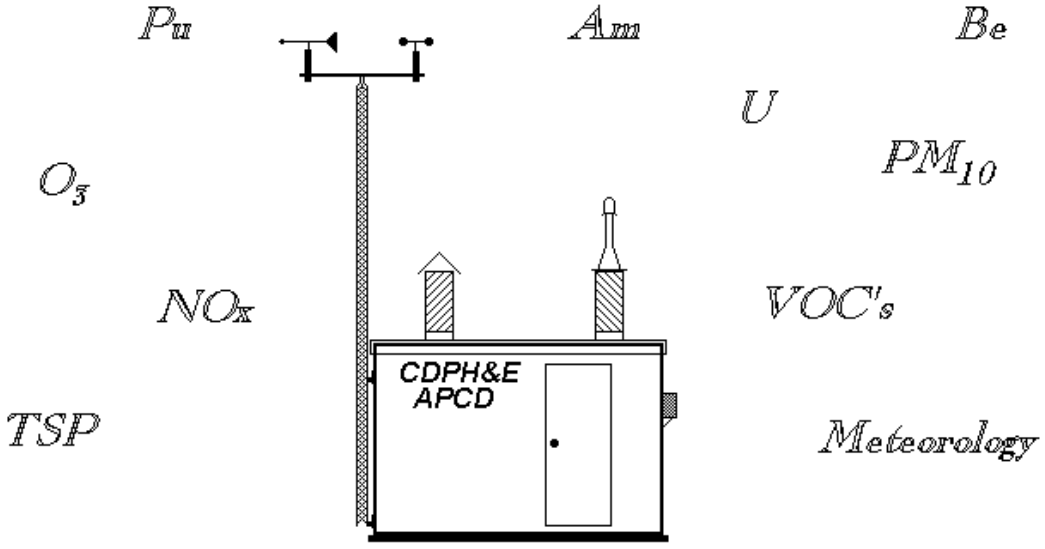
AIR MONITORING DATA REPORT ON THE ROCKY FLATS MONITORING NETWORK

~~~~ 1999 ~~~~



COLORADO DEPARTMENT OF PUBLIC HEALTH & ENVIRONMENT

AIR POLLUTION CONTROL DIVISION

AIR MONITORING DATA REPORT

ON THE

ROCKY FLATS

MONITORING NETWORK

-- 1999 --

Colorado Department
of Public Health
and Environment

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ACRONYMS

ACGIH	American Conference of Governmental Industrial Hygienists
AIP	Agreement In Principle
Am	Americium
APCD	Air Pollution Control Division
AQCC	Air Quality Control Commission
ASTM	American Society for Testing Materials
Be	Beryllium
CDPHE	Colorado Department of Public Health & Environment
CO	Carbon Monoxide
D&D	Decontamination and decommissioning
DOE	United States Department of Energy
EPA	United States Environmental Protection Agency
GC/MS	Gas chromatograph/mass spectrophotometer
ICAP	Inductively coupled argon plasma
LARS	Laboratory and Radiation Services Division
m^3	Cubic meter
NAAQS	National Ambient Air Quality Standards
NCPP	National Conversion Pilot Project
NESHAP	National Emission Standards for Hazardous Air Pollutants
NIOSH	National Institute for Occupational Safety and Health
NO	Nitric oxide
NO_2	Nitrogen dioxide
NOx	Oxides of nitrogen
O_3	Ozone
OSHA	Occupational Safety and Health Administration
Pb	Lead
pCi/m^3	Picocuries per cubic meter
PM_{10}	Particulate matter 10 microns and smaller in diameter
ppb	Parts per billion
ppm	Parts per million
Pu	Plutonium
RFETS	Rocky Flats Environmental Technology Site
SO_2	Sulfur dioxide
TRAC	Terrain Responsive Atmospheric Code
TLV	Threshold limit value
TSP	Total Suspended Particulates
U	Uranium
μg	Microgram
$\mu g/m^3$	Micrograms per cubic meter
VOC	Volatile organic compound

1.0 INTRODUCTION

1.1 Purpose of the Report

This report is being written to provide interested parties the data obtained from ambient air monitoring around the Rocky Flats Environmental Technology Site that is conducted by the Colorado Department of Public Health and Environment, Air Pollution Control Division. This report includes information on monitoring sites, equipment, sampling methods, analytical methods, site locations, monitoring data, comparisons with data from other monitoring sites in the Denver metropolitan area and compliance status as determined by the monitoring data.

1.2 Purpose of Monitoring

The Colorado Department of Public Health and Environment, Air Pollution Control Division established a monitoring network around the Rocky Flats Environmental Technology Site under the Agreement In Principle, discussed further in section 1.3 below. The network provides data to determine compliance with environmental standards, impact on ambient air quality and risks to the general public.

1.3 History

The Agreement In Principle between the State of Colorado and the United States Department of Energy was signed June 28, 1989. The agreement was designed to assure the citizens of Colorado that health, safety and environment are being protected through increased oversight of the Rocky Flats Environmental Technology Site activities by the State of Colorado. One of the major activities included in the agreement is monitoring to be conducted by the State of Colorado, specifically the Colorado Department of Public Health and Environment, and by the Department Of Energy. In accord with the Agreement In Principle, the Air Pollution Control Division committed to and established the ambient air monitoring network around the Rocky Flats Plant.

As part of the review of the existing monitoring of the Rocky Flats Environmental Technology Site, the Governor's Rocky Flats Scientific Panel on Monitoring Systems (Panel) was established. The Panel reviewed and evaluated the existing monitoring being conducted by the Colorado Department of Public Health and Environment and the Department Of Energy at and near the Rocky Flats facility. Several recommendations for additional monitoring and changes to the existing program for both the Colorado Department of Public Health and Environment and the Department of Energy were made.

The Air Pollution Control Division, working with the Department Of Energy and its contractors, compiled a comprehensive emissions inventory of the plant. Using the emissions inventory, past experience, and the Panel recommendations, specific pollutants which were most likely to have an ambient air and public health impact were identified. After identification of the pollutants using emission type, United States Environmental Protection Agency criteria, past experience and Panel recommendations, specific monitoring equipment and methods were selected. Data from the comprehensive emissions inventory were used in a computer model to estimate the major points of potential air pollution impacts for areas located off the Rocky Flats property.

Five locations were selected for monitoring sites using model results and Environmental Protection Agency siting criteria, thus placing a ring around the Rocky Flats Environmental Technology Site.

Monitoring commenced in July of 1992 at three sites. The first sites were located on the north and east side of the plant since these areas were determined by modeling to have the highest potential impact from air pollutants released by the Rocky Flats facility. Two additional sites, one on the south and one on the west, began monitoring in January of 1995.

1.4 Air Quality Standards

The Environmental Protection Agency has established National Ambient Air Quality Standards for six pollutants, known as "criteria" pollutants. They are carbon monoxide (CO), ozone (O_3), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter 10 microns in aerodynamic diameter and smaller (PM_{10}), and lead (Pb). The particulate standard was changed during 1987 from measurement of total suspended particulates (TSP) to PM_{10}. In 1997, the Environmental Protection Agency established new standards for ozone and revised the form of the standard for PM_{10}. Additionally, a new standard for fine particulate matter was established as $PM_{2.5}$ (particulate matter 2.5 microns in aerodynamic diameter and smaller) in 1997.

The current National Ambient Air Quality Standards are presented in Table 1 on page A-1 of Appendix A. Pollutant concentrations higher than the standards are considered unhealthful. Concentrations below the standards are considered acceptable. Primary standards are intended to protect public health while secondary standards are intended to protect public welfare (e.g., nuisance, property damage, etc.). Since the standards take into account both the concentration level of the pollutant and the duration of exposure, they are expressed in terms of a concentration level averaged for a certain period of time.

Determination of a violation of a standard is dependent on the pollutant and standard in question, e.g., ozone and PM_{10} violations are calculated as an average over three years of data. A violation occurs when the standard is exceeded more than an average of once per year over a three year period for O_3 and PM_{10}. The standards for the criteria pollutants are listed in Table 1 of Appendix A. The standards included in the table are annual for NO_2, SO_2, PM_{10} and $PM_{2.5}$, quarterly for Pb, 24 hour for SO_2, PM_{10} and $PM_{2.5}$, eight-hourly for CO and O_3, and hourly for CO, O_3, and SO_2. The former federal TSP standards are included for reference.

Most pollutants do not currently have National Ambient Air Quality Standards. Some pollutants other than those mentioned above may have adverse effects or play a role in a problem for which standards are being contemplated. Therefore, monitoring of some non-criteria pollutants unique to the Rocky Flats site is conducted by the Air Pollution Control Division. These non-criteria pollutant levels may be assessed through comparison to research data on toxicity and workplace standards (such as those of the National Instititute Of Safety and Health, the Occupational Safety and Health Act, and the American Conference of Governmental Industrial Hygienists). Additionally, the State of Colorado has an ambient air quality standard with a monthly average concentration of less than 1.5 $\mu g/m^3$ for lead.

2.0 AMBIENT AIR MONITORING NETWORK AROUND ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

The air pathway is one of the major concerns in protecting public health and welfare in the vicinity of the Rocky Flats facility. To assure that the emissions impacting on the public are within regulatory and known health limits, the Air Pollution Control Division has established an ambient air monitoring network around the outer perimeter of the plant boundaries. This ambient air monitoring network began operating in July of 1992 and was expanded in January 1995.

2.1 Pollutants Monitored

Some of the pollutants monitored are not normally part of the general list of analytes for the Air Pollution Control Division. All the volatile organic compounds (VOCs) checked are not normally monitored throughout the state nor are the metals and radionuclides which are specific to the Rocky Flats Environmental Technology Site. The Air Pollution Control Division used several sources to establish the list of pollutants to be monitored around the Rocky Flats facility. Those sources included the comprehensive emissions inventory conducted by the Air Division and the Department Of Energy based on chemical/material usage, Colorado Air Quality Control Commission Regulations, Air Division inspection reports, Agreement In Principle requirements, Environmental Protection Agency criteria pollutants and National Emission Standards for Hazardous Air Pollutants lists, and recommendations from the Governor's Rocky Flats Scientific Panel on Monitoring Systems. As a result of those reviews, the Air Pollution Control Division determined that the pollutants to be monitored include both particulate matter and specific gaseous compounds.

2.1.1 Particulate Matter

Two types of particulate matter are collected, total suspended particulates (TSP) and PM_{10} (particulate matter 10 μm and smaller). In addition to the gross weight calculated in micrograms per cubic meter ($\mu g/m^3$) the particulates of both types of particulate filters are analyzed for specific metals and radionuclide concentrations. The metals and radionuclides monitored are beryllium (Be), plutonium (Pu), americium (Am) and uranium (U). Specific collection equipment and frequency of sampling are discussed in Section 2.2.

2.1.2 Gaseous

Gaseous sampling is conducted for oxides of nitrogen (NOx) and thirty-three VOCs. The two NOx compounds measured in parts per million (ppm) are nitric oxide (NO) and nitrogen dioxide (NO_2).

The VOCs being analyzed include:

1,1,1,2-tetrafluoroethane (H-134a)	chlorodifluoromethane (Freon-22)

dichlorodifluoromethane (Freon-12)	chloromethane
dichlorotetrafluoroethane (Freon-114)	vinyl chloride
1,3-butadiene	ethyl chloride
dichlorotrifluoroethane (Freon-123)	trichlorofluoromethane (Freon-11)
1,1-dichloroethene	dichloromethane (methylene chloride)
trichlorotrifluoroethane (Freon-113)	methyl tertiary butyl ether
1,1-dichloroethane	chloroform
1,2-dichloroethane	1,1,1-trichloroethane
carbon tetrachloride	benzene
trichloroethylene	1,1,2-trichloroethane
toluene	tetrachloroethylene
chlorobenzene	ethyl benzene
m- + p-xylene	styrene
1,1,2,2-tetrachloroethane	o-xylene
methyl ethyl ketone	methyl butyl ketone
methyl isobutyl ketone	

Three VOCs, carbon tetrachloride, 1,1,1-trichloroethane and methylene chloride, are target compounds due to historically high usage levels at the Rocky Flats facility. The other VOCs on the above list were used occasionally or historically, or may be emitted during remediation activities. All VOC results are reported in parts per billion (ppb).

While not an originally selected pollutant, ozone (O_3) is also being monitored at one site as part of the Air Pollution Control Division's Denver Metropolitan Area Network. It is reported in ppm.

2.1.3 Meteorological Monitoring

Meteorological monitoring is conducted at each site for wind speed and direction (both vector and scalar) and temperature. Separate vane and cups are used for the wind direction and speed with a naturally aspirated vane shield used around the temperature sensor. The vane and cups are at the top of a ten meter high tower with the temperature probe located at 6 meters above the ground. Wind speed results are reported in miles per hour, wind direction in degrees and temperature in degrees Fahrenheit.

2.2 Monitoring Methods

Upon selection of the pollutants to be monitored, the Air Pollution Control Division reviewed previously used and current EPA-recommended sampling techniques for each chemical compound. Based on the review and recommendations of the Governor's Rocky Flats Panel on Monitoring Systems the specific equipment was selected. The monitoring equipment consists of particulate and gaseous monitors. All sampling and analytical methods are approved by the EPA as reference/equivalent methods, or follow suggested EPA guidelines.

2.2.1 Particulate Matter

There are two particulate matter monitoring systems being operated by the Air Pollution Control Division in the vicinity of the Rocky Flats facility: TSP and PM_{10}. The Colorado Department Of Public Health and Environment's Laboratory and Radiation Services Division conducts all analyses of particulate matter.

2.2.1.1 TSP

TSP is collected on glass fiber filter pads. The samplers are made by General Metal Works and use a vacuum cleaner motor to draw air through the filter. Each unit operates for twenty-four hours every sixth day. The units are identical to those used by the Air Pollution Control Division throughout the state.

2.2.1.2 PM_{10}

PM_{10} samplers collect particulate matter 10 microns and smaller in aerodynamic diameter on quartz fiber filters. The samplers are made by Wedding & Associates and use a vacuum cleaner motor to draw air through the filter. Each unit operates for twenty-four hours every sixth day. The units are identical to those used by the Air Pollution Control Division throughout the state and meet the Environmental Protection Agency requirements as a reference method under EPA RFPS-1087-062.

2.2.1.3 Filter Analysis

The TSP and PM_{10} filters are weighed both before and after sampling to determine the particulate loading. The weight of particulate loading in micrograms (μg) divided by the cubic meters (m^3) of air drawn through the filter gives the ambient air concentration in $\mu g/m^3$.

The metal analyses performed on the filters were done on monthly composites of the filters for each particulate sampler from July 1992 through September 1993. All composites beginning with October 1993 are quarterly composites due to low levels of pollutants found. There is a composite performed for each separate sampler being operated. The composite samples are analyzed for beryllium (Be) using inductively coupled argon plasma (ICAP) and results are provided in micrograms of pollutant per cubic meter of air ($\mu g/m^3$). Uranium (U), Plutonium (Pu) and Americium (Am) analyses are by alpha spectrometry and provide results in picocuries of radiation per cubic meter (pCi/m^3).

2.2.2 Gaseous

There are three gaseous monitoring systems being operated by the Air Pollution Control Division in the vicinity of the Rocky Flats Plant. One is for NOx, the second is for VOCs and the third is for O_3.

2.2.2.1 Oxides of Nitrogen (NOx)

Two compounds, NO and NO_2, are analyzed on a continuous basis. The analyzers used at the two sites are an API 200 at X-5 and an API 200A at X-3. Both of these units operate using the

chemiluminescent principle. The units meet the EPA requirements as reference methods under RFNA-0691-082 for the API 200 and RFNA-1194-099 for the API 200A. The data from each day of sampling are transmitted to the Air Division computer for data storage once each day via cellular phone. Automatic zero and span checks are run each day as part of the quality assurance. Calibrations are performed every quarter and independent audits are performed at least once per year.

Monitoring for oxides of nitrogen at X-1 and X-4 was discontinued in January 1999 due to low levels being recorded.

2.2.2.2 Volatile Organic Compounds (VOC)

Gaseous sampling for VOCs is conducted using multi-bed solid sorbent tubes filled with Carbopack-B, Carbopack-C and molecular sieve. The tubes are thermally desorbed followed by gas chromatography/ mass spectrometry (GC/MS) analysis, according to EPA Method TO-17 guidelines. Samples are taken for 24 hours every sixth day by drawing ambient air through the sorbent tubes, which adsorb VOCs. One tube is used during each sampling period. Backup tubes to check for sample break-through of the primary tube were discontinued. A second tube at one site is not exposed to any air flow and is used as a field blank for quality assurance. Additionally, one tube is also transported, but never opened, as a trip blank to check for potential storage contamination. Each tube is analyzed for VOCs in the Colorado Department of Public Health and Environment Laboratory following EPA Method TO-17 guidelines. (See compound list in Section 2.1.2). Flow checks are performed monthly. Calibrations are performed twice per year and an independent audit is performed at least once per year.

2.2.2.3 Ozone (O_3)

O_3 is analyzed on a continuous basis. The analyzer is a Monitor Labs 8810, which uses ultraviolet absorption. The EPA equivalency method is EQOA-0881-053. The data from each day of sampling are transmitted to the Air Division computer for data storage once each day via cellular phone. Automatic zero and span checks are run each day as part of the quality assurance. Calibrations are performed every quarter and independent audits are performed at least once per year.

2.2.3 Meteorological

The meteorological equipment operates on a continuous basis. The equipment being used is manufactured by Met-One Instruments. The meteorological equipment provides wind speed, wind direction and temperature data. The equipment is mounted on a 10 meter tower with the information being transmitted to the Air Pollution Control Division computer once each day via cellular phone. Calibrations are performed twice per year and an independent audit is performed once per year.

The meteorological data are also shared with the DOE via a special data link to feed the data into the Rocky Flats CAPARS (TRAC) model which is used for emergency situations

2.3 Monitoring Locations

Three Air Pollution Control Division monitoring sites located just off the north and east property boundaries of the Rocky Flats facility commenced operation in June 1992. Two additional sites, to the south and west, were activated in January 1995. The sites were selected using modeling techniques to determine the major impact points for emissions from the plant to the general public. An additional goal was to determine the location of a nearby background/ upwind site not normally influenced by the plant. The five sites chosen now complete a ring around the Rocky Flats Environmental Technology Site, providing complete air monitoring coverage. The sites are designated X-1 through X-5. Figure 1 on page B-1 of Appendix B shows the locations of the monitoring sites.

2.3.1 X-1

X-1 is located to the north-north east of the plant on the south side of Colorado Highway 128, approximately 1 1/4 miles to the west of Indiana Street (16600 W. Hwy. 128). Monitoring at this site includes TSP, PM_{10}, Be, U, VOC, meteorology and O_3. NOx monitoring at this site was discontinued in January 1999.

2.3.2 X-2

X-2 is located to the east-northeast of the plant on the west side of Indiana Street approximately 1 mile north of the East Access Gate in the Walnut Creek drainage (11501 Indiana St.). Monitoring at this site includes TSP, PM_{10}, Be, U, VOC and meteorology.

2.3.3 X-3

X-3 is located to the east-southeast of the plant on the west side of Indiana Street approximately 1 mile south of the East Access Gate in the Woman Creek drainage (9901 Indiana St.). Monitoring at this site includes TSP, PM_{10}, Be, U, VOC, NOx and meteorology.

2.3.4 X-4

X-4 is located on the south side of Colorado Highway 72 approximately 2 miles east of Colorado Highway 93 (18000 West Highway 72). Monitoring at this site includes TSP, PM_{10}, Be, U, VOC, and meteorology. NOx monitoring at this site was discontinued in January 1999.

2.3.5 X-5

X-5 is located on the east side of Colorado Highway 93 approximately 1 mile north of the West Access Gate (11190 Highway 93). Monitoring at this site includes TSP, PM_{10}, Be, U, Am, Pu, VOC, NOx and meteorology. This site was designed as an upwind/background site. However, it sometimes records the highest TSP and PM10 results, due to the presence of a nearby sawmill and gravel aggregate operations.

3.0 DATA RESULTS

The following subsections discuss the data obtained from the Air Pollution Control Division ambient air monitoring network around the Rocky Flats Environmental Technology Site by

pollutant. Tables and graphs depicting the ambient air monitoring data are in Appendices C through I. Subsection 3.11 contains a narrative on comparisons of the data found around the Rocky Flats Site with other Air Pollution Control Division monitoring sites in the Denver metropolitan area. These data and comparisons are contained in Appendix J.

3.1 TSP

Particulates may be released into the atmosphere from a number of sources at Rocky Flats. The main sources are any machining, grinding, earth moving, combustion, foundry or forming/molding sources. Additionally, the wind or other mechanical actions may cause particulates to be re-entrained in the air. TSP is generally defined as particles less than 100 microns in aerodynamic diameter, however, the major catch on the TSP filters is 40 microns in diameter or less. The levels of TSP have so far been very low with the exception of the summer of 1995. During this period, particularly in August 1995, construction of the Woman Creek Diversion Reservoir was taking place immediately across the street from the X-3 site. As a result of earth moving operations, TSP levels at X-3 were very high with a maximum of 501 $\mu g/m^3$. This level significantly exceeds the former NAAQS for TSP of 260 $\mu g/m^3$ for a 24-hour sample. No additional construction is planned as the reservoir is now complete.

The average and maximum data for TSP results by month for 1999, both in table and graph form, are in Appendix C. For 1999, the maximum 24-hour value recorded was 116 $\mu g/m^3$ at X-5 and the maximum annual average was 50 $\mu g/m^3$ at X-5. Both of these values are well below the former NAAQS. Data in 1999 showed a fairly level trend, with slightly higher values during March. This is most likely due to blowing dust in gusty spring wind conditions. X-5 was almost always the highest recording site for each month, probably due to its proximity to Highway 93, a nearby sawmill and nearby quarries. Therefore, contrary to network planning expectation, it is not a "background" site. Appendix C also includes a table and graph of historical quarterly average data and shows that the data for 1999 were typical.

Note that there are two TSP samplers at X-1, which are run simultaneously to provide a quality control check on the monitors.

3.2 PM_{10}

Particulates may be released into the atmosphere from a number of sources at the Rocky Flats faciliity. The main sources are any machining, grinding, earth moving, combustion, foundry or forming/molding sources. Additionally, the wind or other mechanical actions may cause particulates to be re-entrained in the air. PM_{10} particles are 10 microns or less in aerodynamic diameter. These particles are easily inhaled and can cause respiratory problems. With the exception of the summer of 1995, the PM_{10} levels detected so far have been well below those that would cause any health concern. During that period, particularly in August 1995, construction of the Woman Creek Diversion Reservoir was taking place immediately across the street from the X-3 site. As a result of earth moving operations, PM_{10} levels at X-3 were elevated with a maximum of 87 $\mu g/m^3$, which is still well below the NAAQS for PM_{10} of 150 $\mu g/m^3$ for a 24-hour sample. After completion of the reservoir, PM_{10} levels decreased.

The average and maximum data for PM_{10} results by month for 1999, both in table and graphic form, are in Appendix D. For 1999, the maximum 24-hour value recorded was 53 $\mu g/m^3$ at X-3, and the maximum annual average was 13 $\mu g/m^3$ at X-2, X-2C, and X-5. Both of these values are well below the National Ambient Air Quality Standards. As with TSP, data in 1999 showed a typical trend of being higher in March, most likely due to blowing dust in gusty wind conditions. June and July 1999 levels of PM_{10} were higher than the other months. This is also due to blowing dust, which occurs more frequently in the dry summer period. Appendix D also includes a table and graph of historical quarterly average data and shows that the data for 1999 were slightly lower than in 1998.

Note that there are two PM_{10} samplers at X-2, which provides a quality control check on the monitors.

3.3 Oxides of Nitrogen (NOx)

Oxides of nitrogen (NOx) are typically a by-product of combustion, which is the major source of NOx at the Rocky Flats Environmental Technology Site. There have historically been large amounts of nitric acid use at the plant. In the presence of sunlight nitric acid (HNO_3) can degrade to NO_2 and OH. Nitric acid use decreased greatly after the shutdown of plant production in 1990. Therefore, the levels of NOx detected in ambient air in recent years have been very low. It is likely that automotive traffic on the roads surrounding the Rocky Flats site is the major emissions source of oxides of nitrogen.

The data for average NOx results, as nitric oxide (NO) and nitrogen dioxide (NO_2) by month for the calendar year 1999, both in table and graph form, are in Appendix E. The Appendix also includes a table and graph of quarterly averages for 1997 through 1999 and monthly 1-hour maximum data for 1999. For NO, a maximum 1-hour value of 0.154 ppm was recorded in 1999 at X-5 and the maximum annual average of 0.007 ppm also occurred at X-5. X-3 was very similar, with an annual average of 0.006 ppm. For NO_2, a maximum 1-hour value of 0.067 ppm was recorded at X-5 and a maximum annual average 0.010 ppm occurred at X-3. NOx levels are slightly higher in the winter than in the summer, probably due to seasonal temperature inversions that trap air close to the ground, permitting buildup of air pollutant concentrations. The quarterly averages show that levels in 1999 were typical compared to previous years.

Monitoring for NO_x at X-1 and X-4 was discontinued in January 1999 due to low levels.

3.4 Volatile Organic Compounds (VOC)

VOCs released from the Rocky Flats Environmental Technology Site are mainly solvents. The three major VOCs used at the plant during production were carbon tetrachloride, 1,1,1-trichloroethane and methylene chloride. In 1999, thirty VOCs were analyzed following EPA Method TO-17 guidelines. Of these, 21 were detected at some time in 1999. Freons, probably from refrigeration units (industrial and automotive) as well as automotive-related combustion

by-products/compounds such as benzene, toluene and xylenes were consistently detected. Additionally, chloromethane, methylene chloride (dichloromethane), 1,1,1-trichloroethane, vinylidene chloride and carbon tetrachloride were consistently detected. Trichloroethene, tetrachloroethene, chloroform, styrene, and methyl tert butyl ether (MTBE) were seen during certain seasons. All levels were well below threshold limit values.

The data for monthly average VOCs for 1999 are presented in a table in Appendix F. Graphs are also presented for compounds that were detected during the year.

3.5 Ozone (O_3)

Ozone is a secondary pollutant formed by the reaction of nitrogen oxides and hydrocarbons in the presence of sunlight. Thus, high ozone concentrations generally occur during the summer months and in the early afternoon during the peak sunlight hours. Since high levels of nitrogen oxides and hydrocarbons can break down ozone, high ozone concentrations most often occur away from urban centers. The area around the Rocky Flats Environmental Technology Site is outside of the Denver core area and meteorologically is often downwind of Denver during late mornings and early afternoons. The entire western foothills area, from Chatfield Reservoir in the south to Rocky Mountain National Park in the north, is often an area of high ozone concentrations. Maximum concentrations in 1999 were consistent with concentrations recorded in previous years and are just below the old 1-hour NAAQS of 0.12 ppm with a maximum 1-hour value of 0.105 ppm being recorded. Compared to the new 8-hour NAAQS of 0.08 ppm, the maximum concentration recorded in 1999 of 0.092 ppm is well above this standard. However, the standard looks at the average of the fourth maximum 8-hour value over three years. In 1999, this fourth maximum value was 0.080 ppm, at the level of the standard.

The average monthly data for O_3 results by month for the calendar year of 1999, both in table and graphic form, are in Appendix G and show a typical trend of being higher in the summer. The Appendix also includes a table and graph of quarterly averages for 1997 through 1999 and monthly 1-hour and 8-hour maximum data. Quarterly average values, compared to previous years, were typical.

Note that this is not a planned monitored pollutant at the Rocky Flats Site. However, as part of a previous special Denver metropolitan area study, O_3 monitoring was initiated at X-1.

3.6 Beryllium (Be)

Be is a naturally occurring element in the form of mineral beryl, which is found in the soils around the Rocky Flats Environmental Technology Site at low levels, as well as being a metal formerly used in the processing at the plant. Be is on the National Emission Standards for Hazardous Air Pollutants (NESHAPS) list and is one of the compounds listed in the Colorado Air Quality Control Commission's Regulation No. 8 as a hazardous or toxic substance.

The data for Be results, by quarter, for the calendar year 1999 are in Appendix H. These quarterly results are for composite samples for each sampler. As can be seen, no Be was detected at any of the five sites in 1999 and thus no graphing or averaging was done.

3.7 Plutonium (Pu)

Pu is considered to be a man-made element and does not occur naturally. Therefore, any Pu detected can be related to the Rocky Flats Plant or to world-wide fall-out created by testing of nuclear weapons.

Pu emissions were analyzed during 1999 at X-5 only. The Colorado Department of Public Health and Environment Laboratory has continued to monitor for Pu at other locations around the Rocky Flats Site but those data are not part of this Air Pollution Control Division report. The data for Pu results, by quarter, for the calendar year of 1999 are in Appendix H. These quarterly results are for composite samples. Since many results were values less than the detection limit of the analytical method, no graphing or averaging was done. No Pu was detected at X-5 in 1999, except for results for the first quarter. However, these results were not far above the detection limits generally obtained for this method.

3.8 Americium (Am)

Am is a man-made element and a by-product of Pu which is not naturally occurring. Any Am detected is considered to be connected with the plant or to world-wide fall out created by testing of nuclear weapons.

Am emissions were analyzed during 1999 at X-5 only. The Colorado Department of Public Health and Environment Laboratory has continued to monitor for Am at other locations around the plant but those data are not part of this report, which discusses only monitoring at the Rocky Flats perimeter sites X-1 through X-5. The data for Am results, by quarter, for the calendar year of 1999 are in Appendix H. These quarterly results are for composite samples. Since many results were values less than the detection limit of the analytical method, no graphing or averaging was done. No Am was detected at X-5 in 1999.

3.9 Uranium (U)

U is a naturally occurring element in the soils around the Rocky Flats Environmental Technology Site. However, the plant is also a source which must be monitored.

The data for U results, by quarter, for the calendar year of 1999 are in Appendix H. These quarterly results are for composite samples for each sampler. Unlike for prior years, results were analyzed for species U-234, U-235, and U-238. Results for the third quarter 1999 TSP sample analyses showed some very high values. These values were not observed for the third quarter PM_{10} filter analyses, or for any of the third quarter samples taken on the plant site itself. An investigation of the TSP filters that went into these third quarter composites revealed that the problematic results all involved filters from three of the manufacturer's batches. Two of these manufacturer batches obviously have a close connection, as the manufacturer's filter numbers are adjacent. The third batch had different numbers. The Colorado Department of Public Health and Environment believes that the high third quarter uranium results were caused by filter contamination during the manufacturing process. Thus, no graphing was done for the uranium results.

3.10 Meteorology

Meteorological data are presented in Appendix I and include monthly and quarterly average data for wind speed and temperature as well as monthly 1-hour maximum data. Wind rose plots for wind speed and direction are also presented in Appendix I.

The data show the Rocky Flats area to have very high wind speeds. A 1-hour maximum wind speed of 60 miles per hour was recorded at the X-2 site in 1999 and a maximum annual average of 9.1 miles per hour was measured at site X-1. Graphs of the quarterly average data show that wind speeds in 1999 were comparable to previous years and show a typical pattern of being higher in the winter. The wind rose diagrams show predominant winds from the west-northwest, especially at night when down slope wind conditions prevail. During the daytime, winds are often from the south-southeast to east, which is more indicative of up slope conditions and convection heating. It can also be seen that the wind directions are less variable at X-2 and X-3 as they are in drainage valleys.

The maximum 1-hour temperature recorded in 1999 was 93 degrees Fahrenheit at X-3. Quarterly average data show that temperatures in 1999 were comparable to previous years.

3.11 Comparisons to Other Sites

The data obtained from the Air Pollution Control Division monitors around the Rocky Flats Site were compared to available data from other monitoring sites around the Denver metropolitan area where some or all of the pollutants were monitored. The comparison stations that were used are the CAMP Station (downtown Denver), Adams City, Arvada, NREL (South Table Mountain), South Boulder Creek, Boulder Chamber and Welby. Table 2 on page A-2 of Appendix A lists the monitoring sites, locations and pollutants sampled. Figure 2 on page B-2 of Appendix B is a map showing the locations of the Rocky Flats and the Denver area sites used for comparisons.

In 1999 the only Air Pollution Control Division monitoring stations to sample for VOCs and metals/radionuclides were at the Rocky Flats site. Therefore, no comparisons can be made with other sites for those pollutants. Nor will there be any comparisons made with meteorological data since the purpose of the report is not to assess impacts from point sources of air pollution. Most of the large point sources at the Rocky Flats site are no longer active.

3.11.1 Particulate Matter

Appendix J contains tables and graphs for TSP and PM_{10} that compare data from the Rocky Flats sites to other sites. In both cases the monitoring results for monthly average particulate concentrations are much lower at the Rocky Flats sites than at the CAMP and Adams City sites. Monthly average PM_{10} concentrations are slightly lower than at the Boulder Chamber site. Similarly, the monthly 24-hour maximum particulate concentrations at the Rocky Flats sites for TSP are much lower than at the CAMP and the Adams City sites. (It should be noted that due to the temporary closure of the CAMP site for re-building, 1999 data at CAMP are not complete).

For 24-hour maximum PM_{10} concentrations, the Rocky Flats sites are much lower than at the CAMP or Adams City sites and slightly lower than the Boulder Chamber site.

3.11.2 NOx

Appendix J contains tables and graphs comparing NO and NO_2 monthly averages to those found at the CAMP and Welby stations. For both NO and NO_2, the Rocky Flats Environmental Technology sites are well below the monthly averages noted for the other two stations. Comparing monthly 1-hour maximums at the same locations, the Rocky Flats locations are again well below the other two stations.

3.11.3 O_3

Ozone is not one of the pollutants designated for monitoring in the Rocky Flats network. Although the site emits some volatile organic compounds, current cleanup operations at Rocky Flats are not expected to create large concentrations of ozone. However, as noted previously, the western foothills area of metropolitan Denver is an area of high ozone concentrations. Therefore the Rocky Flats X-1 station is used as part of the Air Pollution Control Division special ozone study network and has provided valuable information. Appendix J presents ozone data from X-1 compared to four other sites. Three of these other sites, NREL, South Boulder Creek, and Arvada, are along the western foothills corridor where ozone levels are a concern. The fourth location, Welby, is located northeast of the Denver core area, along the down wind Platte River drainage. Monthly average data show that the X-1 site is generally higher than these other sites. The monthly 1-hour maximum data show that the X-1 values frequently track along with the other foothills stations. Site X-1 and NREL tend to show the highest values during the summer period. These sites are in close proximity to one another. (See Figure 2).

4.0 SUMMARY

The monitoring conducted around the boundaries of the Rocky Flats Environmental Technology Site shows values for the pollutants of concern which are below those in other portions of the Denver metropolitan area. In fact the values are typical of the values found on the edges of the Denver area. A major reason for the low values is the change of mission at the plant, which ceased production in October 1990.

This has allowed the Air Pollution Control Division to determine what could be considered to be near background levels in the area. As decontamination and decommissioning (D&D) operations have continued at the Rocky Flats facility, air pollutant levels at the site borders have continued to remain typical of an edge-of-Denver situation. Thus, the air pollution monitoring network at the Rocky Flats perimeter has not measured significant impacts from site remediation activities. This is probably due to the large buffer zone between the site cleanup activities, and the Rocky Flats site boundaries. With these five Air Pollution Control Division sites in operation, the Rocky Flats plant has been ringed by monitors and the resulting data, up and down wind, provides answers to the level of impact the Rocky Flats facility has on the ambient air and the general public.

APPENDIX A

TABLES

Table 1
NATIONAL AMBIENT AIR QUALITY STANDARDS

POLLUTANT	AVERAGING TIME	STANDARD
Carbon Monoxide (CO)		
Primary Standard	1 Hour [a]	35 ppm
Primary Standard	8 Hour [a]	9 ppm
Ozone (O_3)		
Primary and Secondary Standards (up to 1997)	1 Hour [b]	0.12 ppm
Primary and Secondary Standards (as of July 1997)	8 Hour [c]	0.08 ppm
Nitrogen Dioxide (NO_2)		
Primary and Secondary Standards	Annual Arithmetic Mean	0.053 ppm
Sulfur Dioxide (SO_2)		
Primary Standard	Annual Arithmetic Mean	0.030 ppm
Primary Standard	24 Hour [a]	0.14 ppm
Secondary Standard	3 Hour [a]	0.5 ppm
Particulates (PM_{10})		
Primary and Secondary Standards	Annual Arithmetic Mean [d]	50 $\mu g/m^3$
Primary and Secondary Standards	24 Hour [b] prior to July 1997, [e] as of July 1997	150 $\mu g/m^3$
Fine Particulates ($PM_{2.5}$) (as of July 1997)		
Primary and Secondary Standards	Annual Arithmetic Mean [d]	15.0 $\mu g/m^3$
Primary and Secondary Standards	24 Hour [f]	65 $\mu g/m^3$
Lead (Pb)		
Primary and Secondary Standards	Calendar Quarter Average	1.5 $\mu g/m^3$
Total Suspended Particulates (TSP)		
Primary Standard	Annual Geometric Mean [g]	75 $\mu g/m^3$
Primary Standard	24 Hour [g]	260 $\mu g/m^3$
Secondary Standard	Annual Geometric Mean [g]	60 $\mu g/m^3$
Secondary Standard	24 Hour [g]	150 $\mu g/m^3$

(a) Not to be exceeded more than once per year.

(b) Statistically estimated number of days with concentrations above this level averaged over a three year period, is not to be more than 1 per year.

(c) The three year average of the fourth maximum value for each year is not to exceed this level.

(d) The average of three years of annual averages (based on quarterly averages) is not to exceed this level.

(e) The three year average of the 99^{th} percentile for each year is not to exceed this level.

(f) The three year average of the 98^{th} percentile for each year is not to exceed this level.

(g) The TSP standard was replaced by the PM_{10} standard on July 1, 1987. The Colorado state standard for TSP has been abolished. It is listed here for data analysis purposes only.

