



2005 Air Quality Report

New Jersey Department of Environmental Protection

SUMMARY

A summary of the New Jersey air quality monitoring data for 2005. Contains information on the Air Quality Index (AQI), concentrations of individual pollutants – carbon monoxide, lead, nitrogen oxides, ozone, particulate matter, and sulfur dioxide. Data on acid precipitation, sulfates, nitrates and other constituents of particulate matter, ozone precursors and toxic air contaminants are also provided.





2005 Air Quality Report

New Jersey Department of Environmental Protection

TABLE OF CONTENTS

	PAGE(S)
INTRODUCTION	
INTRODUCTION	1
NETWORK SUMMARY	
NETWORK DESIGN	1
SPATIAL SCALES	1-2
CONTINUOUS NETWORK	2-3
MANUAL NETWORK	4-5
REFERENCES	6
AIR QUALITY INDEX SUMMARY	
WHAT IS THE AIR QUALITY INDEX ?	1-3
2005 AQI SUMMARY	3-5
REFERENCES	6
CARBON MONOXIDE SUMMARY	
NATURE AND SOURCES	1
HEALTH AND ENVIRONMENTAL EFFECTS	1-2
STANDARDS	2
MONITORING LOCATIONS	3
LEVELS IN 2005	3-4
TRENDS	4-5
REFERENCES	6
LEAD SUMMARY	
NATURE AND SOURCES	1
HEALTH AND ENVIRONMENTAL EFFECTS	1
STANDARDS	1
MONITORING LOCATIONS	2
LEVELS IN 2005	2-3
TRENDS	3
REFERENCES	4

NITROGEN DIOXIDE SUMMARY

NATURE AND SOURCES	1
HEALTH AND ENVIRONMENTAL EFFECTS	1
STANDARDS	1-2
MONITORING LOCATIONS	3
LEVELS IN 2005.....	3
TRENDS	3-5
TOTAL REACTIVE OXIDES OF NITROGEN	5
REFERENCES	6

OZONE SUMMARY

NATURE AND SOURCES	1
ENVIRONMENTAL EFFECTS	1
HEALTH EFFECTS	2
AMBIENT AIR QUALITY STANDARDS	3
NETWORK	3
HOW CHANGES TO THE OZONE STANDARDS AFFECT AIR QUALITY RATINGS	4
DESIGN VALUES	5
MAJOR OZONE EPISODES	6
SUMMARY 2005 DATA	
1-HOUR STANDARD	7
8-HOUR STANDARD	8
INFLUENCE OF WEATHER	9
TRENDS	10
NON-ATTAINMENT AREAS	11
REFERENCES	12

PHOTOCHEMICAL ASSESSMENT MONITORING STATIONS (PAMS)

PHOTOCHEMICAL ASSESSMENT MONITORING STATIONS	1-5
REFERENCES	6

PARTICULATE SUMMARY

NATURE AND SOURCES	1
ENVIRONMENTAL EFFECTS	1
HEALTH EFFECTS	2
STANDARDS	2
NETWORK	3
FINE PARTICLE SUMMARY	4-8
FINE PARTICLE MONITORING SITES.....	4
FINE PARTICLE CONCENTRATION SUMMARY	4-5
PM _{2.5} REAL-TIME MONITORING	6
FINE PARTICLE SPECIATION SUMMARY	7

FINE PARTICULATE NON-ATTAINMENT AREAS	8
COARSE PARTICLE SUMMARY	9-10
COARSE PARTICLE MONITORING SITES	9
TSP CONCENTRATION SUMMARY	9
PM ₁₀ CONCENTRATION SUMMARY	9-10
SMOKE SHADE SUMMARY	11
SMOKE SHADE MONITORING SITES	11
SMOKE SHADE CONCENTRATION SUMMARY	11
TRENDS	12
REFERENCES	13

SULFUR DIOXIDE SUMMARY

NATURE AND SOURCES	1
HEALTH AND ENVIRONMENTAL EFFECTS	1
STANDARDS	1-2
MONITORING LOCATIONS	3
LEVELS IN 2005	3-4
TRENDS	5
NON-ATTAINMENT AREAS.....	6
FIVE MINUTE AVERAGE MONITORING	7
REFERENCES	8

AIR TOXICS SUMMARY

INTRODUCTION	1
HEALTH EFFECTS	1
SOURCES	1-2
ESTIMATING EXPOSURE	2-3
MONITORING RESULTS FOR 2005.....	4-14
ESIMATED HEALTH RISK.....	7
TRENDS AND COMPARISONS	7-9
REFERENCES	15

ATMOSPHERIC DEPOSITION SUMMARY

NATURE AND SOURCES	1
MONITORING LOCATIONS	2
SUMMARY OF 2005 DATA	2-4
TRENDS	4-5
REFERENCES	6

REGIONAL HAZE & VISIBILITY

THE BASICS OF HAZE	1
ANATOMY OF REGIONAL HAZE.....	1
PARTICLES AND VISIBILITY.....	1-2
HOW IS HAZE REGULATED?	2
SOURCES	2
ENVIRONMENTAL EFFECTS	3
MONITORING OF HAZE IN NEW JERSEY	4-5
REFERENCES	6

APPENDIX A – MONITORING SITES

NORTHERN, NEW JERSEY	2-3
CENTRAL, NEW JERSEY	4-5
SOUTHERN, NEW JERSEY	6-7
PARAMETER CODES	8

APPENDIX B – FINE PARTICULATE SPECIATION SUMMARY

FINE PARTICULATE SPECIATION DATA	1-8
--	-----



2005 Air Quality Report

New Jersey Department of Environmental Protection

LIST OF TABLES

	PAGE(S)
NETWORK	
TABLE 1: 2004-2005 CONTINUOUS NETWORK CHANGES	2
TABLE 2: 2005 – CONTINUOUS AIR MONITORING NETWORK	3
TABLE 3: 2004 - 2005 MANUAL NETWORK CHANGES.....	4
TABLE 4: 2005 - MANUAL AIR MONITORING NETWORK	5
AIR QUALITY INDEX	
TABLE 1: AIR QUALITY INDEX	1
TABLE 2: POLLUTANTS MONITORED ACCORDING TO AIR QUALITY INDEX REPORTING REGION - 2005	2
TABLE 3: AIR QUALITY INDEX EXCEEDANCES OF 100 DURING 2005	4
CARBON MONOXIDE	
TABLE 1: NATIONAL AND NEW JERSEY AMBIENT AIR QUALITY STANDARDS FOR CARBON MONOXIDE	2
TABLE 2: CARBON MONOXIDE DATA – 2005, 1-HOUR AND 8-HOUR AVERAGES	4
LEAD	
TABLE 1: NATIONAL AND NEW JERSEY AMBIENT AIR QUALITY STANDARDS FOR LEAD	1
TABLE 2: LEAD DATA - 2005	3
NITROGEN DIOXIDE	
TABLE 1: NATIONAL AND NEW JERSEY AIR QUALITY STANDARDS FOR NITROGEN DIOXIDE	2
TABLE 2: NITROGEN DIOXIDE & NITRIC OXIDE DATA – 2005, 1-HOUR AND 12-MONTH AVERAGES	3

OZONE

TABLE 1: NATIONAL AND NEW JERSEY AMBIENT AIR QUALITY STANDARDS FOR OZONE	3
TABLE 3: OZONE DATA – 2005, 1-HOUR AVERAGE	7
TABLE 4: OZONE DATA – 2005, 8-HOUR AVERAGE	8

PHOTOCHEMICAL ASSESSMENT MONITORING STATIONS (PAMS)

TABLE 1: SUMMARY OF PHOTOCHEMICAL ASSESSMENT MONITORING (PAMS) DATA	4-5
---	-----

PARTICULATE

TABLE 1: NATIONAL AND NEW JERSEY AMBIENT AIR QUALITY STANDARDS FOR PARTICULATE MATTER	2
TABLE 2: PM _{2.5} SUMMARY DATA – 2005	5
TABLE 3: 2005 SUMMARY OF CONTINUOUS PM _{2.5} DATA	5
TABLE 4: PM ₁₀ DATA – 2005, 24-HOUR AND ANNUAL AVERAGES	10
TABLE 5: SMOKE SHADE – 2005	11

