.75
Toluene	12.20	10.15	18.34
		Average	36.51
Total	264.96	181.00	-36.90
Unidentified	63.77	57.80	

* GKPRB = Gas Kinetics and Photochemistry Research Branch, a branch of the EPA NERL.

Table M-2

Speciated NMOC Base Comparison Results for Sample B1AL 1490

Compound	GKPRB* Conc. (ppbC)	Radian Conc. (ppbC)	Relative % Difference
1,2,4-TriMethylbenzene	24.21	1.00	-184.13
1,3,5-TriMethylbenzene	5.75	4.33	-28.17
1-Pentene	2.82	ND	NA
2,2,4-TriMethylpentane	18.52	14.89	-21.73
2,2-DiMethylbutane	3.81	10.94	96.68
2,3,4-TriMethylpentane	6.35	5.85	-8.20
2,3-DiMethylbutane	5.41	5.00	-7.88
2,3-DiMethylpentane	6.13	2.92	-70.94
2,4-DiMethylpentane	4.15	3.84	-7.76
2-Methyl-1-Pentene	2.57	0.61	-123.27
2-Methyl-2-Butene	6.65	5.33	-22.04
2-Methylheptane	3.86	3.08	-22.48
2-Methylhexane	6.88	3.67	-60.85
2-Methylpentane	17.09	15.05	-12.69
3-Methyl-1-Butene	1.15	0.95	-19.05
3-Methylheptane	3.09	2.71	-13.10
3-Methylhexane	8.03	6.17	-26.20
3-Methylpentane	11.99	9.74	-20.71
4-Methyl-1-Pentene	1.04	1.02	-1.94
α-Pinene	3.53	1.45	-83.53
Acetylene	44.08	31.15	-34.37
β-Pinene	1.96	1.46	-29.24
Benzene	23.18	20.11	-14.18
c-2-Butene	1.71	1.42	-18.53
c-2-Hexene	0.92	1.03	11.28
c-2-Pentene	2.86	2.47	-14.63
CycloHexane	4.63	3.46	-28.92
CycloPentane	1.94	1.66	-15.56
CycloPentene	1.18	1.05	-11.66
Ethane	29.02	27.86	-4.08
Ethylbenzene	9.69	8.46	-13.55
Ethylene	36.01	32.75	-9.48
isoButane	11.55	10.07	-13.69
isoPentane	53.96	51.30	-5.05
Isoprene	2.17	1.93	-11.71
isoPropylbenzene	1.28	0.50	-87.64
m-/*p*-Xylene	33.24	29.59	-11.62
MethylCyclohexane	4.03	2.78	-36.71
MethylCyclopentane	6.89	5.52	-22.08

Table M-2

(Continued)

Compound	GKPRB* Conc. (ppbC)	Radian Conc. (ppbC)	Relative % Difference
n-Butane	26.98	23.79	-12.57
n-Decane	2.23	2.27	1.78
n-Dodecane	1.77	0.83	-72.31
n-Heptane	6.49	3.53	-59.08
n-Hexane	11.60	10.46	-10.34
n-Nonane	1.72	1.78	3.43
n-Octane	2.29	1.95	-16.04
n-Pentane	21.41	19.20	-10.88
n-Propylbenzene	2.76	2.34	-16.47
n-Undecane	2.19	1.70	-25.19
o-Xylene	12.56	10.70	-15.99
Propane	100.53	94.48	-6.20
Propene	16.21	15.60	NA
Styrene	2.95	1.64	-57.08
t-2-Butene	2.80	2.43	-14.15
t-2-Hexene	1.51	1.42	-6.14
t-2-Pentene	5.29	4.83	-9.09
Toluene	51.34	46.02	-10.93
		Average	-24.49
Total	950.21	764.00	-21.73
Unidentified	48.77	122.00	

* GKPRB = Gas Kinetics and Photochemistry Research Branch, a branch of the EPA NERL.