Table 2
Stations Used For Comparisons

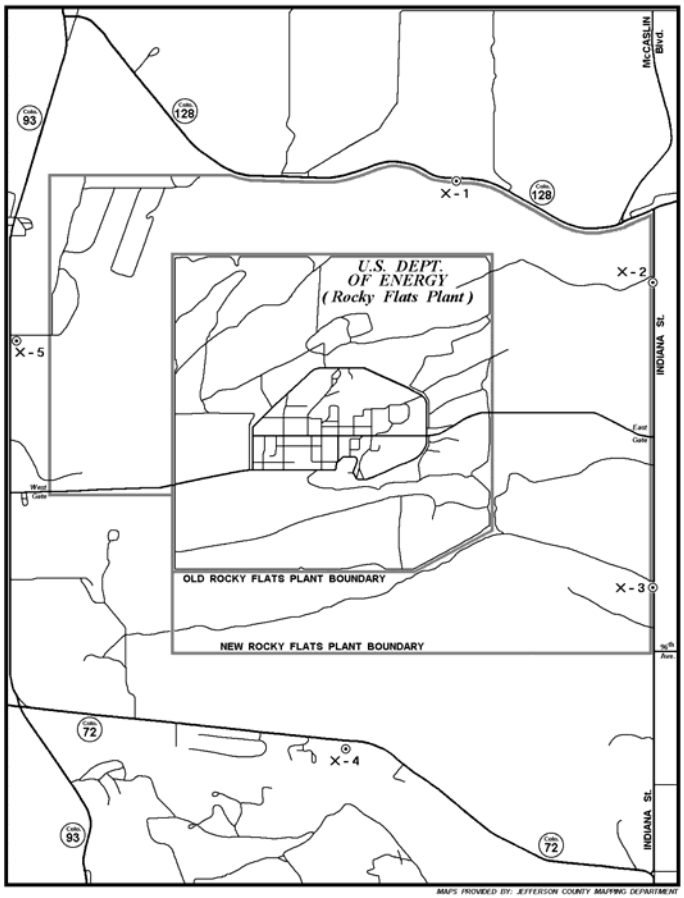
SITE NAME	LOCATION	TSP	PM_{10}	NOx	O_3	MET
RFETS X-1	16600 W. Colorado Hwy. 128	X	X		X	X
RFETS X-2	11501 Indiana Street	X	X			X
RFETS X-3	9901 Indiana Street	X	X	X		X
RFETS X-4	18000 W. Colorado Hwy. 72	X	X			X
RFETS X-5	11190 Colorado Hwy. 93	X	X	X		X
DENVER (CAMP)	2105 Broadway	X	X	X		X
WELBY	78th Avenue & Steele Street		X	X	X	X
ADAMS CITY	4301 E. 72nd Avenue	X	X			
ARVADA	57th Avenue & Garrison Street				X	X
NREL (S. TABLE MTN.)	20th Avenue & Quaker Street				X	
SOUTH BOULDER CREEK	1405 1/2 S. Foothills Highway				X	
BOULDER - CHAMBER	Chamber - 2440 Pearl Street	X	X			

APPENDIX B

MAPS

APPENDIX B
Figure 1

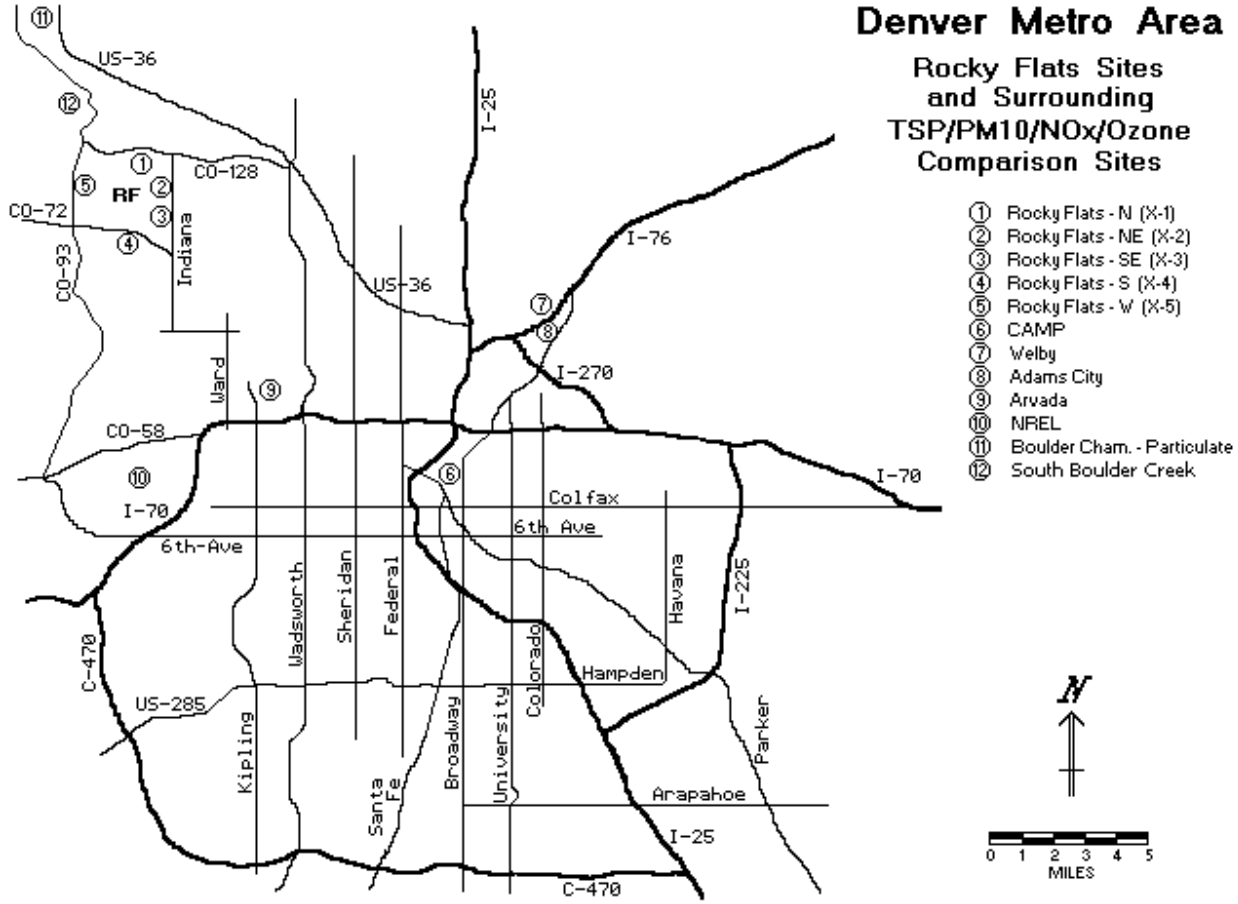
COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT
AIR POLLUTION CONTROL DIVISION - SAMPLING LOCATIONS



Site	**Location**
X-1	16600 West Highway 128 --- Rocky Flats north property boundary, outside of boundary fence on the south side of Colorado Highway 128, approximately 1.3 miles to the west of Indiana Street.
X-2	11501 Indiana Street --- Rocky Flats east property boundary, outside the boundary fence on the west side of Indiana Street, approximately 1 mile north of the Rocky Flats East access road.
X-3	9901 Indiana Street --- Rocky Flats east property boundary, outside the boundary fence on the west side of Indiana Street, approximately 1 mile south of the Rocky Flats East access road.
X-4	18000 West Highway 72 --- On south side of Colorado Highway 72 on south edge of an unused parking lot, approximately 2 miles east of Colorado Highway 93.
X-5	11190 Highway 93 --- On east side of Colorado Highway 93 and south side of 112th Avenue, approximately 1 mile north of the Rocky Flats West access road.

APPENDIX B
Figure 2

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT
AIR POLLUTION CONTROL DIVISION - COMPARISON SITES



Site	**Location**
Rocky Flats - N (X-1)	16600 West Highway 128
Rocky Flats - NE (X-2)	11501 Indiana Street
Rocky Flats - SE (X-3)	9901 Indiana Street
Rocky Flats - S (X-4)	18000 West Highway 72
Rocky Flats - W (X-5)	11190 Highway 93
CAMP	2105 Broadway, Denver
Welby	78th Avenue and Steele Street
Adams City	4301 East 72nd Avenue
Arvada	57th Avenue and Garrison Street
NREL (South Table Mtn.)	20th Avenue & Quaker Street
Boulder Chamber - Particulate	2440 Pearl Street
South Boulder Creek	1405 1/2 South Foothills Highway

APPENDIX C

TOTAL SUSPENDED PARTICULATE DATA

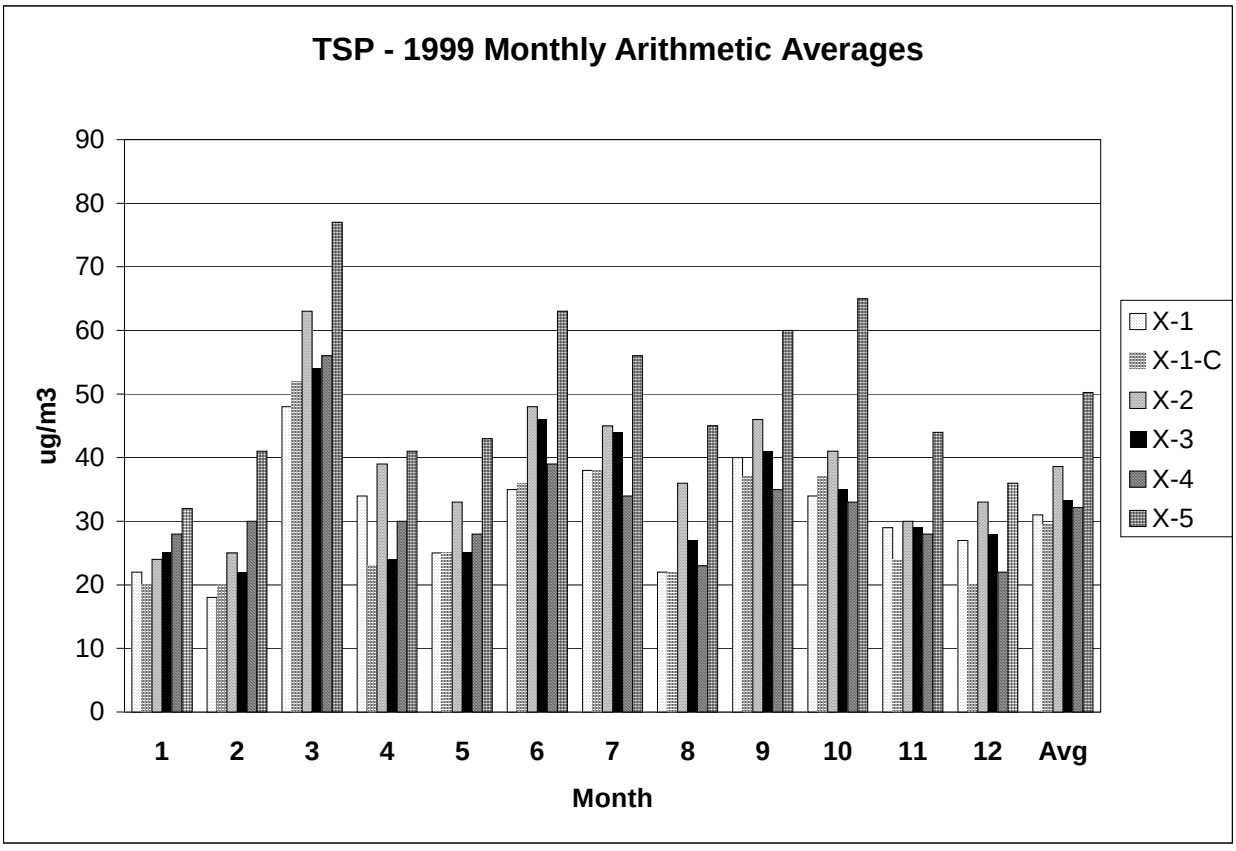
AIR MONITORING AT RFETS

Total Suspended Particulates

1999

Monthly Arithmetic Average Data
($\mu g/m^3$)

	1999												1999
Site	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Avg**
X-1	22	18	48	34	25	35	38	22	40	34	29	27	31
X-1-C	20	20	52	23	25	36	38	22	37	37	24	20	30
X-2	24	25	63	39	33	48	45	36	46	41	30	33	39
X-3	25	22	54	24	25	46	44	27	41	35	29	28	33
X-4	28	30	56	30	28	39	34	23	35	33	28	22	32
X-5	32	41	77	41	43	63	56	45	60	65	44	36	50

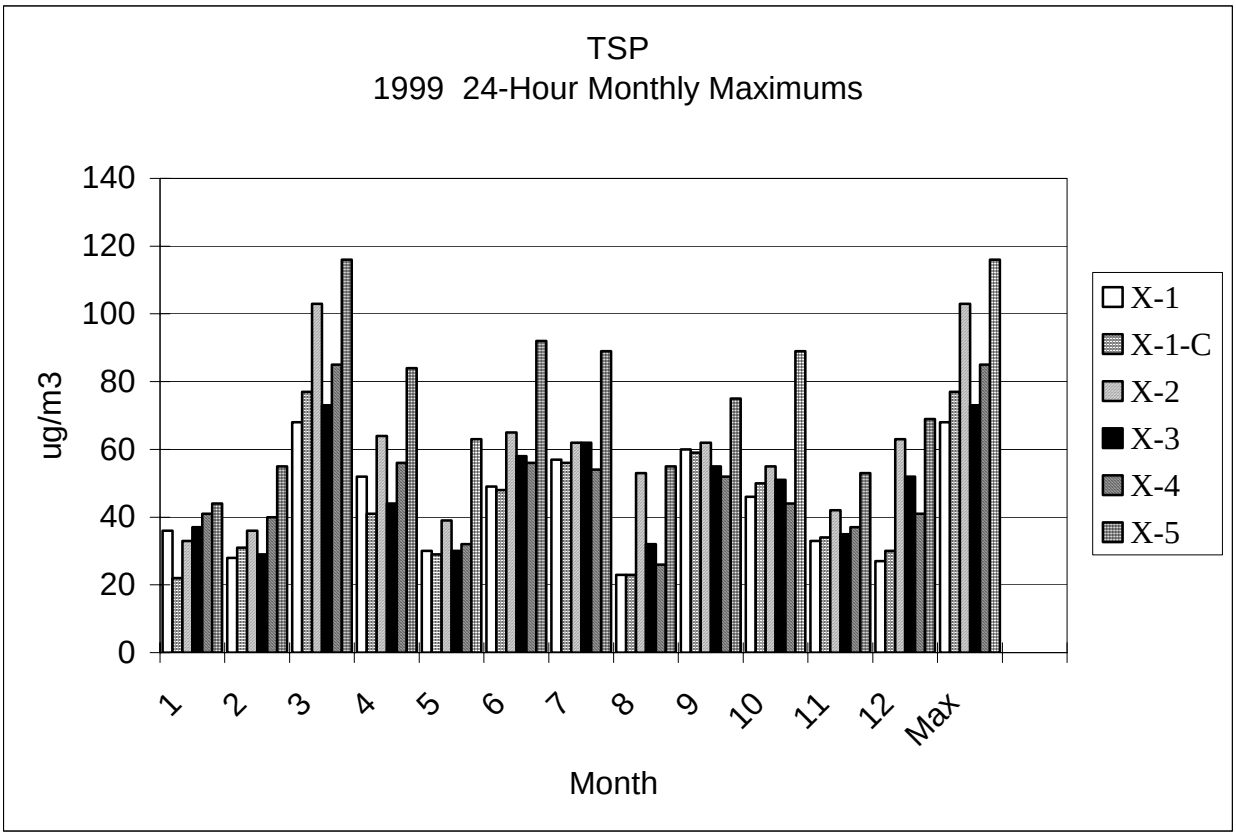


AIR MONITORING AT RFETS

Total Suspended Particulates
1999
Monthly 24 Hour Maximum Data (ug/m3)

1999 Months **1999**

Site	1	2	3	4	5	6	7	8	9	10	11	12	Max
X-1	36	28	68	52	30	49	57	23	60	46	33	27	68
X-1-C	22	31	77	41	29	48	56	23	59	50	34	30	77
X-2	33	36	103	64	39	65	62	53	62	55	42	63	103
X-3	37	29	73	44	30	58	62	32	55	51	35	52	73
X-4	41	40	85	56	32	56	54	26	52	44	37	41	85
X-5	44	55	116	84	63	92	89	55	75	89	53	69	116



AIR MONITORING AT RFETS

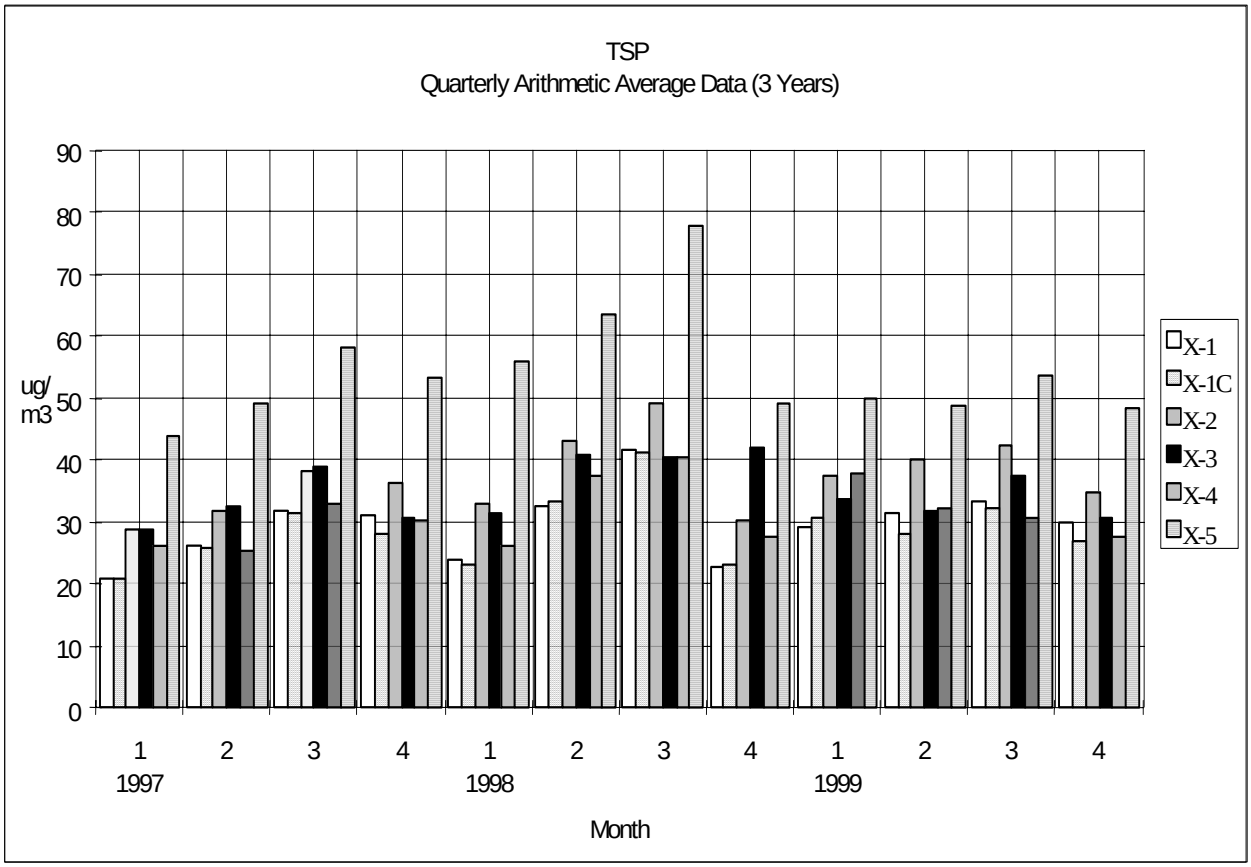
Total Suspended Particulates

1999

Quarterly Arithmetic Average Data (3 years)

ug/m3

Site	1997				1998				1999			
	1	2	3	4	1	2	3	4	1	2	3	4
X-1	21	26	32	31	24	33	42	23	29	31	33	30
X-1C	21	26	31	28	23	33	41	23	31	28	32	27
X-2	29	32	38	36	33	43	49	30	37	40	42	35
X-3	29	33	39	31	31	41	41	42	34	32	37	31
X-4	26	25	33	30	26	38	41	28	38	32	31	28
X-5	44	49	58	53	56	64	78	49	50	49	54	48



APPENDIX D

PM_{10} DATA

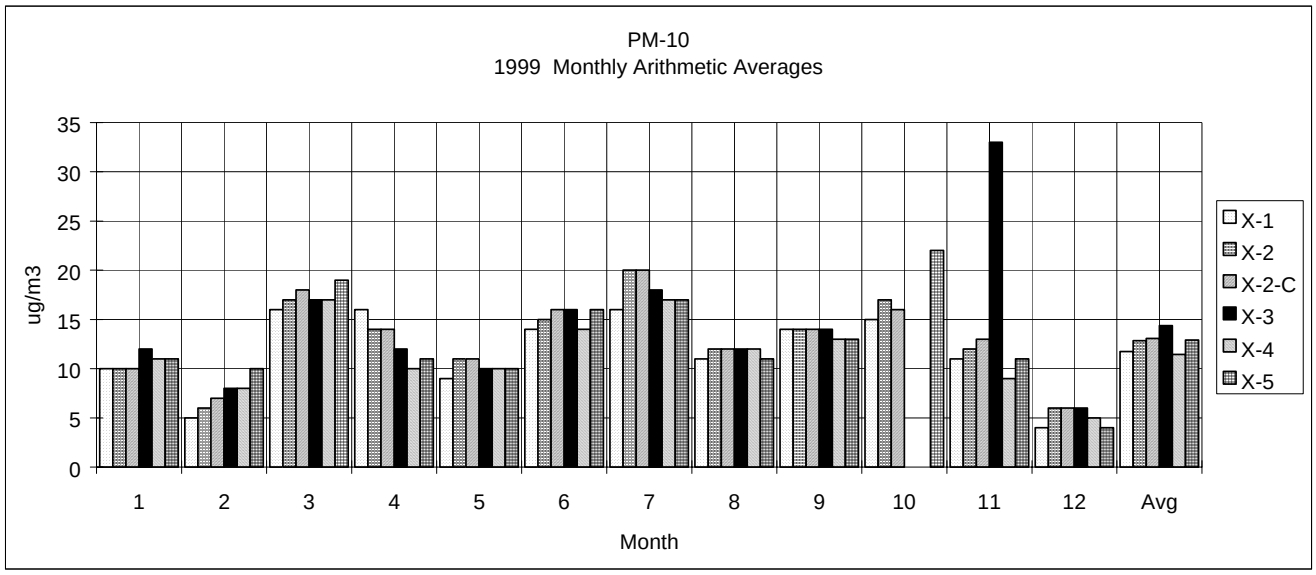
AIR MONITORING AT RFETS

PM_{10}

1999

Monthly Arithmetic Average Data
($\mu g/m^3$)

	1999												1999
Site	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Avg**
X-1	10	5	16	16	9	14	16	11	14	15	11	4	12
X-2	10	6	17	14	11	15	20	12	14	17	12	6	13
X-2-C	10	7	18	14	11	16	20	12	14	16	13	6	13
X-3	12	8	17	12	10	16	18	12	14		33	6	14
X-4	11	8	17	10	10	14	17	12	13		9	5	11
X-5	11	10	19	11	10	16	17	11	13	22	11	4	13



X-3 and X-4 missing for October due to laboratory error on filter tare weights

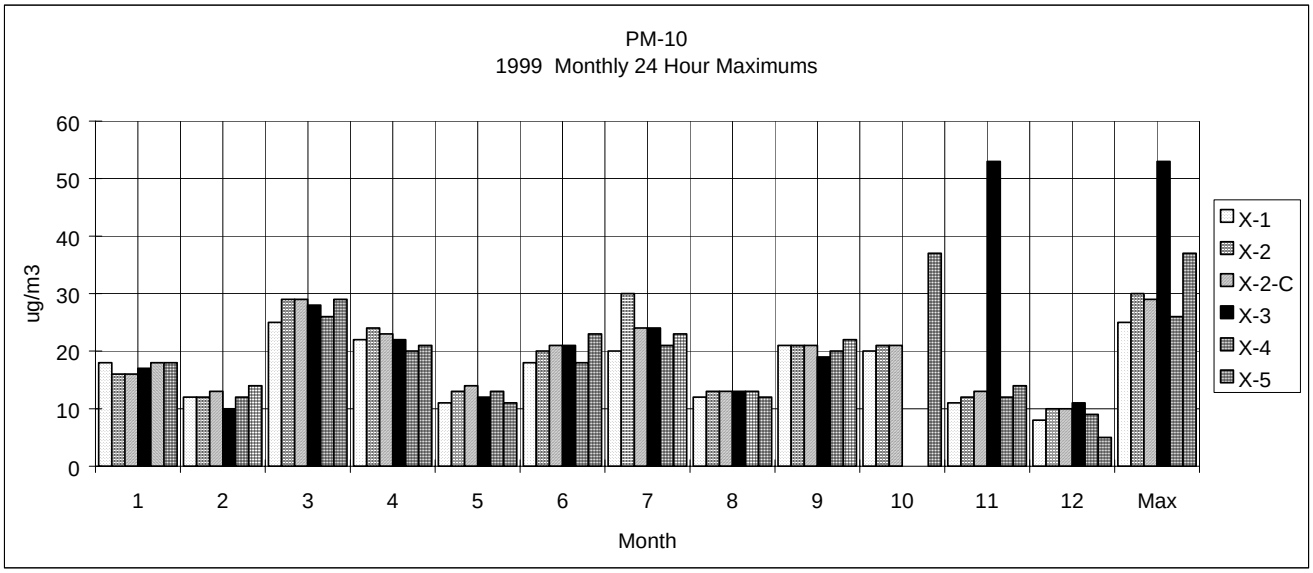
AIR MONITORING AT RFETS

PM_{10}

1999

Monthly 24-Hour Maximum Data
($\mu g/m^3$)

	1999												1999
Site	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Max**
X-1	18	12	25	22	11	18	20	12	21	20	11	8	25
X-2	16	12	29	24	13	20	30	13	21	21	12	10	30
X-2-C	16	13	29	23	14	21	24	13	21	21	13	10	29
X-3	17	10	28	22	12	21	24	13	19		53	11	53
X-4	18	12	26	20	13	18	21	13	20		12	9	26
X-5	18	14	29	21	11	23	23	12	22	37	14	5	37



X-3 and X-4 missing for October due to laboratory error on filter tare weights

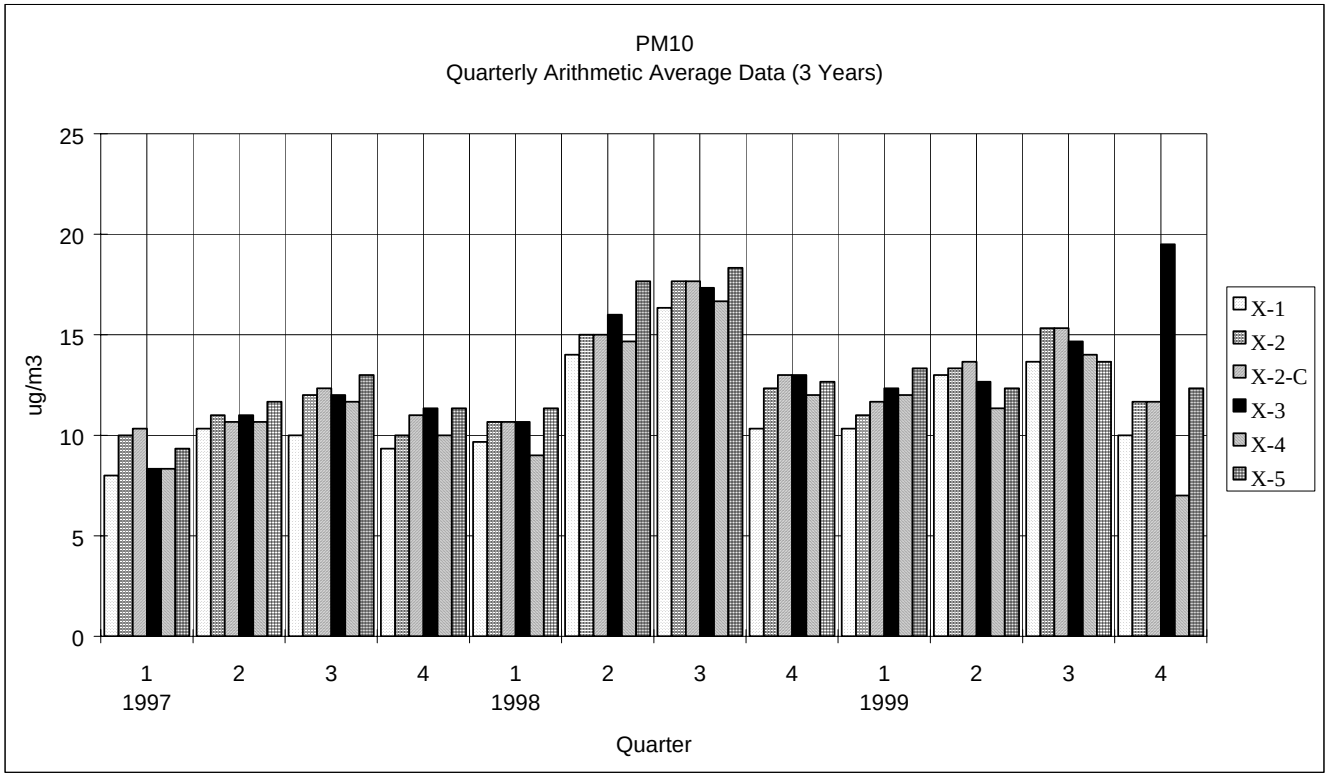
AIR MONITORING AT RFETS

PM_{10}

1999

Quarterly Arithmetic Average Data (3-years)
($\mu g/m^3$)

	1997				1998				1999			
Site	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
X-1	8	10	10	9	10	14	16	10	10	13	14	10
X-2	10	11	12	10	11	15	18	12	11	13	15	12
X-2-C	10	11	12	11	11	15	18	13	12	14	15	12
X-3	8	11	12	11	11	16	17	13	12	13	15	20
X-4	8	11	12	10	9	15	17	12	12	11	14	7
X-5	9	12	13	11	11	18	18	13	13	12	14	12



APPENDIX E

OXIDES OF NITROGEN DATA

AIR MONITORING AT RFETS

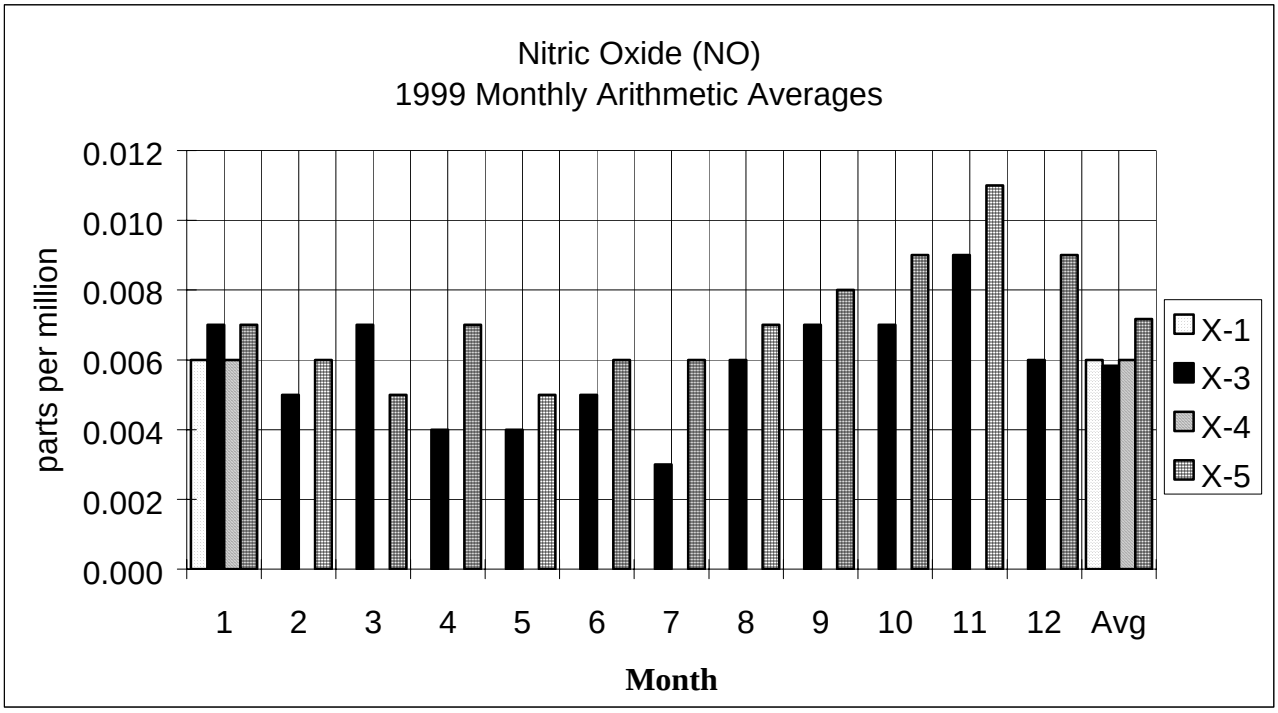
Nitric Oxide (NO)

1999

Monthly Arithmetic Average Data

(ppm)

	1999												1999
Site	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Avg**
X-1	0.006												0.006
X-3	0.007	0.005	0.007	0.004	0.004	0.005	0.003	0.006	0.007	0.007	0.009	0.006	0.006
X-4	0.006												0.006
X-5	0.007	0.006	0.005	0.007	0.005	0.006	0.006	0.007	0.008	0.009	0.011	0.009	0.007



Note: NOx at X-1 and X-4 Discontinued in January 1999.

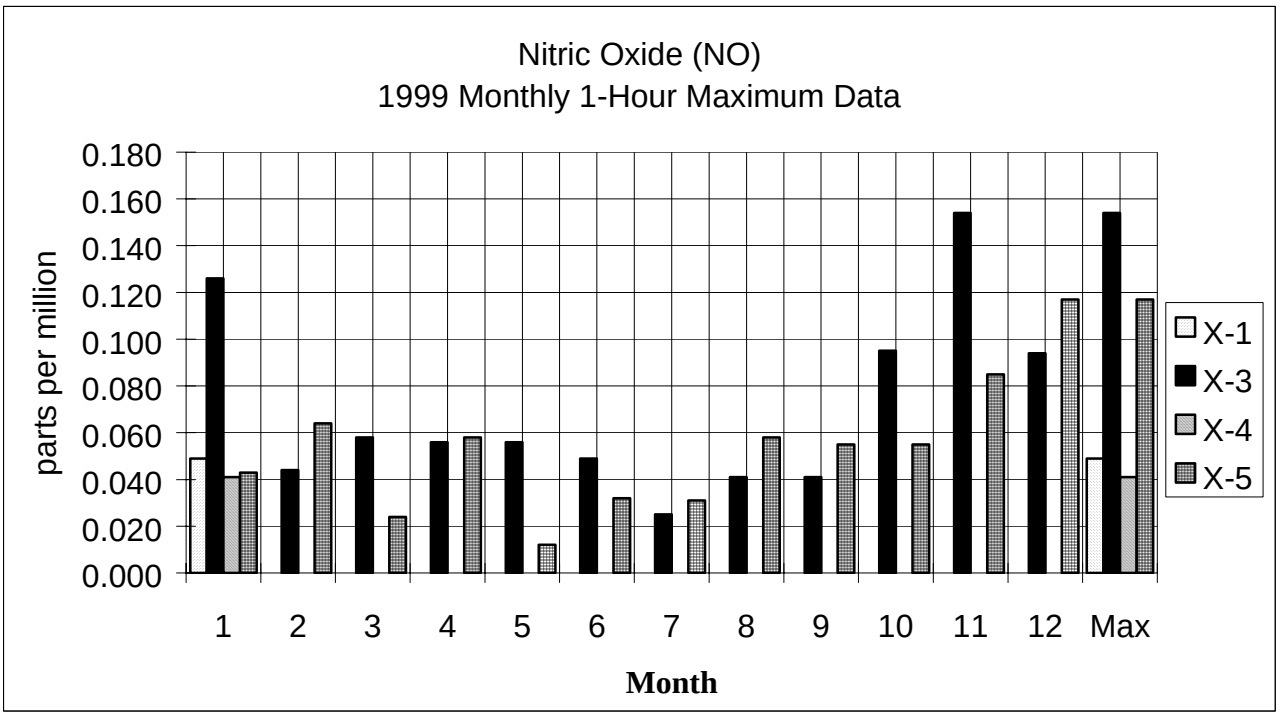
AIR MONITORING AT RFETS

Nitric Oxide (NO)

1999

Monthly 1-Hour Maximum Data (ppm)

1999												1999
Site	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Max**
X-1	0.049												0.049
X-3	0.126	0.044	0.058	0.056	0.056	0.049	0.025	0.041	0.041	0.095	0.154	0.094	0.154
X-4	0.041												0.041
X-5	0.043	0.064	0.024	0.058	0.012	0.032	0.031	0.058	0.055	0.055	0.085	0.117	0.117



Note: NOx at X-1 and X-4 Discontinued in January 1999.

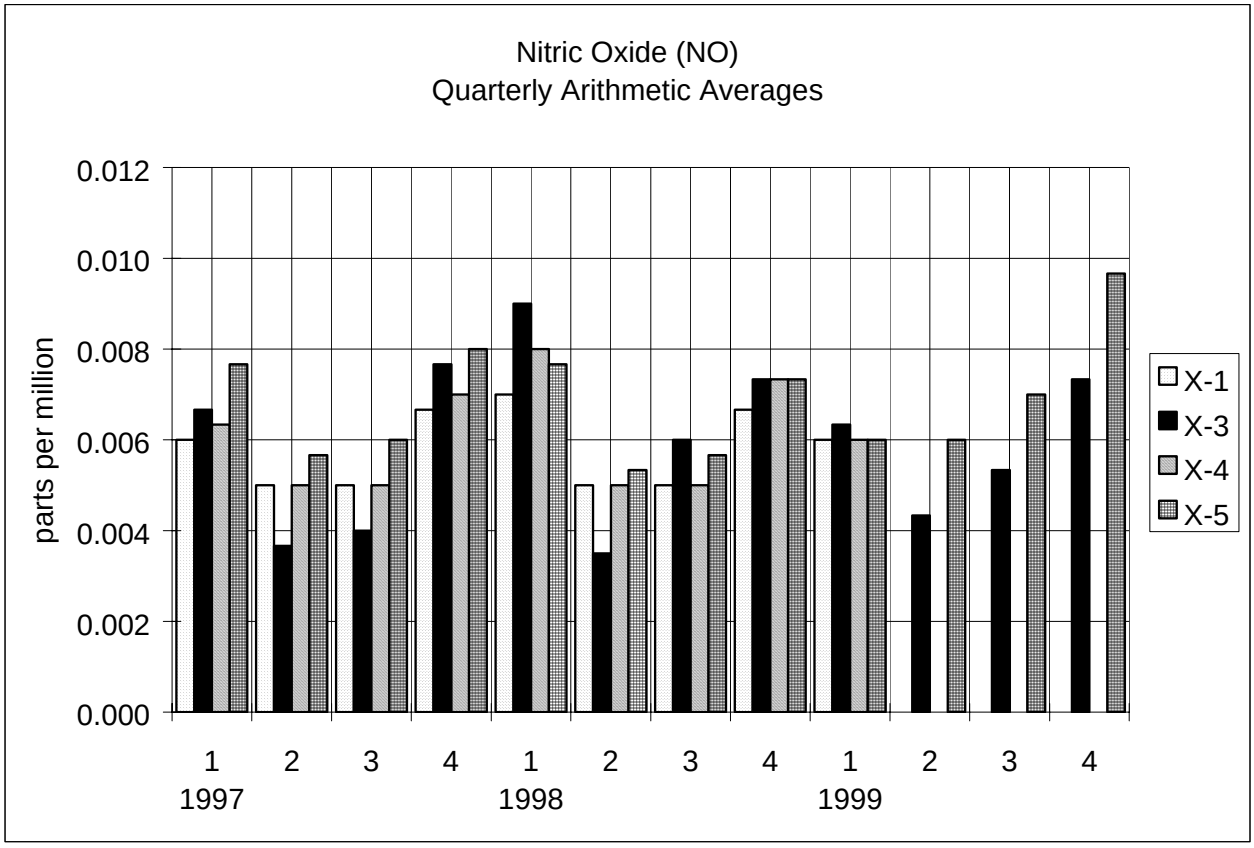
AIR MONITORING AT RFETS

Nitric Oxide (NO)

1999

Quarterly Arithmetic Average Data (3-years)
(ppm)

Site	1997				1998				1999			
	1	2	3	4	1	2	3	4	1	2	3	4
X-1	0.006	0.005	0.005	0.007	0.007	0.005	0.005	0.007	0.006			
X-3	0.007	0.004	0.004	0.008	0.009	0.004	0.006	0.007	0.006	0.004	0.005	0.007
X-4	0.006	0.005	0.005	0.007	0.008	0.005	0.005	0.007	0.006			
X-5	0.008	0.006	0.006	0.008	0.008	0.005	0.006	0.007	0.006	0.006	0.007	0.010



Note: NOx at X-1 and X-4 Discontinued in January 1999.