SULFUR DIOXIDE

TABLE 1: NATIONAL AND NEW JERSEY AMBIENT AIR QUALITY STANDARDS FOR SULFUR DIOXIDE	2
TABLE 2: SULFUR DIOXIDE DATA – 2005, 3-HOUR AND ANNUAL AVERAGES ...	3
TABLE 3: SULFUR DIOXIDE DATA – 2005, 24-HOUR AND DAILY AVERAGES ...	4

AIR TOXICS

TABLE 1: AIR TOXICS OF GREATEST CONCERN IN NEW JERSEY BASED ON 1999 NATIONAL AIR TOXICS ASSESSMENT	3
TABLE 2: NEW JERSEY AIR TOXICS SUMMARY – 2005.....	5-6
TABLE 3: ANALYTES WITH THE 5 HIGHEST RISK RATIOS	7
TABLE 4: COMPARISON OF NATA PREDICTED TO MEASURED LEVELS IN CAMDEN, NJ	9
TABLE 5: 2005 AIR TOXICS DATA FOR CAMDEN, NJ	10
TABLE 6: 2005 AIR TOXICS DATA FOR CHESTER, NJ	11
TABLE 7: 2005 AIR TOXICS DATA FOR ELIZABETH, NJ	12
TABLE 8: 2005 AIR TOXICS DATA FOR NEW BRUNSWICK, NJ	13
TABLE 9: ANALYTES WITH 100 PERCENT NON-DETECTS IN 2005	14

ATMOSPHERIC DEPOSITION

TABLE 1: ACID PRECIPITATION MONITORING NETWORK – 2005, ANNUAL AND SEASONAL AVERAGES	3-4
---	-----

APPENDIX A – AIR MONITORING SITES

TABLE 1: NORTHERN NEW JERSEY AIR MONITORING SITES	3
TABLE 2: CENTRAL NEW JERSEY AIR MONITORING SITES	5
TABLE 3: SOUTHERN NEW JERSEY AIR MONITORING SITES	7
TABLE 4: PARAMETER CODES	8

APPENDIX B – FINE PARTICULATE SPECIATION SUMMARY

TABLE 1: FINE PARTICULATE SPECIATION DATA – 2005 CAMDEN, NEW JERSEY	1-2
TABLE 2: FINE PARTICULATE SPECIATION DATA – 2005 CHESTER, NEW JERSEY	3-4
TABLE 3: FINE PARTICULATE SPECIATION DATA – 2005 ELIZABETH LAB, NEW JERSEY	5-6
TABLE 4: FINE PARTICULATE SPECIATION DATA – 2005 NEW BRUNSWICK, NEW JERSEY	7-8



2005 Air Quality Report

New Jersey Department of Environmental Protection

LIST OF FIGURES

	PAGE(S)
NETWORK	
FIGURE 1: AMBIENT AIR MONITORING SAMPLER – CAMDEN COUNTY MUNICIPAL UTILITIES AUTHORITY BUILDING	1
FIGURE 2: 2005 – CONTINUOUS MONITORING NETWORK	2
FIGURE 3: 2005 – MANUAL MONITORING NETWORK	4
AIR QUALITY INDEX	
FIGURE 1: AIR QUALITY INDEX REGIONS	1
FIGURE 2: EXAMPLES OF NJDEP’S AIR MONITORING WEBSITE	3
FIGURE 3: AIR QUALITY SUMMARY BY DAYS	3
FIGURE 4: 2005 AIR QUALITY INDEX SUMMARY, NUMBER OF DAYS BY REPORTING REGION	5
CARBON MONOXIDE	
FIGURE 1: NATIONAL SUMMARY OF 2002 CO EMISSIONS BY SOURCE CATEGORY	1
FIGURE 2: EFFECTS OF ATMOSPHERIC INVERSION ON AIR POLLUTION	1
FIGURE 3: CARBON MONOXIDE CONCENTRATIONS – NEW JERSEY 1967-1999	2
FIGURE 4: 2005 CARBON MONOXIDE MONITORING NETWORK	3
FIGURE 5: HIGHEST AND 2 ND HIGHEST 8-HOUR AVERAGES OF CARBON MONOXIDE IN NEW JERSEY - 2005.....	3
FIGURE 6: CARBON MONOXIDE UNHEALTHY DAYS 1985 – 2005	5
FIGURE 7: CARBON MONOXIDE AIR QUALITY, 1975-2005, 2 ND HIGHEST 8-HOUR AVERAGE	5
LEAD	
FIGURE 1: NEW JERSEY’S SUMMARY OF 2005, LEAD EMISSIONS BY INDUSTRIAL CATEGORY	1
FIGURE 2: 2005 LEAD MONITORING NETWORK	2
FIGURE 3: 2005 NEW JERSEY QUARTERLY AVERAGE LEAD CONCENTRATIONS	2
FIGURE 4: LEAD CONCENTRATIONS – MAXIMUM 3 MONTH AVERAGE 1990 – 2005	3

NITROGEN DIOXIDE

FIGURE 1:	NATIONAL SUMMARY OF 2002 NO _x EMISSIONS BY SOURCE CATEGORY	1
FIGURE 2:	NITROGEN DIOXIDE AND NITRIC OXIDE CONCENTRATION – NEW JERSEY, 1967-1999	2
FIGURE 3:	2005 OXIDES OF NITROGEN MONITORING NETWORK	3
FIGURE 4:	ANNUAL AVERAGE NO AND NO ₂ CONCENTRATIONS IN NEW JERSEY -2005	4
FIGURE 5:	NITROGEN DIOXIDE CONCENTRATIONS IN NEW JERSEY, 1975-2005, 12-MONTH (CALENDAR YEAR) AVERAGE	4

OZONE

FIGURE 1:	GOOD AND BAD OZONE	1
FIGURE 2:	OZONE DAMAGE TO BLACKBERRY BUSH	1
FIGURE 3:	OZONE DAMAGE TO SASSAFRAS TREE	1
FIGURE 4:	AREA OF THE RESPIRATORY TRACT THAT MAY BE AFFECTED BY OZONE	2
FIGURE 5:	2005 OZONE MONITORING NETWORK	3
FIGURE 6:	DAYS ON WHICH THE OLD AND NEW OZONE STANDARDS HAVE BEEN EXCEEDED IN NEW JERSEY, 1988-2005	4
FIGURE 7:	1-HOUR OZONE AIR QUALITY, 1986-2005.....	5
FIGURE 8:	8-HOUR OZONE AIR QUALITY, 1986-2005.....	5
FIGURE 9:	TEMPERATURE PERCENTILE VALUE RELATIVE TO 1895-1999 APR TO SEP 2005	6
FIGURE 10:	HIGHEST AND SECOND HIGHEST DAILY 1-HOUR AVERAGES	7
FIGURE 11:	OZONE DESIGN VALUE FOR 2003-2005 (8-HOUR VALUE)	8
FIGURE 12:	NUMBER OF DAYS 8-HOUR OZONE STANDARD WAS EXCEEDED AND NUMBER OF DAYS ABOVE 90 DEGREES, NEW JERSEY 1988-2005	9
FIGURE 13:	OZONE CONCENTRATIONS IN NEW JERSEY 1975-2005 SECOND HIGHEST 1-HOUR AVERAGE	10
FIGURE 14:	OZONE NON-ATTAINMENT AREAS IN NEW JERSEY.....	11

PHOTOCHEMICAL ASSESSMENT MONITORING STATIONS (PAMS)

FIGURE 1:	PAMS NETWORK DESIGN	1
FIGURE 2:	REGIONAL PAMS SITES	1
FIGURE 3:	PHILADELPHIA REGION, TOTAL NON-METHANE ORGANIC CARBON SEASONAL AVERAGE 1995-2005	2
FIGURE 4:	NEW YORK CITY REGION, TOTAL NON-METHANE ORGANIC CARBON SEASONAL AVERAGE 1995-2005	3