Table M-3

Speciated NMOC Base Comparison Results for Sample B2AL 1480

Compound	GKPRB* Conc. (ppbC)	Radian Conc. (ppbC)	Relative % Difference
1,2,4-TriMethylbenzene	10.71	6.90	-43.27
1,3,5-TriMethylbenzene	0.34	ND	NA
2,2,4-TriMethylpentane	1.15	0.79	-37.11
2,2-DiMethylbutane	0.42	1.26	100.00
2,3,4-TriMethylpentane	0.31	ND	NA
2,3-DiMethylbutane	0.46	0.75	47.93
2,3-DiMethylpentane	0.98	ND	NA
2,4-DiMethylpentane	0.22	0.34	42.86
2-Methyl-2-Butene	0.19	ND	NA
2-Methylheptane	0.46	ND	NA
2-Methylhexane	0.44	ND	NA
2-Methylpentane	1.14	0.84	-30.30
3-Methyl-1-Butene	0.08	ND	NA
3-Methylheptane	0.26	0.25	-3.92
3-Methylhexane	1.35	0.34	-119.53
3-Methylpentane	2.26	0.51	-126.35
4-Methyl-1-Pentene	0.52	ND	NA
Acetylene	2.76	1.55	-56.15
β-Pinene	1.20	0.54	-75.86
Benzene	1.78	1.61	-10.03
c-2-Pentene	0.30	ND	NA
CycloPentane	0.18	ND	NA
Ethane	4.35	3.44	-23.36
Ethylbenzene	0.74	0.56	-27.69
Ethylene	2.60	1.97	-27.57
isoButane	2.66	2.39	-10.69
isoPentane	3.56	3.23	-9.72
Isoprene	0.50	0.47	-6.19
isoPropylbenzene	0.10	ND	NA
m-/*p*-Xylene	1.89	1.44	-27.03
MethylCyclohexane	0.52	ND	NA
MethylCyclopentane	0.46	0.41	-11.49
n-Butane	2.55	1.56	-48.18
n-Decane	0.29	0.24	-18.87
n-Dodecane	0.40	0.38	-5.13
n-Heptane	0.53	0.40	-27.96
n-Hexane	0.65	0.64	-1.55
n-Nonane	0.16	ND	NA

Table M-3

(Continued)

Compound	GKPRB* Conc. (ppbC)	Radian Conc. (ppbC)	Relative % Difference
n-Octane	0.22	ND	NA
n-Pentane	1.36	1.27	-6.84
n-Propylbenzene	0.19	ND	NA
n-Undecane	0.51	0.63	21.05
o-Xylene	0.63	0.49	-25.00
Propane	3.52	3.55	0.85
Propene	0.73	0.85	15.19
Styrene	1.24	ND	NA
t-2-Butene	0.04	ND	NA
t-2-Pentene	0.16	ND	NA
Toluene	6.26	3.75	-50.15
		Average	-19.42
Total	119.13	60.90	-64.69
Unidentified	14.54	10.60	

* GKPRB = Gas Kinetics and Photochemistry Research Branch, a branch of the EPA NERL.

Table M-4

Speciated Base NMOC Comparison Results for Sample B2AL 1491

Compound	GKPRB[a] Conc. (ppbC)	Radian Conc. (ppbC)	Relative % Difference
1,2,4-TriMethylbenzene	18.88	14.75	-24.56
1,3,5-TriMethylbenzene	0.94	0.74	-23.81
1-Pentene	0.63	ND	NA
2,2,4-TriMethylpentane	2.95	2.29	-25.19
2,2-DiMethylbutane	0.67	1.48	75.35
2,3,4-TriMethylpentane	0.93	0.78	-17.54
2,3-DiMethylbutane	1.05	0.84	-22.22
2,3-DiMethylpentane	1.22	0.47	-88.76
2,4-DiMethylpentane	0.67	0.53	-23.33
2-Methyl-1-Pentene	0.54	ND	NA
2-Methyl-2-Butene	0.95	0.88	-7.65
2-Methylheptane	0.62	0.51	-19.47
2-Methylhexane	1.06	0.61	-53.89
2-Methylpentane	2.84	2.67	-6.17
3-Methyl-1-Butene	0.18	ND	NA
3-Methylheptane	0.49	0.50	2.02
3-Methylhexane	2.14	1.43	-39.78
3-Methylpentane	2.57	1.46	-55.09
4-Methyl-1-Pentene	0.33	ND	NA
α-Pinene	2.59	2.68	3.42
Acetylene	7.01	5.22	-29.27
β-Pinene	1.79	0.67	-91.06
Benzene	5.06	4.33	-15.55
c-2-Butene	0.71	0.32	-75.73
c-2-Hexene	0.12	ND	NA
c-2-Pentene	0.49	0.38	-25.29
CycloHexane	0.63	0.36	-54.55
CycloPentane	0.40	0.28	-35.29
CycloPentene	0.16	ND	NA
Ethane	8.50	7.29	-15.33
Ethylbenzene	1.79	1.59	-11.83
Ethylene	8.92	7.78	-13.65
isoButane	4.94	4.25	-15.02
isoPentane	9.28	8.51	-8.66
Isoprene	0.63	0.55	-13.56
isoPropylbenzene	0.35	ND	NA
m-/*p*-Xylene	6.10	5.03	-19.23
MethylCyclohexane	0.68	0.40	-51.85
MethylCyclopentane	1.11	0.98	-12.44

Table M-4

(Continued)

Compound	GKPRB* Conc. (ppbC)	Radian Conc. (ppbC)	Relative % Difference
n-Butane	4.83	3.99	-19.05
n-Decane	0.36	ND	NA
n-Dodecane	0.51	0.69	30.00
n-Heptane	1.08	0.75	-36.07
n-Hexane	1.90	1.64	-14.69
n-Nonane	0.21	ND	NA
n-Octane	0.39	0.33	-16.67
n-Pentane	4.30	4.10	-4.76
n-Propylbenzene	0.37	0.33	-11.43
n-Undecane	0.48	0.50	4.08
o-Xylene	2.12	1.77	-17.99
Propane	8.19	7.96	-2.85
Propene	3.29	3.30	0.30
Styrene	1.21	0.43	-95.12
t-2-Butene	0.55	1.13	69.05
t-2-Hexene	0.28	ND	NA
t-2-Pentene	0.78	0.68	-13.70
Toluene	10.48	8.71	-18.45
		Average	-20.47
Total	193.67	147.00	-27.40
Unidentified	8.98	18.50	

* GKPRB = Gas Kinetics and Photochemistry Research Branch, a branch of the EPA NERL.