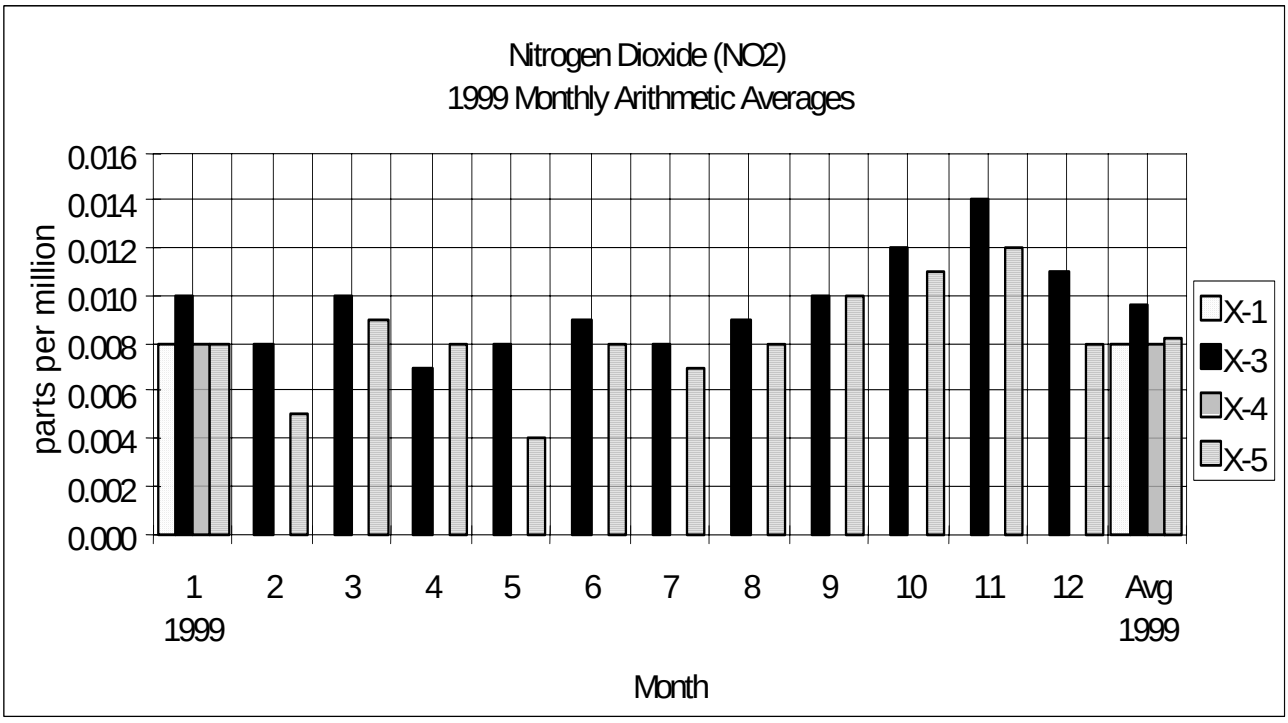
AIR MONITORING AT RFETS

Nitrogen Dioxide (NO_2)

1999

Monthly Arithmetic Average Data (ppm)

	1999												1999
Site	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Avg**
X-1	0.008												0.008
X-3	0.010	0.008	0.010	0.007	0.008	0.009	0.008	0.009	0.010	0.012	0.014	0.011	0.010
X-4	0.008												0.008
X-5	0.008	0.005	0.009	0.008	0.004	0.008	0.007	0.008	0.010	0.011	0.012	0.008	0.008



Note: NOx at X-1 and X-4 Discontinued in January 1999.

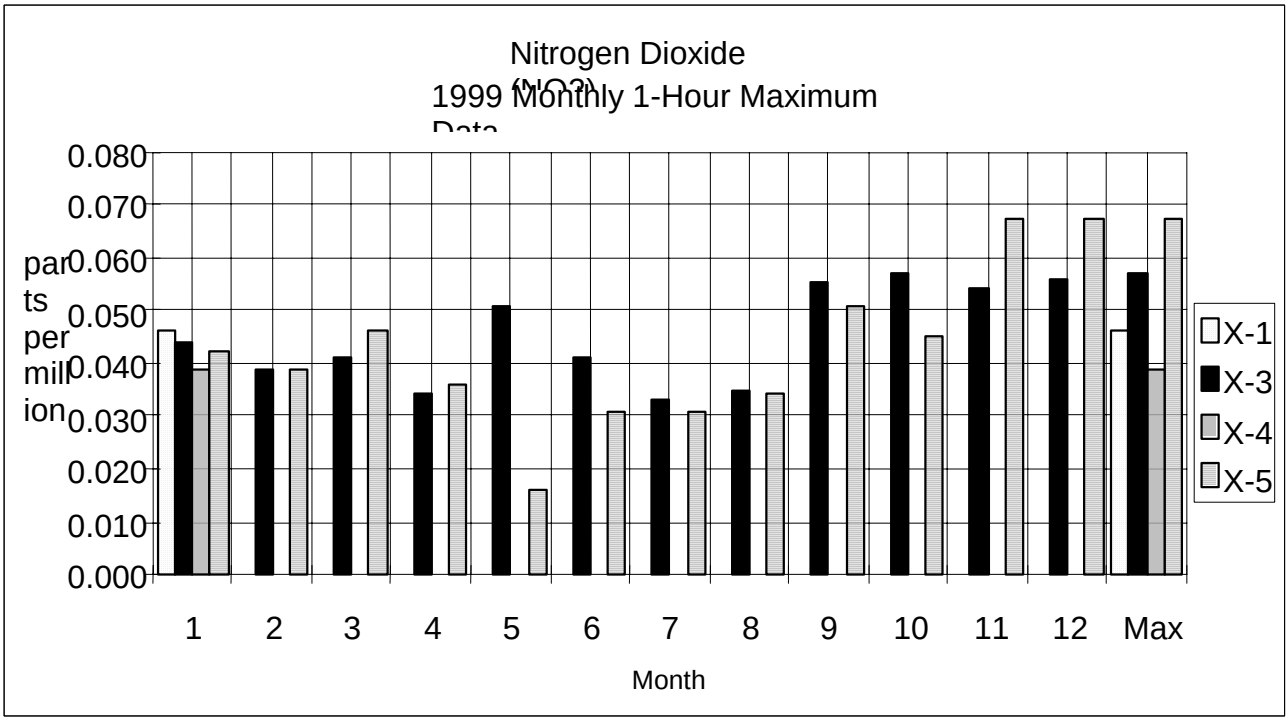
AIR MONITORING AT RFETS

Nitrogen Dioxide (NO_2)

1999

Monthly 1-Hour Maximum Data (ppm)

1999												1999
Site	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Max**
X-1	0.046												
X-3	0.044	0.039	0.041	0.034	0.051	0.041	0.033	0.035	0.055	0.057	0.054	0.056	0.057
X-4	0.039												
X-5	0.042	0.039	0.046	0.036	0.016	0.031	0.031	0.034	0.051	0.045	0.067	0.067	0.067



Note: NOx at X-1 and X-4 Discontinued in January 1999.

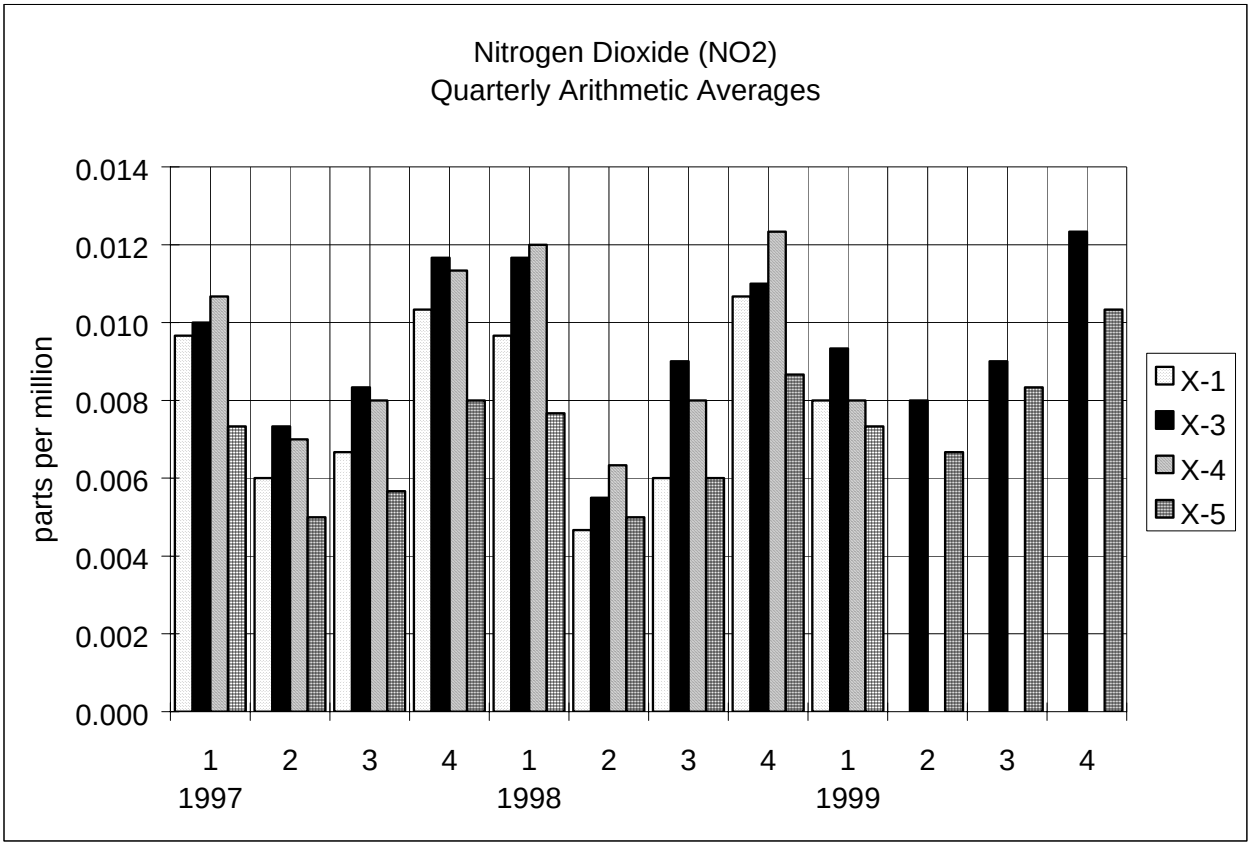
AIR MONITORING AT RFETS

Nitrogen Dioxide (NO_2)

1999

Quarterly Arithmetic Average Data (3-years)
(ppm)

Site	1997				1998				1999			
	1	2	3	4	1	2	3	4	1	2	3	4
X-1	0.010	0.006	0.007	0.010	0.010	0.005	0.006	0.011	0.008			
X-3	0.010	0.007	0.008	0.012	0.012	0.006	0.009	0.011	0.009	0.008	0.009	0.012
X-4	0.011	0.007	0.008	0.011	0.012	0.006	0.008	0.012	0.008			
X-5	0.007	0.005	0.006	0.008	0.008	0.005	0.006	0.009	0.007	0.007	0.008	0.010



Note: NOx at X-1 and X-4 Discontinued in January 1999.

APPENDIX F

VOLATILE ORGANIC COMPOUNDS DATA

AIR MONITORING AT RFETS

Volatile Organic Compounds (VOCs)

1999

Monthly Arithmetic Average Data
(In Parts Per Billion)

Data are in Parts Per Billion.

		1999	Month											1999
Site	**Compound**	1	2	3	4	5	6	7	8	9	10	11	12	Avg
X-1	Freon 134a (1,1,1,2-Tetrafluoroethane)	0.01	0.00	1.20	0.23	0.29	0.03	0.03	0.01	0.00	0.00	0.00	0.00	0.15
X-2	CAS # 811-97-2	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.01
X-3		0.00	0.00	0.00	0.00	1.54	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.13
X-4		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-5		0.00	0.00	0.00	0.00	0.35	0.00	0.00	0.01	0.00	0.00	1.53	0.91	0.23
X-1	Freon 22 (Chlorodifluoromethane)	0.23	0.10	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.03
X-2	CAS # 75-45-6	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.33	0.15	0.05	0.00	0.01	0.05
X-3		0.10	0.00	0.01	0.00	0.03	0.00	0.09	2.68	1.96	0.92	0.00	0.00	0.48
X-4		0.22	0.02	0.12	0.01	0.03	0.00	0.02	1.44	1.21	0.37	0.00	0.00	0.29
X-5		0.83	0.78	0.57	0.89	0.09	0.00	0.04	0.30	0.08	0.00	0.00	0.00	0.30
X-1	Freon 12 (Dichlorodifluoromethane)	0.55	0.55	0.38	0.40	0.52	0.49	0.47	0.32	0.47	0.43	0.05	0.42	0.42
X-2	CAS # 75-71-8	0.38	0.42	0.14	0.17	0.32	0.27	0.28	0.00	0.00	0.00	0.36	0.39	0.23
X-3		0.55	0.49	0.37	0.45	0.53	0.55	0.62	0.40	0.19	0.19	0.23	0.29	0.41
X-4		0.53	0.52	0.45	0.35	0.52	0.50	0.43	0.21	0.23	0.25	0.42	0.57	0.42
X-5		0.54	0.46	0.45	0.40	0.49	0.54	0.43	0.16	0.33	0.33	0.43	0.44	0.42
X-1	Chloromethane (Methyl chloride)	0.20	0.00	0.09	0.18	0.13	0.10	0.02	0.00	0.03	0.07	0.02	0.02	0.07
X-2	CAS # 74-87-3	0.31	0.00	0.04	0.11	0.12	0.12	0.01	0.00	0.00	0.00	0.01	0.02	0.06
X-3		0.25	0.00	0.00	0.13	0.14	0.17	0.01	0.00	0.00	0.05	0.01	0.03	0.07
X-4		0.14	0.00	0.03	0.02	0.08	0.04	0.00	0.00	0.01	0.03	0.01	0.04	0.03
X-5		0.13	0.02	0.05	0.06	0.10	0.08	0.01	0.00	0.01	0.05	0.01	0.02	0.05
X-1	Freon 114 (1,2-Dichloro-1,1,2,2-tetrafluoroethane)	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.00
X-2	CAS # 76-14-2	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.01	0.00
X-3		0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.01	0.00
X-4		0.00	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
X-5		0.00	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00
X-1	Vinyl chloride	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-2	CAS # 75-01-4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-3		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-4		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-5		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

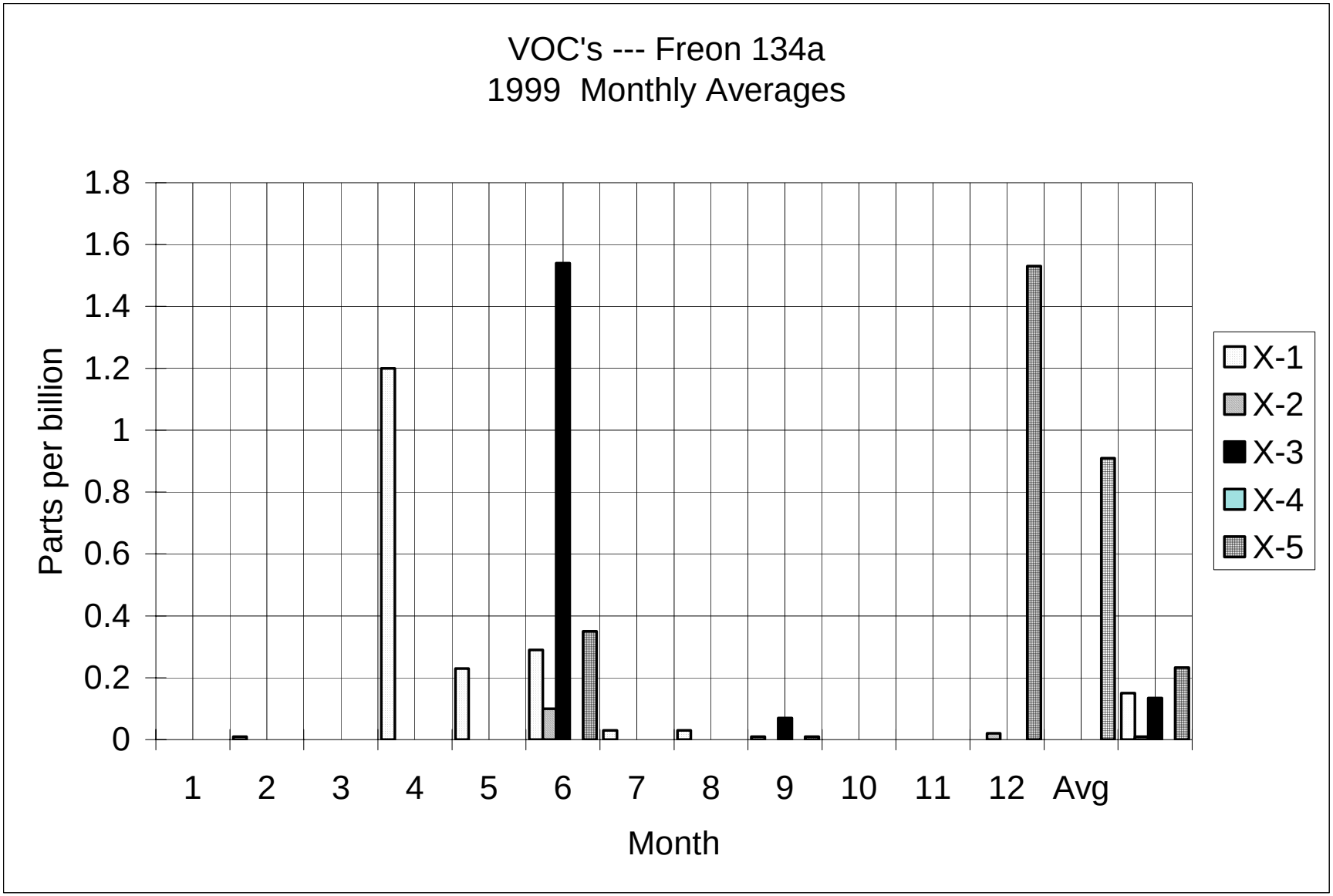
		1999	Month											1999
Site	**Compound**	1	2	3	4	5	6	7	8	9	10	11	12	Avg
X-1	1,3-Butadiene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-2	CAS # 106-99-0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-3		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-4		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-5		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-1	Chloroethane (Ethyl chloride)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-2	CAS # 75-00-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-3		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-4		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-5		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-1	Freon 123 (2,2-Dichloro-1,1,1-trifluoroethane)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-2	CAS # 306-83-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-3		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-4		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-5		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-1	Freon 11 (Trichlorofluoromethane)	**0.05**	**0.12**	**0.03**	**0.10**	**0.14**	**0.15**	**0.19**	**0.16**	**0.17**	**0.15**	**0.12**	**0.12**	**0.13**
X-2	CAS # 75-69-4	**0.01**	**0.16**	**0.03**	**0.09**	**0.18**	**0.23**	**0.33**	0.00	0.00	0.00	**0.11**	**0.16**	**0.11**
X-3		**0.05**	**0.12**	**0.06**	**0.11**	**0.17**	**0.22**	**0.26**	**0.17**	**0.12**	**0.08**	**0.06**	**0.09**	**0.13**
X-4		**0.07**	**0.10**	**0.07**	**0.07**	**0.14**	**0.17**	**0.14**	**0.27**	**0.14**	**0.11**	**0.12**	**0.16**	**0.13**
X-5		**0.09**	**0.09**	**0.07**	**0.09**	**0.11**	**0.15**	**0.11**	**0.08**	**0.12**	**0.15**	**0.12**	**0.13**	**0.11**
X-1	Vinylidene chloride (1,1-Dichloroethene)	**0.02**	0.00	0.00	0.00	0.00	**0.01**	**0.01**	0.00	0.00	0.00	**0.01**	**0.02**	**0.01**
X-2	CAS # 75-35-4	**0.02**	**0.04**	0.00	0.00	0.00	**0.01**	**0.02**	0.00	0.00	0.00	**0.01**	**0.03**	**0.01**
X-3		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-4		**0.04**	**0.04**	0.00	**0.01**	**0.01**	**0.02**	**0.05**	0.00	0.00	0.00	**0.01**	**0.02**	**0.02**
X-5		**0.04**	**0.07**	0.00	**0.01**	**0.01**	**0.01**	**0.04**	0.00	**0.01**	**0.02**	**0.01**	**0.01**	**0.02**
X-1	Dichloromethane (Methylene chloride)	**0.02**	**0.06**	0.00	0.00	0.00	**0.02**	0.00	0.00	**0.02**	**0.03**	**0.01**	**0.01**	**0.01**
X-2	CAS # 75-09-2	0.00	**0.10**	0.00	0.00	0.00	0.00	**0.01**	0.00	0.00	0.00	**0.01**	**0.04**	**0.01**
X-3		**0.03**	**0.05**	0.00	0.00	0.00	**0.05**	**0.01**	0.00	0.00	0.00	**0.01**	**0.03**	**0.02**
X-4		**0.04**	**0.08**	0.00	**0.01**	**0.02**	**0.04**	0.00	0.00	**0.01**	0.00	**0.02**	**0.10**	**0.03**
X-5		**0.04**	**0.06**	0.00	**0.01**	**0.01**	**0.02**	**0.02**	0.00	0.00	0.00	**0.01**	**0.02**	**0.02**

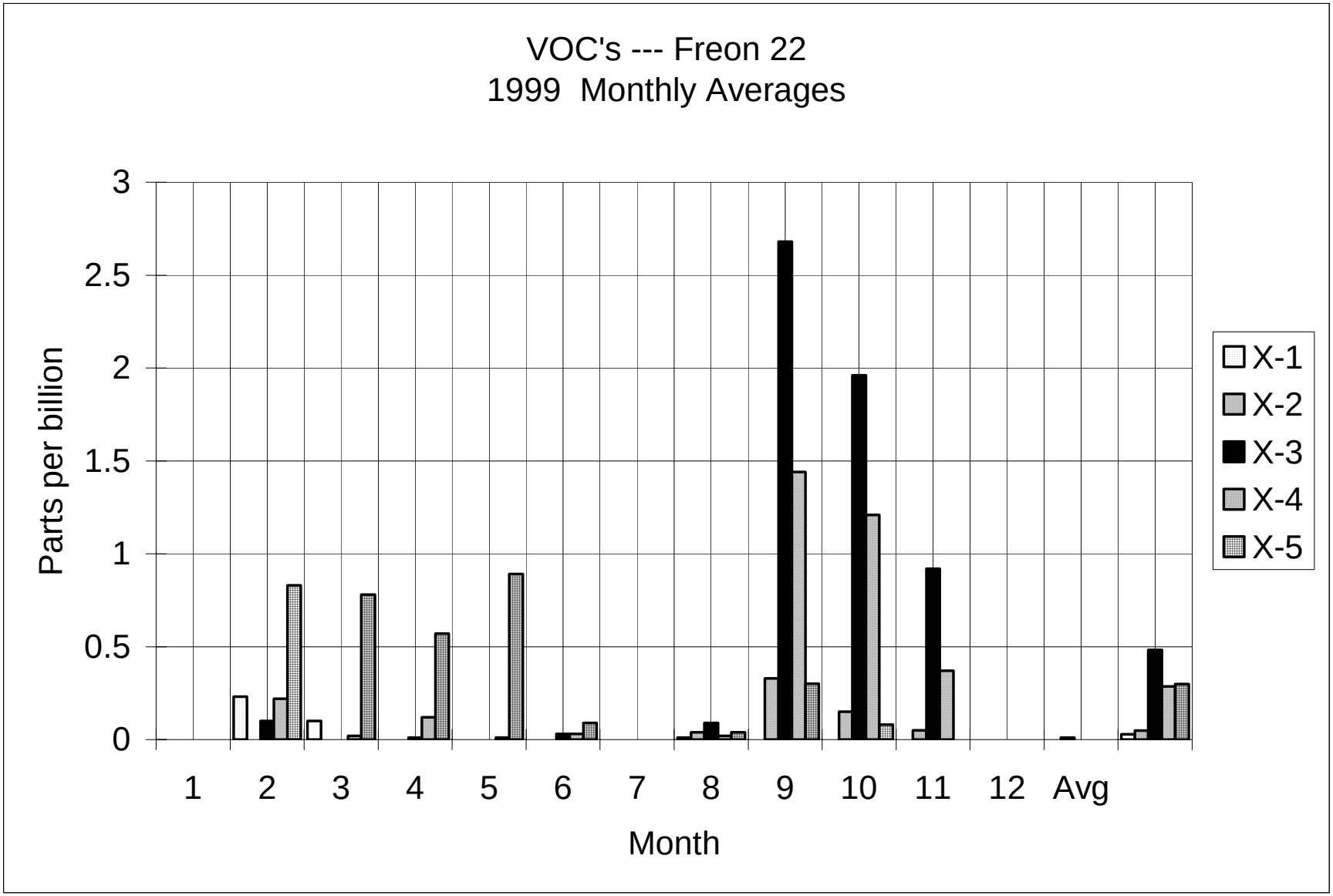
		1999	Month											1999
Site	Compound	1	2	3	4	5	6	7	8	9	10	11	12	Avg
X-1	Freon 113 (1,1,2-Trichloro-1,2,2-trifluoroethane)	0.08	0.08	0.09	0.09	0.10	0.11	0.11	0.09	0.09	0.09	0.09	0.09	0.09
X-2	CAS # 76-13-1	0.02	0.03	0.02	0.01	0.07	0.12	0.12	0.00	0.00	0.00	0.08	0.09	0.05
X-3		0.07	0.07	0.08	0.09	0.10	0.11	0.12	0.10	0.05	0.05	0.05	0.06	0.08
X-4		0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.05	0.04	0.06	0.08	0.12	0.09
X-5		0.10	0.09	0.10	0.10	0.10	0.10	0.09	0.05	0.05	0.06	0.09	0.08	0.08
X-1	Methyl tert-butyl ether (MTBE)	0.00	0.00	0.07	0.00	0.00	0.00	0.01	0.14	0.07	0.00	0.02	0.08	0.03
X-2	CAS # 1634-04-4	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.04	0.01
X-3		0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.12	0.05	0.00	0.02	0.03	0.02
X-4		0.00	0.00	0.09	0.01	0.00	0.00	0.01	0.11	0.02	0.00	0.03	0.07	0.03
X-5		0.00	0.00	0.09	0.00	0.00	0.00	0.01	0.08	0.03	0.00	0.01	0.06	0.02
X-1	1,1-Dichloroethane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-2	CAS # 75-34-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-3		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-4		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-5		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-1	Chloroform	0.00	0.00	0.00	0.00	0.04	0.02	0.00	0.04	0.05	0.03	0.03	0.04	0.02
X-2	CAS # 67-66-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.00
X-3		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.02	0.01
X-4		0.00	0.00	0.00	0.00	0.03	0.07	0.01	0.03	0.02	0.02	0.02	0.04	0.02
X-5		0.00	0.00	0.00	0.00	0.03	0.03	0.00	0.01	0.04	0.05	0.02	0.02	0.02
X-1	1,2-Dichloroethane (Ethylene dichloride)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-2	CAS # 107-06-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-3		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-4		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-5		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-1	1,1,1-Trichloroethane (Methylchloroform)	0.00	0.07	0.06	0.04	0.04	0.11	0.06	0.16	0.08	0.09	0.08	0.12	0.08
X-2	CAS # 71-55-6	0.00	0.05	0.04	0.06	0.04	0.18	0.13	0.00	0.00	0.00	0.06	0.07	0.05
X-3		0.00	0.06	0.04	0.03	0.06	0.13	0.10	0.20	0.05	0.07	0.04	0.06	0.07
X-4		0.02	0.06	0.07	0.06	0.06	0.09	0.05	0.12	0.05	0.06	0.06	0.05	0.06
X-5		0.03	0.06	0.07	0.06	0.05	0.09	0.04	0.09	0.03	0.08	0.07	0.08	0.06

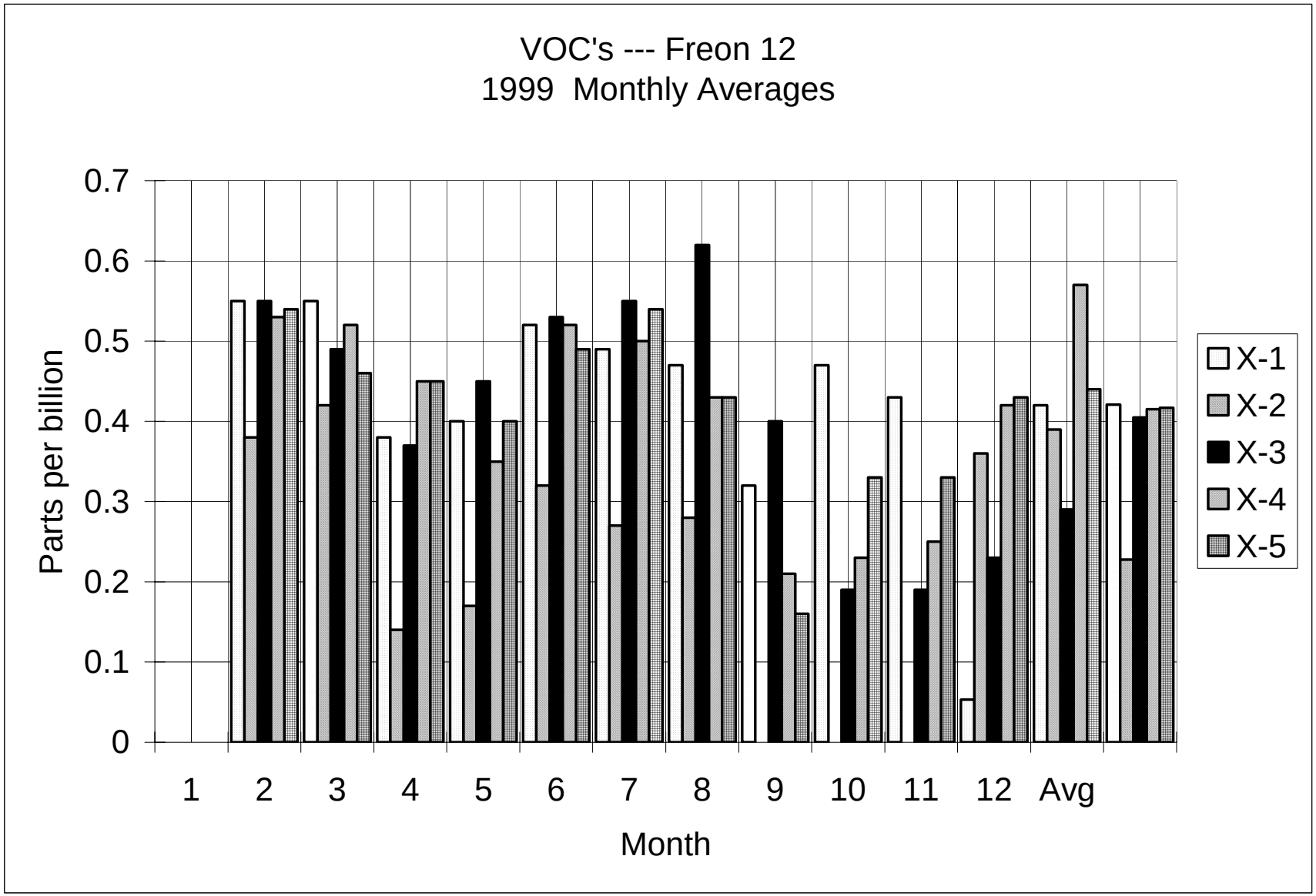
		1999	Month											1999
Site	Compound	1	2	3	4	5	6	7	8	9	10	11	12	Avg
X-1	Carbon tetrachloride	0.06	0.09	0.09	0.14	0.19	0.24	0.21	0.28	0.21	0.15	0.16	0.13	0.16
X-2	CAS # 56-23-5	0.00	0.01	0.07	0.13	0.25	0.37	0.40	0.00	0.00	0.00	0.13	0.10	0.12
X-3		0.04	0.06	0.09	0.14	0.22	0.28	0.29	0.35	0.21	0.15	0.08	0.06	0.16
X-4		0.12	0.10	0.13	0.14	0.17	0.21	0.18	0.18	0.12	0.10	0.13	0.17	0.15
X-5		0.10	0.10	0.12	0.14	0.15	0.19	0.14	0.16	0.11	0.09	0.14	0.11	0.13
X-1	Benzene	0.20	0.12	0.17	0.17	0.13	0.29	0.16	0.20	0.21	0.22	0.14	0.20	0.18
X-2	CAS # 71-43-2	0.00	0.02	0.05	0.00	0.09	0.37	0.21	0.00	0.00	0.00	0.21	0.29	0.10
X-3		0.17	0.09	0.16	0.21	0.19	0.30	0.20	0.31	0.14	0.12	0.12	0.15	0.18
X-4		0.32	0.23	0.28	0.22	0.18	0.28	0.17	0.19	0.11	0.11	0.20	0.46	0.23
X-5		0.30	0.23	0.31	0.27	0.17	0.24	0.16	0.12	0.13	0.15	0.19	0.23	0.21
X-1	Trichloroethene	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.09	0.08	0.10	0.00	0.01	0.02
X-2	CAS # 79-01-6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.00
X-3		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.01	0.01
X-4		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.04	0.01
X-5		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
X-1	1,1,2-Trichloroethane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-2	CAS # 79-00-5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-3		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-4		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-5		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-1	Toluene (Methyl benzene)	0.32	0.21	0.27	0.25	0.18	0.49	0.25	10.00	6.55	2.65	0.20	0.27	1.80
X-2	CAS # 108-88-3	0.18	0.09	0.20	0.18	0.22	0.43	0.29	0.07	0.00	0.02	0.32	0.41	0.20
X-3		0.26	0.14	0.33	0.29	0.29	0.29	0.26	0.45	0.15	0.17	0.12	0.19	0.25
X-4		0.54	1.24	0.41	0.35	0.25	0.47	0.30	0.25	0.07	0.18	0.29	0.19	0.38
X-5		0.40	0.31	0.40	0.38	0.22	0.40	0.22	0.17	0.13	0.07	0.20	0.24	0.26
X-1	Tetrachloroethene (Perchloroethylene)	0.00	0.00	0.00	0.02	0.00	0.01	0.00	0.01	0.02	0.00	0.00	0.01	0.01
X-2	CAS # 127-18-4	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.02	0.00
X-3		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00
X-4		0.01	0.00	0.01	0.02	0.00	0.02	0.01	0.01	0.00	0.00	0.02	0.06	0.01
X-5		0.01	0.00	0.00	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.01	0.01	0.01

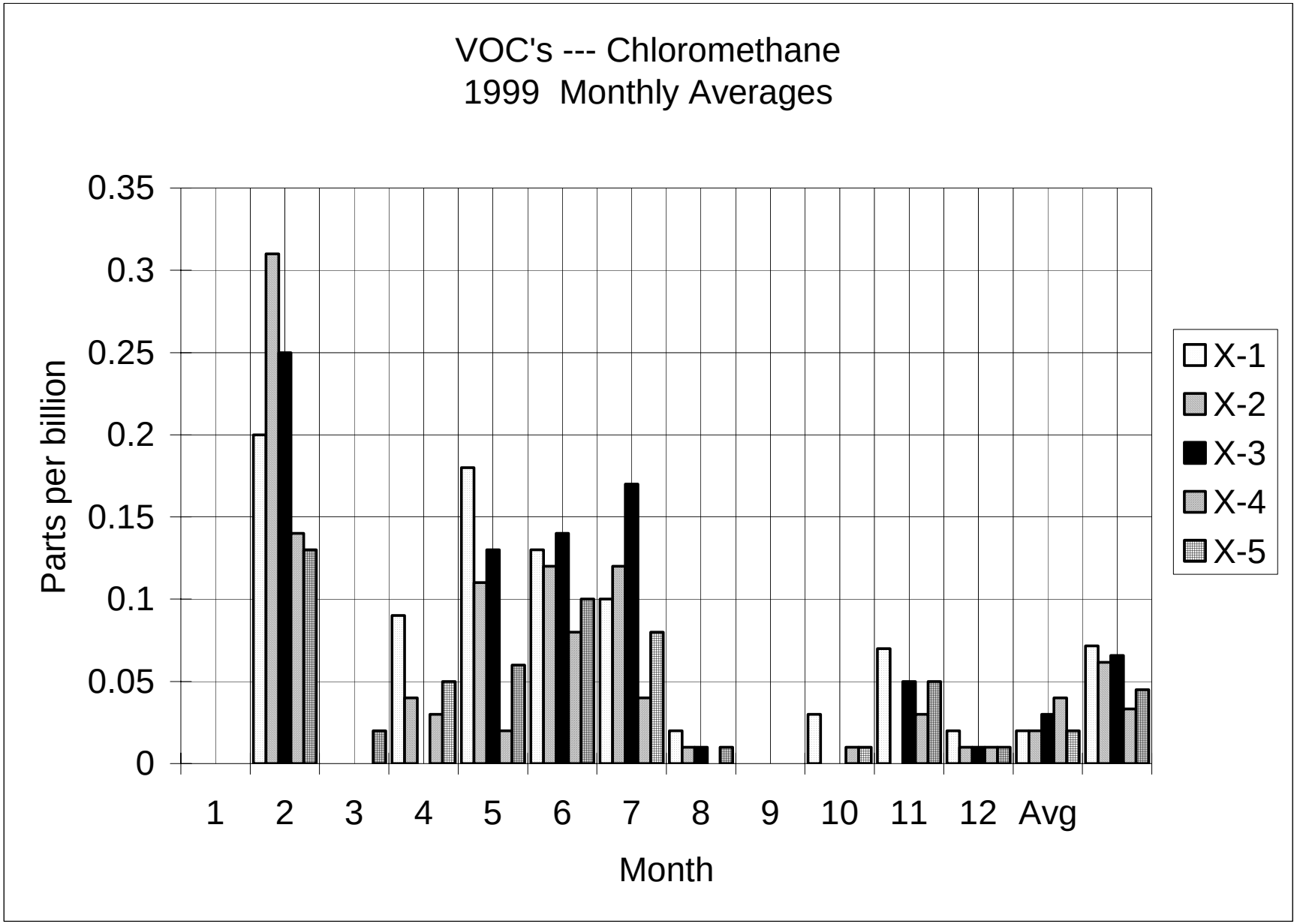
		1999	Month											1999
Site	Compound	1	2	3	4	5	6	7	8	9	10	11	12	Avg
X-1	Chlorobenzene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-2	CAS # 108-90-7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-3		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-4		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-5		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-1	Ethyl benzene (Phenylethane)	0.00	0.00	0.00	0.00	0.00	**0.02**	**0.01**	**0.92**	**0.57**	**0.25**	**0.04**	**0.02**	**0.15**
X-2	CAS # 100-41-4	0.00	0.00	0.00	0.00	0.00	**0.01**	0.00	0.00	0.00	0.00	**0.03**	**0.03**	**0.01**
X-3		0.00	0.00	0.00	0.00	**0.01**	0.00	0.00	**0.15**	**0.06**	**0.04**	**0.01**	**0.02**	**0.02**
X-4		**0.02**	**0.04**	0.00	**0.01**	**0.01**	**0.01**	**0.04**	**0.09**	**0.02**	**0.05**	**0.04**	0.00	**0.03**
X-5		**0.02**	0.00	0.00	**0.01**	0.00	**0.01**	**0.03**	**0.07**	**0.04**	0.00	**0.02**	**0.02**	**0.02**
X-1	m- + p-Xylene (1,3- + 1,4-Dimethylbenzene)	**0.16**	**0.05**	**0.06**	**0.10**	**0.01**	**0.09**	**0.05**	**3.44**	**1.87**	**0.85**	**0.05**	**0.06**	**0.57**
X-2	CAS # n/a	**0.12**	**0.04**	**0.01**	**0.03**	**0.03**	**0.03**	**0.03**	0.00	0.00	0.00	**0.08**	**0.10**	**0.04**
X-3		**0.15**	**0.08**	**0.06**	**0.10**	**0.04**	**0.01**	**0.05**	**0.25**	**0.07**	**0.09**	**0.03**	**0.06**	**0.08**
X-4		**0.28**	**0.26**	**0.11**	**0.06**	**0.03**	**0.06**	**0.06**	**0.18**	**0.03**	**0.14**	**0.08**	**0.04**	**0.11**
X-5		**0.20**	**0.08**	**0.09**	**0.09**	**0.03**	**0.05**	**0.05**	**0.11**	**0.07**	0.00	**0.05**	**0.05**	**0.07**
X-1	Styrene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.13**	**0.10**	**0.08**	0.00	**0.02**	**0.03**
X-2	CAS # 100-42-5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.01**	**0.01**	**0.00**
X-3		0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.12**	0.00	**0.02**	**0.01**	**0.01**	**0.01**
X-4		0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.08**	**0.02**	**0.04**	**0.01**	0.00	**0.01**
X-5		0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.06**	**0.04**	0.00	0.00	**0.01**	**0.01**
X-1	1,1,2,2-Tetrachloroethane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-2	CAS # 79-34-5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-3		0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-4		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-5		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X-1	o-Xylene (1,2-Dimethylbenzene)	**0.05**	**0.01**	0.00	0.00	0.00	**0.02**	**0.01**	**0.52**	**0.30**	**0.14**	**0.01**	**0.02**	**0.09**
X-2	CAS # 95-47-6	**0.02**	0.00	0.00	0.00	0.00	0.00	**0.02**	0.00	0.00	0.00	**0.02**	**0.02**	**0.01**
X-3		**0.02**	**0.02**	0.00	0.00	0.00	0.00	**0.02**	**0.09**	**0.03**	**0.02**	**0.01**	**0.01**	**0.02**
X-4		**0.10**	**0.08**	**0.01**	**0.01**	0.00	0.00	**0.03**	**0.06**	**0.01**	**0.04**	**0.02**	**0.02**	**0.03**
X-5		**0.08**	**0.03**	0.00	**0.01**	0.00	0.00	**0.02**	**0.04**	**0.02**	0.00	**0.01**	**0.01**	**0.02**

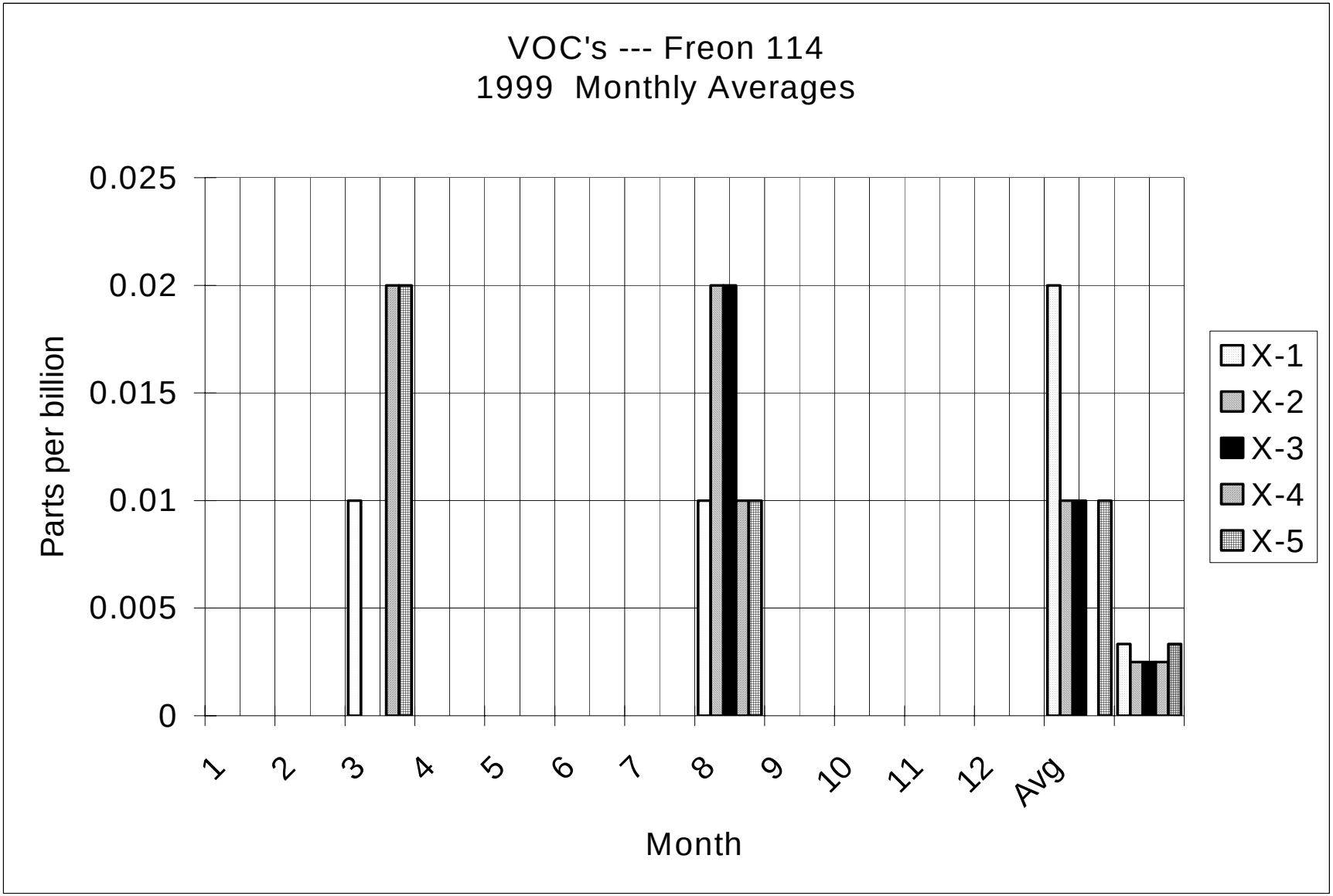
NOTE: 0.000 = Less than analytical detection level (0.000 used for year averages).