PARTICULATE

FIGURE 1:	SIZE OF PM _{2.5} PARTICLE COMPARED TO A HUMAN HAIR	1
FIGURE 2:	VISIBILITY WEBCAM	1
FIGURE 3:	2005 PM _{2.5} MONITORING NETWORK	3
FIGURE 4:	2005 FINE PARTICULATE CONCENTRATIONS	4
FIGURE 5:	2005 MAXIMUM DAILY FINE PARTICULATE CONCENTRATION (HIGHEST SITE) AIR QUALITY INDEX (AQI)	6
FIGURE 6:	2005 FINE PARTICULATE ANALYTE COMPOSITION (HIGHEST 7 ANALYTES DEPICTED)	7
FIGURE 7:	NEW JERSEY PARTICULATE MATTER NON-ATTAINMENT AREA	8
FIGURE 8:	2005 PM ₁₀ MONITORING NETWORK	9
FIGURE 9:	SUMMARY OF PM ₁₀ CONCENTRATIONS, NEW JERSEY 2005.....	10
FIGURE 10:	2005 SMOKE SHADE MONITORING NETWORK	11
FIGURE 11:	LONG TERM TREND IN PARTICULATE, STATE AVERAGE, 1967-2005	12

SULFUR DIOXIDE

FIGURE 1:	NATIONAL SUMMARY OF SO ₂ EMISSIONS BY SOURCE CATEGORY	1
FIGURE 2:	SULFUR DIOXIDE CONCENTRATION – NEW JERSEY 1967-1999	2
FIGURE 3:	2005 SULFUR DIOXIDE MONITORING NETWORK	3
FIGURE 4:	HIGHEST AND 2 ND HIGHEST 24-HOUR AVERAGES OF SO ₂ IN NEW JERSEY - 2005	4
FIGURE 5:	SULFUR DIOXIDE CONCENTRATIONS IN NEW JERSEY 1975-2005 SECOND HIGHEST DAILY AVERAGES	5
FIGURE 6:	SULFUR DIOXIDE NON-ATTAINMENT AREAS IN NEW JERSEY	6

AIR TOXICS

FIGURE 1:	1999 AIR TOXICS EMISSIONS ESTIMATES FOR NEW JERSEY	2
FIGURE 2:	ESTIMATED AIR TOXICS EMISSIONS FOR 178 COMPOUNDS IN NEW JERSEY, BY COUNTY BASED ON USEPA'S 1996 AIR TOXICS INVENTORY	2
FIGURE 3:	NATA PREDICTED CONCENTRATIONS IN NEW JERSEY FOR 1999 ..	3
FIGURE 4:	2005 AIR TOXICS MONITORING NETWORK	4
FIGURE 5:	ANNUAL AVERAGES FOR SELECTED HAZARDOUS AIR POLLUTANTS (HAPs) AT CAMDEN LAB FROM 1990-2005	8
FIGURE 6:	AIR TOXICS LEVELS MEASURED IN 1999 AT CAMDEN, NEW JERSEY COMPARED TO NATA PREDICTED LEVELS	9

ATMOSPHERIC DEPOSITION

FIGURE 1: SOURCES OF DEPOSITION	1
FIGURE 2: ACID PRECIPITATION MONITORING NETWORK – 2005	2
FIGURE 3: TREND IN SULFATE DEPOSITION IN PRECIPITATION AT WASHINGTON CROSSING STATE PARK, NEW JERSEY, 1990-2005: ANNUAL LOADING	5

REGIONAL HAZE & VISIBILITY

FIGURE 1: CONTRIBUTORS TO VISIBILITY IMPAIRMENT	1
FIGURE 2: COMPOSITION OF FINE PARTICLES ON DAYS WITH GOOD VISIBILITY COMPARED TO DAYS WITH POOR VISIBILITY BRIGANTINE, NEW JERSEY, 2005	1
FIGURE 4: ILLUSTRATES HOW SULFATES AND NITRATES ENTER THE ECOSYSTEM BY WAY OF DEPOSITION	3
FIGURE 5: VISIBILITY CAMERA – NEW JERSEY TRANSIT BUILDING (MANHATTAN SKYLINE – CLEAR DAY)	4
FIGURE 6: VISIBILITY CAMERA – NEW JERSEY TRANSIT BUILDING (MANHATTAN SKYLINE – HAZY DAY)	4
FIGURE 7: VISIBILITY CAMERA – BRIGANTINE NATIONAL WILDLIFE REFUGE (CLEAR DAY)	4
FIGURE 8: VISIBILITY CAMERA – BRIGANTINE NATIONAL WILDLIFE REFUGE (HAZY DAY)	4
FIGURE 9: SULFATE TREND SUMMARY, BRIGANTINE, NJ, 1993-2005	5

APPENDIX A – 2005 AIR MONITORING SITES

FIGURE 1: NORTHERN NEW JERSEY AIR MONITORING SITES	2
FIGURE 2: CENTRAL NEW JERSEY AIR MONITORING SITES	4
FIGURE 3: SOUTHERN NEW JERSEY AIR MONITORING SITES	6



2005 Introduction

New Jersey Department of Environmental Protection

INTRODUCTION

The State of New Jersey has been monitoring air quality for over 30 years. During that time, pollution levels have improved significantly. This is a result of state regulations, which are among the more stringent in the country, as well as regional and national air pollution reduction efforts.

But air quality problems do remain in the state. Ozone continues to be a significant problem in the summer months, and has been found to have serious health effects at lower levels than previously thought. The United States Environmental Protection Agency (USEPA) revised the NAAQS for ozone in 1997 to account for this new health information. Although the standard changes were challenged, the courts eventually upheld them. If the new standards for ozone are to be met, additional emission reduction strategies will have to be implemented.

At the same time the USEPA revised the standards for ozone, they promulgated a new standard for fine particles. Fine particles are defined as particles less than 2.5 micrometers in diameter and are referred to as PM2.5. These small particles have been found to have a greater impact on public health than larger particles, which were the focus of the previous standards. Monitoring data indicate PM2.5 levels in New Jersey are likely to be a problem in some areas of the state.

In addition to ozone and PM2.5, there is increasing concern about a class of air pollutants termed "air toxics". These pollutants include substances known to cause cancer or other serious health problems. The list of potential air toxics is very large and includes many different types of compounds from heavy metals to toxic volatile organic compounds such as benzene. New Jersey is using the results of an EPA air toxics study and other information to address this complex problem. More comprehensive monitoring of air toxics in New Jersey is being implemented and data from that program is presented in this report.

Questions or comments concerning this report can be made by e-mailing us at bamweb@dep.state.nj.us, by phone at (609) 292-0138 or by writing to us at:

New Jersey Department of Environmental Protection
Bureau of Air Monitoring
P. O. Box 418
Trenton, New Jersey 08625



2005 Network Summary

New Jersey Department of Environmental Protection

NETWORK DESIGN

In 2005, the Bureau of Air Monitoring maintained 43 Ambient Air Monitoring Sites in New Jersey. These monitoring sites are designed to fulfill the following monitoring objectives for federal and state regulated pollutants: to measure maximum pollutant concentrations, to assess population exposure, to determine the impact of major pollution sources, to measure background levels, to determine the extent of regional pollutant transport, and to measure secondary impacts in rural areas. In addition, monitoring data are provided to various public and media outlets and are used to provide hourly updates on air quality to the Bureau's web page at www.state.nj.us/dep/airmon. The Air Monitoring Sites can be divided into two primary networks: the Continuous Monitoring Network and the Manual Sampling Network.