Table M-5

Speciated NMOC Base Comparison Results for Sample B3AL 1484

Compound	GKPRB* Conc. (ppbC)	Radian Conc. (ppbC)	Relative % Difference
1,2,4-TriMethylbenzene	4.50	1.31	-109.81
1,3,5-TriMethylbenzene	1.61	0.51	-103.77
1Me4iProBenzene	1.23	ND	NA
2,2,4-TriMethylpentane	5.55	2.51	-75.43
2,2-DiMethylbutane	1.23	4.69	116.89
2,3,4-TriMethylpentane	0.78	0.68	-13.70
2,3-DiMethylbutane	1.03	1.95	61.75
2,3-DiMethylpentane	1.83	0.72	-87.06
2,4-DiMethylpentane	1.06	0.50	-71.79
2-Methyl-2-Butene	0.63	ND	NA
2-Methylheptane	0.90	0.74	-19.51
2-Methylhexane	1.51	0.85	-55.93
2-Methylpentane	4.15	3.49	-17.28
3-Methyl-1-Butene	0.15	ND	NA
3-Methylheptane	0.66	0.57	-14.63
3-Methylhexane	3.76	3.17	-17.03
3-Methylpentane	4.60	3.64	-23.30
α-Pinene	5.28	1.25	-123.43
Acetylene	108.40	1.52	-194.47
β-Pinene	2.89	0.75	-117.58
Benzene	2.56	2.79	8.60
c-2-Hexene	0.09	ND	NA
c-2-Pentene	0.29	0.59	68.18
CycloHexane	4.78	4.25	-11.74
CycloPentane	3.73	2.62	-34.96
CycloPentene	0.10	ND	NA
Ethane	5.25	79.25	175.15
Ethylbenzene	3.08	2.48	-21.58
Ethylene	5.61	ND	NA
isoButane	39.11	41.66	6.31
isoPentane	361.18	413.00	13.39
Isoprene	7.85	0.47	-177.40
isoPropylbenzene	0.93	ND	NA
m-/*p*-Xylene	6.20	4.63	-28.99
MethylCyclohexane	2.95	1.38	-72.52
MethylCyclopentane	4.33	4.35	0.46
n-Butane	5.52	4.12	-29.05
n-Decane	7.15	6.55	-8.76
n-Dodecane	23.13	21.29	-8.28

Table M-5

(Continued)

Compound	GKPRB* Conc. (ppbC)	Radian Conc. (ppbC)	Relative % Difference
n-Heptane	2.14	1.18	-57.83
n-Hexane	6.54	6.19	-5.50
n-Nonane	5.11	5.14	0.59
n-Octane	1.79	1.02	-54.80
n-Pentane	28.28	29.65	4.73
n-Propylbenzene	0.87	ND	-100.00
n-Undecane	22.23	22.12	-0.50
o-Xylene	2.41	1.94	-21.61
Propane	4.99	3.99	-22.27
Propene	1.49	1.14	-26.62
Styrene	5.68	4.32	-27.20
t-2-Butene	0.12	0.48	120.00
t-2-Hexene	1.51	ND	NA
t-2-Pentene	0.60	0.65	8.00
Toluene	39.26	37.38	-4.91
		Average	-25.55
Total	950.21	815.00	-15.32
Unidentified	64.82	67.70	

* GKPRB = Gas Kinetics and Photochemistry Research Branch, a branch of the EPA NERL.