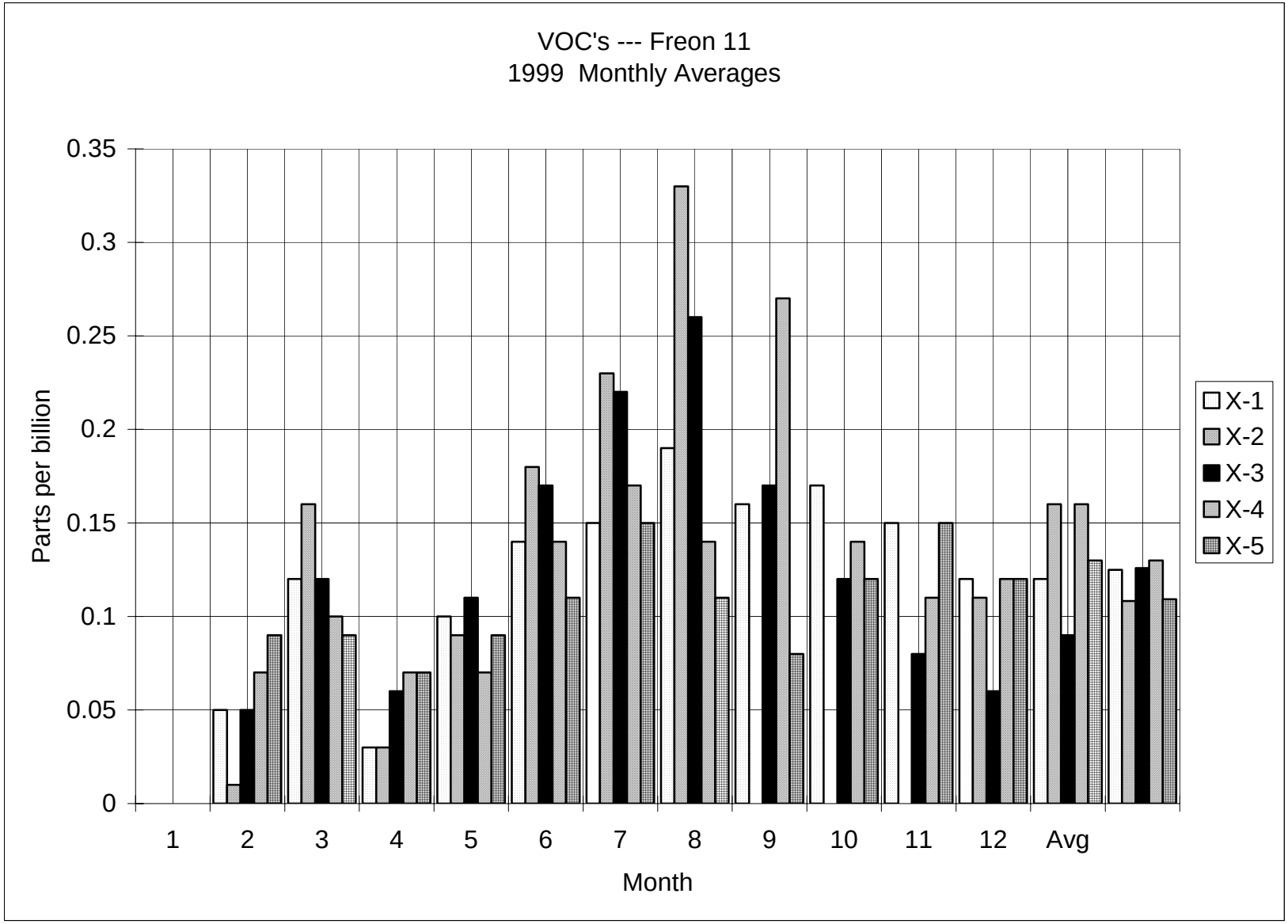

VOC's --- Freon 134a
1999 Monthly Averages
Parts per billion
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1
2
3
4
5
6
7
8
9
10
11
12
Avg
Month
X-1
X-2
X-3
X-4
X-5

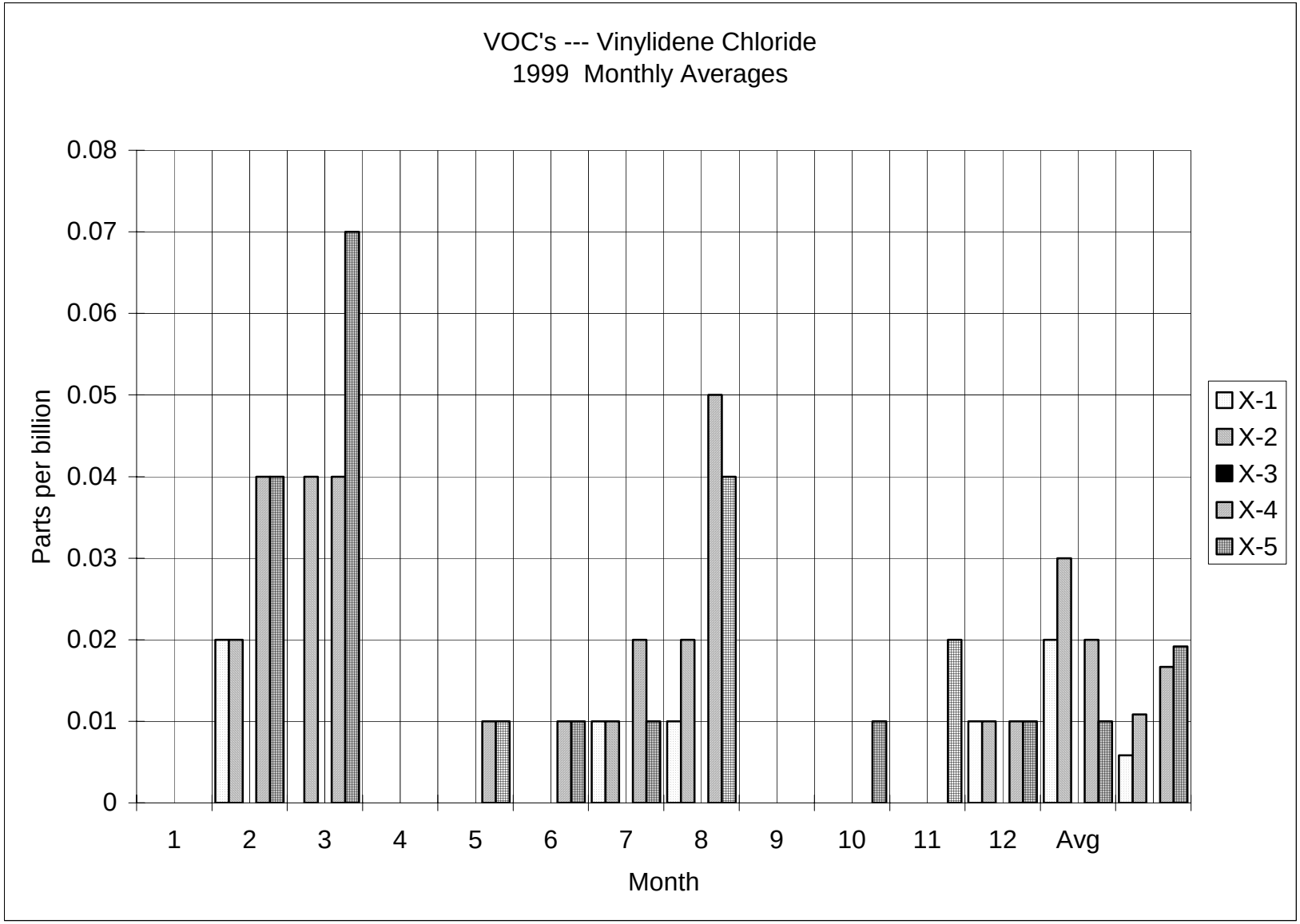

VOC's --- Freon 22
1999 Monthly Averages
Parts per billion
3
2.5
2
1.5
1
0.5
0
1
2
3
4
5
6
7
8
9
10
11
12
Avg
Month
X-1
X-2
X-3
X-4
X-5

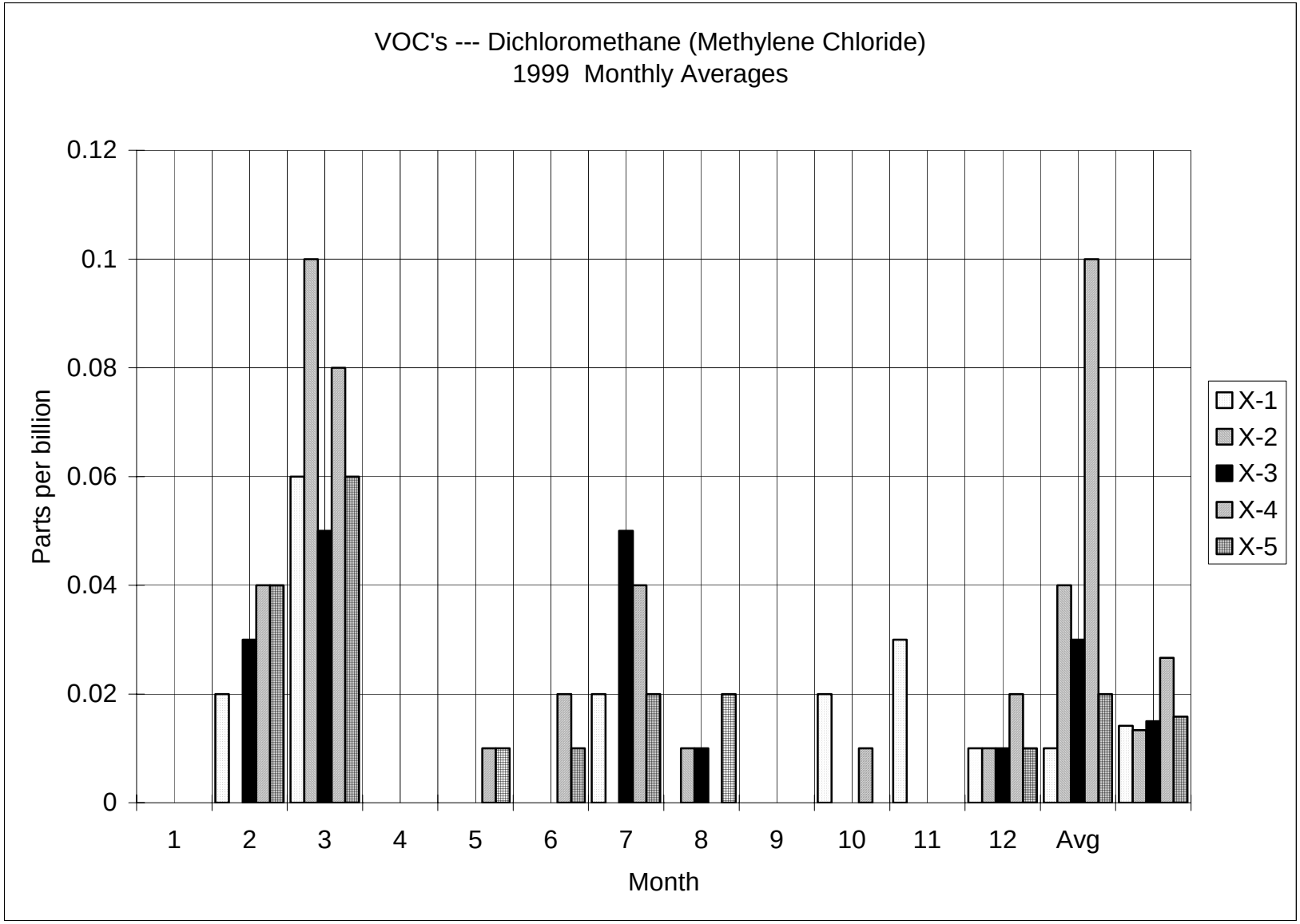

VOC's --- Freon 12
1999 Monthly Averages
Parts per billion
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1
2
3
4
5
6
7
8
9
10
11
12
Avg
Month
X-1
X-2
X-3
X-4
X-5

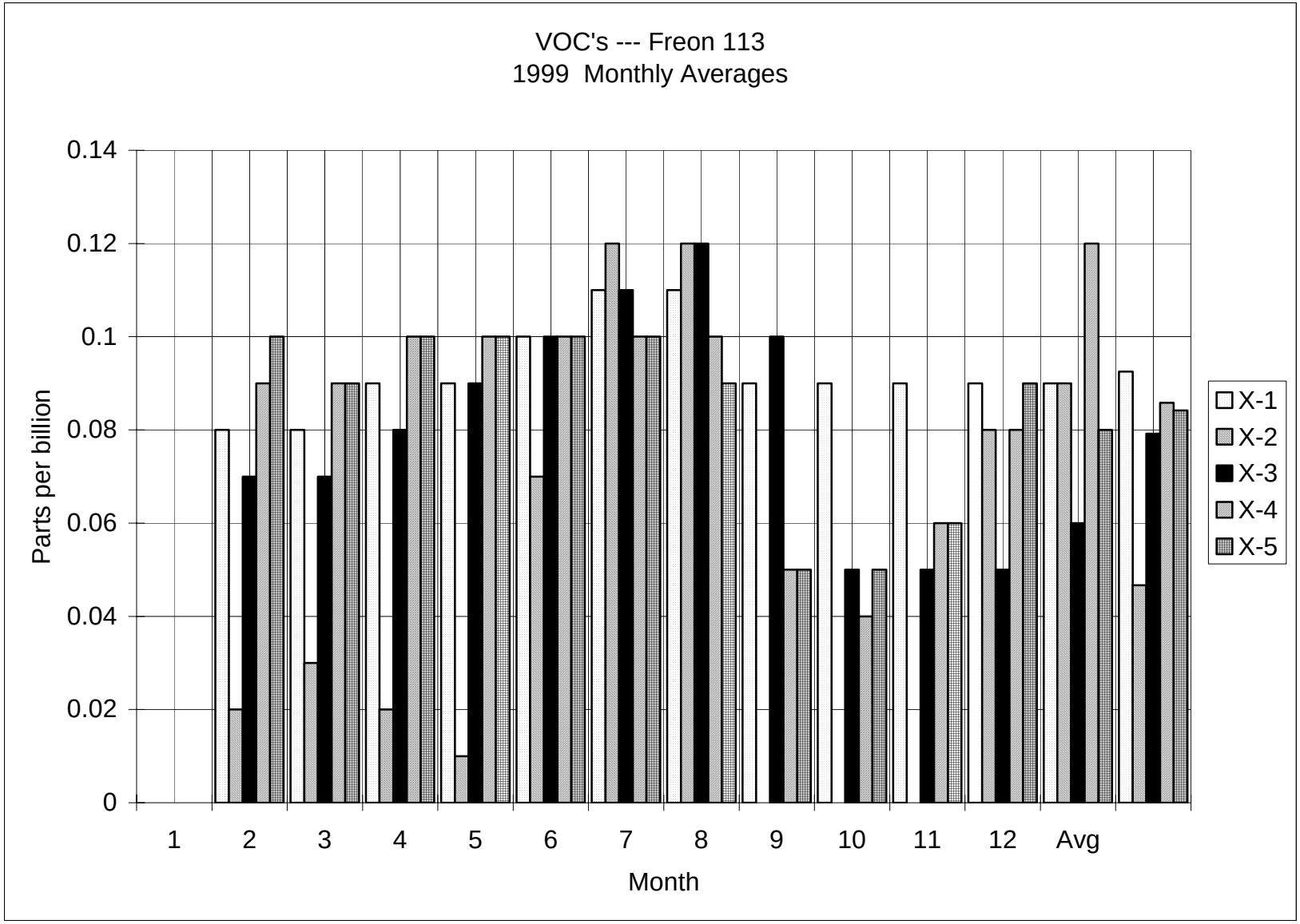

VOC's --- Chloromethane
1999 Monthly Averages
Parts per billion
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1
2
3
4
5
6
7
8
9
10
11
12
Avg
Month
X-1
X-2
X-3
X-4
X-5

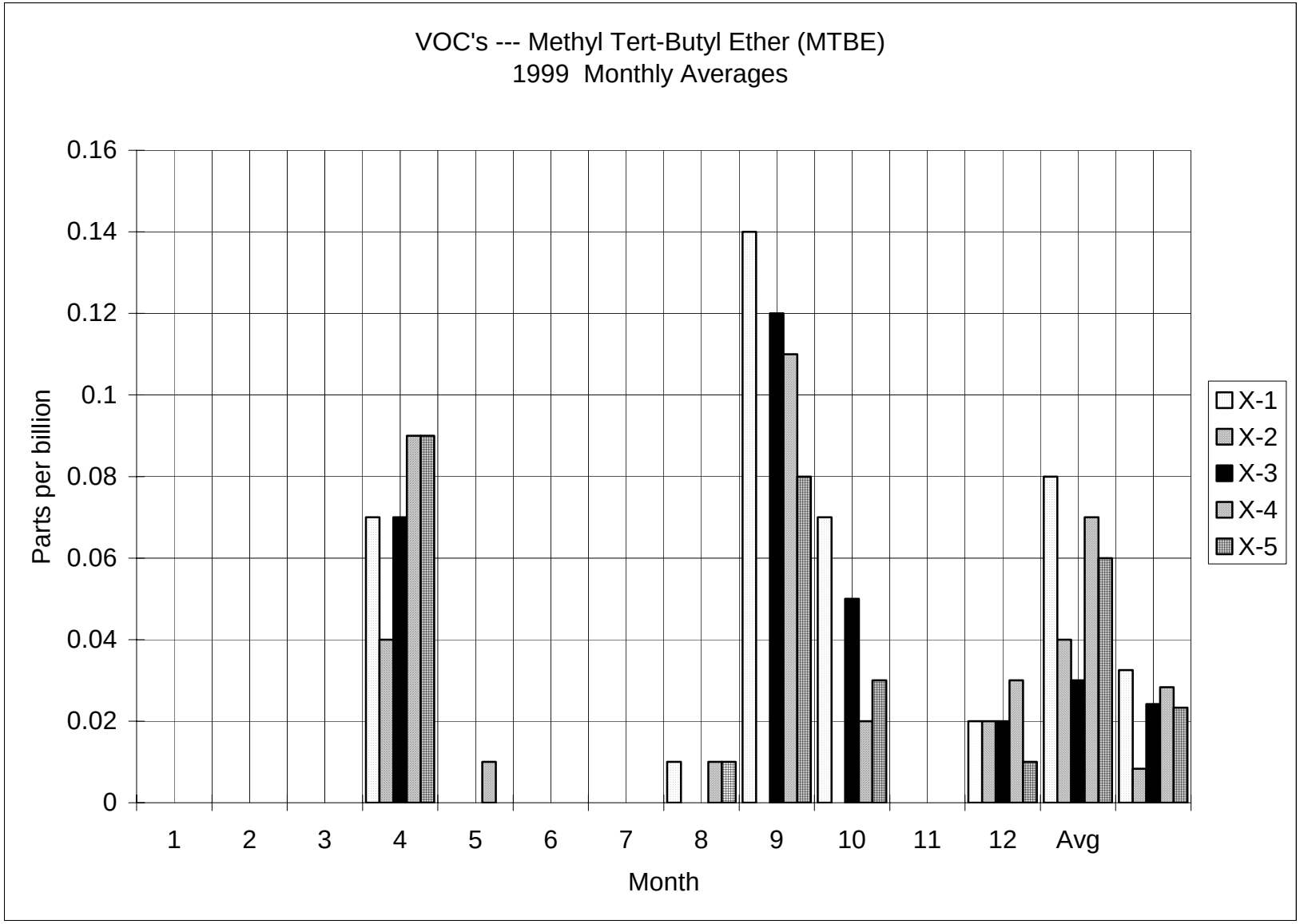

VOC's --- Freon 114
1999 Monthly Averages
Parts per billion
0.025
0.02
0.015
0.01
0.005
0
1
2
3
4
5
6
7
8
9
10
11
12
Avg
Month
X-1
X-2
X-3
X-4
X-5

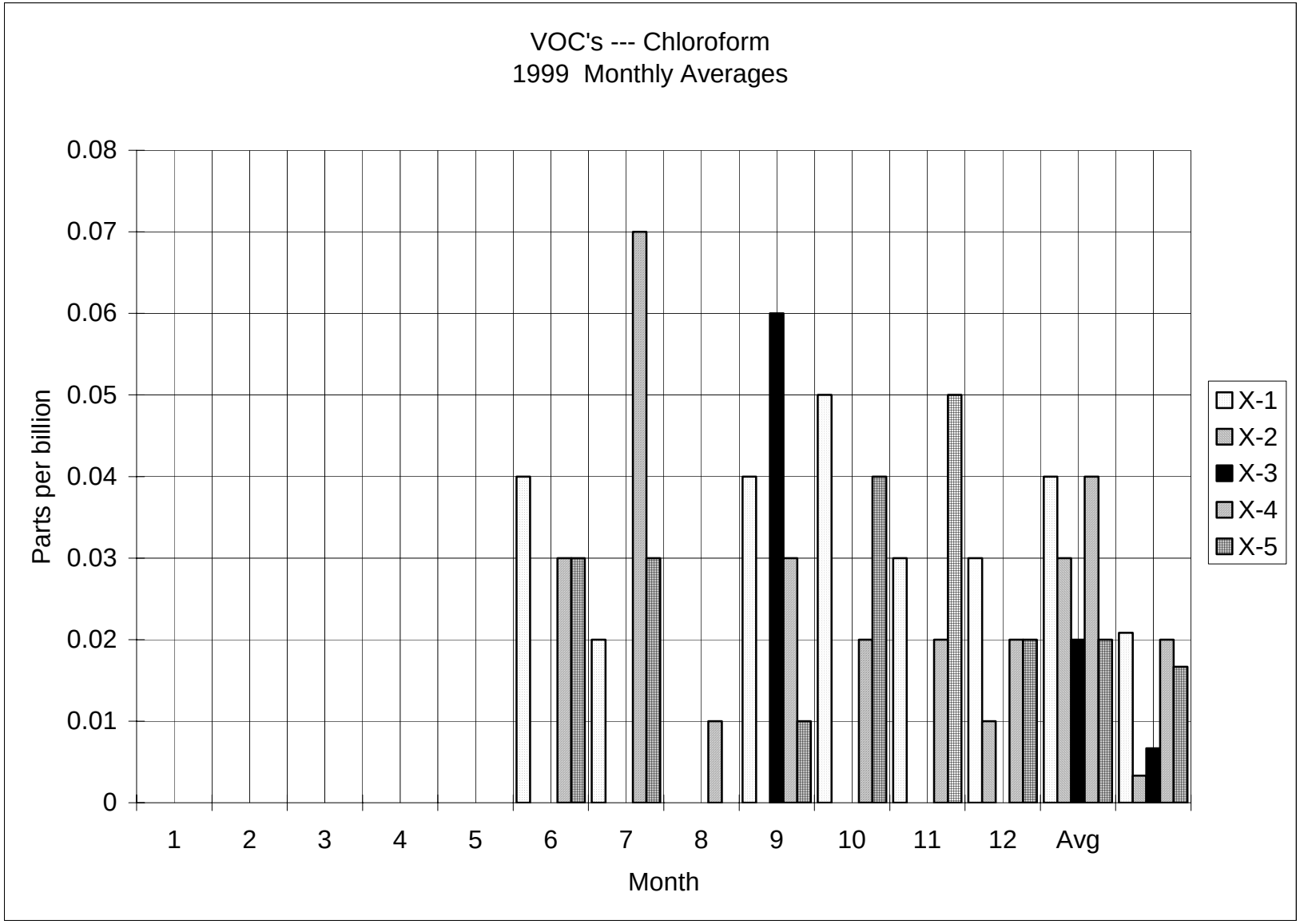

VOC's --- Freon 11
1999 Monthly Averages
Parts per billion
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1
2
3
4
5
6
7
8
9
10
11
12
Avg
Month
X-1
X-2
X-3
X-4
X-5

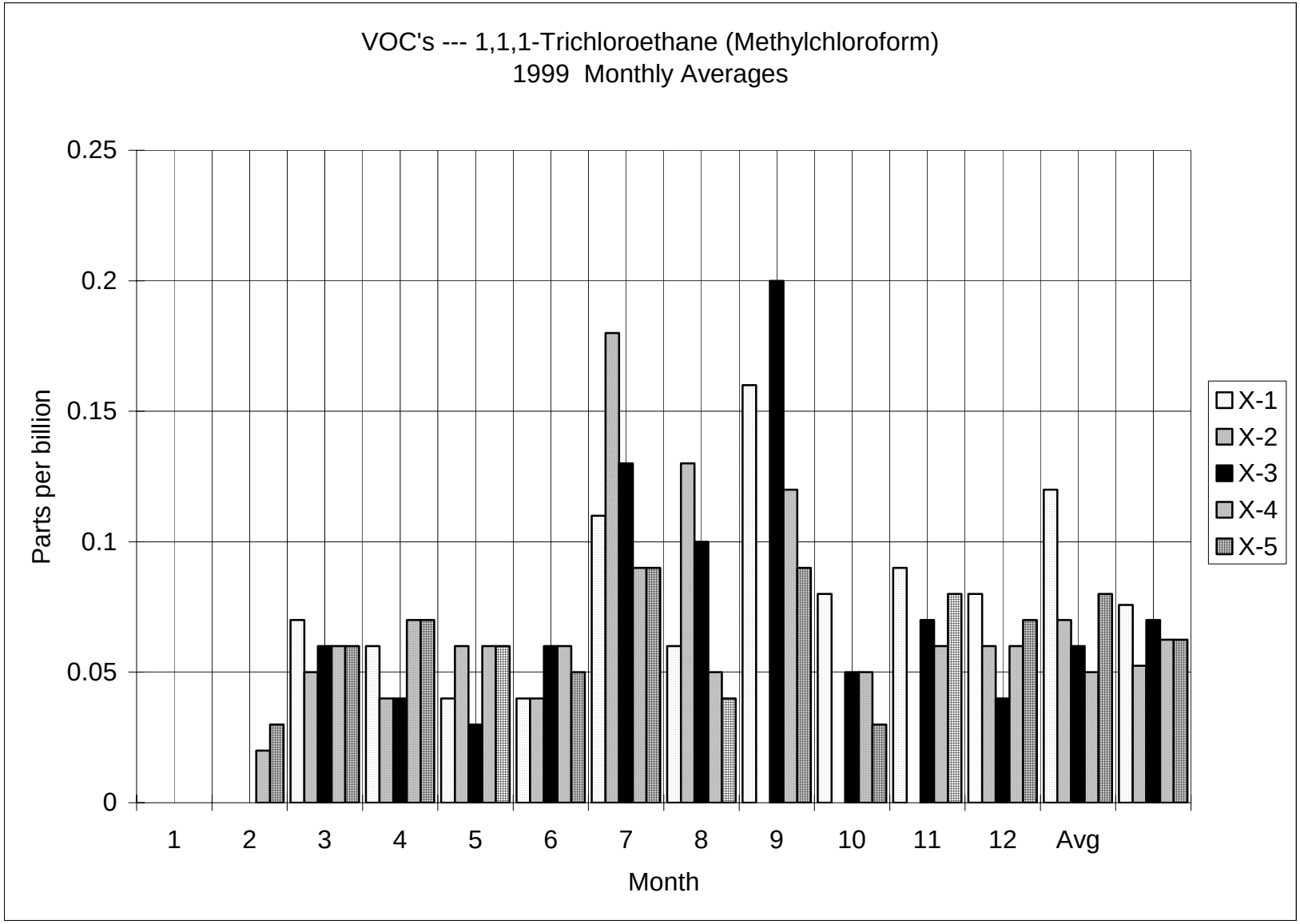

VOC's --- Vinylidene Chloride
1999 Monthly Averages
Parts per billion
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
1
2
3
4
5
6
7
8
9
10
11
12
Avg
Month
X-1
X-2
X-3
X-4
X-5

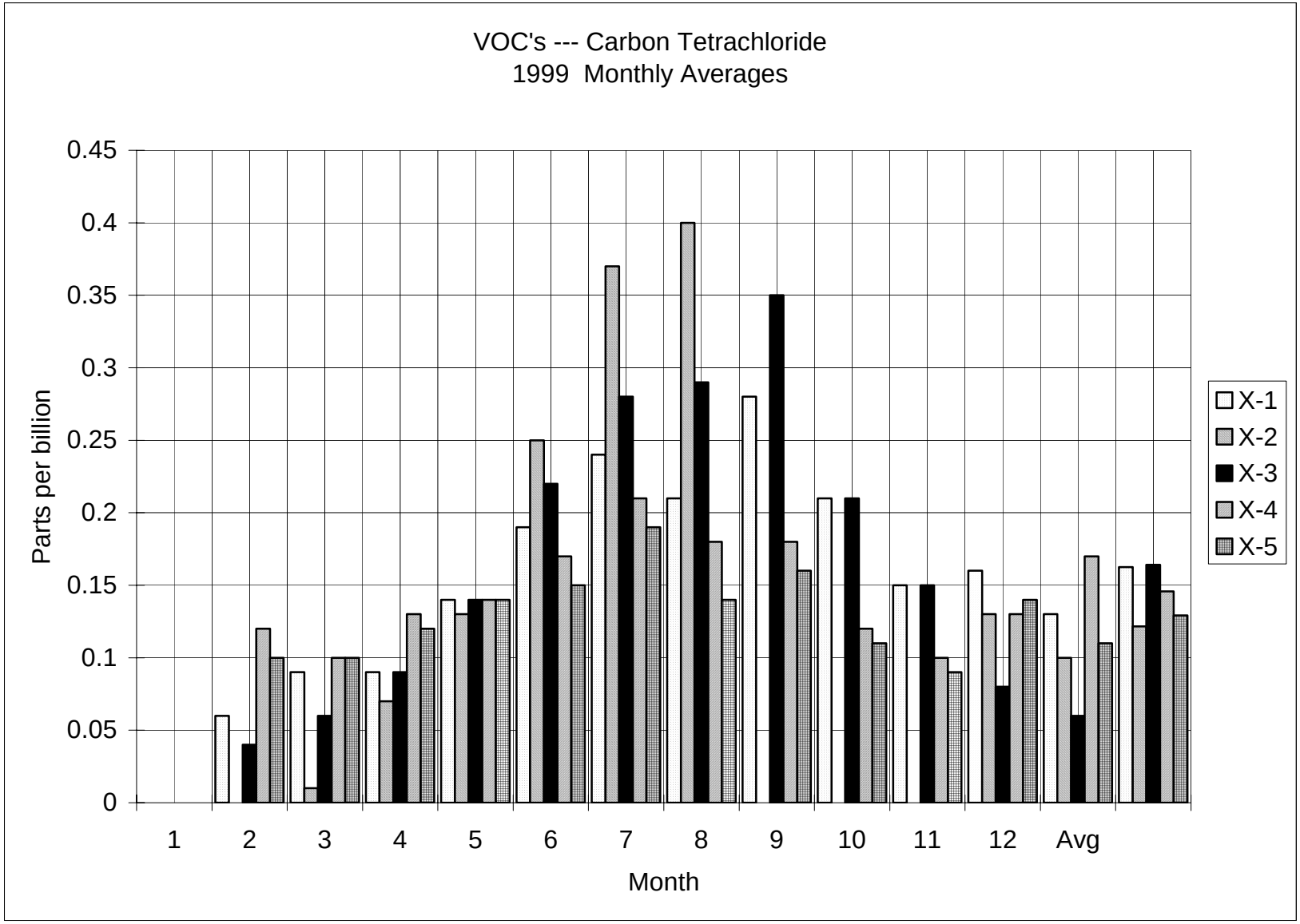

VOC's --- Dichloromethane (Methylene Chloride)
1999 Monthly Averages
Parts per billion
0.12
0.1
0.08
0.06
0.04
0.02
0
1
2
3
4
5
6
7
8
9
10
11
12
Avg
Month
X-1
X-2
X-3
X-4
X-5

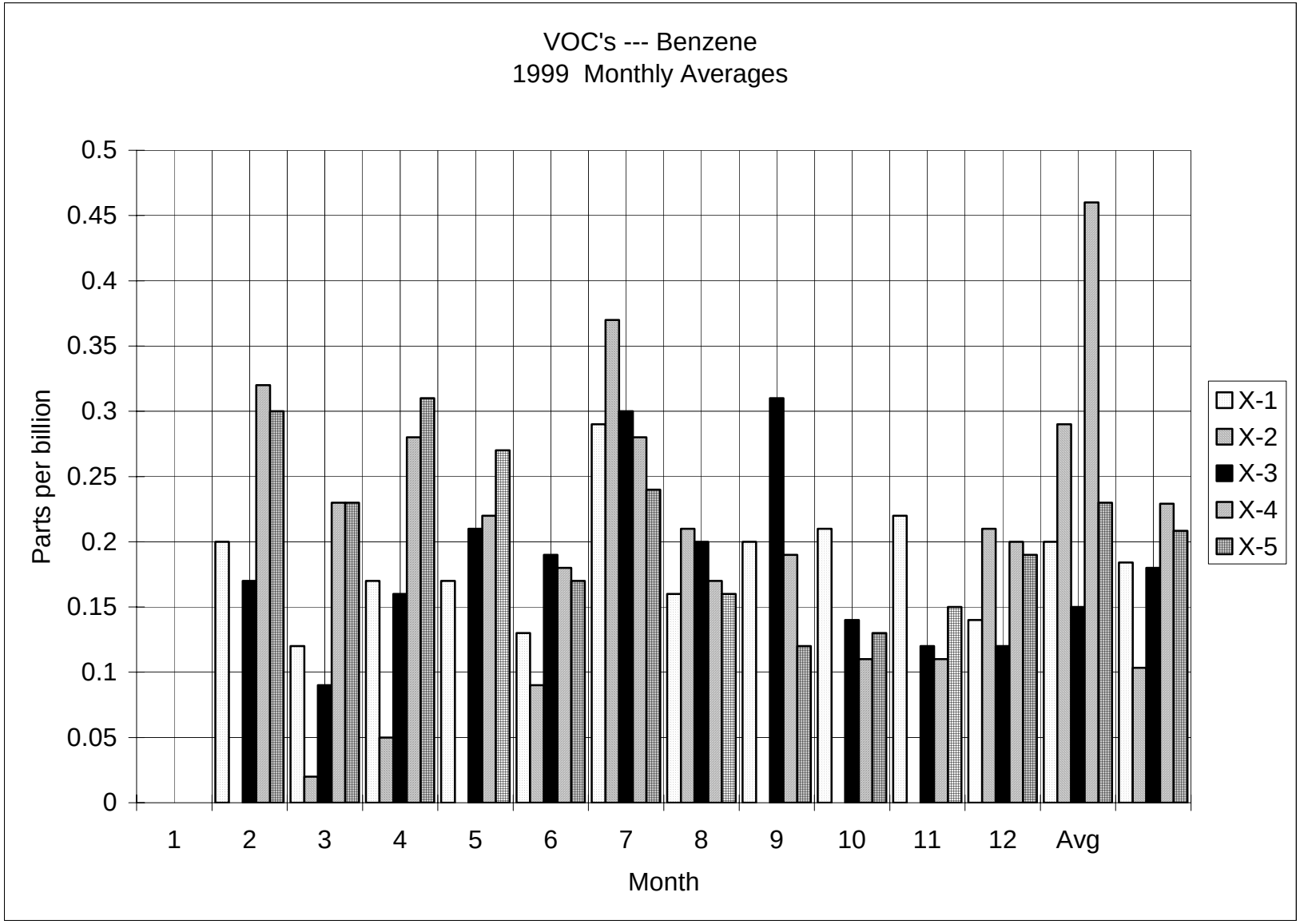

VOC's --- Freon 113
1999 Monthly Averages
Parts per billion
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
1
2
3
4
5
6
7
8
9
10
11
12
Avg
Month
X-1
X-2
X-3
X-4
X-5

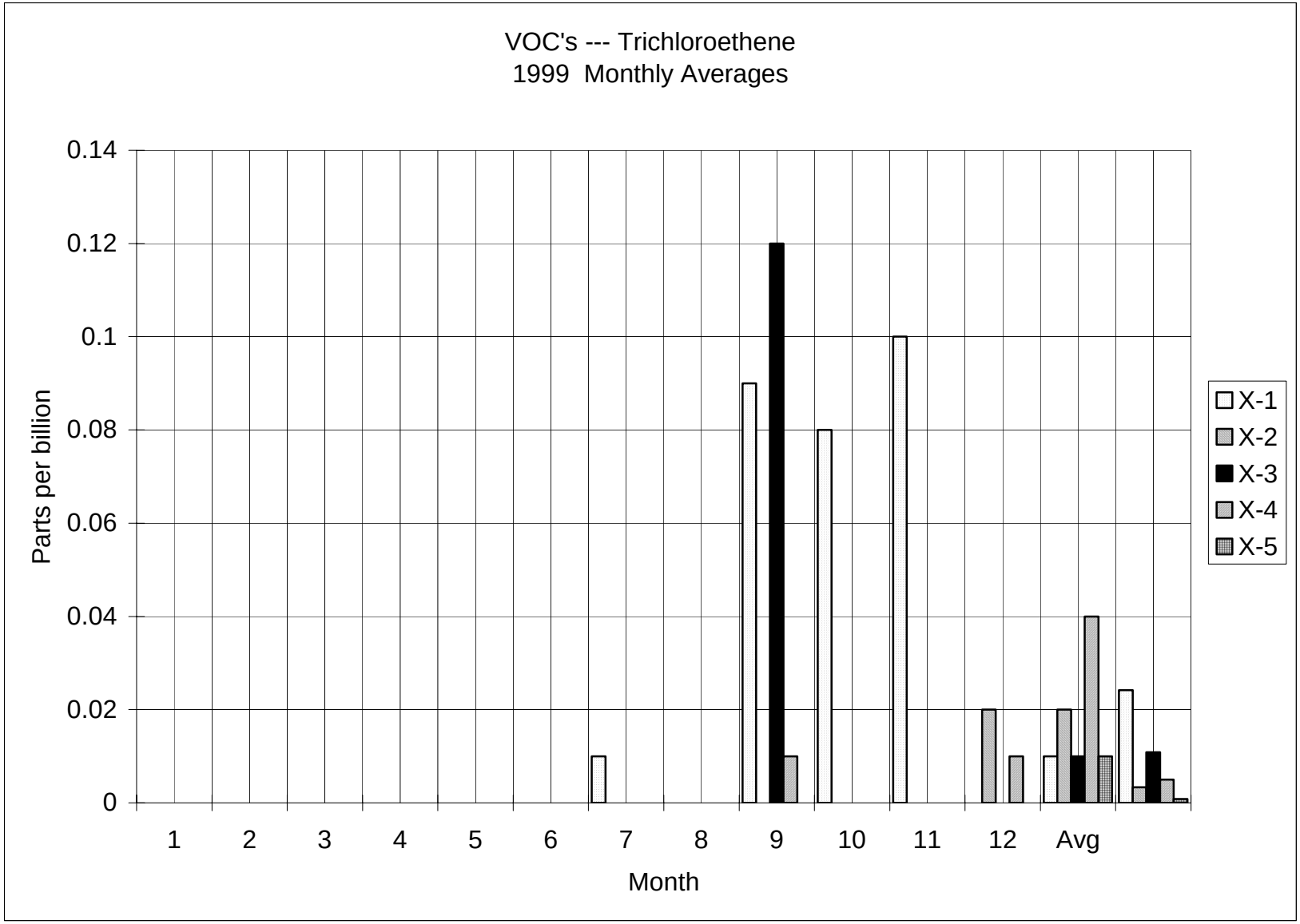

VOC's --- Methyl Tert-Butyl Ether (MTBE)
1999 Monthly Averages
Parts per billion
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
1
2
3
4
5
6
7
8
9
10
11
12
Avg
Month
X-1
X-2
X-3
X-4
X-5

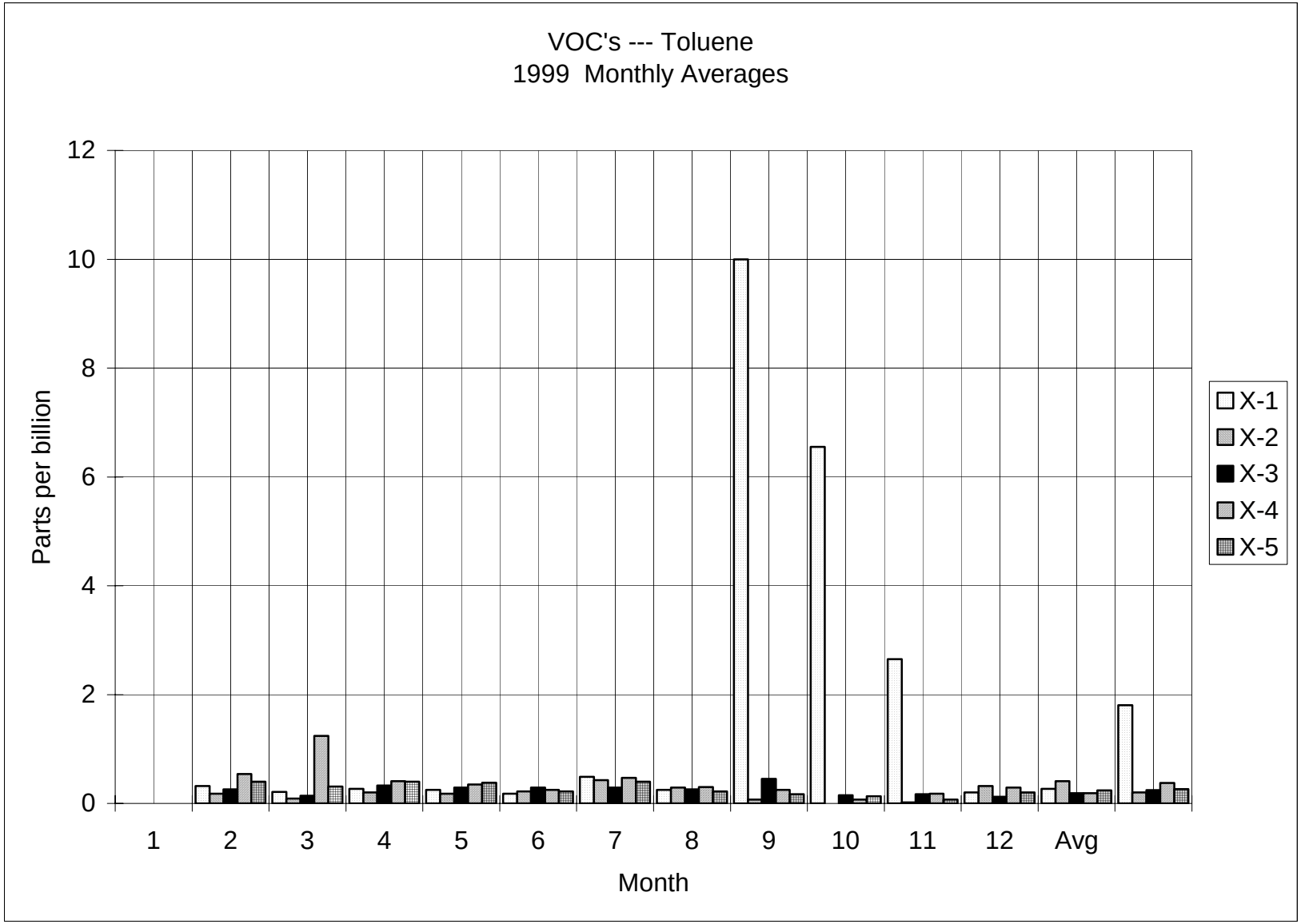

VOC's --- Chloroform
1999 Monthly Averages
Parts per billion
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
1
2
3
4
5
6
7
8
9
10
11
12
Avg
Month
X-1
X-2
X-3
X-4
X-5

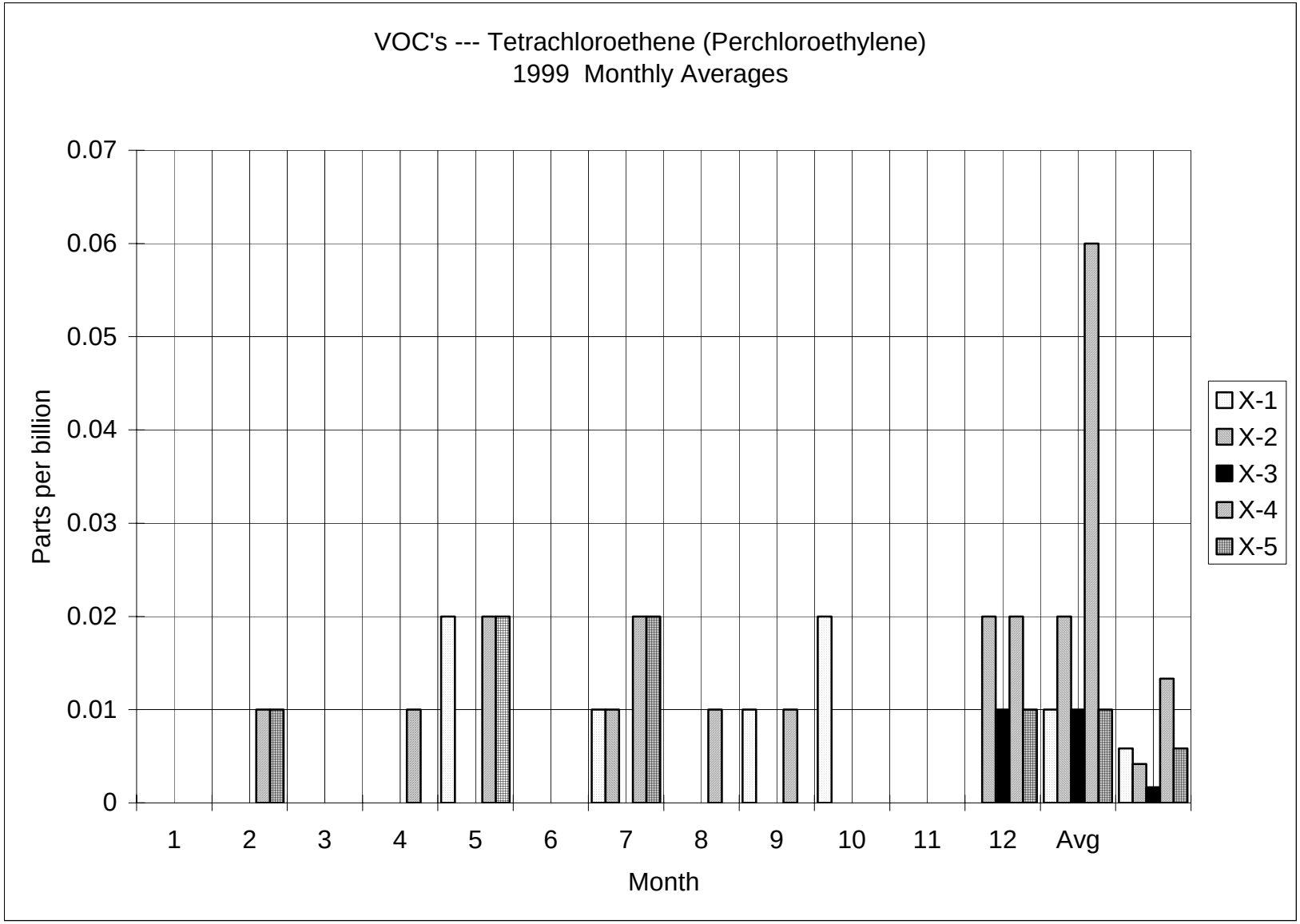

VOC's --- 1,1,1-Trichloroethane (Methylchloroform)
1999 Monthly Averages
Parts per billion
0.25
0.2
0.15
0.1
0.05
0
1
2
3
4
5
6
7
8
9
10
11
12
Avg
Month
X-1
X-2
X-3
X-4
X-5

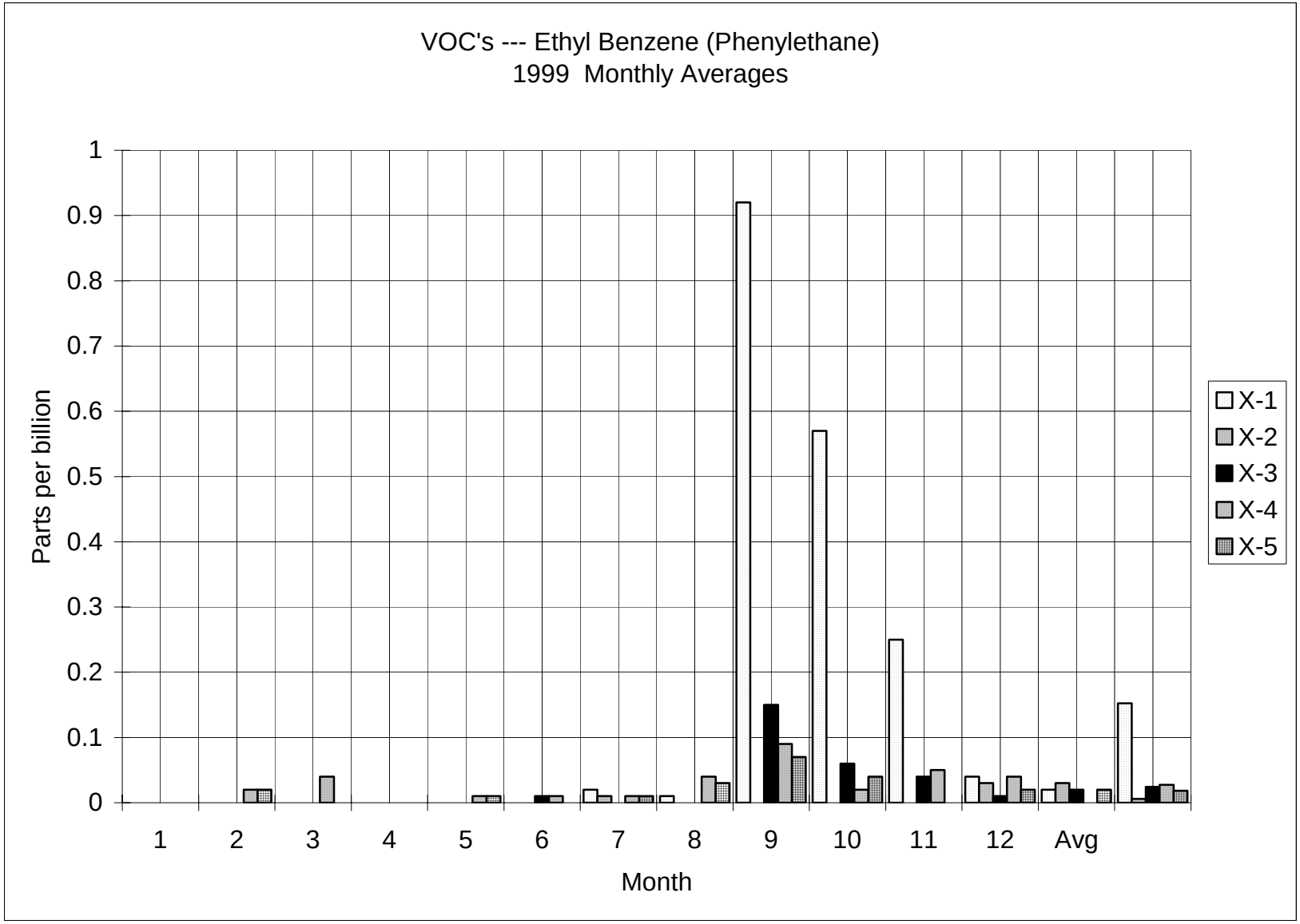

VOC's --- Carbon Tetrachloride
1999 Monthly Averages
Parts per billion
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1
2
3
4
5
6
7
8
9
10
11
12
Avg
Month
X-1
X-2
X-3
X-4
X-5

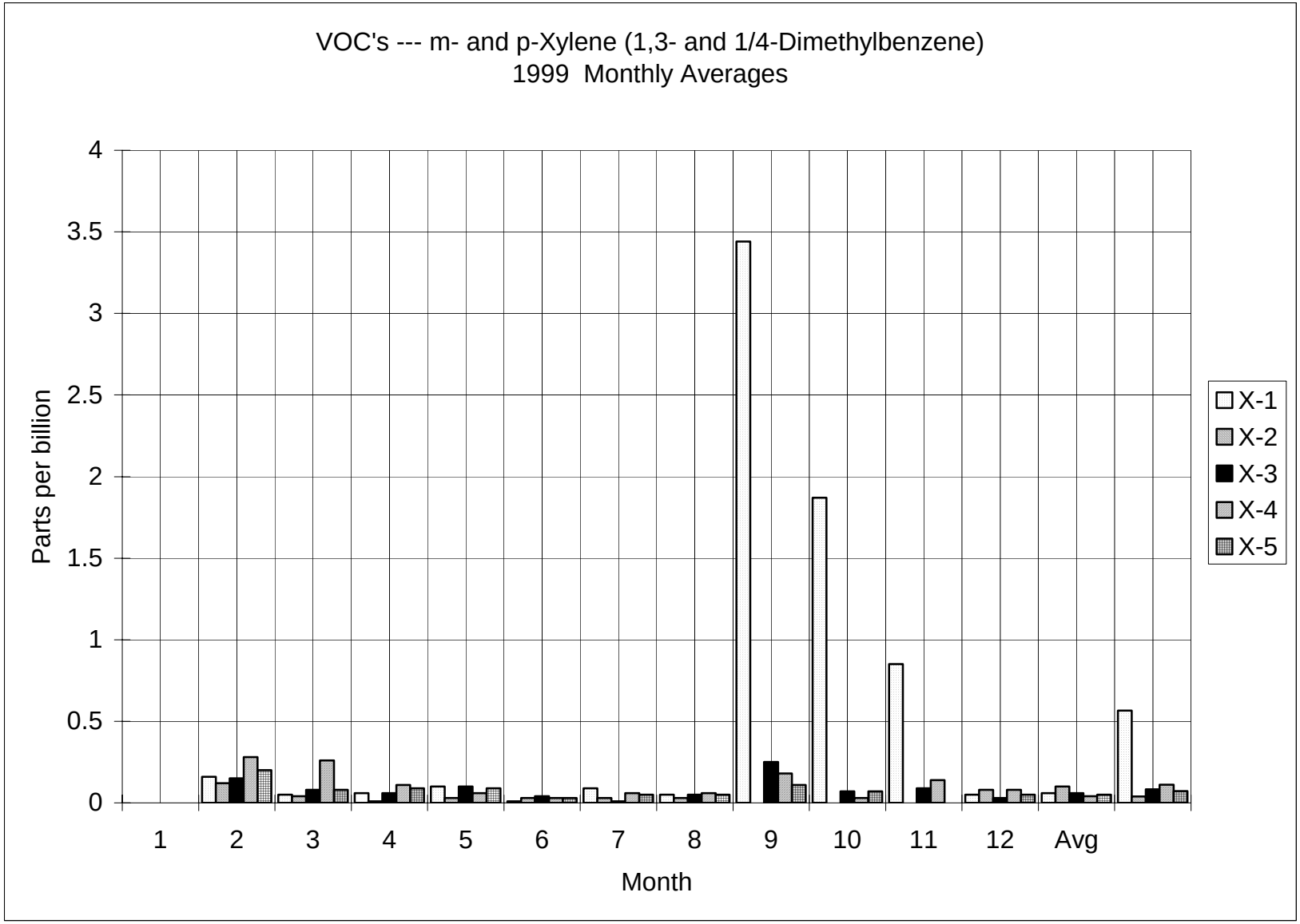

VOC's --- Benzene
1999 Monthly Averages
Parts per billion
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1
2
3
4
5
6
7
8
9
10
11
12
Avg
Month
X-1
X-2
X-3
X-4
X-5

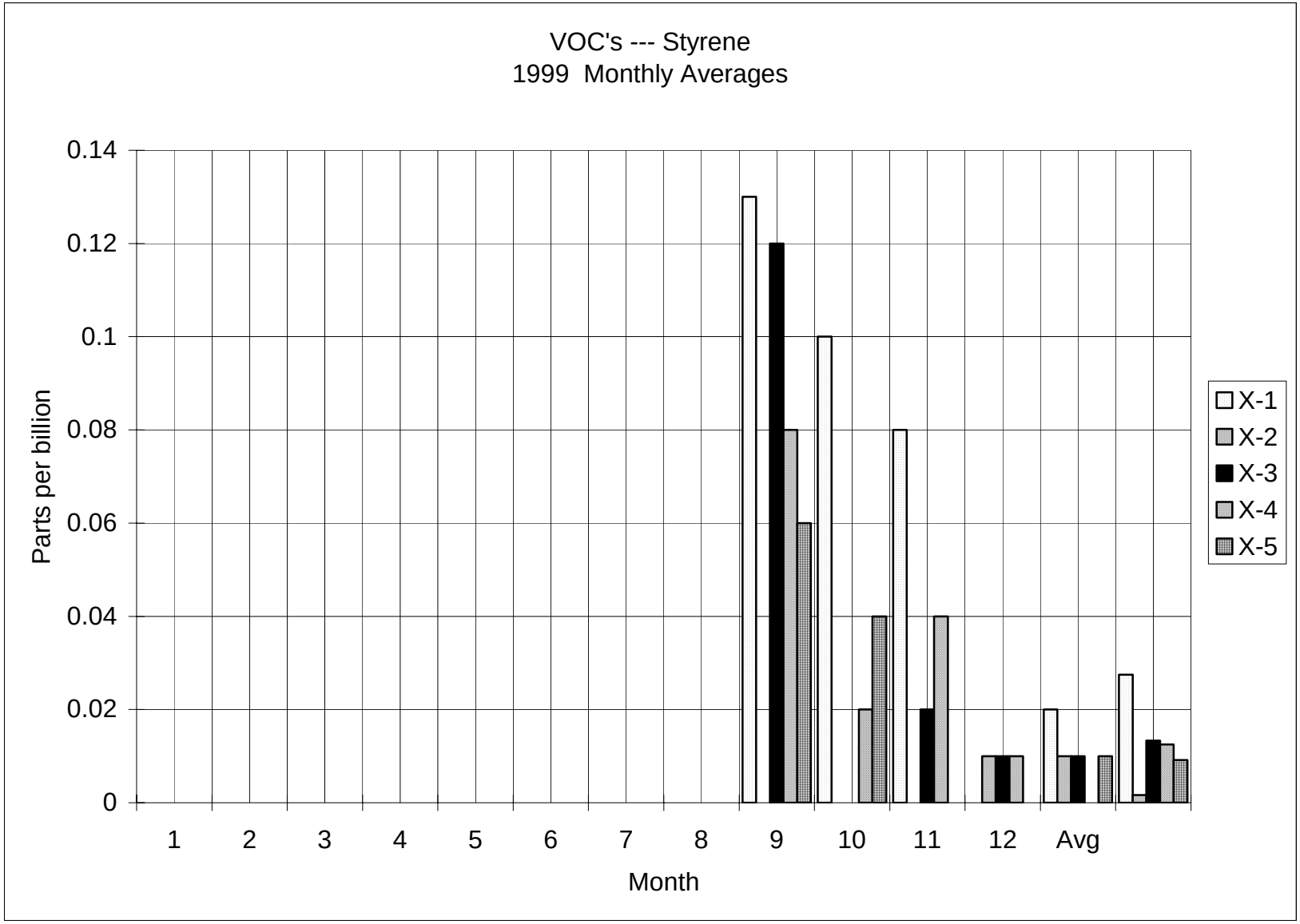

VOC's --- Trichloroethene
1999 Monthly Averages
Parts per billion
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
1
2
3
4
5
6
7
8
9
10
11
12
Avg
Month
X-1
X-2
X-3
X-4
X-5

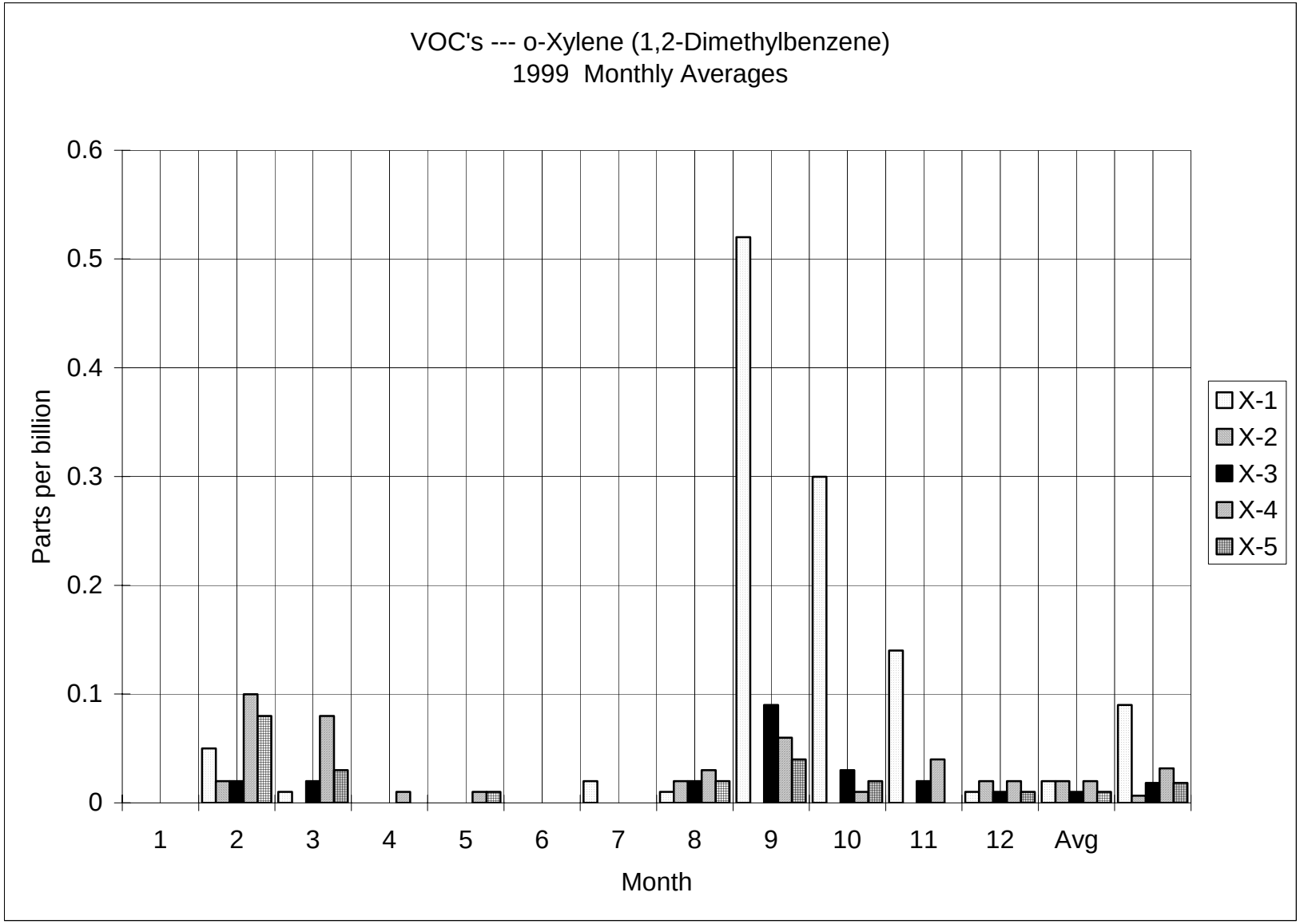

VOC's --- Toluene
1999 Monthly Averages
Parts per billion
12
10
8
6
4
2
0
1
2
3
4
5
6
7
8
9
10
11
12
Avg
Month
X-1
X-2
X-3
X-4
X-5


VOC's --- Tetrachloroethene (Perchloroethylene)
1999 Monthly Averages
Parts per billion
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
1
2
3
4
5
6
7
8
9
10
11
12
Avg
Month
X-1
X-2
X-3
X-4
X-5


VOC's --- Ethyl Benzene (Phenylethane)
1999 Monthly Averages
Parts per billion
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1
2
3
4
5
6
7
8
9
10
11
12
Avg
Month
X-1
X-2
X-3
X-4
X-5


VOC's --- m- and p-Xylene (1,3- and 1/4-Dimethylbenzene)
1999 Monthly Averages
Parts per billion
4
3.5
3
2.5
2
1.5
1
0.5
0
1
2
3
4
5
6
7
8
9
10
11
12
Avg
Month
X-1
X-2
X-3
X-4
X-5


VOC's --- Styrene
1999 Monthly Averages
Parts per billion
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
1
2
3
4
5
6
7
8
9
10
11
12
Avg
Month
X-1
X-2
X-3
X-4
X-5


VOC's --- o-Xylene (1,2-Dimethylbenzene)
1999 Monthly Averages
Parts per billion
0.6
0.5
0.4
0.3
0.2
0.1
0
1
2
3
4
5
6
7
8
9
10
11
12
Avg
Month
X-1
X-2
X-3
X-4
X-5

APPENDIX G

OZONE DATA

AIR MONITORING AT RFETS

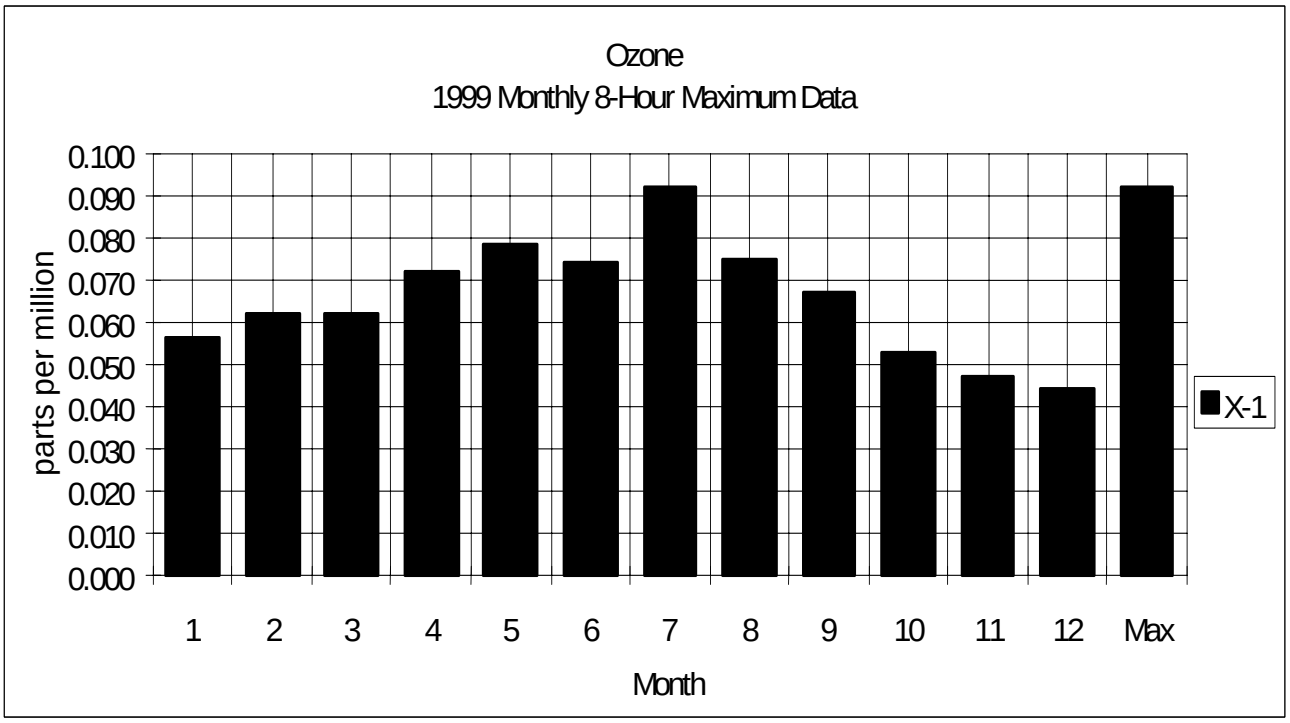
Ozone

1999

Monthly 8-Hour Maximum Data

(ppm)

	1999												1999
Site	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Max**