SPATIAL SCALES

There are many factors and constraints, which affect the design of a monitoring network. Among these factors, a network design should consider pollutant characteristics, topographical features, and resource limitations when evaluating whether data collected at a particular site can meet monitoring objectives. To assist in designing an effective air monitoring network, the United States Environmental Protection Agency (USEPA) developed the concept of spatial scales of representativeness. The spatial scales define prospective sites in terms of the area surrounding a monitor where the pollutant concentrations are relatively similar. For each monitoring objective, appropriate spatial scales can be used to identify the general physical location of a suitable monitoring site. The various spatial scales are defined below:

Micro-scale (10 – 100m): Monitors that show significant concentration differences from as little as 10 meters or up to 50 meters away from the monitor are classified being Micro-scale monitors. This often occurs when monitors are located right next to low-level emission sources, such as busy roadways, construction sites, and facilities with short stacks.



Figure 1: Ambient air monitoring sampler located on the roof of the Camden County Municipal Utilities Authority Building

These locations should be in areas where the general public is exposed to the concentrations measured.

Middle Scale (100 – 1000m): These monitors show pollutant measurement variations between locations that are approximately 1 kilometer apart. These differences may occur near large industrial areas with many different operations or near large construction sites. Middle scale monitoring sites are often source oriented. Monitoring measurements of this type might be appropriate for the evaluation of short-term exposure to an emission source.

Neighborhood scale (1 – 10km): Neighborhood scale monitors do not show significant differences in pollutant concentrations over areas of a few kilometers. A particular scale location can represent not only the immediate neighborhood but also neighborhoods of the same type in other parts of the city. Neighborhood scale monitors provide good data for trend analysis studies and compliance with National Ambient Air Quality Standards (NAAQS) because their zone of representation are often found in areas where people commonly reside.

Urban Scale (10 – 100km): Urban scale monitors show consistency among pollutant measurements with monitor separations of at least 10 kilometers. Urban scale sites are usually located at higher elevations and away from highly traveled roads, and industries. These locations are ideal for evaluating concentrations over an entire metropolitan and/or rural area.

Regional scale (100 – 1000km): Regional scale (background monitors) show consistency among measurements for monitor separations of a few hundred kilometers. These monitors are best located in rural areas away from local sources, and at higher elevations. National parks, national wilderness areas, and many state and county parks and reserves are appropriate areas for regional scale sites. Data gathered at this scale location is most useful in assessing pollutant concentrations over a large area and evaluating transported emissions.

THE CONTINUOUS MONITORING NETWORK

The Continuous Monitoring Network consists of sites which measure carbon monoxide (CO), oxides of nitrogen (NO_x), ozone (O₃), sulfur dioxide (SO₂), particulate matter, and meteorological data by automated instruments (not all pollutants are measured at all sites). The data is transmitted to a centralized computer system in Trenton, New Jersey, once every minute, thus providing near real-time data. A map showing the location of the continuous monitoring sites is shown in Figure 2 and the parameters recorded at each site are displayed in Table 2 (page 3). Changes to the Continuous Network are summarized in Table 1. Many of the continuous site locations are also part of the Manual Monitoring Network, which is described in the next section.

Figure 2
2005 – Continuous Monitoring Network

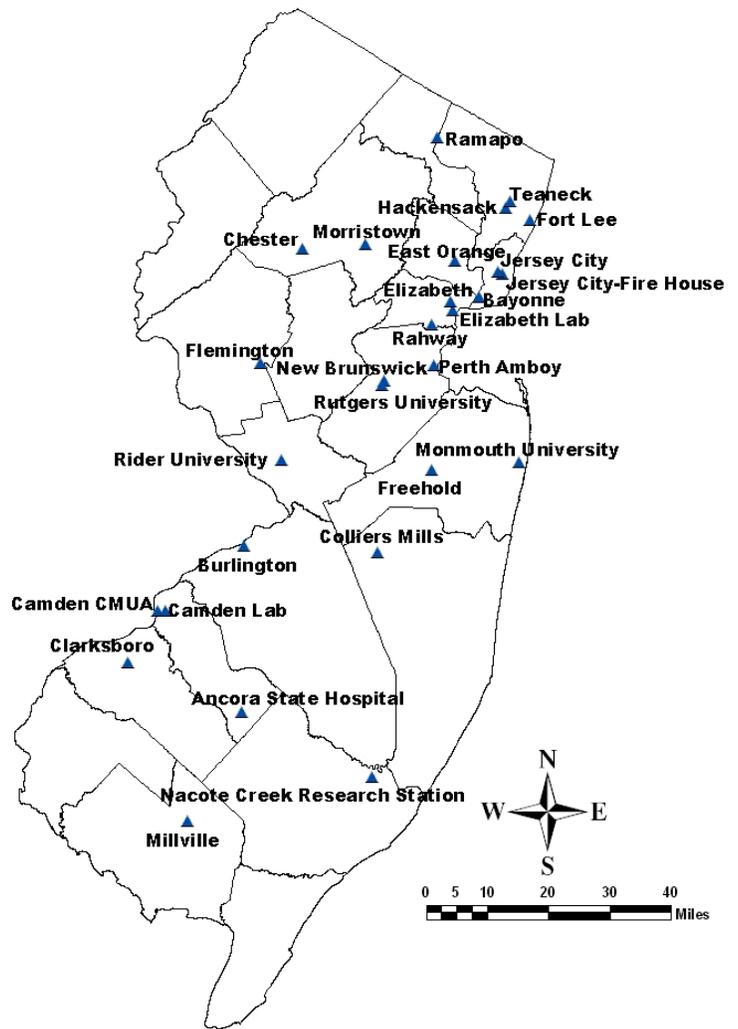


Table 1

2004-2005 Continuous Network Changes			
Monitoring Site	Parameter(s)	Action	Date
Clarksboro	O ₃ ,SO ₂	Site relocated on same property	12/15/04
Fort Lee	CO,TEOM	Re-Start	03/31/05
Millville	TEOM	Start-up	05/05/05

Table 2
2005 – Continuous Air Monitoring Network

Continuous Parameter Codes

- | | | | |
|-----------------------|-------------------------------------|-------------|---|
| CO | - Carbon Monoxide | SS | - Smoke Shade |
| NO_x | - Nitrogen Dioxide and Nitric Oxide | TEOM | - Continuous PM _{2.5} Analyzer |
| O₃ | - Ozone | MET | - Meteorological Parameters |
| SO₂ | - Sulfur Dioxide | | |

SITE	CO	NO _x	O ₃	SO ₂	SS	TEOM	MET
Ancora State Hospital	U		U	U			
Bayonne		U	N	N			
Burlington	Mi			N	N		
Camden CMUA						N	
Camden Lab	N	N	U	N	N	N	U
Chester		U	U	U			U
Clarksboro			U	U			
Colliers Mills			U				
East Orange	N	N					U
Elizabeth	Mi			M	N		
Elizabeth Lab	N	N		N	N	N	U
Flemington			U		N		U
Fort Lee	M					M	
Freehold	Mi				N		
Hackensack	N			N	N		
Jersey City-Firehouse						N	
Jersey City	Mi			N	N		
Millville		N	N	N		N	
Monmouth University			N				
Morristown	Mi				N		
Nacote Creek Research Station			U	U			
New Brunswick						N	
Perth Amboy	N			N	N		
Rahway						N	
Ramapo			U				
Rider University		N	N				U
Rutgers University		N	N				U
Teaneck		N	N				
TOTAL	12	9	14	13	10	8	7

Spatial Scale codes: Mi - **Micro**, M - **Middle**, N - **Neighborhood**, U - **Urban**, R – **Regional**

MANUAL MONITORING NETWORK

The Manual Monitoring Network does not transmit data in near real-time as does the Continuous Monitoring Network. The manual network consists primarily of various instruments that collect samples for subsequent analysis in a laboratory. The network provides data on fine particulates (particles smaller than 2.5 micrometers in diameter or PM_{2.5}), inhalable particulates (particles smaller than 10 micrometers in diameter or PM₁₀), lead (Pb), Total Suspended Particulates (TSP), several parameters associated with atmospheric deposition, pollutants important in the formation of ground level ozone (ozone precursors), and a group of organic and inorganic compounds that are considered toxic pollutants. Sites that measure ozone precursors are part of the national Photochemical Assessment Monitoring Station (PAMS) program. While these ozone precursors are automatically measured every hour, the data are retrieved once a day and require extensive review before they are validated. Changes to the Manual Network are summarized in Table 3. A map of the manual sampling sites is shown in Figure 3 and a list of the pollutants measured at each location is shown in Table 4 (page 5).