Table M-6

Speciated NMOC Base Comparison Results for Sample B3AL 1485

Compound	GKPRB* Conc. (ppbC)	Radian Conc. (ppbC)	Relative % Difference
1,2,4-TriMethylbenzene	1.60	0.55	-97.67
1,3,5-TriMethylbenzene	0.28	ND	NA
1Me4iProBenzene	0.95	ND	NA
2,2-DiMethylbutane	0.37	3.83	164.76
2,3,4-TriMethylpentane	0.31	0.28	-10.17
2,3-DiMethylbutane	0.82	ND	NA
2,3-DiMethylpentane	0.19	ND	NA
2,4-DiMethylpentane	0.24	ND	NA
2-Methyl-2-Butene	0.36	0.29	-21.54
2-Methylheptane	0.43	ND	NA
2-Methylhexane	0.27	ND	NA
2-Methylpentane	0.76	1.61	71.73
3-Methyl-1-Butene	0.06	ND	NA
3-Methylheptane	0.20	ND	NA
3-Methylhexane	0.42	0.27	-43.48
3-Methylpentane	1.49	0.45	-107.22
4-Methyl-1-Pentene	0.27	ND	NA
Acetylene	1.93	1.46	-27.73
β-Pinene	0.66	0.31	-72.16
Benzene	2.02	1.69	-17.79
c-2-Pentene	0.16	0.43	91.53
CycloPentene	0.04	ND	NA
Ethane	2.86	3.59	22.64
Ethylbenzene	0.73	0.49	-39.34
Ethylene	1.94	2.31	17.41
isoButane	0.72	0.57	-23.26
isoPentane	2.88	2.83	-1.75
Isoprene	0.38	0.45	16.87
isoPropylbenzene	0.68	ND	NA
m-/*p*-Xylene	1.91	1.52	-22.74
MethylCyclohexane	0.23	ND	NA
MethylCyclopentane	0.42	0.33	-24.00
n-Butane	1.38	1.17	-16.47
n-Decane	0.33	0.24	-31.58
n-Dodecane	0.30	0.46	42.11
n-Heptane	0.45	0.29	-43.24
n-Hexane	0.60	0.46	-26.42
n-Nonane	0.15	ND	NA
n-Octane	0.15	ND	NA

Table M-6

(Continued)

Compound	GKPRB* Conc. (ppbC)	Radian Conc. (ppbC)	Relative % Difference
n-Pentane	1.19	0.95	-22.43
n-Undecane	0.38	0.56	38.30
o-Xylene	0.61	0.47	-25.93
Propane	3.13	3.22	2.83
Propene	1.03	1.12	8.37
Styrene	0.56	ND	NA
t-2-Butene	0.12	ND	NA
t-2-Hexene	0.06	ND	NA
t-2-Pentene	0.23	0.39	51.61
Toluene	4.35	3.30	-27.45
		Average	-5.62
Total	116.40	57.80	-67.28
Unidentified	41.14	11.50	

* GKPRB = Gas Kinetics and Photochemistry Research Branch, a branch of the EPA NERL.

Table M-7

Speciated NMOC Base Comparison Results for Sample B3AL 1500

Compound	GKPRB* Conc. (ppbC)	Radian Conc. (ppbC)	Relative % Difference
1,2,4-TriMethylbenzene	4.84	1.12	-124.83
1,3,5-TriMethylbenzene	1.37	0.86	-45.74
1-Pentene	2.68	ND	NA
2,2,4-TriMethylpentane	6.50	5.30	-20.34
2,2-DiMethylbutane	2.85	5.66	66.04
2,3,4-TriMethylpentane	1.77	1.63	-8.24
2,3-DiMethylbutane	4.27	3.72	-13.77
2,3-DiMethylpentane	2.36	1.16	-68.18
2,4-DiMethylpentane	1.70	1.83	7.37
2-Methyl-1-Pentene	1.74	1.92	9.84
2-Methyl-2-Butene	6.15	5.81	-5.69
2-Methylheptane	1.63	0.89	-58.73
2-Methylhexane	2.67	1.40	-62.41
2-Methylpentane	12.96	11.55	-11.51
3-Methyl-1-Butene	1.01	0.96	-5.08
3-Methylheptane	0.91	0.83	-9.20
3-Methylhexane	3.37	2.90	-14.99
3-Methylpentane	8.19	6.84	-17.96
4-Methyl-1-Pentene	0.78	0.61	-24.46
α-Pinene	4.68	4.92	5.00
Acetylene	6.49	4.68	-32.41
β-Pinene	2.29	0.67	-109.46
Benzene	6.09	6.10	0.16
c-2-Butene	1.28	1.16	-9.84
c-2-Hexene	0.53	0.52	-1.90
c-2-Pentene	2.71	2.42	-11.31
CycloHexane	1.07	0.69	-43.18
CycloPentane	1.68	1.47	-13.33
CycloPentene	0.88	0.76	-14.63
Ethane	11.53	11.11	-3.71
Ethylbenzene	2.53	2.06	-20.48
Ethylene	5.85	5.07	-14.29
isoButane	13.44	11.48	-15.73
isoPentane	71.92	70.89	-1.44
Isoprene	1.12	0.81	-32.12
isoPropylbenzene	0.35	ND	NA
m-/*p*-Xylene	7.59	6.98	-8.37
MethylCyclohexane	2.03	1.31	-43.11
MethylCyclopentane	3.84	3.69	-3.98

Table M-7

(Continued)