X-1	0.056	0.062	0.062	0.072	0.078	0.074	0.092	0.075	0.067	0.053	0.047	0.044	0.092



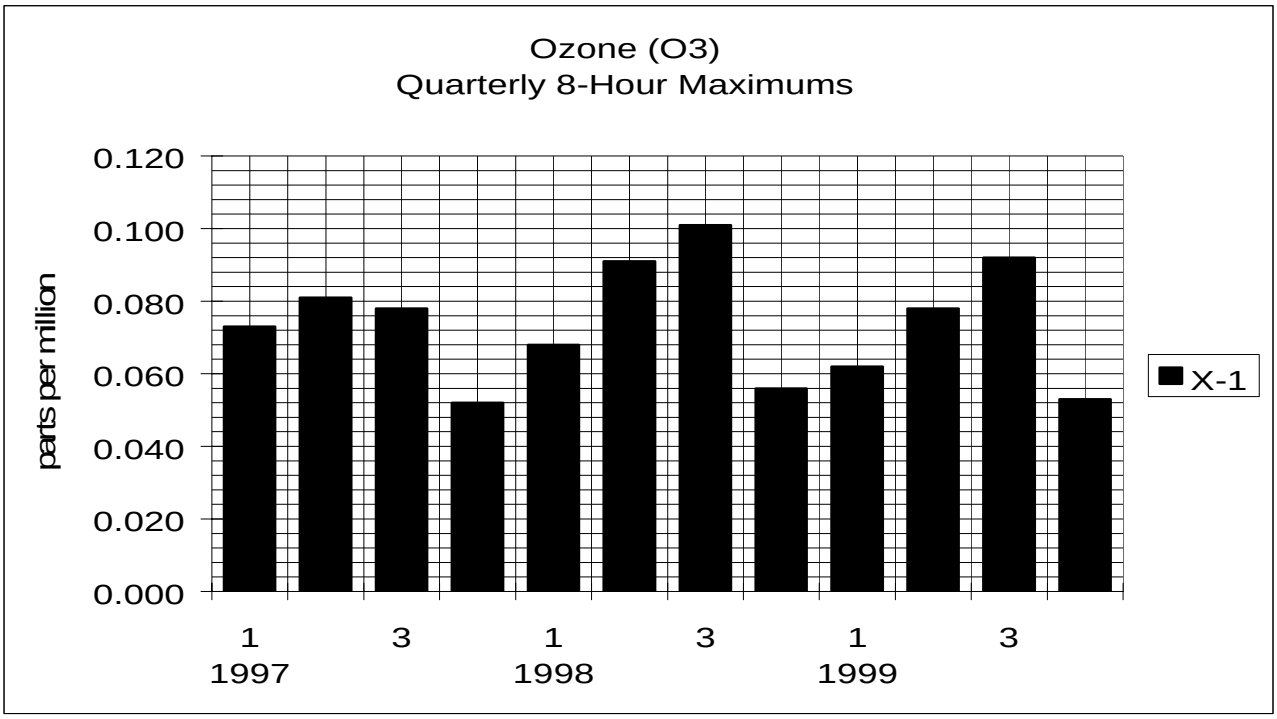
AIR MONITORING AT RFETS

Ozone

1999

Quarterly 8-Hour Maximum Data (3-years)
(ppm)

Site	1997				1998				1999			
	1	2	3	4	1	2	3	4	1	2	3	4
X-1	0.073	0.081	0.078	0.052	0.068	0.091	0.101	0.056	0.062	0.078	0.092	0.053



AIR MONITORING AT RFETS

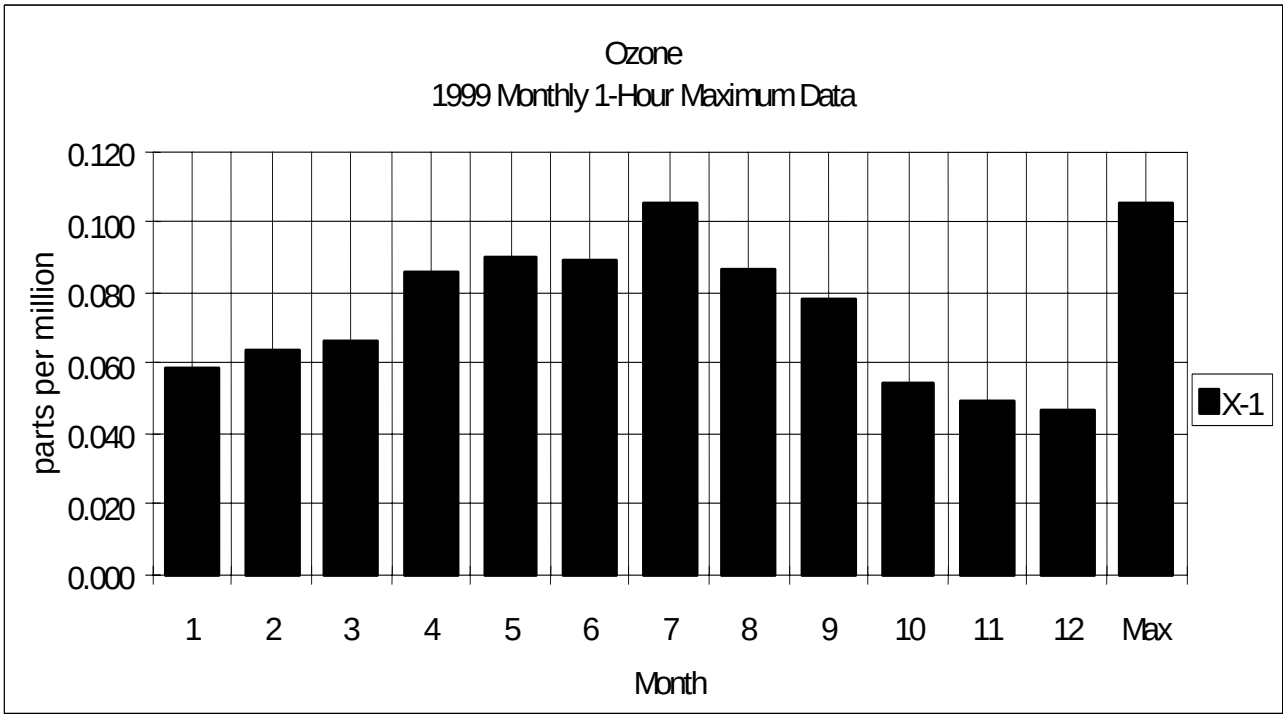
Ozone

1999

Monthly 1-Hour Maximum Data

(ppm)

Site	1	2	3	4	5	6	7	8	9	10	11	12	Max
X-1	0.059	0.064	0.066	0.086	0.090	0.089	0.105	0.087	0.078	0.054	0.049	0.047	0.105



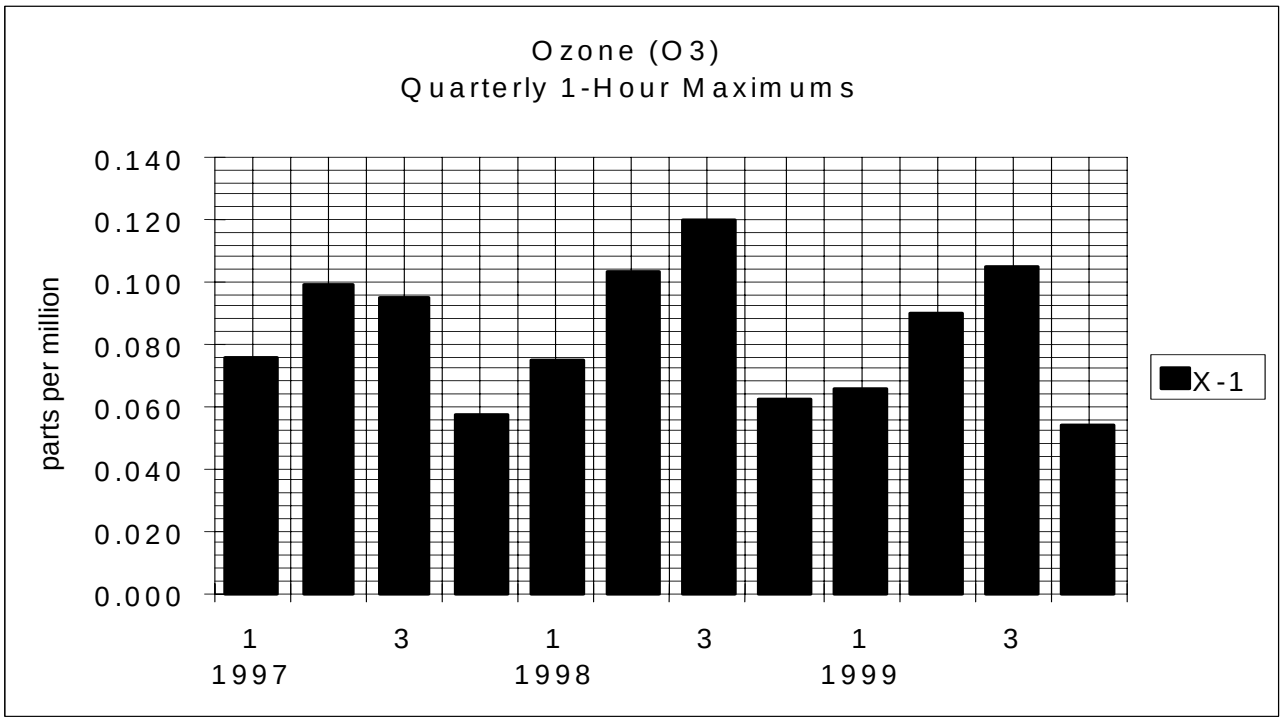
AIR MONITORING AT RFETS

Ozone

1999

Quarterly 1-Hour Maximum Data (3-years)
(ppm)

Site	1997				1998				1999			
	1	2	3	4	1	2	3	4	1	2	3	4
X-1	0.076	0.099	0.095	0.057	0.075	0.103	0.120	0.062	0.066	0.090	0.105	0.054



APPENDIX H

RADIONUCLIDE AND METALS DATA

AIR MONITORING AT RFETS

Total Suspended Particulates (TSP) Metals and Radionuclides

1999

Quarterly Composite Data
($\mu g/m^3$)

TSP Site	Item	Months 01-03 Composite	Months 04-06 Composite	Months 07-09 Composite	Months 10-12 Composite
X-1	Be	<0.0011	<0.0011	<0.0011	<0.0011
X-1-C	Be - Coll	<0.0011	<0.0011	<0.0011	<0.0011
X-2	Be	<0.0011	<0.0011	<0.0011	<0.0011
X-3	Be	<0.0011	<0.0011	<0.0011	<0.0011
X-4	Be	<0.0011	<0.0011	<0.0011	<0.0011
X-5	Be	<0.0011	<0.0011	<0.0011	<0.0011

AIR MONITORING AT RFETS

Total Suspended Particulates (TSP) Metals and Radionuclides

1999

Quarterly Composite Data
(pCi/m^3)

TSP Site	Item	Months 01-03 Composite	Months 04-06 Composite	Months 07-09 Composite	Months 10-12 Composite
X-1	U-234	<0.000029	<0.000066	<0.000065	<0.000060
X-1-C	U-234 - Coll	<0.000033	<0.000060	**0.000125**	<0.000051
X-2	U-234	<0.000033	<0.000068	**0.000519**	**0.000074**
X-3	U-234	<0.000030	<0.000056	**0.000454**	**0.000084**
X-4	U-234	<0.000027	**0.000075**	**0.000399**	**0.000067**
X-5	U-234	<0.000033	<0.000065	**0.000599**	**0.000105**
X-1	U-235	**0.000007**	<0.000013	<0.000012	<0.000012
X-1-C	U-235 - Coll	<0.000007	<0.000012	<0.000011	<0.000010
X-2	U-235	**0.000009**	<0.000013	**0.000032**	<0.000013
X-3	U-235	<0.000006	**0.000013**	**0.000034**	<0.000011
X-4	U-235	<0.000006	<0.000014	**0.000014**	<0.000012
X-5	U-235	<0.000007	<0.000013	**0.000029**	<0.000012
X-1	U-238	<0.000030	<0.000067	<0.000065	<0.000060
X-1-C	U-238 - Coll	<0.000034	<0.000061	**0.000121**	**0.000075**
X-2	U-238	<0.000033	<0.000068	**0.000502**	**0.000087**
X-3	U-238	<0.000031	<0.000056	**0.000518**	**0.000101**
X-4	U-238	<0.000028	<0.000075	**0.000401**	<0.000061
X-5	U-238	<0.000034	<0.000066	**0.000585**	**0.000079**
X-5	Pu-239	**0.000007**	<0.000009	<0.000004	<0.000017
X-5	Am-241	<0.000010	<0.000011	<0.000019	<0.000020

AIR MONITORING AT RFETS

PM_{10} Metals and Radionuclides

1999

Quarterly Composite Data
($\mu g/m^3$)

PM-10 Site	Item	Months 01-03 Composite	Months 04-06 Composite	Months 07-09 Composite	Months 10-12 Composite
X-1	Be	<0.0011	<0.0011	<0.0011	<0.0011
X-2	Be	<0.0011	<0.0011	<0.0011	<0.0011
X-2-C	Be - Coll	<0.0011	<0.0011	<0.0011	<0.0011
X-3	Be	<0.0011	<0.0011	<0.0011	<0.0011
X-4	Be	<0.0011	<0.0011	<0.0011	<0.0011
X-5	Be	<0.0011	<0.0011	<0.0011	<0.0011

AIR MONITORING AT RFETS

PM_{10} Metals and Radionuclides

1999

Quarterly Composite Data
(pCi/m^3)

PM-10 Site	Item	Months 01-03 Composite	Months 04-06 Composite	Months 07-09 Composite	Months 10-12 Composite
X-1	U-234	<0.000051	<0.000057	<0.000058	<0.000060
X-2	U-234	<0.000063	<0.000055	**0.000055**	<0.000057
X-2-C	U-234 - Coll	**0.000070**	<0.000056	**0.000094**	<0.000062
X-3	U-234	<0.000057	**0.000085**	<0.000048	**0.000061**
X-4	U-234	<0.000053	**0.000067**	<0.000047	<0.000062
X-5	U-234	**0.000111**	**0.000062**	<0.000057	<0.000057
X-1	U-235	<0.000010	<0.000011	<0.000011	<0.000012
X-2	U-235	<0.000012	<0.000011	<0.000010	<0.000011
X-2-C	U-235 - Coll	<0.000010	<0.000011	<0.000010	<0.000012
X-3	U-235	<0.000011	<0.000011	<0.000009	<0.000011
X-4	U-235	<0.000010	<0.000012	<0.000009	<0.000012
X-5	U-235	<0.000011	<0.000010	<0.000011	<0.000011
X-1	U-238	**0.000059**	**0.000074**	**0.000076**	<0.000060
X-2	U-238	**0.000080**	**0.000069**	**0.000066**	<0.000057
X-2-C	U-238 - Coll	**0.000050**	<0.000057	**0.000091**	<0.000062
X-3	U-238	<0.00057	**0.000070**	<0.000048	**0.000060**
X-4	U-238	**0.000061**	**0.000071**	<0.000047	<0.000062
X-5	U-238	**0.000133**	<0.000054	<0.000057	<0.000057
X-5	Pu-239	**0.000009**	<0.000005	<0.000003	<0.000007
X-5	Am-241	<0.000006	<0.000006	<0.000009	<0.000011

APPENDIX I

METEOROLOGICAL DATA

AIR MONITORING AT RFETS