**Figure 3
2005 – Manual Monitoring Network**

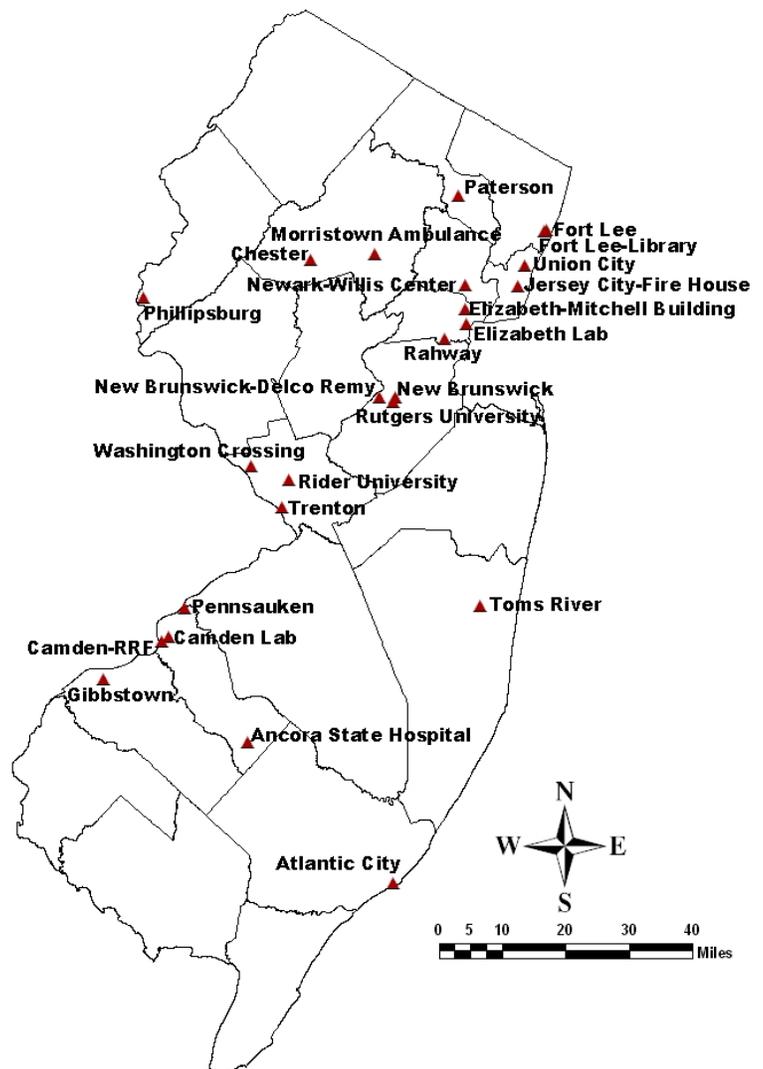


Table 3

2004-2005 Manual Network Changes			
Monitoring Site	Parameter(s)	Action	Date
Lebanon State Forest	Acid Deposition	Discontinued	10/27/04
Fort Lee	PM ₁₀	Re-Start	03/31/05
¹ Jersey City-Firehouse	PM ₁₀	Start-up	05/12/05
Union City	PM _{2.5}	Start-up	07/25/05

¹ Collocated a PM₁₀ sampler for precision measurements.

**Table 4
2005 - Manual Air Monitoring Network**

Manual Parameter Codes

- | | |
|---|---|
| PM_{2.5} - FRM (Federal Reference Method) Manual PM _{2.5} Sampler | PAMS - Photochemical Assessment Monitoring Station (Ozone Precursors) |
| PM₁₀ - FRM Manual PM ₁₀ Sampler | CARB - Carbonyls |
| Pb - Particulates Analyzed for Lead | VOCs - Volatile Organic Compounds |
| TSP - Total Suspended Particulates | SVOCs - Semi-Volatile Organic Compounds |
| PM_{2.5} Spec - PM _{2.5} Speciation Trends Network Sampler | Acid Deposition - Dry - Nitrates and Sulfates in PM ₁₀
Wet - Acidity (pH scale) in precipitation |

SITE	PM _{2.5}	PM ₁₀	Pb	TSP	PM _{2.5} Spec	PAMS	CARB	VOCs	Acid Deposition	
									Dry	Wet
Ancora State Hospital										U
Atlantic City	N	N								
Camden Lab	N	N			N	N	N	N	N	
Camden-RRF		M								
Chester	U				U		U	U		
Elizabeth Lab	N				N		N	N		
Elizabeth-Mitchell Building	N									
Fort Lee		M							M	
Fort Lee-Library	N									
Gibbstown	N									
Jersey City-Firehouse	N	N								
Morristown-Ambulance Squad	N									
New Brunswick	N				N		N	N		
New Brunswick-Delco Remy			Mi	Mi						
Newark-Willis Center	N									
Paterson	N									
Pennsauken	N									
Phillipsburg	N									
Rahway	N									
Rider University						N				
Rutgers University						N				
Toms River	N									
Trenton	N	N								
Union City	N									
Washington Crossing	N									U
TOTAL	19	6	1	1	4	3	4	4	2	2

Spatial Scale codes: Mi - **Micro**, M - **Middle**, N - **Neighborhood**, U - **Urban**, R - **Regional**

REFERENCES

Ball, R. J. and G. E. Andersen, *Optimum Site Exposure Criteria for Sulfur Dioxide Monitoring*, EPA-450/3-77-013, The Center for the Environment and Man, Inc., Hartford, CT, Prepared for USEPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC, April 1977

Ludwig, F. L. and J. H. S. Kealoha, *Selecting Sites for Carbon Monoxide Monitoring*, EPA-450/3-75-077, Stanford Research Institute, Menlo Park, CA. Prepared for USEPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC, September 1975.

Ludwig, F. L. and E. Shelar, *Site Selection for the Monitoring of Photochemical Air Pollutants*, EPA-450/3-78-013, Stanford Research Institute, Menlo Park, CA, Prepared for USEPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC, April 1978.

Network Design for State and Local Air Monitoring Stations (SLAMS), National Air Monitoring Stations (NAMS), and Photochemical Assessment Monitoring Stations (PAMS), 40 CFR 58 Appendix D, US Government Printing Office, Washington DC, July 1997.

Pelton, D. J. and R. C. Koch, *Optimum Sampling Exposure Criteria for Lead*, EPA-450/4-84-012, GEOMET Technologies, Inc., Rockville, MD, Prepared for USEPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC, February 1984.

Watson, J. G., et. al., *Guidance for Network Design and Optimum Site Exposure for PM_{2.5} and PM₁₀*, EPA-454/R-99-022, Desert Research Institute, University and Community College System of Nevada, Reno, NV. Prepared for USEPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC, December 1997.



2005 Air Quality Index Summary

New Jersey Department of Environmental Protection

WHAT IS THE AIR QUALITY INDEX (AQI)?

The Air Quality Index (AQI) is a national air quality rating system based on the National Ambient Air Quality Standards (NAAQS). Generally, an index value of 100 is equal to the primary, or health based, NAAQS for each pollutant. This allows for a direct comparison of each of the pollutants used in the AQI (carbon monoxide, nitrogen dioxide, particulate matter, ozone, and sulfur dioxide). The AQI rating for a reporting region is equal to the highest rating recorded for any pollutant within that region. In an effort to make the AQI easier to understand, a descriptive rating and a color code, based on the numerical rating are used (see Table 1).

For more information on the AQI, visit EPA's web site at <http://airnow.gov/>.