Compound	GKPRB* Conc. (ppbC)	Radian Conc. (ppbC)	Relative % Difference
n-Butane	65.99	60.58	-8.55
n-Decane	1.14	0.94	-19.23
n-Dodecane	0.28	0.29	3.51
n-Heptane	2.54	2.52	-0.79
n-Hexane	5.61	5.25	-6.63
n-Nonane	0.90	0.85	-5.71
n-Octane	0.95	0.83	-13.48
n-Pentane	27.74	26.26	-5.48
n-Propylbenzene	0.72	0.32	-76.92
n-Undecane	0.68	0.58	-15.87
o-Xylene	2.91	2.25	-25.58
Propane	14.32	13.80	-3.70
Propene	2.75	2.82	2.51
Styrene	1.21	0.62	-64.48
t-2-Butene	1.80	1.10	-48.28
t-2-Hexene	0.79	0.82	3.73
t-2-Pentene	5.15	4.92	-4.57
Toluene	14.98	13.40	-11.13
		Average	-19.69
Total	460.29	375.00	-20.42
Unidentified	30.34	28.80	

* GKPRB = Gas Kinetics and Photochemistry Research Branch, a branch of the EPA NERL.

Table M-8

Speciated NMOC Base Comparison Results for Sample FWTX 1476

Compound	GKPRB* Conc. (ppbC)	Radian Conc. (ppbC)	Relative % Difference
1,2,4-TriMethylbenzene	4.05	1.26	-105.08
1,3,5-TriMethylbenzene	0.41	0.26	-44.78
2,2,4-TriMethylpentane	1.25	0.34	-114.47
2,3,4-TriMethylpentane	0.26	ND	NA
2,3-DiMethylbutane	0.47	0.67	35.09
2,3-DiMethylpentane	0.50	ND	NA
2,4-DiMethylpentane	0.12	ND	NA
2-Methyl-2-Butene	0.10	ND	NA
2-Methylheptane	0.50	ND	NA
2-Methylhexane	0.42	0.30	-33.33
2-Methylpentane	1.98	1.38	-35.71
3-Methyl-1-Butene	0.04	ND	NA
3-Methylheptane	0.22	ND	NA
3-Methylhexane	1.35	1.20	-11.76
3-Methylpentane	2.69	0.83	-105.68
α-Pinene	0.66	0.97	38.04
Acetylene	0.77	0.43	-56.67
β-Pinene	1.26	0.57	-75.41
Benzene	0.90	0.93	3.28
c-2-Butene	0.19	ND	NA
CycloHexane	0.81	0.54	-40.00
CycloPentane	0.29	0.28	-3.51
Ethane	13.37	12.38	-7.69
Ethylbenzene	0.77	0.49	-44.44
Ethylene	0.92	0.36	-87.50
isoButane	3.60	2.93	-20.52
isoPentane	4.42	4.19	-5.34
Isoprene	0.07	ND	NA
isoPropylbenzene	0.39	0.36	-8.00
m-/*p*-Xylene	2.05	1.69	-19.25
MethylCyclohexane	1.51	1.03	-37.80
MethylCyclopentane	1.02	0.48	-72.00
n-Butane	9.05	7.86	-14.07
n-Decane	0.85	0.30	-95.65
n-Dodecane	0.63	0.51	-21.05
n-Heptane	1.10	0.93	-16.75
n-Hexane	2.21	2.03	-8.49
n-Nonane	0.32	0.25	-24.56
n-Octane	0.52	ND	NA

Table M-8

(Continued)

Compound	GKPRB* Conc. (ppbC)	Radian Conc. (ppbC)	Relative % Difference
n-Pentane	5.11	4.55	-11.59
n-Propylbenzene	1.53	0.27	-140.00
n-Undecane	0.56	0.88	44.44
o-Xylene	0.93	0.47	-65.71
Propane	14.33	13.93	-2.83
Propene	0.49	0.58	16.82
Styrene	1.29	0.28	-128.66
Toluene	3.51	2.32	-40.82
		Average	-36.80
Total	251.79	158.90	-45.24
Unidentified	74.81	60.90	

* GKPRB = Gas Kinetics and Photochemistry Research Branch, a branch of the EPA NERL.