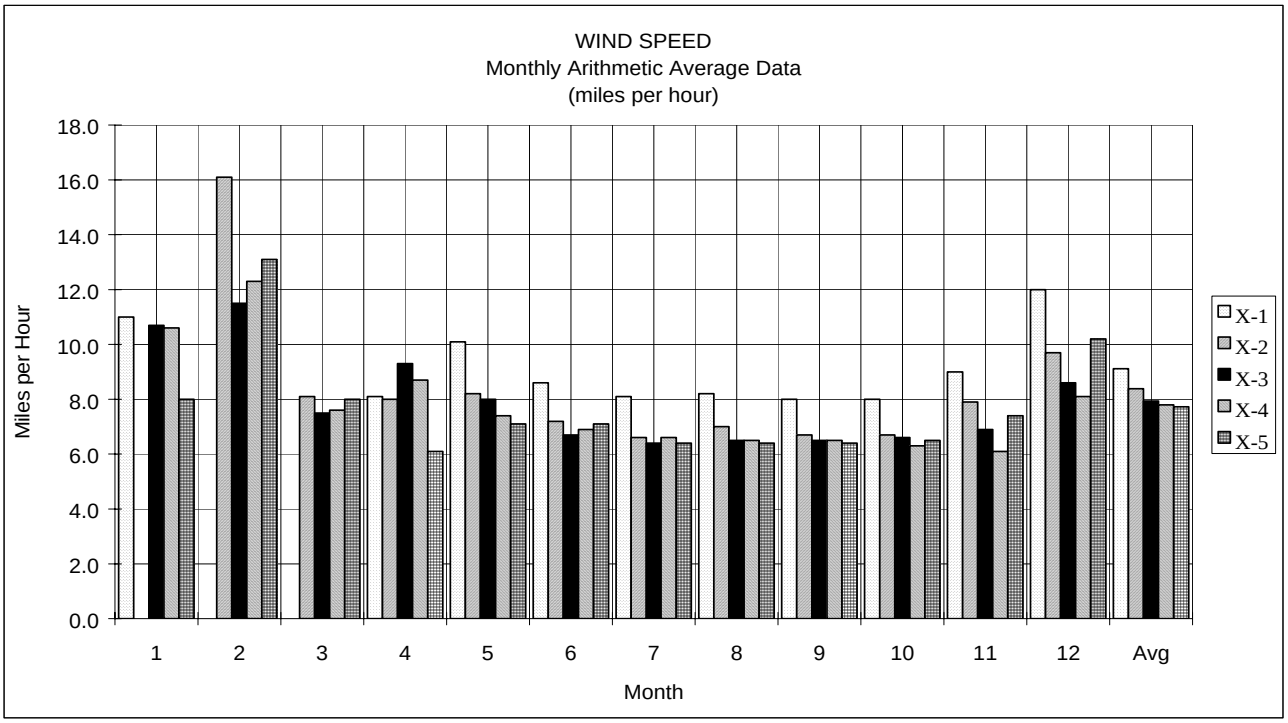
Wind Speed (vector)

1999

Monthly Arithmetic Average Data
(miles per hour)

1999													1999
Site	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Avg**
X-1	11.0			8.1	10.1	8.6	8.1	8.2	8.0	8.0	9.0	12.0	9.1
X-2		16.1	8.1	8.0	8.2	7.2	6.6	7.0	6.7	6.7	7.9	9.7	8.4
X-3	10.7	11.5	7.5	9.3	8.0	6.7	6.4	6.5	6.5	6.6	6.9	8.6	7.9
X-4	10.6	12.3	7.6	8.7	7.4	6.9	6.6	6.5	6.5	6.3	6.1	8.1	7.8
X-5	8.0	13.1	8.0	6.1	7.1	7.1	6.4	6.4	6.4	6.5	7.4	10.2	7.7

X-1 February and March 1999 wind speed data deleted due to sensor failure.
X-2 January 1999 wind speed data deleted because data acquisition system was not calculating resultant speed correctly.



AIR MONITORING AT RFETS

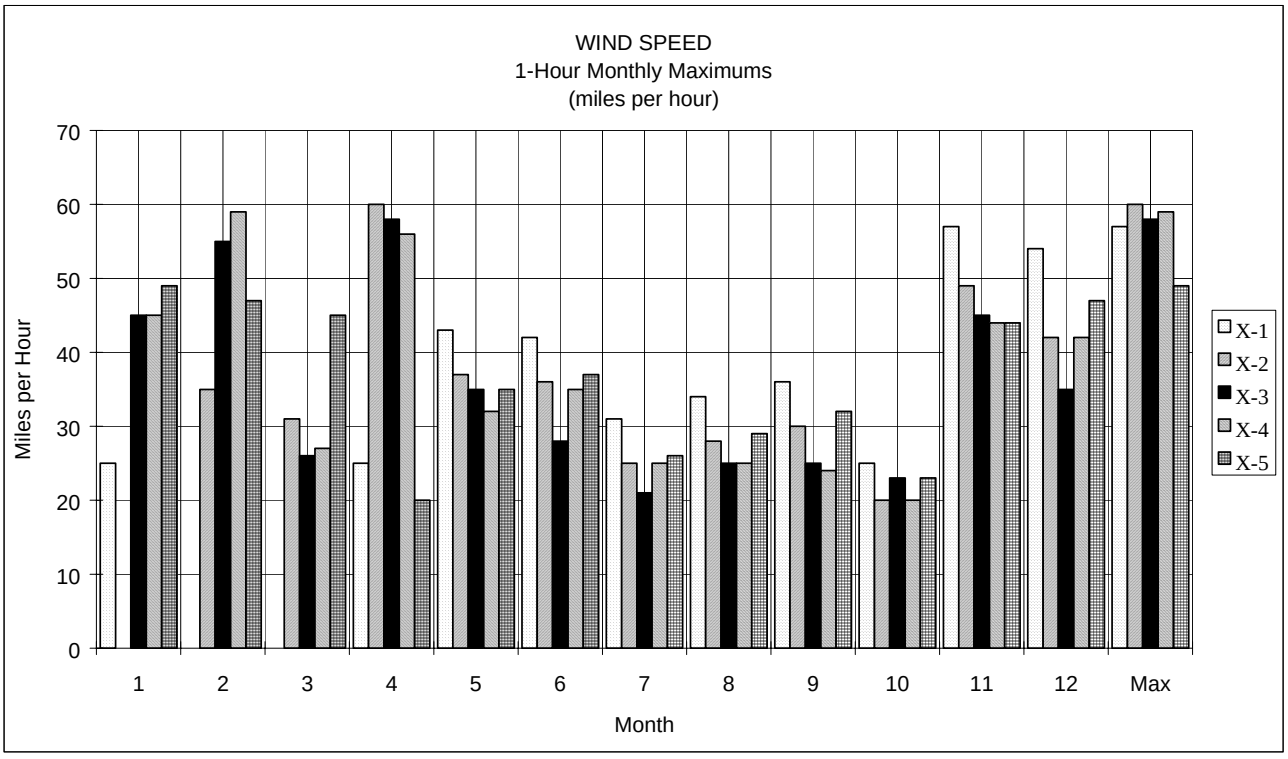
Wind Speed (vector)

1999

Monthly 1-Hour Maximum Data
(miles per hour)

1999													1999
Site	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Max**
X-1	25			25	43	42	31	34	36	25	57	54	57
X-2		35	31	60	37	36	25	28	30	20	49	42	60
X-3	45	55	26	58	35	28	21	25	25	23	45	35	58
X-4	45	59	27	56	32	35	25	25	24	20	44	42	59
X-5	49	47	45	20	35	37	26	29	32	23	44	47	49

X-1 February and March 1999 wind speed data deleted due to sensor failure.
X-2 January 1999 wind speed data deleted because data acquisition system was not calculating resultant speed correctly



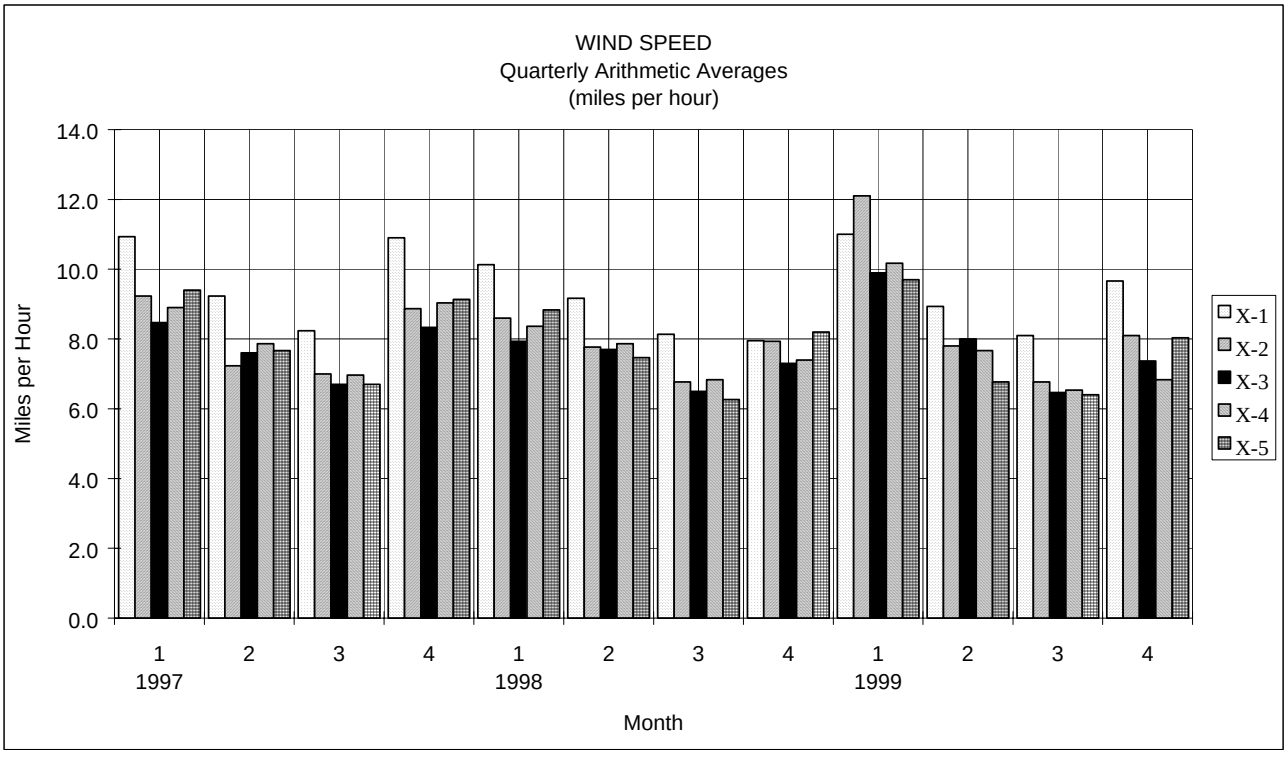
AIR MONITORING AT RFETS

Wind Speed (vector)

1999

Quarterly Arithmetic Average Data (3-years)
(miles per hour)

Site	1997				1998				1999			
	1	2	3	4	1	2	3	4	1	2	3	4
X-1	10.9	9.2	8.2	10.9	10.1	9.2	8.1	8.0	11.0	8.9	8.1	9.7
X-2	9.2	7.2	7.0	8.9	8.6	7.8	6.8	7.9	12.1	7.8	6.8	8.1
X-3	8.5	7.6	6.7	8.3	7.9	7.7	6.5	7.3	9.9	8.0	6.5	7.4
X-4	8.9	7.9	7.0	9.0	8.4	7.9	6.8	7.4	10.2	7.7	6.5	6.8
X-5	9.4	7.7	6.7	9.1	8.8	7.5	6.3	8.2	9.7	6.8	6.4	8.0



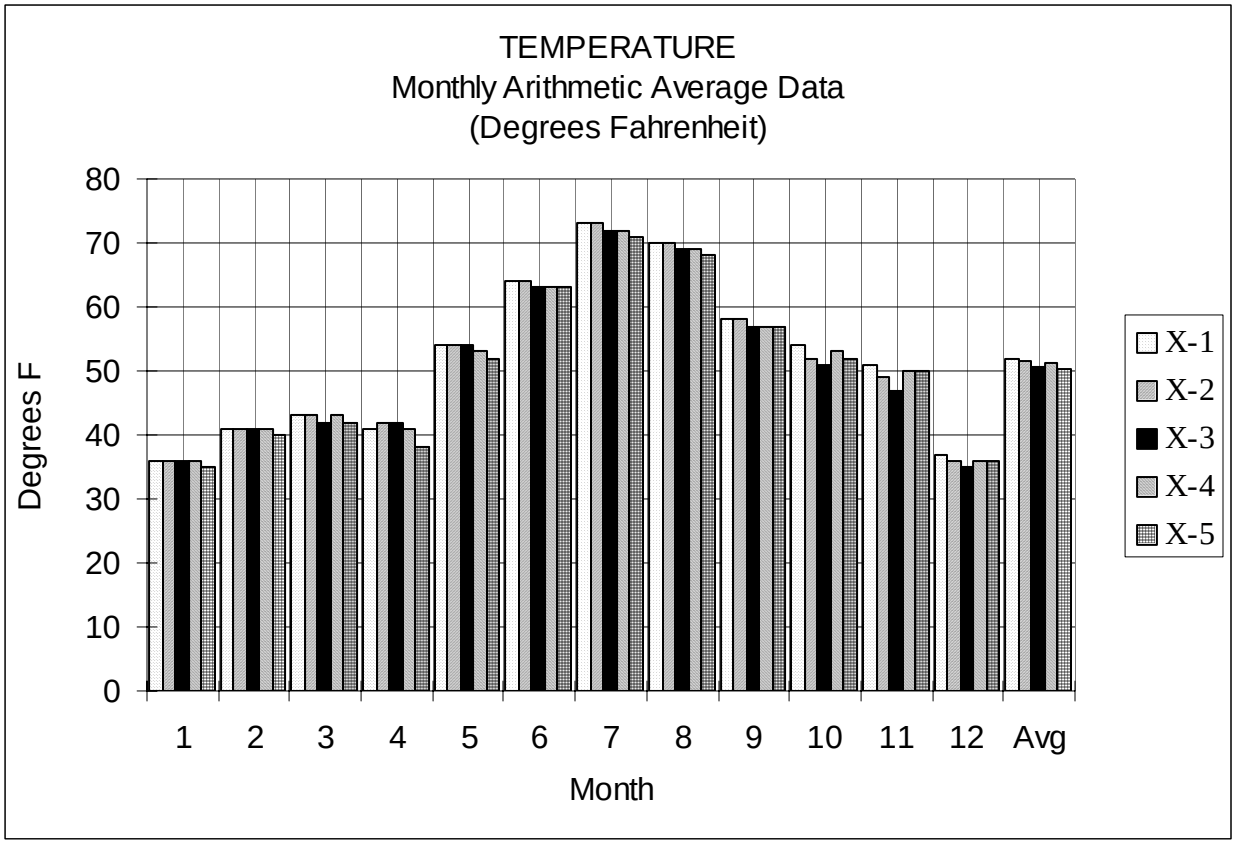
AIR MONITORING AT RFETS

Temperature

1999

Monthly Arithmetic Average Data
(degrees Fahrenheit)

1999												1999
Site	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Avg**
X-1	36	41	43	41	54	64	73	70	58	54	51	37	52
X-2	36	41	43	42	54	64	73	70	58	52	49	36	52
X-3	36	41	42	42	54	63	72	69	57	51	47	35	51
X-4	36	41	43	41	53	63	72	69	57	53	50	36	51
X-5	35	40	42	38	52	63	71	68	57	52	50	36	50



AIR MONITORING AT RFETS

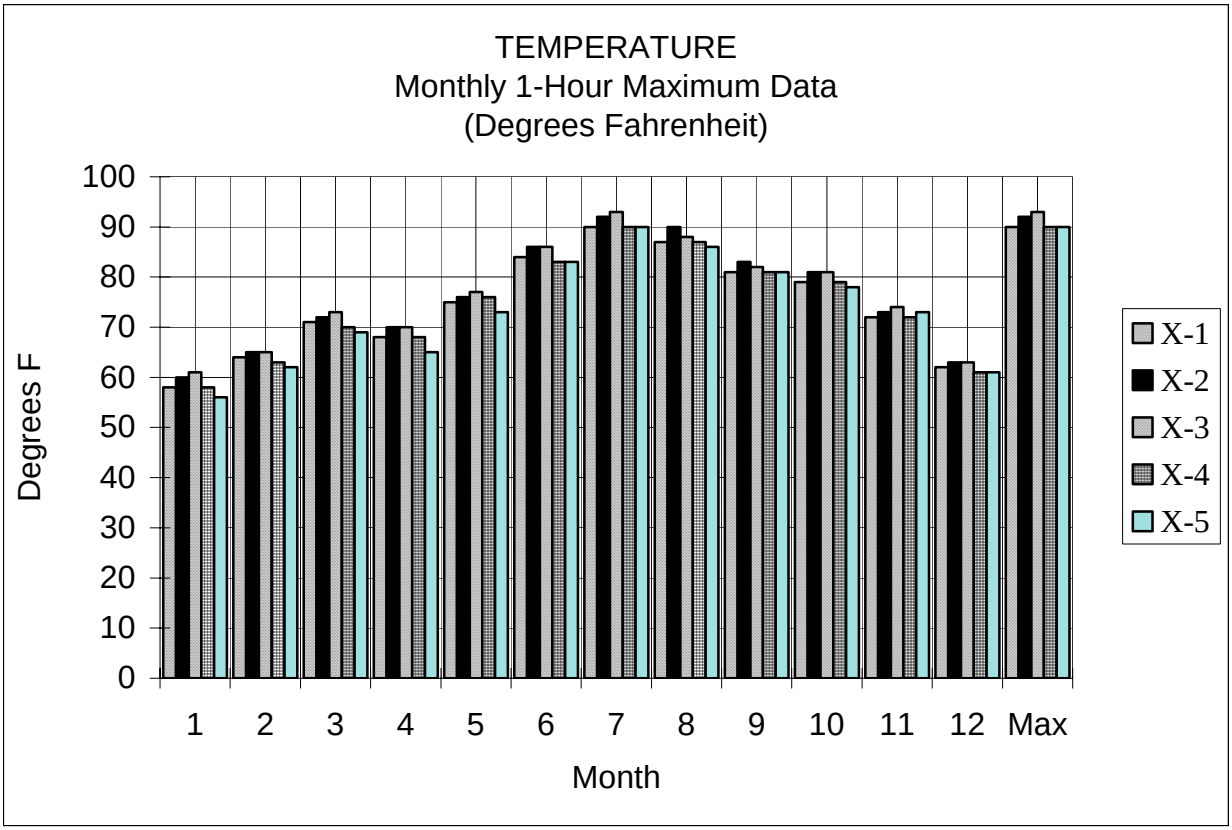
Temperature

1999

Monthly 1-Hour Maximum Data

(Degrees Fahrenheit)

	1999												1999
Site	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Max**
X-1	58	64	71	68	75	84	90	87	81	79	72	62	90
X-2	60	65	72	70	76	86	92	90	83	81	73	63	92
X-3	61	65	73	70	77	86	93	88	82	81	74	63	93
X-4	58	63	70	68	76	83	90	87	81	79	72	61	90
X-5	56	62	69	65	73	83	90	86	81	78	73	61	90



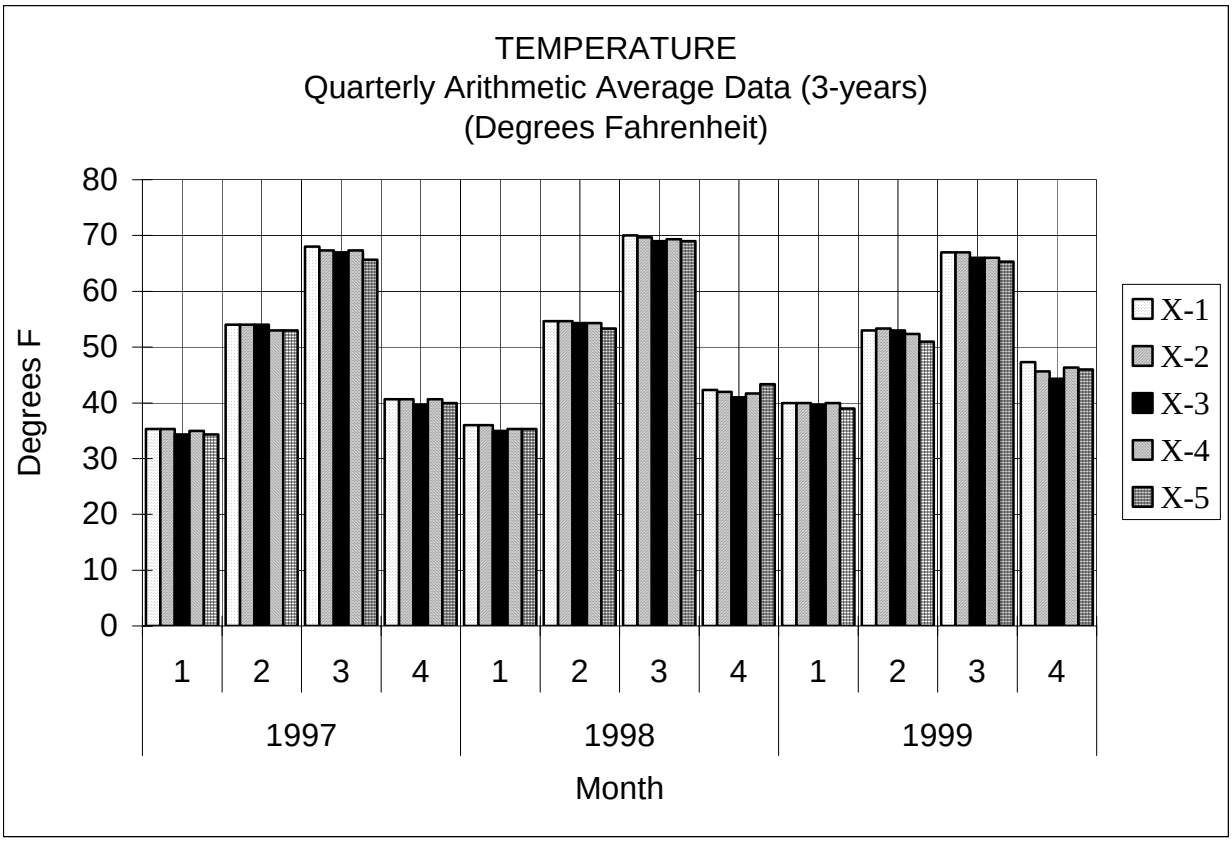
AIR MONITORING AT RFETS

Temperature

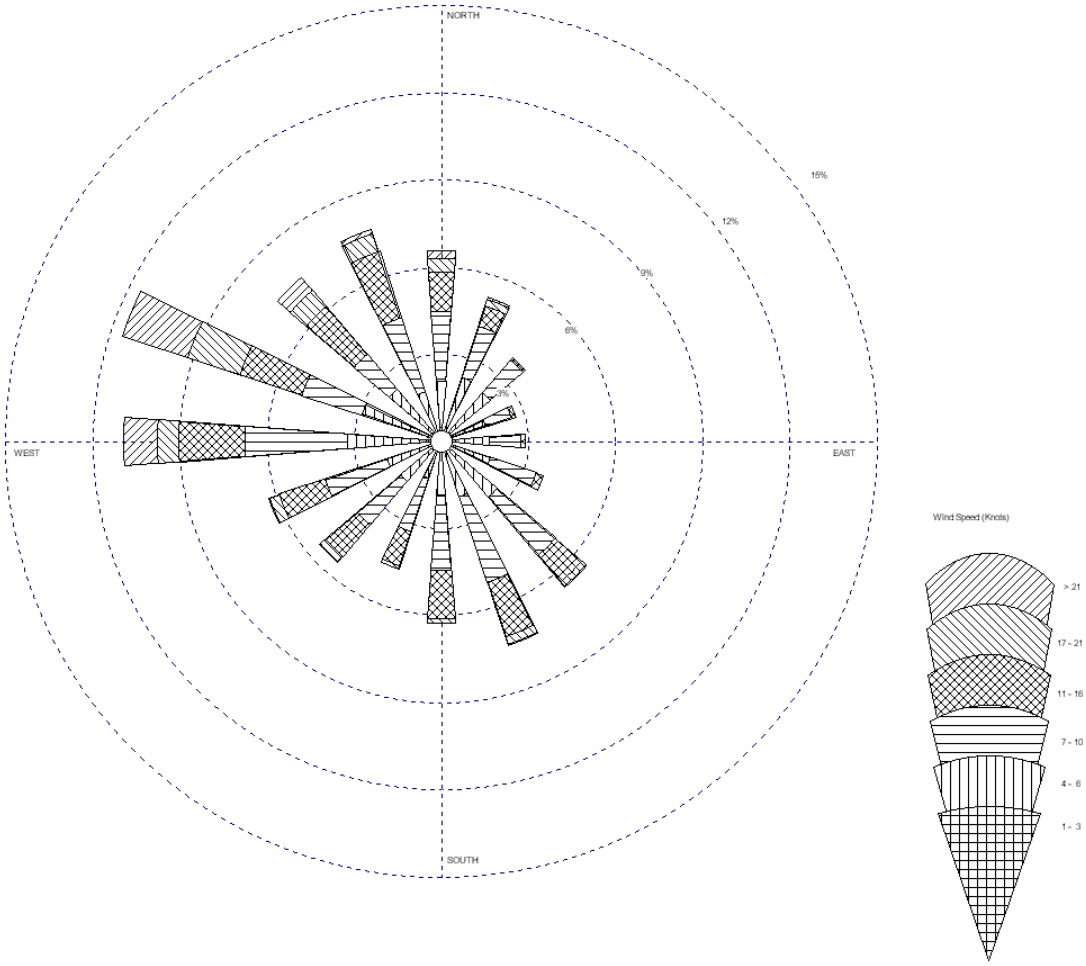
1999

Quarterly Arithmetic Average Data (3-years)
(degrees Fahrenheit)

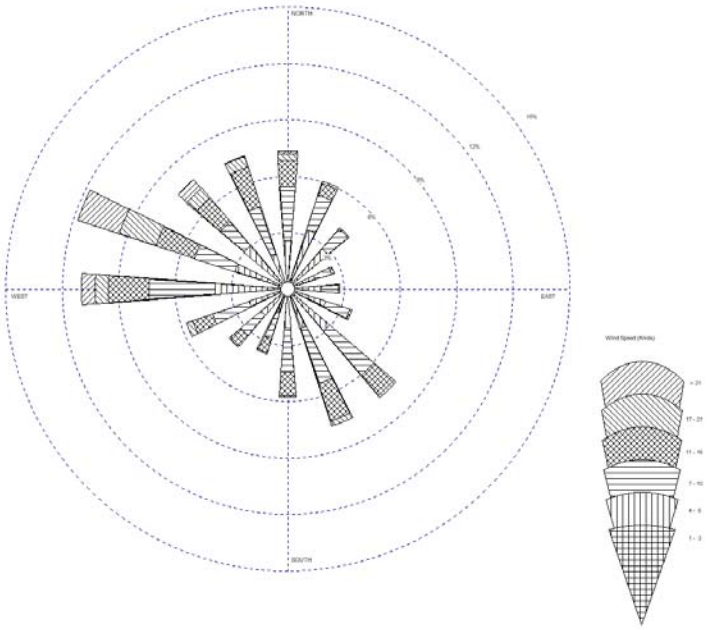
Site	1997				1998				1999			
	1	2	3	4	1	2	3	4	1	2	3	4
X-1	35	54	68	41	36	55	70	42	40.0	53.0	67.0	47.3
X-2	35	54	67	41	36	55	70	42	40.0	53.3	67.0	45.7
X-3	34	54	67	40	35	54	69	41	39.7	53.0	66.0	44.3
X-4	35	53	67	41	35	54	69	42	40.0	52.3	66.0	46.3
X-5	34	53	66	40	35	53	69	43	39.0	51.0	65.3	46.0



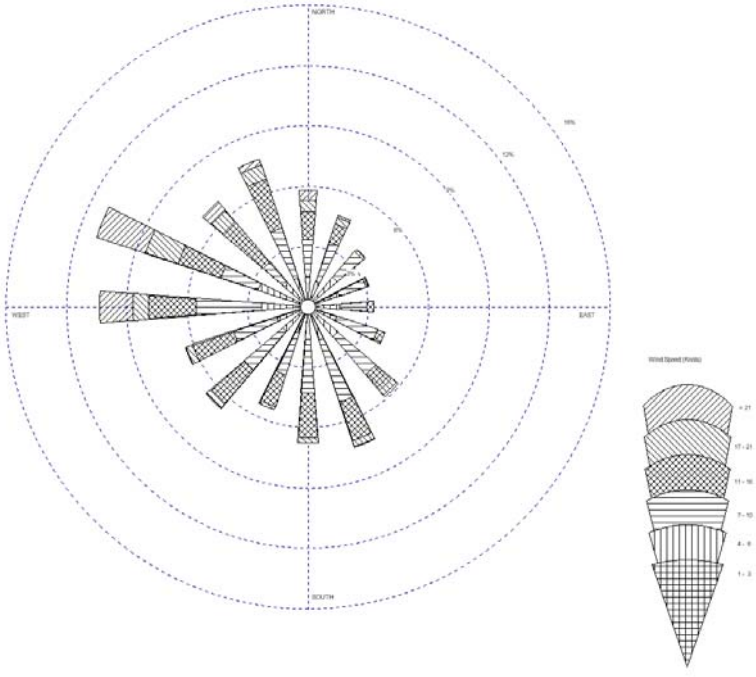
Rocky Flats North X-1
1999 – All Data



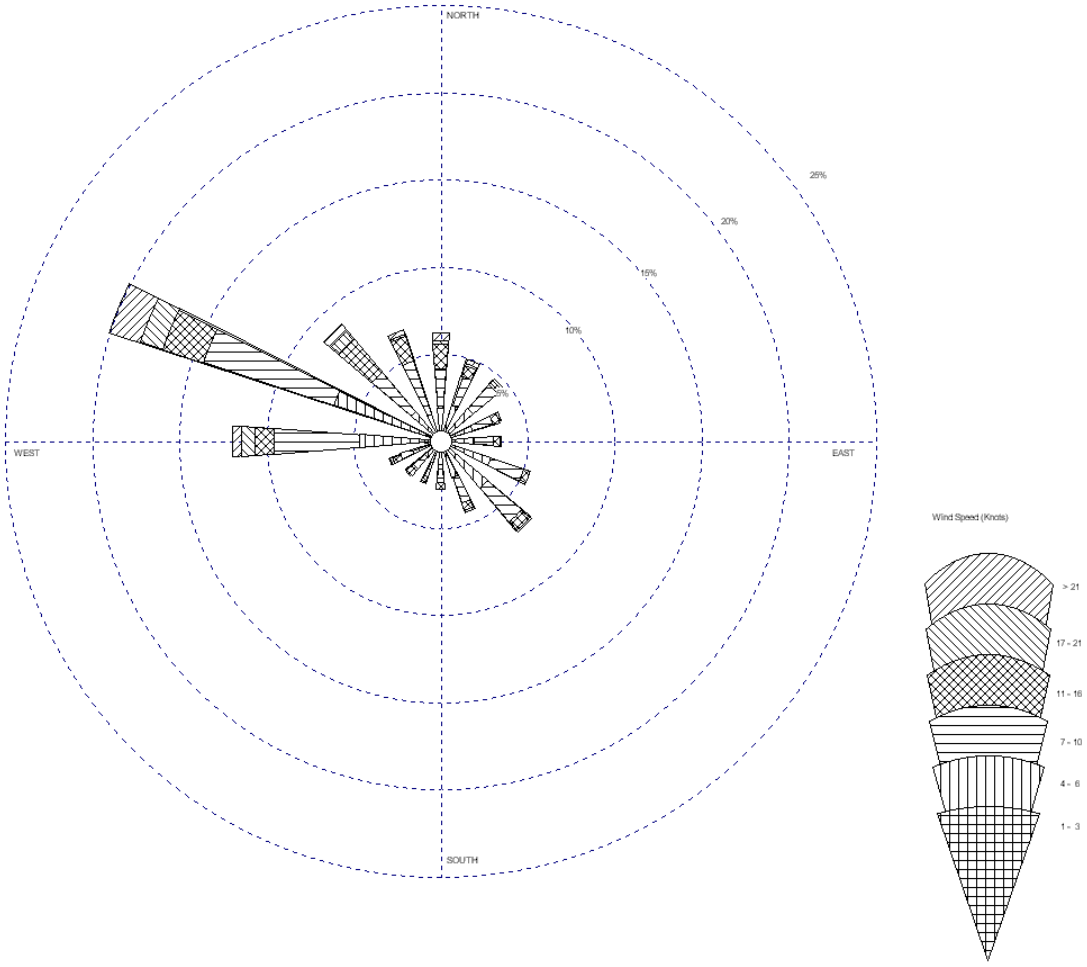
Rocky Flats North X-1
1999 – Midnight to Noon



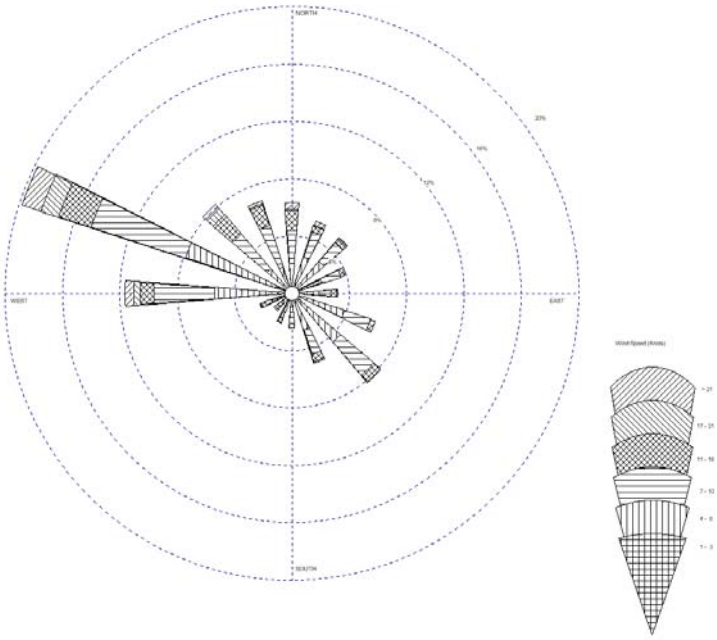
Rocky Flats North X-1
1999 – Noon to Midnight



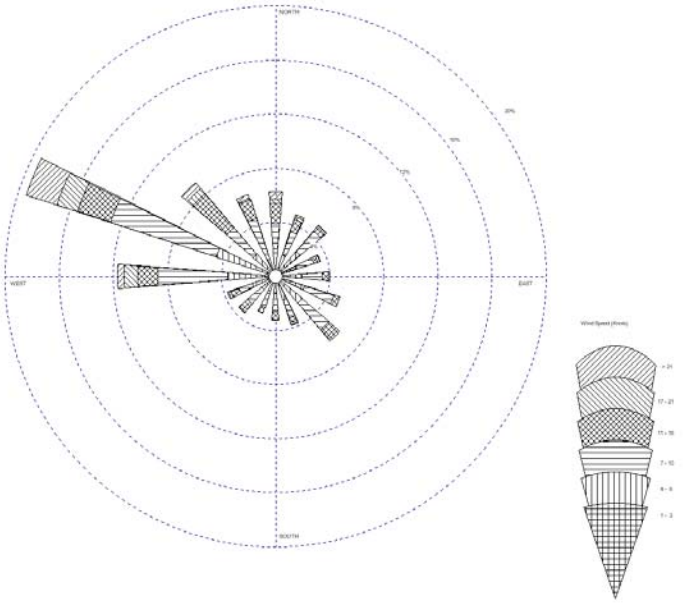
Rocky Flats Northeast X-2
1999 – All Data



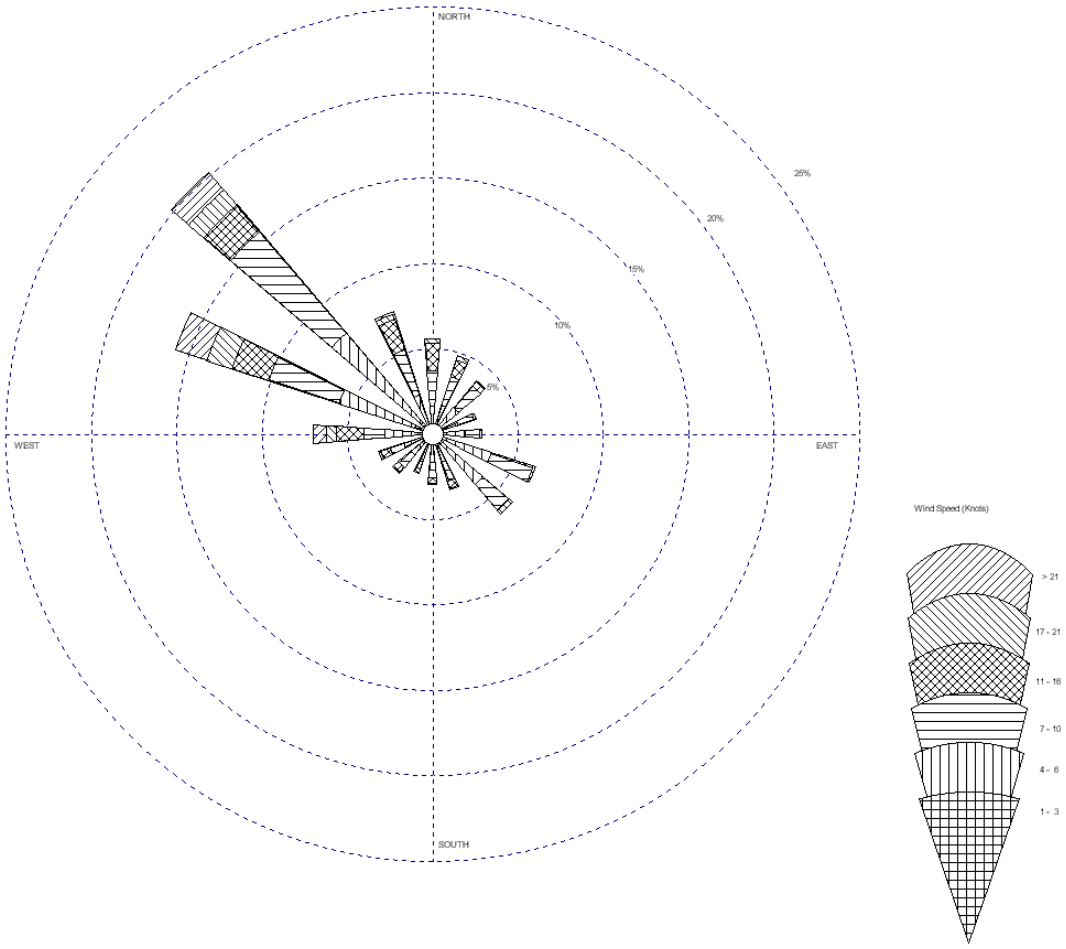
Rocky Flats Northeast X-2
1999 – Midnight to Noon



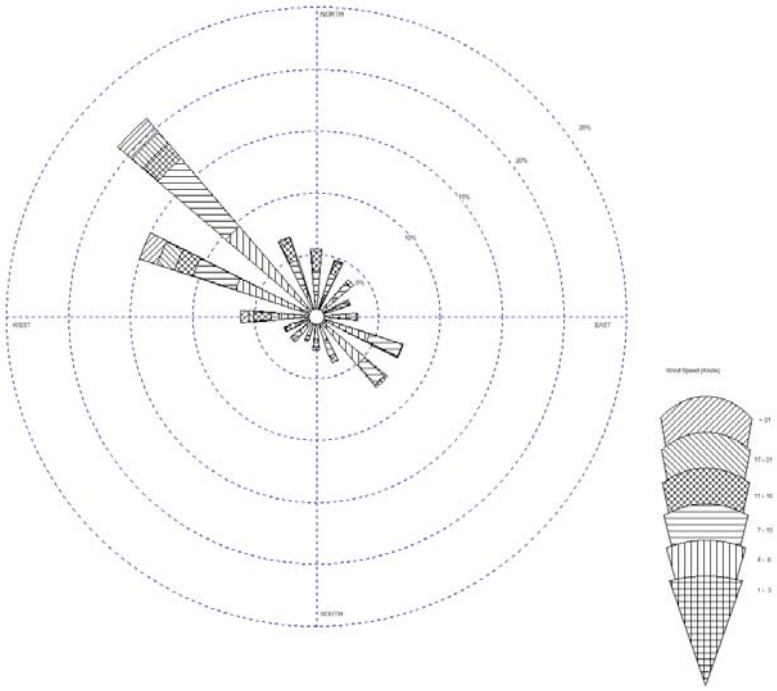
Rocky Flats Northeast X-2
1999 – Noon to Midnight



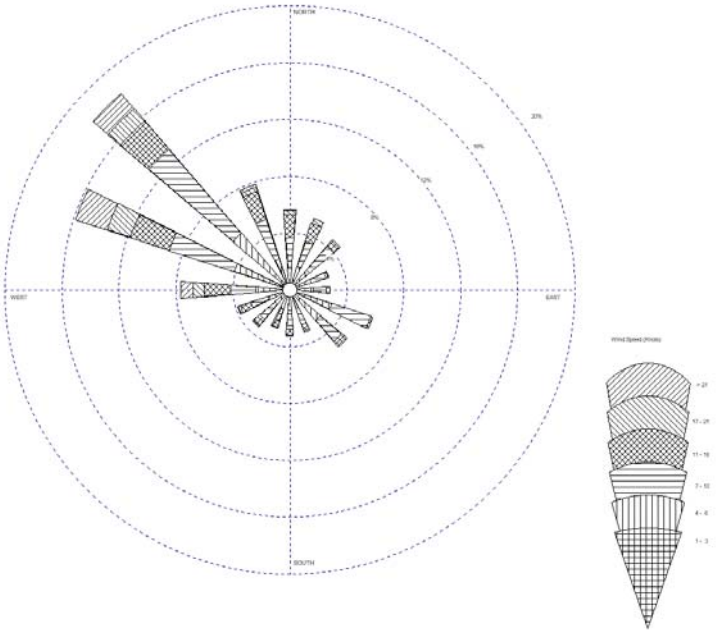
Rocky Flats Southeast X-3
1999 – All Data



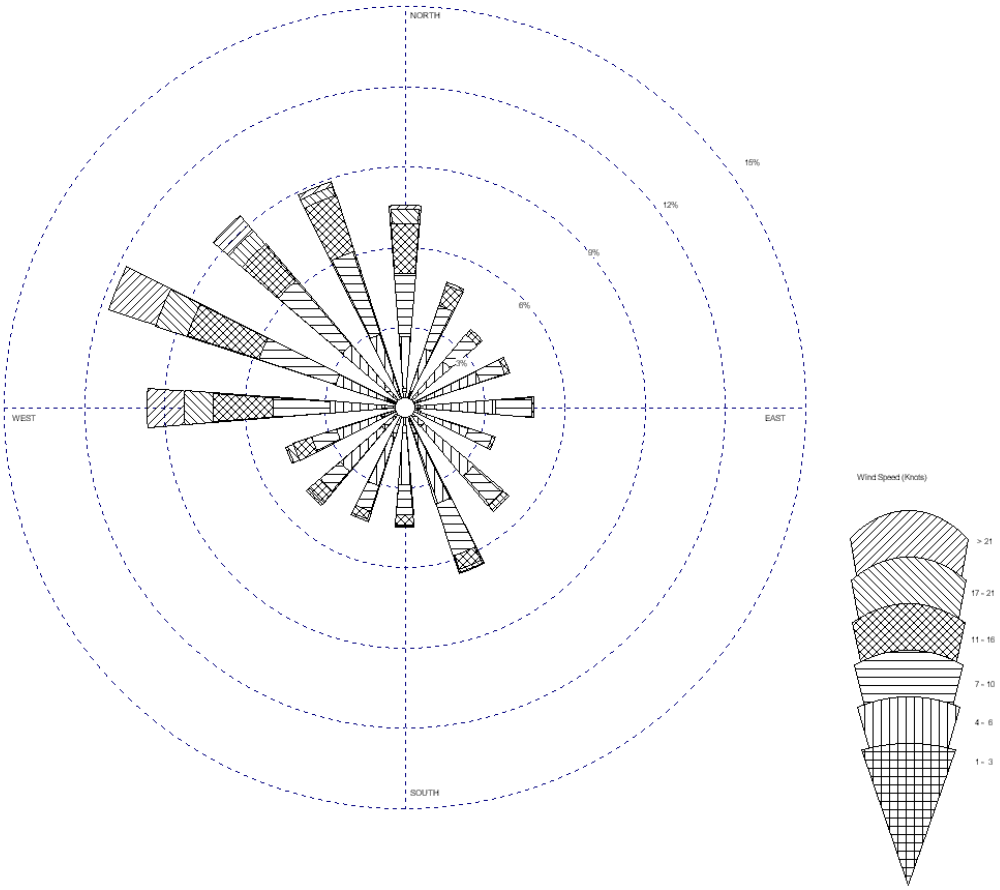
Rocky Flats Southeast X-3
1999 – Midnight to Noon



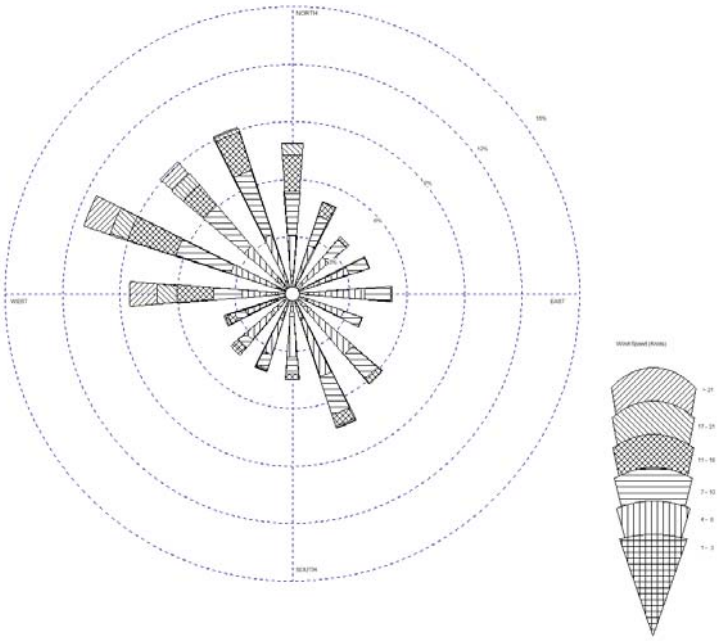
Rocky Flats Southeast X-3
1999 – Noon to Midnight



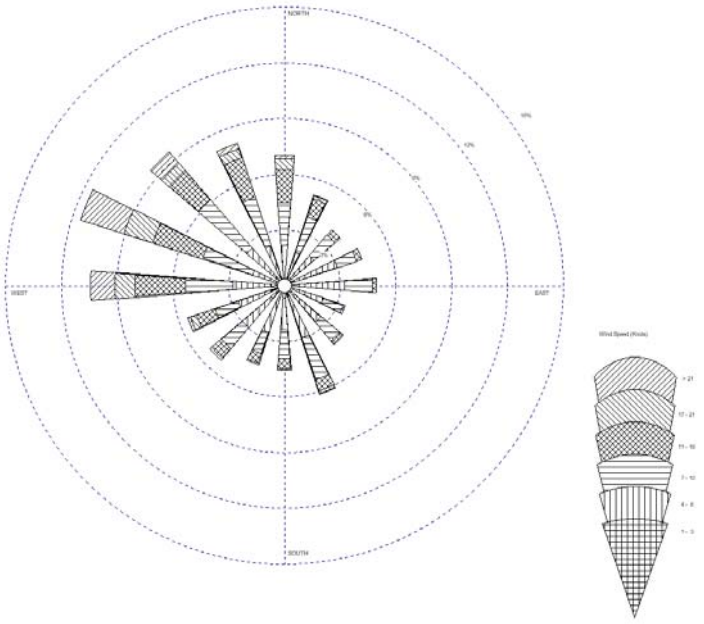
Rocky Flats South X-4
1999 – All Data



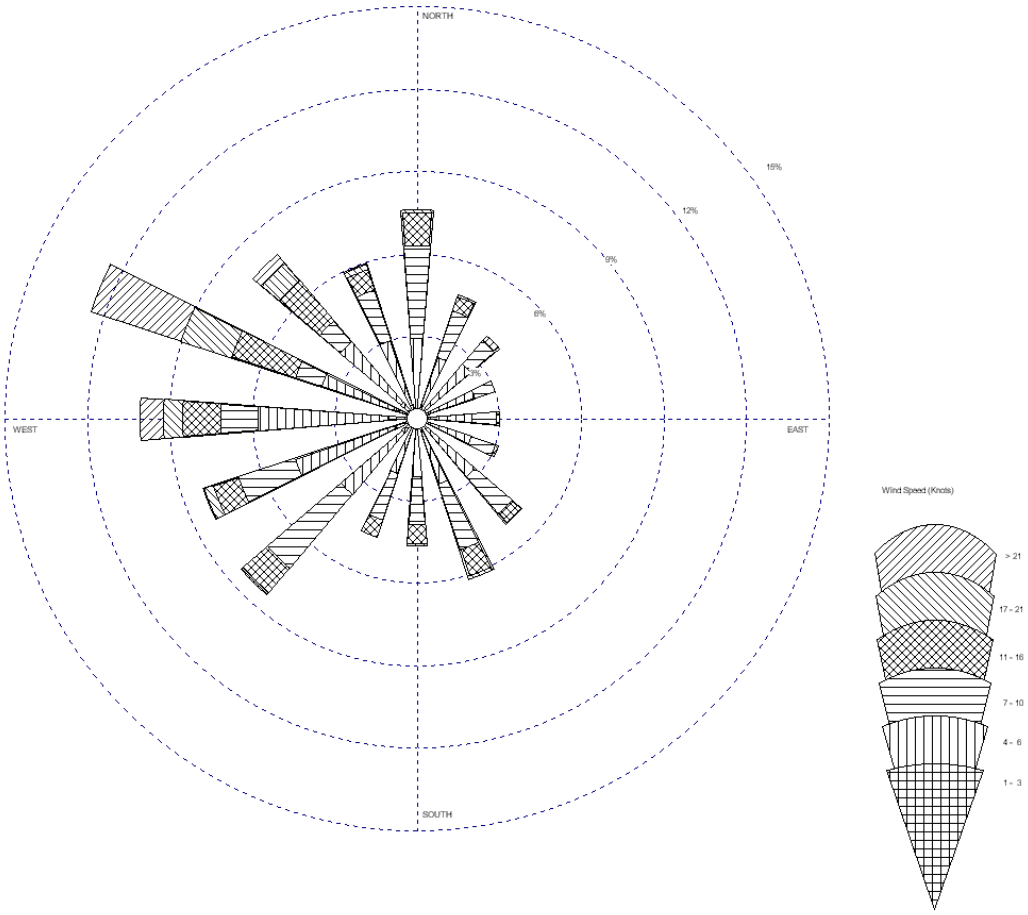
Rocky Flats South X-4
1999 – Midnight to Noon



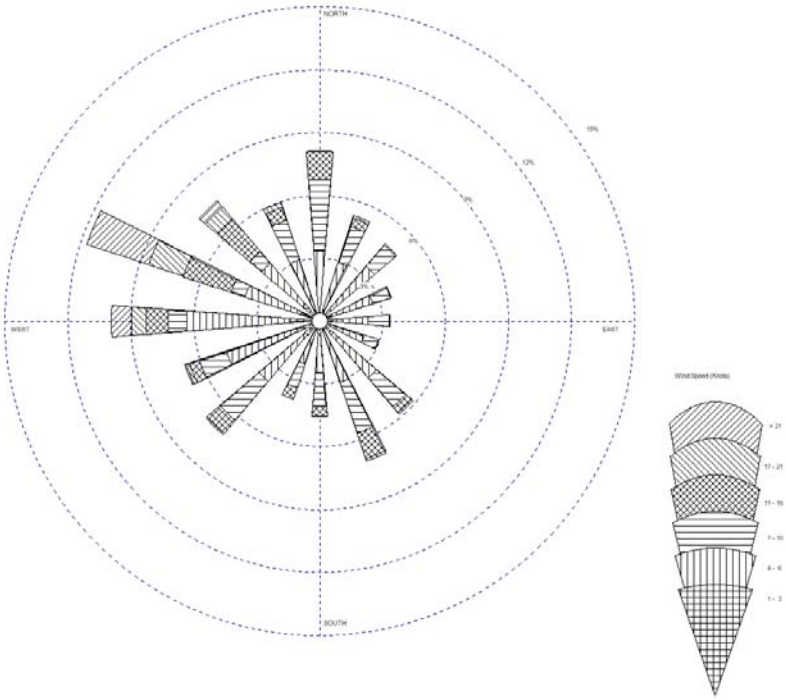
Rocky Flats South X-4
1999 – Noon to Midnight



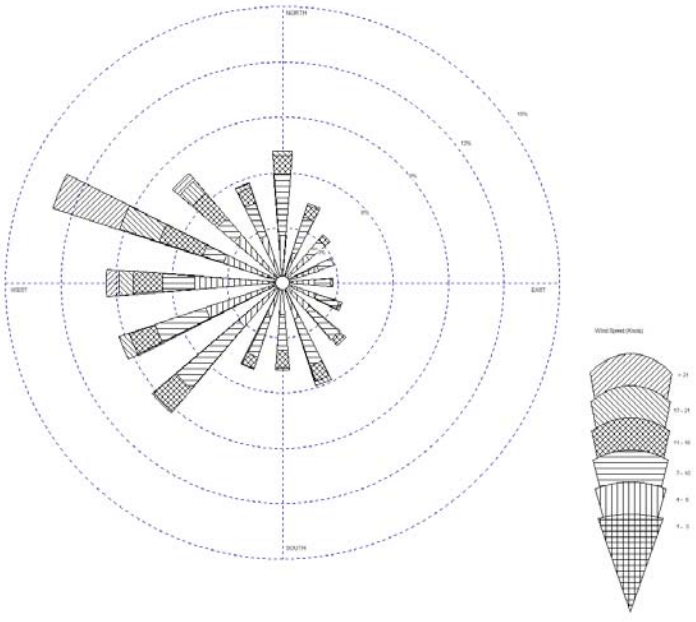
Rocky Flats West X-5
1999 – All Data



Rocky Flats West X-5
1999 – Midnight to Noon



Rocky Flats West X-5
1999 – Noon to Midnight



APPENDIX J

COMPARISON DATA

Total Suspended Particulates (TSP) Comparison