Table 1
Air Quality Index

Numerical AQI Rating	Descriptive Rating	AQI Color Code
0-50	Good	Green
51-100	Moderate	Yellow
101-150	Unhealthy for Sensitive Groups	Orange
151-200	Unhealthy	Red
200-300	Very Unhealthy	Purple

Each weekday morning a forecast is prepared using the AQI format. The forecast is provided to participating radio and television stations. Each afternoon, an air quality update, which includes the current air quality information and a forecast for the following day, is issued to various newspapers.

For purposes of reporting the AQI, the state is divided into 9 regions (see Figure 1). Table 2 shows the monitoring sites and parameters used in each reporting region to calculate the AQI values.

Figure 1
Air Quality Index Regions

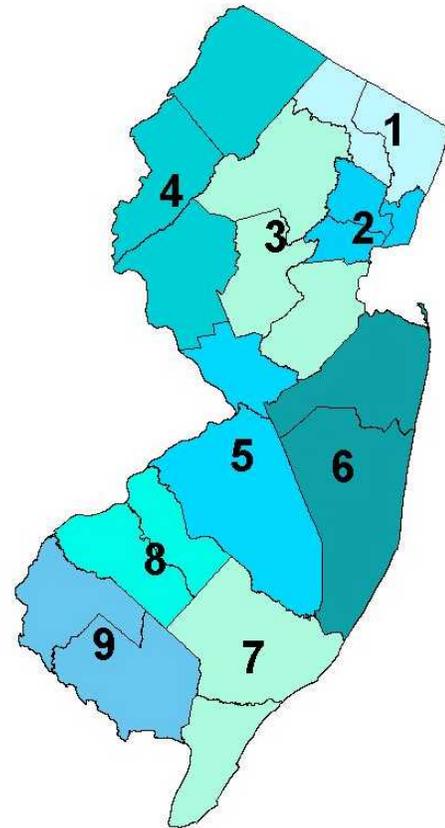


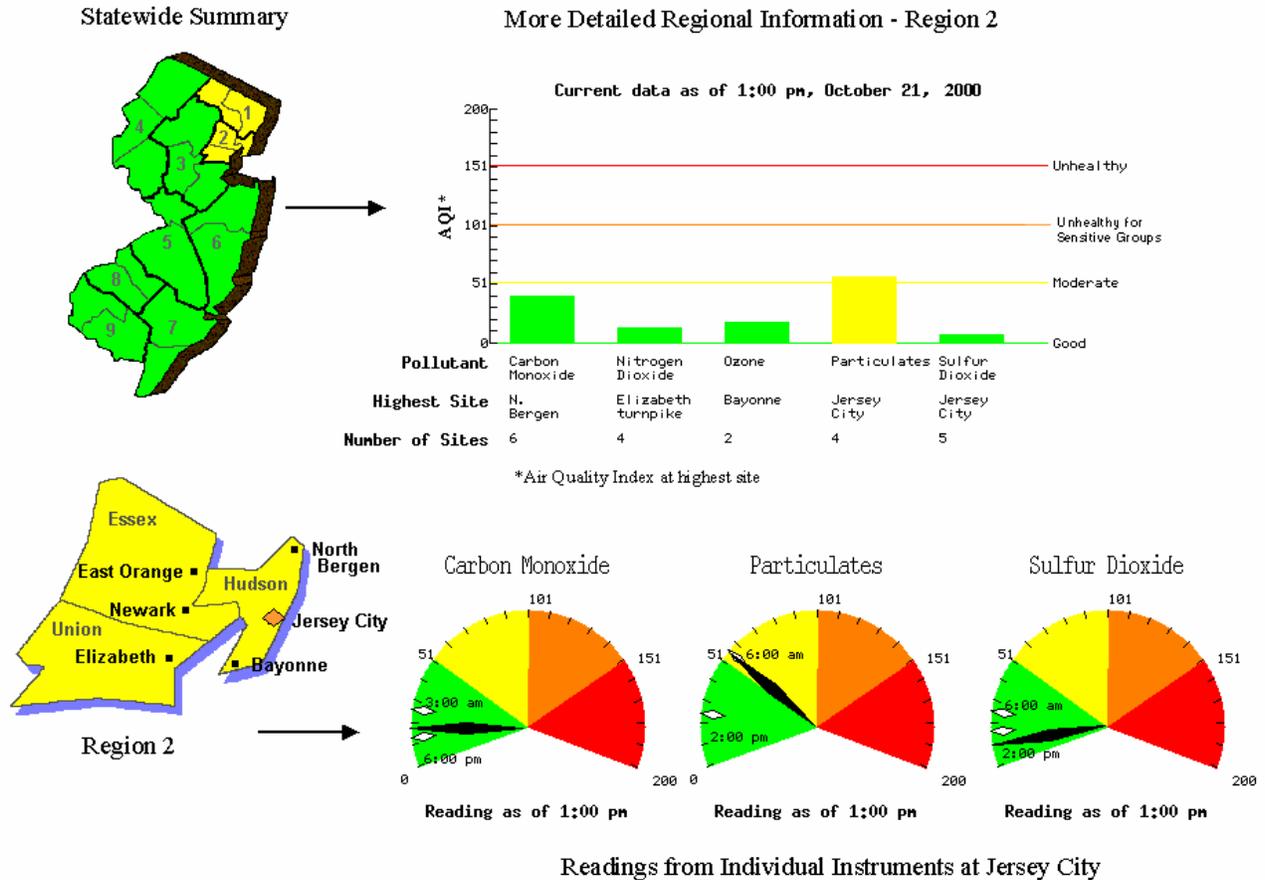
Table 2
Pollutants Monitored According to Air Quality Index Reporting Region - 2005

CO - Carbon Monoxide O₃ - Ozone
SO₂ - Sulfur Dioxide NO₂ - Nitrogen Dioxide
PM - Particulate Matter

Reporting Region	Monitoring Site	CO	SO ₂	PM	O ₃	NO ₂
1. Northern Metropolitan	Fort Lee	X	---	X	---	---
	Hackensack	X	X	X	---	---
	Ramapo	---	---	---	X	---
	Teaneck	---	---	---	X	X
2. Southern Metropolitan	Bayonne	---	X	---	X	X
	East Orange	X	---	---	---	X
	Elizabeth	X	X	X	---	---
	Elizabeth Lab	X	X	X	---	X
	Jersey City	X	X	X	---	---
	Jersey City Firehouse	---	---	X	---	---
3. Suburban	Chester	---	X	---	X	X
	Morristown	X	---	X	---	---
	New Brunswick	---	---	X	---	---
	Perth Amboy	X	X	X	---	---
	Rutgers University	---	---	---	X	X
4. Northern Delaware Valley	Flemington	---	---	X	X	---
5. Central Delaware Valley	Burlington	X	X	X	---	---
	Rider University	---	---	---	X	X
6. Northern Coastal	Colliers Mills	---	---	---	X	---
	Freehold	X	---	X	---	---
	Monmouth University	---	---	---	X	---
7. Southern Coastal	Nacote Creek R. S.	---	X	---	X	---
8. Southern Delaware Valley	Ancora State Hospital	X	X	---	X	---
	Camden Lab	X	X	X	X	X
	Clarksboro	---	X	---	X	---
	South Camden	---	---	X	---	---
9. Delaware Bay	Millville	---	X		X	X

Along with the forecast, cautionary statements are provided for days when the air quality is expected to be unhealthy. A weekday air quality forecast map, introduced during the 1996 ozone season, is televised on New Jersey Network's (NJN) TV News Broadcast. A web page was also created in 1996 to show current air quality levels. This page can be accessed at the following internet address: <http://www.state.nj.us/dep/airmon>. Some examples of the air quality information available on our web site are shown in Figure 2 below:

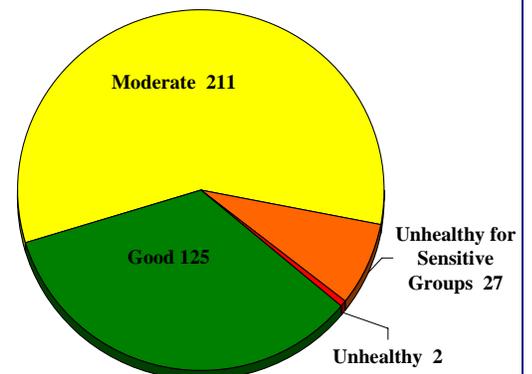
Figure 2
Examples of NJDEP's Air Monitoring Website



2005 AQI SUMMARY

A summary of the AQI ratings for New Jersey in 2005 is presented in the pie chart to the right. In 2005 there were 125 "Good" days, 211 were "Moderate", 27 were rated "Unhealthy for Sensitive Groups", 2 were considered "Unhealthy", and zero were rated "Very Unhealthy". This indicates that air quality in New Jersey is considered good or moderate most of the time, but that pollution is still bad enough to adversely affect some people on about one day in thirteen. Table 3 lists the dates when the AQI exceeded the "Unhealthy for Sensitive Groups" threshold at any monitoring location and shows which pollutant(s) were in that range or higher. Figure 4 shows the AQI ratings for the year broken down by AQI region.