Table M-9

Speciated NMOC Base Comparison Results for Sample FWTX 1482

Compound	GKPRB* Conc. (ppbC)	Radian Conc. (ppbC)	Relative % Difference
1,2,4-TriMethylbenzene	17.60	0.55	-187.88
1,3,5-TriMethylbenzene	5.18	4.29	-18.80
1-Pentene	2.29	2.20	-4.01
2,2,4-TriMethylpentane	14.20	12.92	-9.44
2,2-DiMethylbutane	3.75	16.41	125.60
2,3,4-TriMethylpentane	5.66	5.47	-3.41
2,3-DiMethylbutane	4.77	4.82	1.04
2,3-DiMethylpentane	3.40	ND	NA
2,4-DiMethylpentane	2.45	2.50	2.02
2-Methyl-1-Pentene	2.15	ND	NA
2-Methyl-2-Butene	5.87	5.99	2.02
2-Methylheptane	2.57	3.29	24.57
2-Methylhexane	7.68	10.07	26.93
2-Methylpentane	16.80	17.07	1.59
3-Methyl-1-Butene	0.88	0.82	-7.06
3-Methylheptane	3.79	2.81	-29.70
3-Methylhexane	8.75	7.55	-14.72
3-Methylpentane	11.31	12.28	8.22
4-Methyl-1-Pentene	0.66	1.25	61.78
Acetylene	30.30	21.67	-33.21
β-Pinene	0.54	0.76	33.85
Benzene	14.54	13.04	-10.88
c-2-Butene	1.32	1.31	-0.76
c-2-Hexene	0.85	0.91	6.82
c-2-Pentene	2.64	2.39	-9.94
CycloHexane	2.98	2.27	-27.05
CycloPentane	2.29	2.05	-11.06
CycloPentene	0.99	0.86	-14.05
Ethane	31.37	28.26	-10.43
Ethylbenzene	8.71	7.68	-12.57
Ethylene	20.58	18.32	-11.62
isoButane	15.00	12.83	-15.59
isoPentane	62.03	61.20	-1.35
Isoprene	1.04	3.21	102.12
isoPropylbenzene	1.63	0.65	-85.96
m-/*p*-Xylene	27.58	25.91	-6.24
MethylCyclohexane	4.73	3.61	-26.86
MethylCyclopentane	6.80	5.57	-19.89
n-Butane	24.41	21.06	-14.74

Table M-9

(Continued)

Compound	GKPRB* Conc. (ppbC)	Radian Conc. (ppbC)	Relative % Difference
n-Decane	5.85	5.33	-9.30
n-Dodecane	28.90	23.80	-19.35
n-Heptane	6.07	4.71	-25.23
n-Hexane	11.86	11.30	-4.84
n-Nonane	1.34	1.22	-9.38
n-Octane	2.30	1.96	-15.96
n-Pentane	19.34	19.14	-1.04
n-Propylbenzene	3.27	2.60	-22.83
n-Undecane	28.27	26.07	-8.10
o-Xylene	10.49	9.59	-8.96
Propane	26.97	26.01	-3.62
Propene	7.86	7.77	-1.15
Styrene	3.71	2.67	-32.60
t-2-Butene	1.67	1.36	-20.46
t-2-Hexene	1.52	1.38	-9.66
t-2-Pentene	4.73	4.58	-3.22
Toluene	44.90	42.09	-6.46
		Average	-7.27
Total	852.63	726.00	-16.04
Unidentified	82.86	138.00	

* GKPRB = Gas Kinetics and Photochemistry Research Branch, a branch of the EPA NERL.

Table M-10

Speciated NMOC Base Comparison Results for Sample FWTX 1489

Compound	GKPRB* Conc. (ppbC)	Radian Conc. (ppbC)	Relative % Difference
1,2,4-TriMethylbenzene	7.94	2.72	-97.94
1,3,5-TriMethylbenzene	0.88	0.64	-31.58
1-Pentene	0.28	0.89	104.27
2,2-DiMethylbutane	0.49	24.17	192.05
2,3,4-TriMethylpentane	0.90	0.79	-13.02
2,3-DiMethylbutane	0.78	1.09	33.16
2,3-DiMethylpentane	1.03	ND	NA
2,4-DiMethylpentane	0.39	0.34	-13.70
2-Methyl-1-Pentene	0.35	0.83	81.36
2-Methyl-2-Butene	0.39	0.41	5.00
2-Methylheptane	0.82	0.61	-29.37
2-Methylhexane	1.19	0.72	-49.21
2-Methylpentane	3.04	2.72	-11.11
3-Methyl-1-Butene	0.15	ND	NA
3-Methylheptane	0.54	0.42	-25.00
3-Methylhexane	2.36	1.89	-22.12
3-Methylpentane	3.10	1.87	-49.50
Acetylene	4.49	3.70	-19.29
β-Pinene	1.18	0.84	-33.66
Benzene	2.99	2.71	-9.82
c-2-Butene	0.25	ND	NA
c-2-Hexene	0.09	ND	NA
c-2-Pentene	0.27	ND	NA
CycloHexane	0.75	0.45	-50.00
CycloPentane	0.33	0.29	-12.90
CycloPentene	0.06	ND	NA
Ethane	18.92	18.30	-3.33
Ethylbenzene	1.68	1.33	-23.26
Ethylene	3.97	3.99	0.50
isoButane	4.32	3.69	-15.73
isoPentane	8.53	7.74	-9.71
Isoprene	0.27	ND	NA
isoPropylbenzene	0.32	0.48	40.00
m-/*p*-Xylene	5.24	4.36	-18.33
MethylCyclohexane	1.24	0.94	-27.52
MethylCyclopentane	1.22	0.88	-32.38
n-Butane	8.09	7.09	-13.18
n-Decane	0.46	0.44	-4.44
n-Dodecane	0.59	0.68	14.17

Table M-10

(Continued)