1999
Monthly Arithmetic Average Data ($\mu g/m^3$)

		RF X-1	RF X-2	RF X-3	RF X-4	RF X-5	CAMP	Adams City
Jan	1999	22	24	25	28	32	87	87
Feb	1999	18	25	22	30	41	106	85
Mar	1999	48	63	54	56	77	108	80
Apr	1999	34	39	24	30	41	88	61
May	1999	25	33	25	28	43	68	59
Jun	1999	35	48	46	39	63		70
Jul	1999	38	45	44	34	56		86
Aug	1999	22	36	27	23	45		53
Sep	1999	40	46	41	35	60		70
Oct	1999	34	41	35	33	65		85
Nov	1999	29	30	29	28	44		105
Dec	1999	27	33	28	22	36		76

CAMP down for building reconstruction, June – December 1999.

Monthly 24-Hour Maximum Data ($\mu g/m^3$)

		RF X-1	RF X-2	RF X-3	RF X-4	RF X-5	CAMP	Adams City
Jan	1999	36	33	37	41	44	112	135
Feb	1999	28	36	29	40	55	134	116
Mar	1999	68	103	73	85	116	189	148
Apr	1999	52	64	44	56	84	118	110
May	1999	30	39	30	32	63	86	87
Jun	1999	49	65	58	56	92		146
Jul	1999	57	62	62	54	89		86
Aug	1999	23	53	32	26	55		75
Sep	1999	60	62	55	52	75		99
Oct	1999	46	55	51	44	89		157
Nov	1999	33	42	35	37	53		152
Dec	1999	27	63	52	41	69		150

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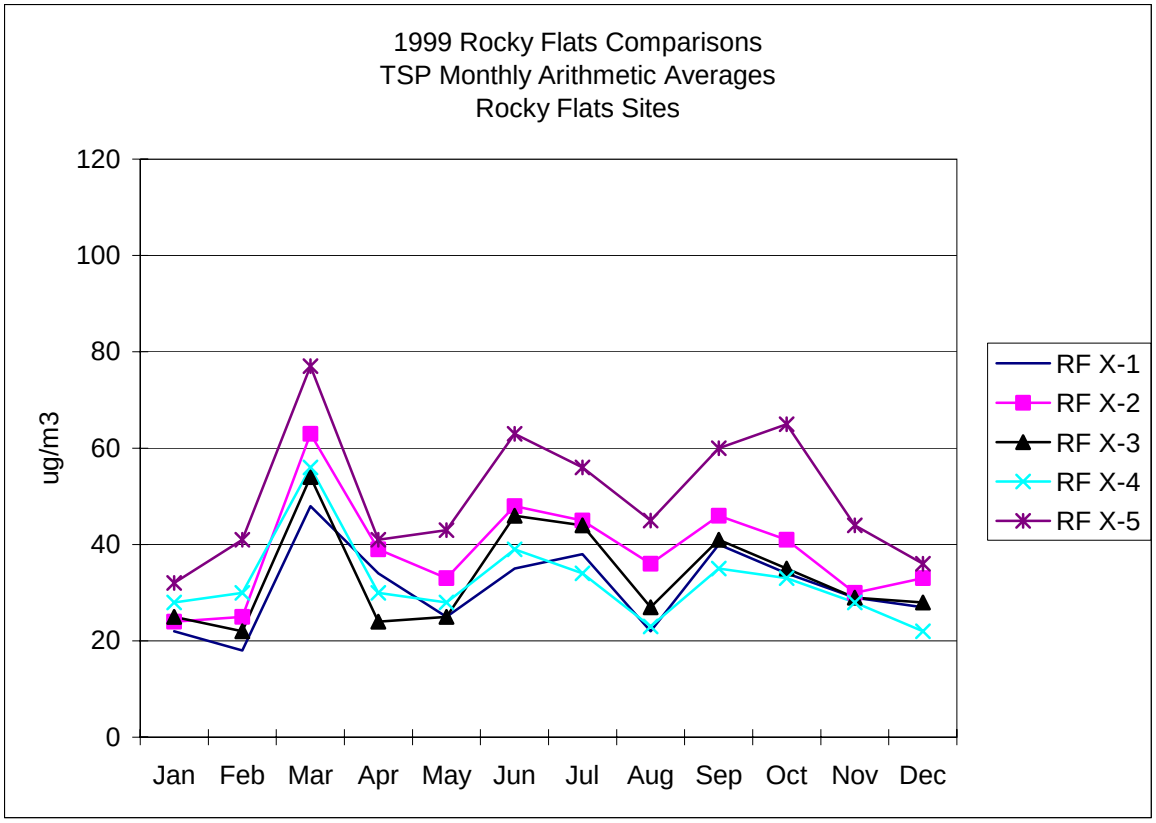
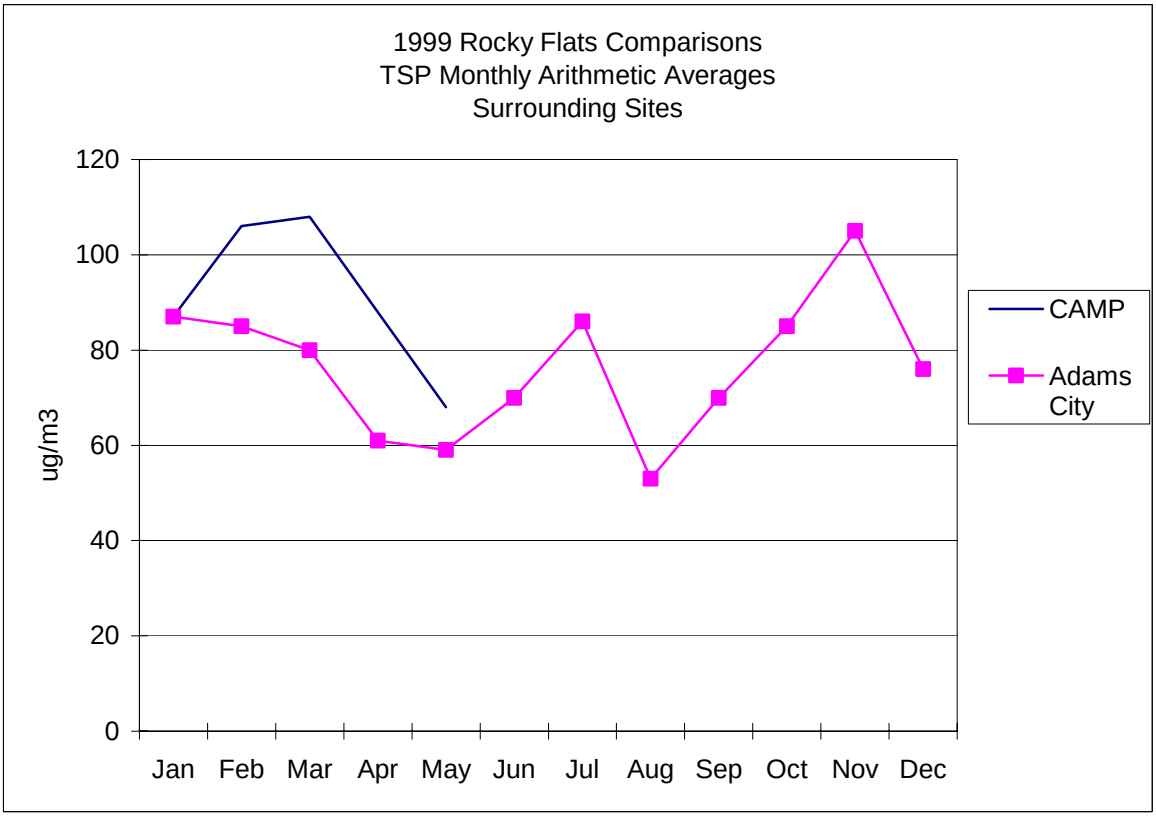

1999 Rocky Flats Comparisons
TSP Monthly Arithmetic Averages
Rocky Flats Sites
ug/m3
120
100
80
60
40
20
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
RF X-1
RF X-2
RF X-3
RF X-4
RF X-5


1999 Rocky Flats Comparisons
TSP Monthly Arithmetic Averages
Surrounding Sites
ug/m3
120
100
80
60
40
20
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
CAMP
Adams City

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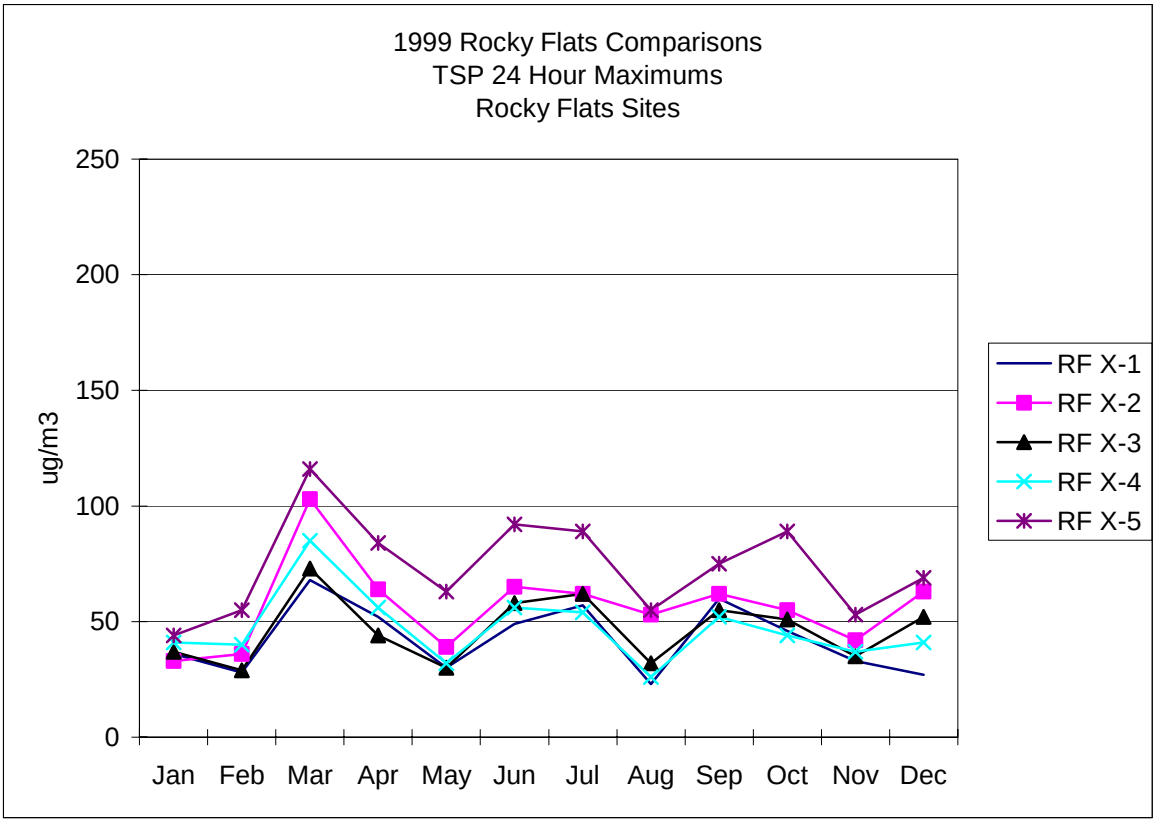
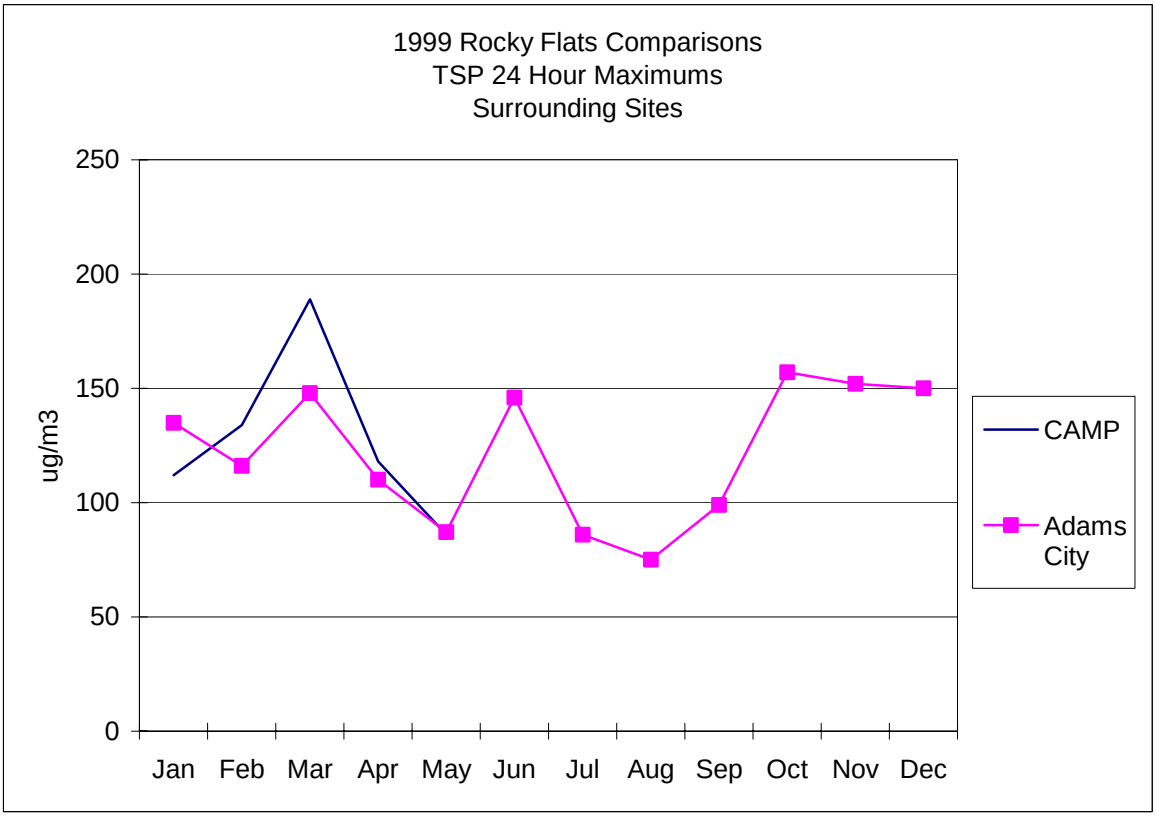

1999 Rocky Flats Comparisons
TSP 24 Hour Maximums
Rocky Flats Sites
ug/m3
250
200
150
100
50
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
RF X-1
RF X-2
RF X-3
RF X-4
RF X-5


1999 Rocky Flats Comparisons
TSP 24 Hour Maximums
Surrounding Sites
ug/m3
250
200
150
100
50
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
CAMP
Adams City

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PM_{10} Comparison

1999

Monthly Arithmetic Average Data ($\mu g/m^3$)

		RF X-1	RF X-2	RF X-3	RF X-4	RF X-5	CAMP	Adams City	Bldr Cham
Jan	1999	10	10	12	11	11	87	34	21
Feb	1999	5	6	8	8	10	106	38	20
Mar	1999	16	17	17	17	19	108	35	34
Apr	1999	16	14	12	10	11	88	25	20
May	1999	9	11	10	10	10	68	24	20
Jun	1999	14	15	16	14	16		29	24
Jul	1999	16	20	18	17	17		36	25
Aug	1999	11	12	12	12	11		28	19
Sep	1999	14	14	14	13	13		33	22
Oct	1999	15	17			22		52	43
Nov	1999	11	12	33	9	11		65	25
Dec	1999	4	6	6	5	4		42	14

CAMP down for reconstruction, June – December 1999

Monthly 24-Hour Maximum Data ($\mu g/m^3$)

		RF X-1	RF X-2	RF X-3	RF X-4	RF X-5	CAMP	Adams City	Bldr Cham
Jan	1999	18	16	17	18	18	112	64	46
Feb	1999	12	12	10	12	14	134	99	32
Mar	1999	25	29	28	26	29	189	71	40
Apr	1999	22	24	22	20	21	118	55	32
May	1999	11	13	12	13	11	86	60	21
Jun	1999	18	20	21	18	23		62	27
Jul	1999	20	30	24	21	23		52	28
Aug	1999	12	13	13	13	12		54	22
Sep	1999	21	21	19	20	22		77	34
Oct	1999	20	21			37		106	43
Nov	1999	11	12	53	12	14		160	43
Dec	1999	8	10	11	9	5		115	23

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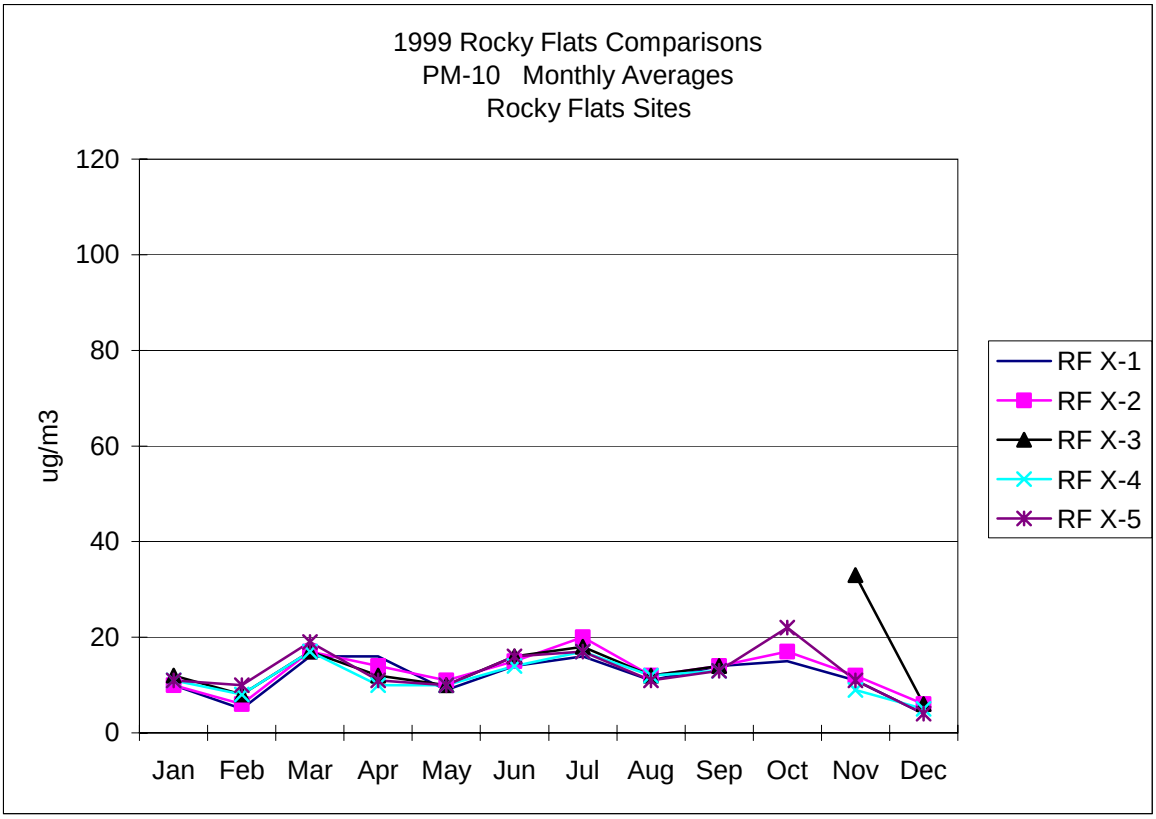
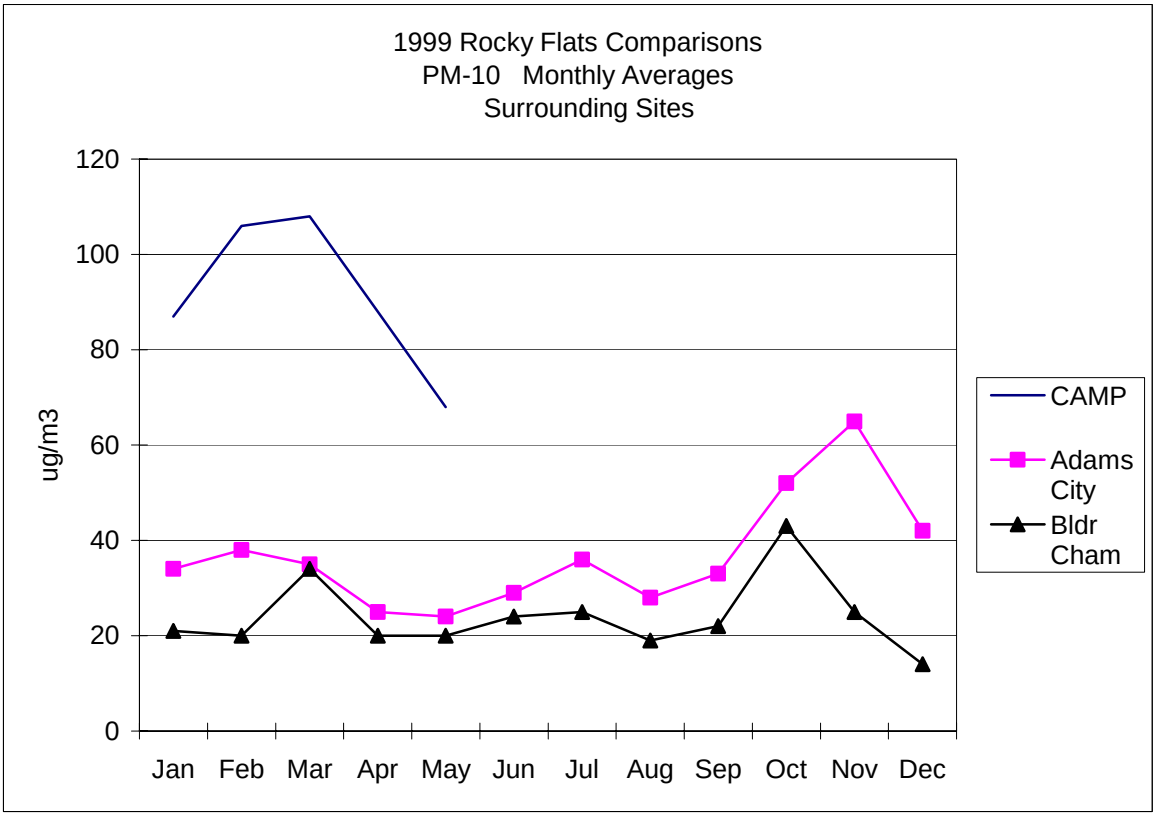

1999 Rocky Flats Comparisons
PM-10 Monthly Averages
Rocky Flats Sites
ug/m3
120
100
80
60
40
20
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
RF X-1
RF X-2
RF X-3
RF X-4
RF X-5


1999 Rocky Flats Comparisons
PM-10 Monthly Averages
Surrounding Sites
ug/m3
120
100
80
60
40
20
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
CAMP
Adams City
Bldr Cham

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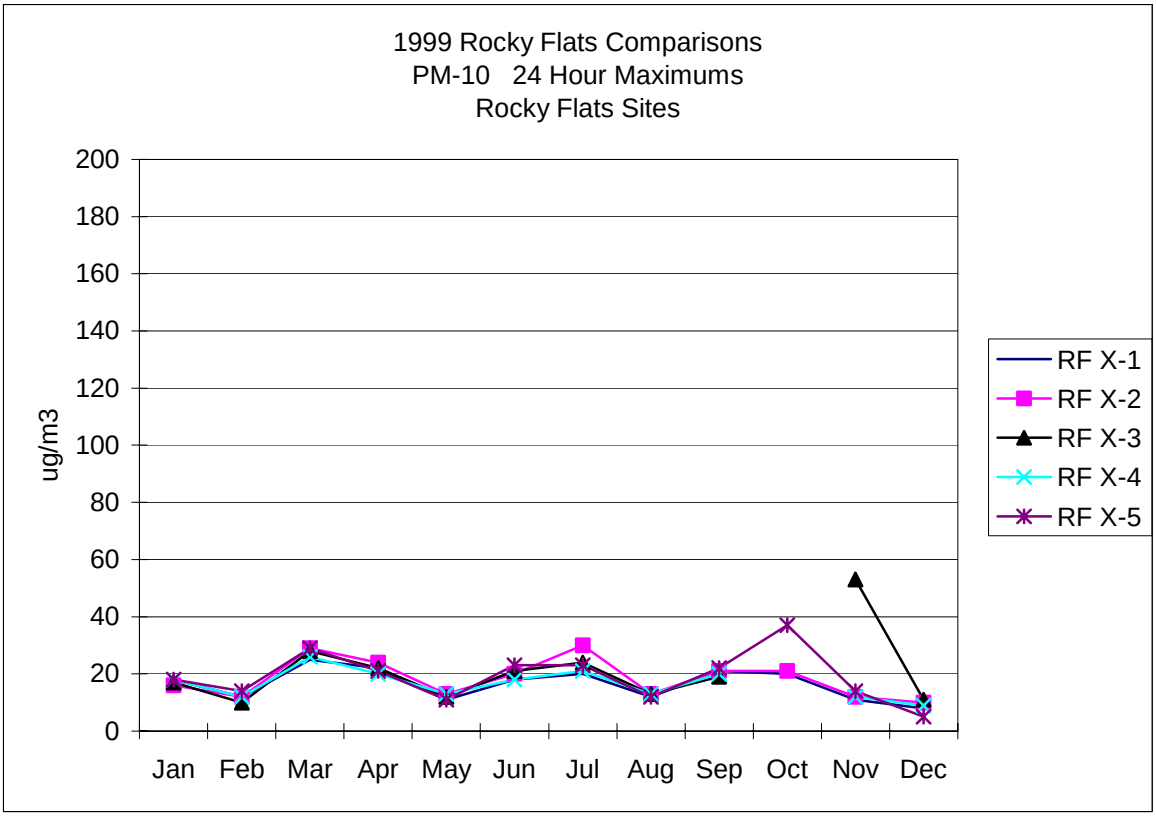
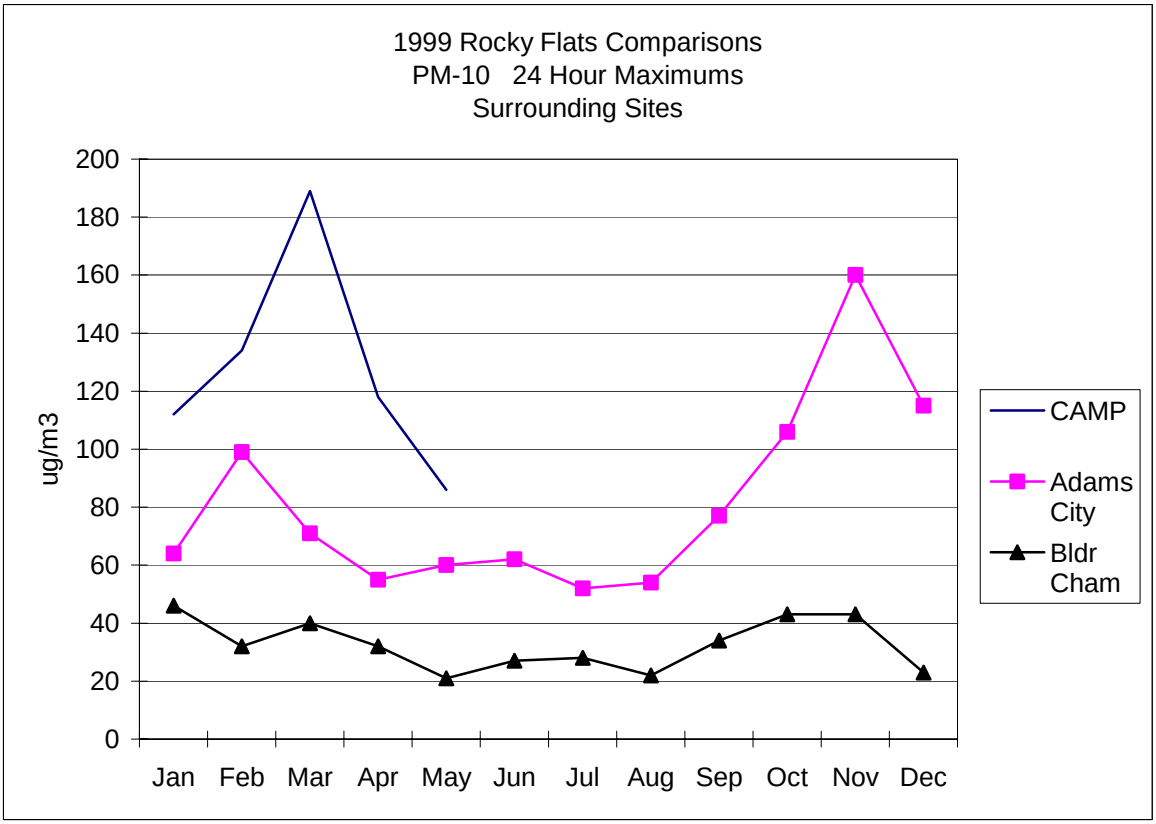

1999 Rocky Flats Comparisons
PM-10 24 Hour Maximums
Rocky Flats Sites
ug/m3
200
180
160
140
120
100
80
60
40
20
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
RF X-1
RF X-2
RF X-3
RF X-4
RF X-5


1999 Rocky Flats Comparisons
PM-10 24 Hour Maximums
Surrounding Sites
ug/m3
200
180
160
140
120
100
80
60
40
20
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
CAMP
Adams City
Bldr Cham

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Nitric Oxide (NO) Comparison
1999
Monthly Arithmetic Average Data (ppm)

		RF X-1	RF X-3	RF X-4	RF X-5	CAMP	Welby
Jan	1999	0.006	0.007	0.006	0.007	0.089	0.048
Feb	1999		0.005		0.006	0.079	0.053
Mar	1999		0.007		0.005	0.050	0.024
Apr	1999		0.004		0.007	0.039	0.017
May	1999		0.004		0.005	0.030	0.013
Jun	1999		0.005		0.006	0.032	0.015
Jul	1999		0.003		0.006		0.013