Figure 3
Air Quality Summary by Days



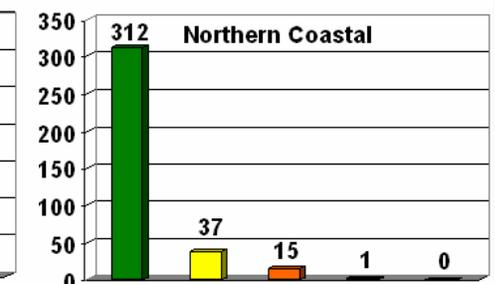
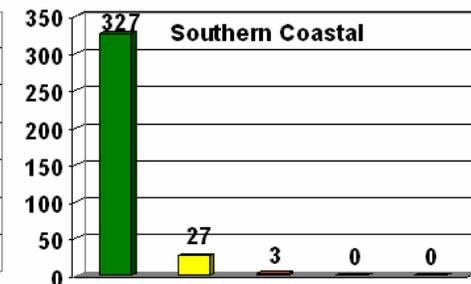
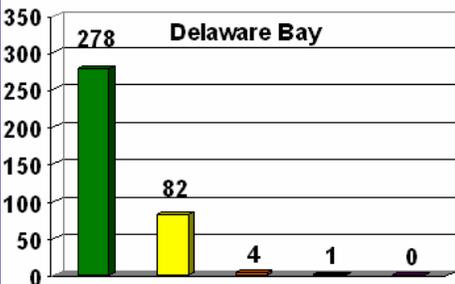
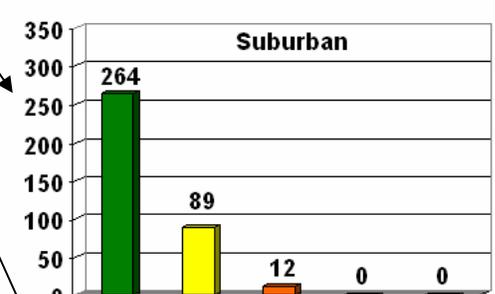
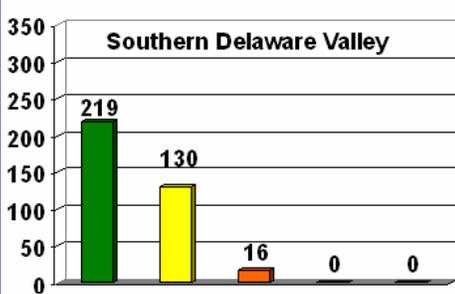
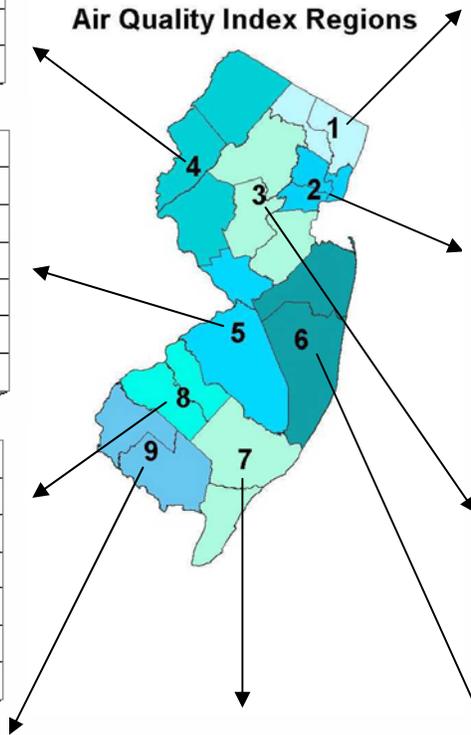
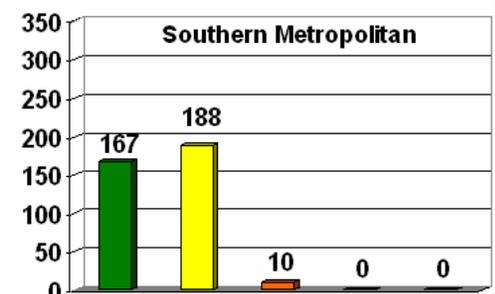
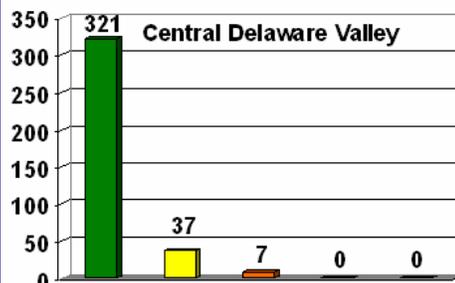
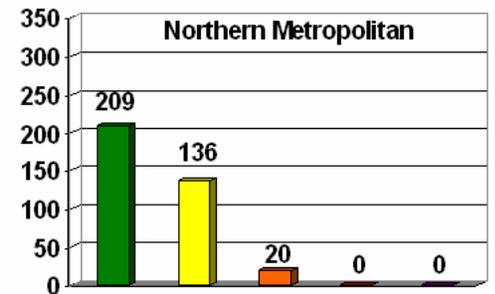
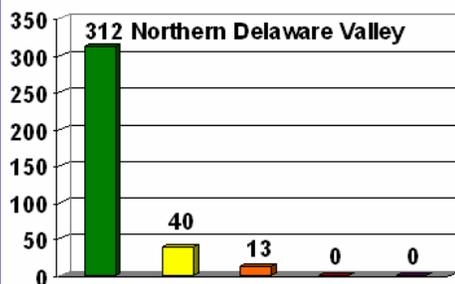
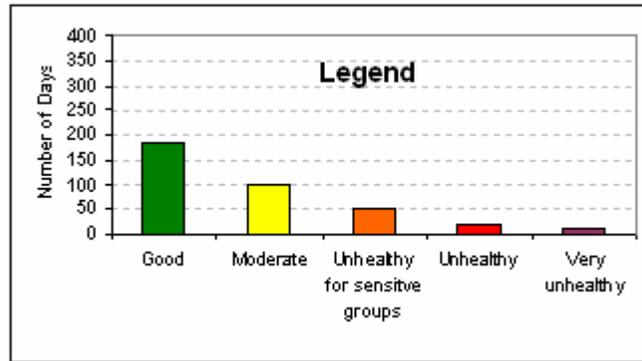
**Table 3
Air Quality Index (AQI) Exceedances of 100 During 2005**

	<u>Ratings</u>			<u>Pollutants</u>	
USG	-	Unhealthy for Sensitive Groups	PM	-	Fine Particle Matter
UH	-	Unhealthy	O ₃	-	Ozone
VUH	-	Very Unhealthy			

* Number in parentheses () indicates the number of monitoring sites exceeding 100 on a given day