Compound	GKPRB* Conc. (ppbC)	Radian Conc. (ppbC)	Relative % Difference
n-Heptane	1.28	0.85	-40.38
n-Hexane	2.64	2.35	-11.62
n-Nonane	0.35	0.30	-15.38
n-Octane	0.57	0.27	-71.43
n-Pentane	4.30	3.70	-15.00
n-Propylbenzene	2.03	0.40	-134.16
n-Undecane	0.70	0.87	21.66
o-Xylene	2.22	1.49	-39.35
Propane	18.94	17.69	-6.83
Propene	1.83	1.67	-9.14
Styrene	1.59	ND	NA
t-2-Butene	0.16	0.36	76.92
t-2-Hexene	0.23	ND	NA
t-2-Pentene	1.05	2.48	81.02
Toluene	10.18	7.81	-26.35
		Average	-7.46
Total	389.75	265.00	-38.11
Unidentified	114.74	107.00	

* GKPRB = Gas Kinetics and Photochemistry Research Branch, a branch of the EPA NERL.

Table M-11

Speciated NMOC Base Comparison Results for Sample EPTX 1478

Compound	GKPRB* Conc. (ppbC)	Radian Conc. (ppbC)	Relative % Difference
1,2,4-TriMethylbenzene	3.89	1.59	-83.94
1,3,5-TriMethylbenzene	1.12	0.69	-47.51
1-Pentene	0.26	ND	NA
2,2,4-TriMethylpentane	3.79	2.11	-56.95
2,2-DiMethylbutane	0.18	13.60	194.78
2,3,4-TriMethylpentane	0.75	0.68	-9.79
2,3-DiMethylbutane	0.88	1.03	15.71
2,3-DiMethylpentane	1.77	0.83	-72.31
2,4-DiMethylpentane	1.04	0.68	-41.86
2-Methyl-1-Pentene	0.43	1.32	101.71
2-Methyl-2-Butene	0.75	0.68	-9.79
2-Methylheptane	0.76	0.60	-23.53
2-Methylhexane	1.06	0.59	-56.97
2-Methylpentane	2.55	2.40	-6.06
3-Methyl-1-Butene	0.15	ND	NA
3-Methylheptane	0.53	0.42	-23.16
3-Methylhexane	2.24	1.78	-22.89
3-Methylpentane	2.95	1.50	-65.17
Acetylene	6.39	4.20	-41.36
Benzene	4.66	4.31	-7.80
c-2-Butene	0.33	ND	NA
c-2-Hexene	0.11	ND	NA
c-2-Pentene	0.38	0.27	-33.85
CycloHexane	1.05	0.70	-40.00
CycloPentane	0.44	0.40	-9.52
CycloPentene	0.12	ND	NA
Ethane	6.97	6.33	-9.62
Ethylbenzene	2.18	1.75	-21.88
Ethylene	6.49	5.26	-20.94
isoButane	2.13	1.85	-14.07
isoPentane	6.94	5.89	-16.37
Isoprene	0.24	ND	NA
isoPropylbenzene	0.58	ND	NA
m-/*p*-Xylene	5.81	4.96	-15.78
MethylCyclohexane	1.21	0.65	-60.22
MethylCyclopentane	1.49	2.50	50.63
n-Butane	4.50	3.55	-23.60
n-Decane	0.97	0.81	-17.98
n-Dodecane	0.63	0.63	0.00

Table M-11

(Continued)

Compound	GKPRB* Conc. (ppbC)	Radian Conc. (ppbC)	Relative % Difference
n-Heptane	1.46	1.27	-13.92
n-Hexane	2.77	2.37	-15.56
n-Nonane	0.47	0.56	17.48
n-Octane	0.56	0.81	36.50
n-Pentane	4.62	3.98	-14.88
n-Propylbenzene	0.58	0.49	-16.82
n-Undecane	0.97	0.85	-13.19
o-Xylene	2.10	1.52	-32.04
Propane	7.62	7.30	-4.29
Propene	2.52	2.45	-2.82
Styrene	1.64	0.30	-138.14
t-2-Butene	0.42	0.34	-21.05
t-2-Hexene	0.26	ND	NA
t-2-Pentene	1.58	2.25	34.99
Toluene	10.42	8.95	-15.18
		Average	-14.98
Total	264.68	167.00	-45.26
Unidentified	63.51	43.90	

* GKPRB = Gas Kinetics and Photochemistry Research Branch, a branch of the EPA NERL.