Aug	1999		0.006		0.007		0.018
Sep	1999		0.007		0.008		0.031
Oct	1999		0.007		0.009		0.066
Nov	1999		0.009		0.011		0.105
Dec	1999		0.006		0.009		0.086

CAMP down for reconstruction, June – December 1999. X-1 and X-4 NOx sites closed in January 1999.

Monthly 24-Hour Maximum Data (ppm)

		RF X-1	RF X-3	RF X-4	RF X-5	CAMP	Welby
Jan	1999	0.049	0.126	0.041	0.043	0.587	0.402
Feb	1999		0.044		0.064	0.789	0.527
Mar	1999		0.058		0.024	0.298	0.329
Apr	1999		0.056		0.058	0.390	0.350
May	1999		0.056		0.012	0.230	0.174
Jun	1999		0.049		0.032	0.159	0.202
Jul	1999		0.025		0.031		0.157
Aug	1999		0.041		0.058		0.239
Sep	1999		0.041		0.055		0.341
Oct	1999		0.095		0.055		0.373
Nov	1999		0.154		0.085		0.706
Dec	1999		0.094		0.117		0.536

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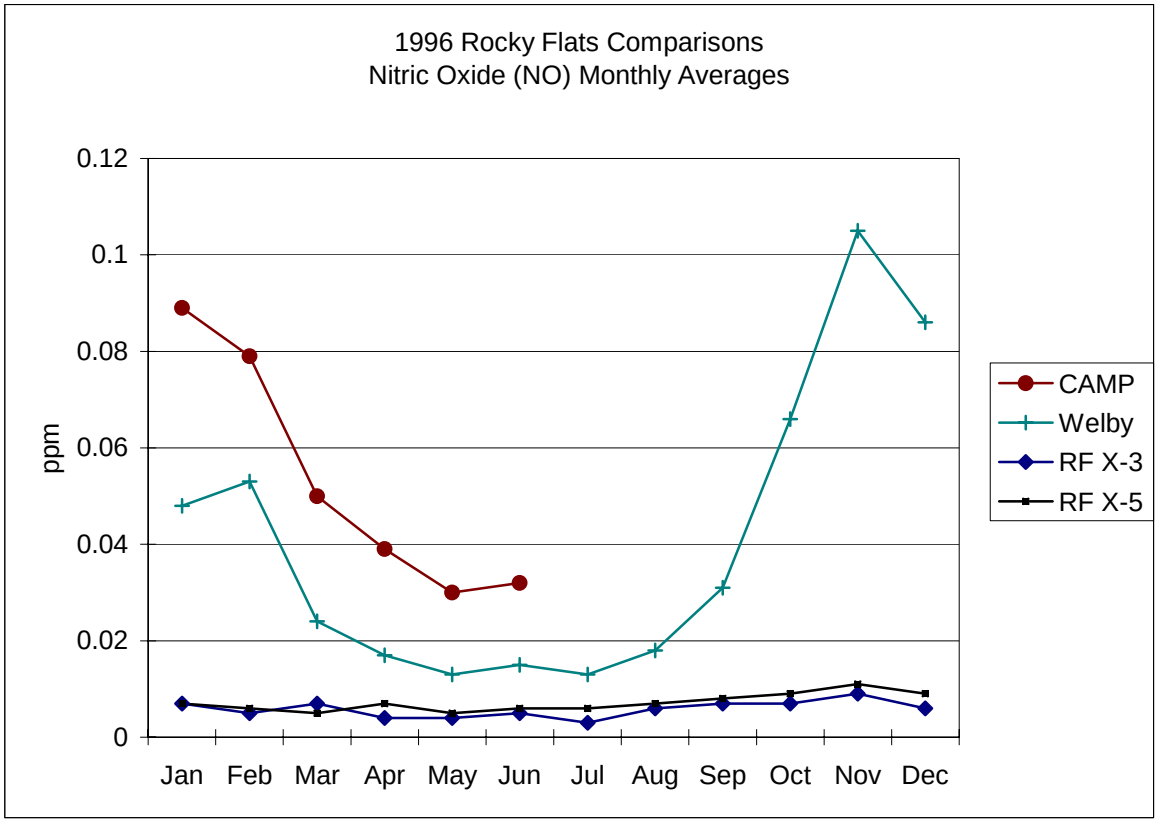
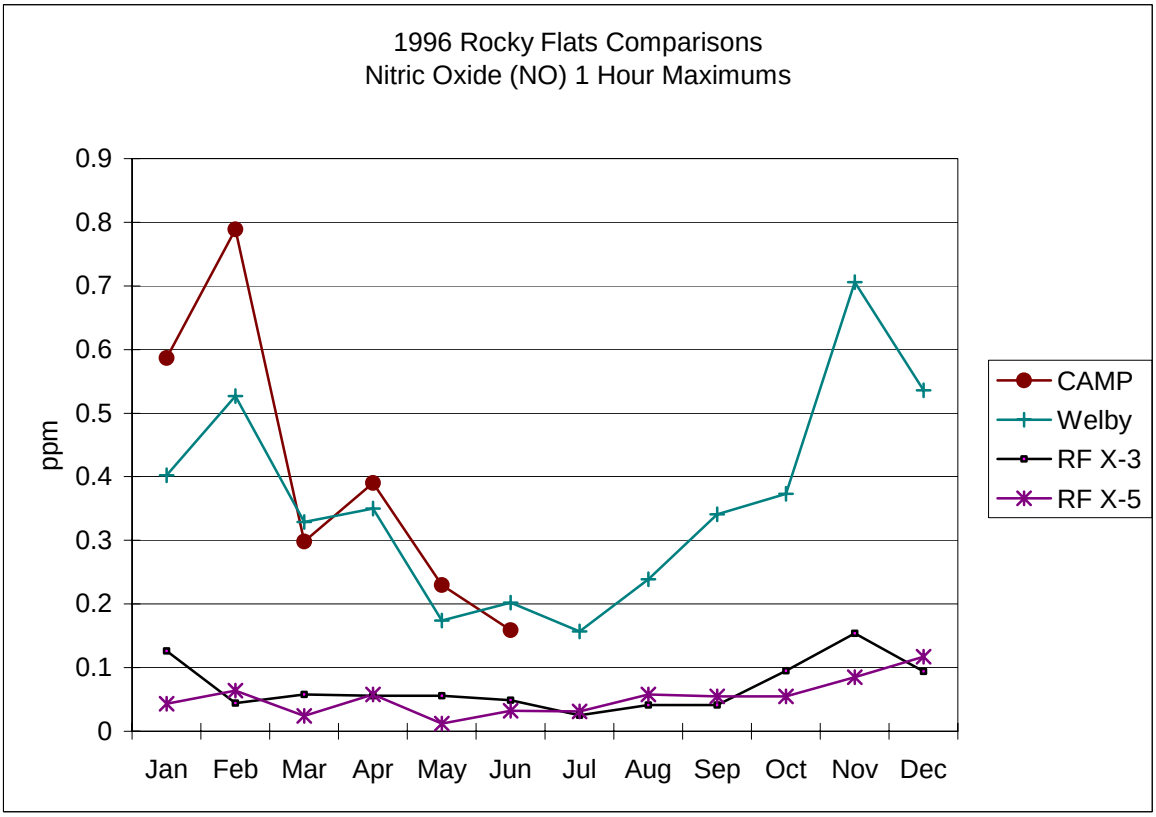

1996 Rocky Flats Comparisons
Nitric Oxide (NO) Monthly Averages
ppm
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
CAMP
Welby
RF X-3
RF X-5


1996 Rocky Flats Comparisons
Nitric Oxide (NO) 1 Hour Maximums
ppm
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
CAMP
Welby
RF X-3
RF X-5

Nitrogen Dioxide (NO_2) Comparison
1999
Monthly Arithmetic Average Data (ppm)

		RF X-1	RF X-3	RF X-4	RF X-5	CAMP	Welby
Jan	1999	0.008	0.010	0.008	0.008	0.035	0.024
Feb	1999		0.008		0.005	0.037	0.029
Mar	1999		0.010		0.009	0.033	0.023
Apr	1999		0.007		0.008	0.033	0.019
May	1999		0.008		0.004	0.028	0.016
Jun	1999		0.009		0.008	0.029	0.015
Jul	1999		0.008		0.007		0.019
Aug	1999		0.009		0.008		0.019
Sep	1999		0.010		0.010		0.020
Oct	1999		0.012		0.011		0.014
Nov	1999		0.014		0.012		0.008
Dec	1999		0.011		0.008		0.03

CAMP down for reconstruction, June – December 1999. X-1 and X-4 NOx sites closed in January 1999.

Monthly 24-Hour Maximum Data (ppm)

		RF X-1	RF X-3	RF X-4	RF X-5	CAMP	Welby
Jan	1999	0.046	0.044	0.039	0.042	0.088	0.083
Feb	1999		0.039		0.039	0.090	0.096
Mar	1999		0.041		0.046	0.072	0.071
Apr	1999		0.034		0.036	0.077	0.078
May	1999		0.051		0.016	0.071	0.071
Jun	1999		0.041		0.031	0.081	0.073
Jul	1999		0.033		0.031		0.074
Aug	1999		0.035		0.034		0.060
Sep	1999		0.055		0.051		0.078
Oct	1999		0.057		0.045		0.064
Nov	1999		0.054		0.067		0.075
Dec	1999		0.056		0.067		0.089

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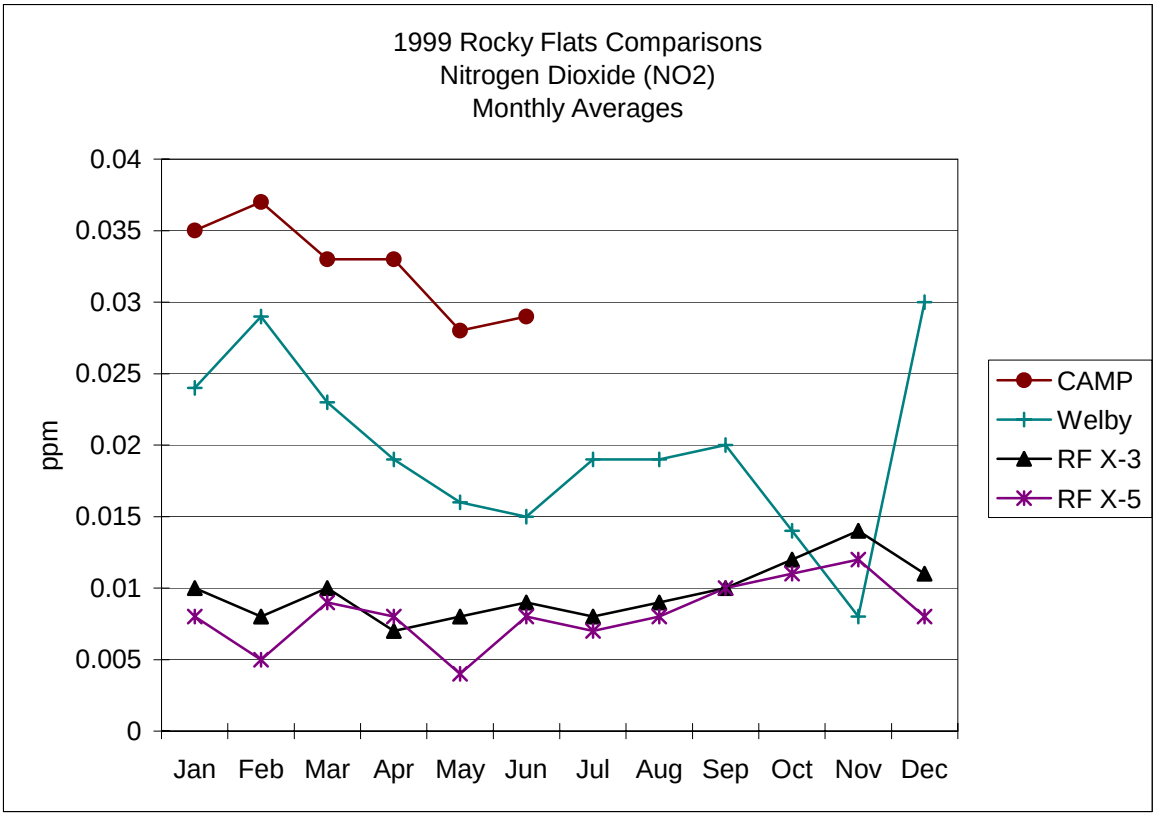
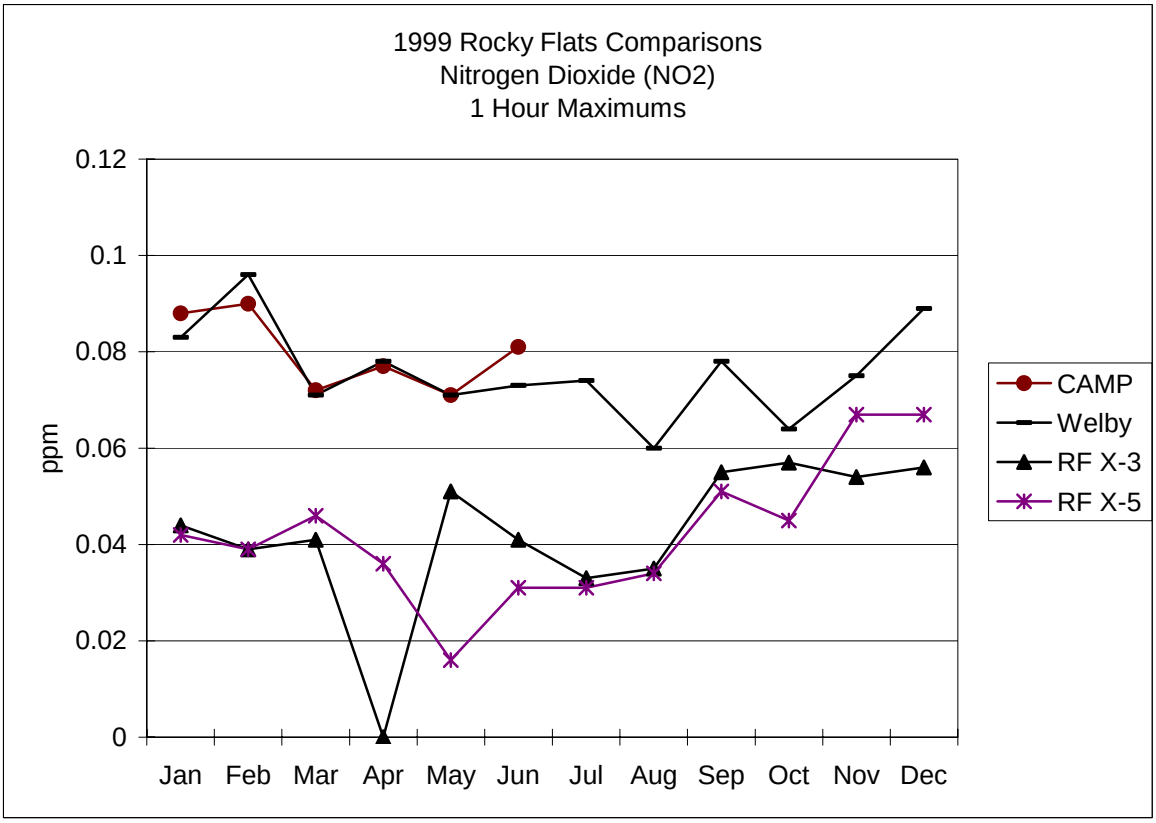

1999 Rocky Flats Comparisons
Nitrogen Dioxide (NO2)
Monthly Averages
ppm
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
CAMP
Welby
RF X-3
RF X-5


1999 Rocky Flats Comparisons
Nitrogen Dioxide (NO2)
1 Hour Maximums
ppm
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
CAMP
Welby
RF X-3
RF X-5

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Ozone (O_3) Comparison
1999
Monthly Arithmetic Average Data (ppm)

		RF X-1	Welby	Arvada	NREL	S. Boulder Creek
Jan	1999	0.029	0.015	0.016	0.026	0.021
Feb	1999	0.039	0.02	0.022		0.011
Mar	1999	0.039	0.024	0.023		0.010
Apr	1999	0.043	0.030	0.030		0.019
May	1999	0.046	0.035	0.034	0.043	0.037
Jun	1999	0.043	0.03	0.029	0.041	0.037
Jul	1999	0.049	0.032	0.031	0.049	0.042
Aug	1999	0.043	0.027	0.024	0.041	0.034
Sep	1999	0.037	0.022	0.021	0.034	0.030
Oct	1999	0.031	0.011	0.011	0.027	0.022
Nov	1999	0.027	0.010	0.010	0.023	0.020
Dec	1999	0.029	0.011	0.012	0.024	0.023

Monthly 1-Hour Maximum Data (ppm)

		RF X-1	Welby	Arvada	NREL	S. Boulder Creek
Jan	1999	0.059	0.056	0.057	0.062	0.052
Feb	1999	0.064	0.061	0.059		0.035
Mar	1999	0.066	0.065	0.066		0.039
Apr	1999	0.086	0.077	0.078		0.00
May	1999	0.090	0.088	0.081	0.079	0.076
Jun	1999	0.089	0.083	0.081	0.095	0.080
Jul	1999	0.105	0.093	0.098	0.107	0.103
Aug	1999	0.087	0.085	0.077	0.084	0.078
Sep	1999	0.078	0.073	0.072	0.075	0.069
Oct	1999	0.054	0.058	0.050	0.052	0.043
Nov	1999	0.049	0.045	0.045	0.053	0.043
Dec	1999	0.047	0.041	0.041	0.045	0.042

NREL Shut down February – April 1999 for relocation due to construction at site.

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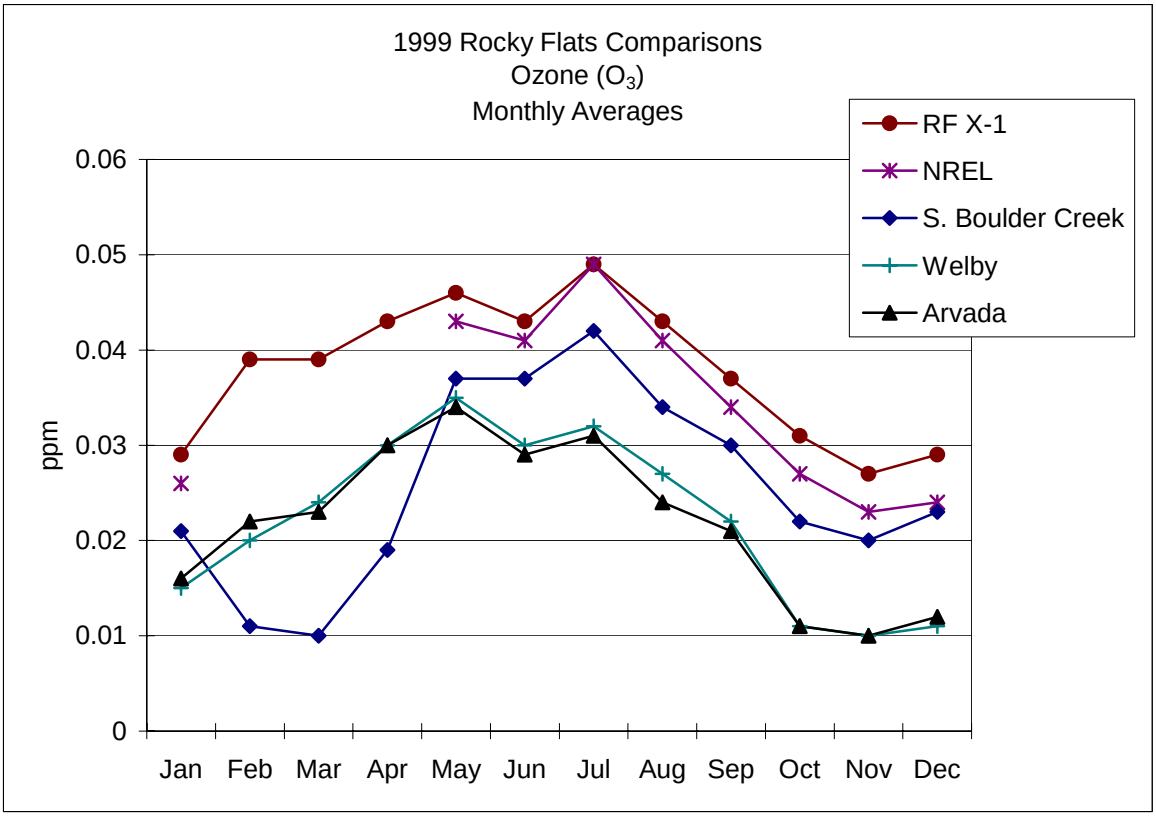
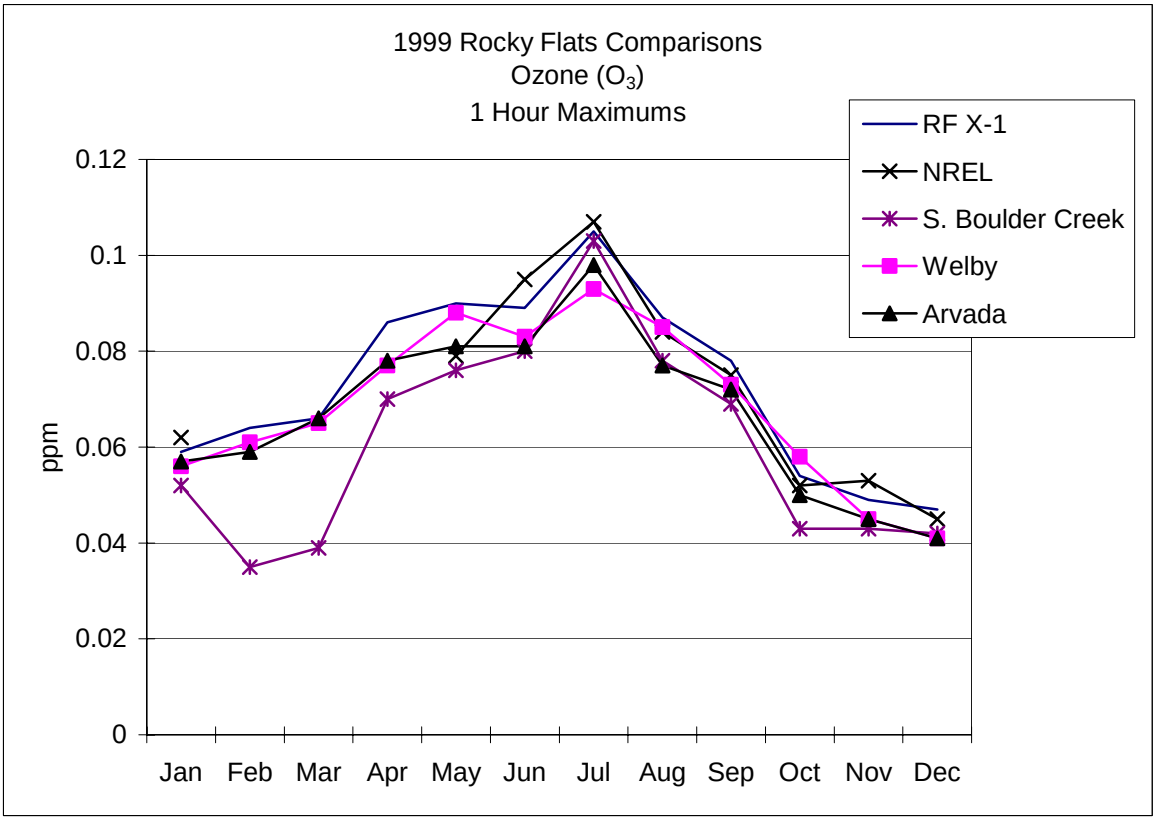

1999 Rocky Flats Comparisons
Ozone (O_3)
Monthly Averages
RF X-1
NREL
S. Boulder Creek
Welby
Arvada
ppm
0.06
0.05
0.04
0.03
0.02
0.01
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec


1999 Rocky Flats Comparisons
Ozone (O_3)
1 Hour Maximums
RF X-1
NREL
S. Boulder Creek
Welby
Arvada
ppm
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

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Colorado Department
of Public Health
and Environment