Table M-12

Speciated NMOC Base Comparison Results for Sample EPTX 1507

Compound	GKPRB* Conc. (ppbC)	Radian Conc. (ppbC)	Relative % Difference
1,2,4-TriMethylbenzene	12.93	0.63	-181.42
1,3,5-TriMethylbenzene	4.39	3.84	-13.37
1-Pentene	1.82	0.73	-85.49
2,2,4-TriMethylpentane	12.58	10.55	-17.55
2,2-DiMethylbutane	0.81	11.09	172.77
2,3,4-TriMethylpentane	3.68	3.48	-5.59
2,3-DiMethylbutane	3.98	3.21	-21.42
2,3-DiMethylpentane	7.53	4.51	-50.17
2,4-DiMethylpentane	3.87	3.58	-7.79
2-Methyl-1-Pentene	1.49	0.48	-102.54
2-Methyl-2-Butene	3.45	3.33	-3.54
2-Methylheptane	1.78	2.19	20.65
2-Methylhexane	4.56	2.15	-71.83
2-Methylpentane	11.88	10.64	-11.01
3-Methyl-1-Butene	0.64	0.53	-18.80
3-Methylheptane	2.11	1.85	-13.13
3-Methylhexane	5.79	4.65	-21.84
3-Methylpentane	8.90	6.95	-24.61
4-Methyl-1-Pentene	0.88	0.64	-31.58
α-Pinene	0.91	2.75	100.55
Acetylene	18.82	14.17	-28.19
β-Pinene	1.29	0.90	-35.62
Benzene	18.29	16.67	-9.27
c-2-Butene	1.11	1.34	18.78
c-2-Hexene	0.49	0.43	-13.04
c-2-Pentene	1.51	1.24	-19.64
CycloHexane	3.45	2.61	-27.72
CycloPentane	2.03	1.67	-19.46
CycloPentene	0.66	0.58	-12.90
Ethane	16.40	15.93	-2.91
Ethylbenzene	7.61	6.89	-9.93
Ethylene	23.26	21.91	-5.98
isoButane	5.28	4.71	-11.41
isoPentane	28.90	27.86	-3.66
Isoprene	0.97	0.85	-13.19
isoPropylbenzene	1.65	0.68	-83.26
m-/p-Xylene	21.69	20.11	-7.56
MethylCyclohexane	3.11	2.46	-23.34
MethylCyclopentane	6.90	5.72	-18.70

Table M-12

(Continued)

Compound	GKPRB* Conc. (ppbC)	Radian Conc. (ppbC)	Relative % Difference
n-Butane	16.85	15.03	-11.42
n-Decane	7.65	7.65	0.00
n-Dodecane	0.98	0.56	-54.55
n-Heptane	5.09	3.97	-24.72
n-Hexane	10.24	9.51	-7.39
n-Nonane	3.66	3.51	-4.18
n-Octane	1.58	1.41	-11.37
n-Pentane	19.03	17.41	-8.89
n-Propylbenzene	2.13	1.18	-57.40
n-Undecane	3.58	2.86	-22.36
o-Xylene	7.99	6.88	-14.93
Propane	24.91	23.97	-3.85
Propene	9.18	8.88	-3.32
Styrene	2.26	1.14	-65.88
t-2-Butene	1.91	1.56	-20.17
t-2-Hexene	0.82	0.79	-3.73
t-2-Pentene	2.71	2.63	-3.00
Toluene	41.39	38.14	-8.17
		Average	-18.25
Total	617.48	478.00	-25.46
Unidentified	32.20	69.50	

*GKPRB = Gas Kinetics and Photochemistry Research Branch, a branch of the EPA NERL.

TECHNICAL REPORT DATA

(PLEASE READ INSTRUCTIONS ON THE REVERSE BEFORE COMPLETING)

'ORT NO. A-454/R-99-013	2.	3. RECIPIENT'S ACCESSION NO.
.E AND SUBTITLE 4 Nonmethane Organic Compound And Speciated Nonmethane ıanic Compounds Monitoring Program		5. REPORT DATE 1/1/96
		6. PERFORMING ORGANIZATION CODE
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FORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT NO.
		11. CONTRACT/GRANT NO. 68-D3-0095
ONSORING AGENCY NAME AND ADDRESS ce Of Air Quality Planning And Standards . Environmental Protection Agency earch Triangle Park, N. C. 27711		13. TYPE OF REPORT AND PERIOD COVERED
		14. SPONSORING AGENCY CODE

PPLEMENTARY NOTES

STRACT

ERTAIN AREAS OF THE COUNTRY WHERE THE NATIONAL AMBIENT AIR QUALITY STANDARD (NAAQS) OZONE IS BEING EXCEEDED, ADDITIONAL MEASUREMENTS OF AMBIENT NONMETHANE ORGANIC MPOUNDS (NMOC) ARE NEEDED TO ASSIST THE AFFECTED STATES IN DEVELOPING REVISED OZONE NTROL STRATEGIES. BECAUSE OF PREVIOUS DIFFICULTY IN OBTAINING ACCURATE NMOC ASUREMENTS, THE U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA) HAS PROVIDED MONITORING) ANALYTICAL ASSISTANCE TO THESE STATES, BEGINNING IN 1984 AND CONTINUING THROUGH THE NMOC MONITORING PROGRAM.

KEY WORDS AND DOCUMENT ANALYSIS

RIPTORS ne Control Strategies onal Ambient Air Quality Standards methane Organic Compound itoring Analysis NMOC Monitoring Program	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI FIELD/GROUP
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