Date	Highest Location	Highest AQI Value	Highest Pollutant	Highest Rating	Pollutant(s) with AQI above 100 *	
April 19	Colliers Mills/ Ft. Lee	116	O3 / PM	USG	O3 (4)	PM (1)
April 20	Ancora S.H.	109	O3	USG	O3 (4)	PM (1)
June 06	Fort Lee	114	PM	USG		PM (2)
June 08	Teaneck	111	O3	USG	O3 (6)	
June 09	J.C. Firehouse	108	PM	USG		PM (1)
June 21	Colliers Mills	129	O3	USG	O3 (4)	
June 24	Flemington	109	O3	USG	O3 (2)	
June 25	Rider University	137	O3	USG	O3 (6)	
June 26	Flemington/Teaneck	140	O3	USG	O3 (5)	
July 06	Fort Lee	104	PM	USG		PM (1)
July 18	Fort Lee	139	PM	USG		PM (1)
July 19	Fort Lee	118	PM	USG		PM (2)
July 21	Colliers Mills	150	O3	USG	O3 (10)	
July 22	Millville	164	O3	UH	O3 (8)	PM (1)
July 26	Colliers Mills	161	O3	UH	O3 (5)	PM (1)
July 27	Colliers Mills	119	O3	USG	O3 (3)	PM (3)
August 02	Ancora S.H.	119	O3	USG	O3 (2)	
August 03	Colliers Mills	127	O3	USG	O3 (6)	
August 04	Colliers Mills	140	O3	USG	O3 (5)	PM (1)
August 05	Colliers Mills	150	O3	USG	O3 (2)	PM (2)
August 11	Ancora S.H.	106	O3	USG	O3 (3)	
August 12	Rutgers University	127	O3	USG	O3 (5)	PM (4)
August 13	Ft. Lee/ J.C. Firehouse	128	PM	USG	O3 (5)	PM (7)
August 14	Fleminton	114	O3	USG	O3 (1)	PM (1)
September 08	Ancora S.H.	132	O3	USG	O3 (8)	
September 12	Colliers Mills	104	O3	USG	O3 (2)	
September 13	Fort Lee	141	PM	USG	O3 (10)	PM (3)
November 06	Fort Lee	106	PM	USG		PM (1)
November 21	Fort Lee	114	PM	USG		PM (1)

Figure 4
 2005 Air Quality Index Summary
 Number of Days by Reporting Region



References

Air Quality Index, A Guide to Air Quality and Your Health, USEPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC, June 2000, EPA-454/R-00-005, URL: www.epa.gov/airnow/aqi_cl.pdf

Guideline for Reporting of Daily Air Quality - Air Quality Index (AQI), USEPA, Office of Air Quality Planning and Standards, July 1999, EPA-454/R-99-010, URL: www.epa.gov/ttn/oarpg/t1/memoranda/rg701.pdf

Air Quality Index Reporting, Final Rule: Title 40, Part 58, Code of Federal Regulations, August 4, 1999. URL: http://www.epa.gov/ttn/oarpg/t1/fr_notices/airqual.pdf

National Air Quality and Emissions Trend Report, 1999, EPA-454/R-01-004, USEPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC, March 2001, URL: www.epa.gov/oar/aqtrnd99/

Latest Findings on National Air Quality: 2000 Status and Trends, EPA-454/K-01-002, USEPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC, September 2001, URL: www.epa.gov/oar/aqtrnd00/



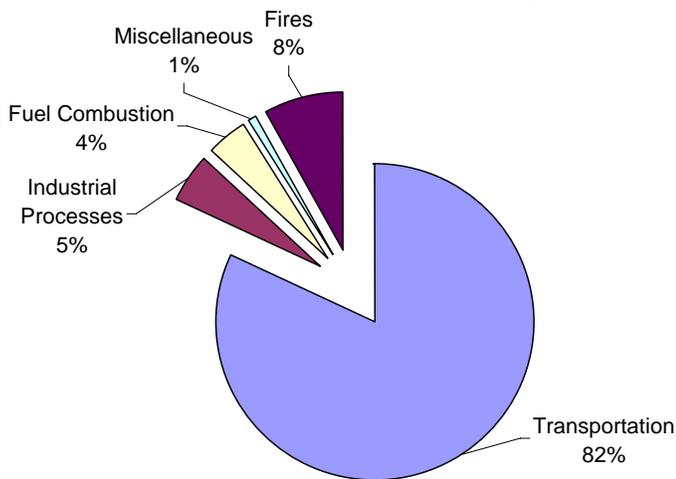
2005 Carbon Monoxide Summary

New Jersey Department of Environmental Protection

NATURE AND SOURCES

Carbon monoxide (CO) is a colorless, odorless, poisonous gas formed when carbon in fuels is not burned completely. It is a by-product of motor vehicle exhaust, which contributes over 50 percent of all CO emissions nationwide. In cities, automobile exhaust can cause as much as 95 percent of all CO emissions, and high CO levels often coincide with morning and afternoon rush hours (Figure 3 on page 2). Non-road engines and vehicles, such as construction equipment and boats, are also significant sources of CO and overall the transportation sector is responsible for about 82% of all CO emissions nationally. Other sources of CO include industrial processes, fuel combustion in sources such as boilers and incinerators, and natural sources such as forest fires. Figure 1 shows the national average contributions of these sources.

**Figure 1
National Summary of 2002
CO Emissions by Source Category**

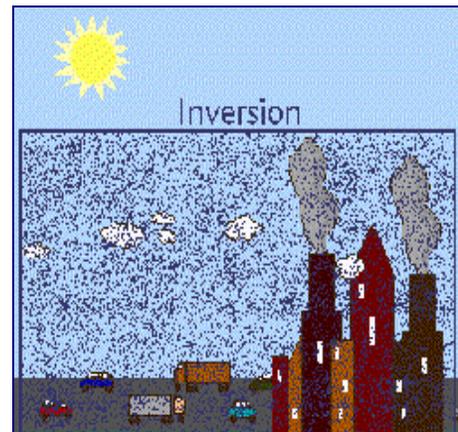
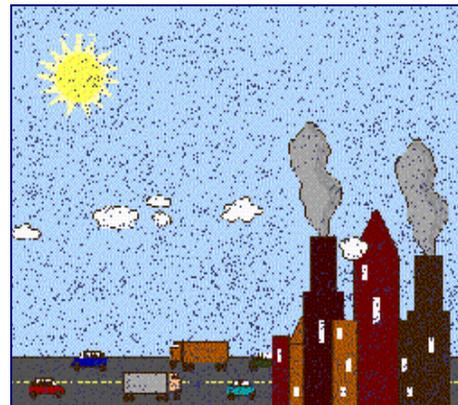


Source: USEPA National Air Quality Emissions Trends Report, 2003 Special Studies, September 2003

Figure 3 also shows that CO levels are typically higher in the winter. This is because motor vehicles do not burn fuel as efficiently when they are cold. Atmospheric inversions are also more frequent during the winter months. Inversions usually occur overnight when cooler air is trapped beneath a layer of warmer air aloft. When this occurs, the inversion acts

like a lid, preventing pollution from mixing in the atmosphere and effectively trapping it close to ground level (see Figure 2).

Figure 2: Effect of Atmospheric Inversion on Air Pollution



HEALTH AND ENVIRONMENTAL EFFECTS

Carbon monoxide enters the bloodstream and reduces the body's ability to distribute oxygen to organs and tissues. The most common symptoms associated with exposure to carbon monoxide are headaches and nausea. The health threat from exposure to CO is most serious for those who suffer from cardiovascular disease. For a person with

heart disease, a single exposure to CO at low levels may cause chest pain and reduce that individual's ability to exercise. Healthy people are also affected, but only at higher levels of exposure. Elevated CO levels are also associated with visual impairment, reduced work capacity, reduced manual dexterity, decreased learning ability, and difficulty in performing complex tasks.

opposed to parts per million), and our standards are not to be exceeded more than once in any 12-month period. The state has set secondary (welfare based) standards for CO at the same level as the primary standards. The standards are summarized in Table 1.

STANDARDS

There are currently two national primary, or health based, standards for carbon monoxide. They are set at a one-hour concentration of 35 parts per million (ppm), and an 8-hour average concentration of 9 ppm. These levels are not to be exceeded more than once in any calendar year. There are no national secondary (welfare based) standards for CO at this time.

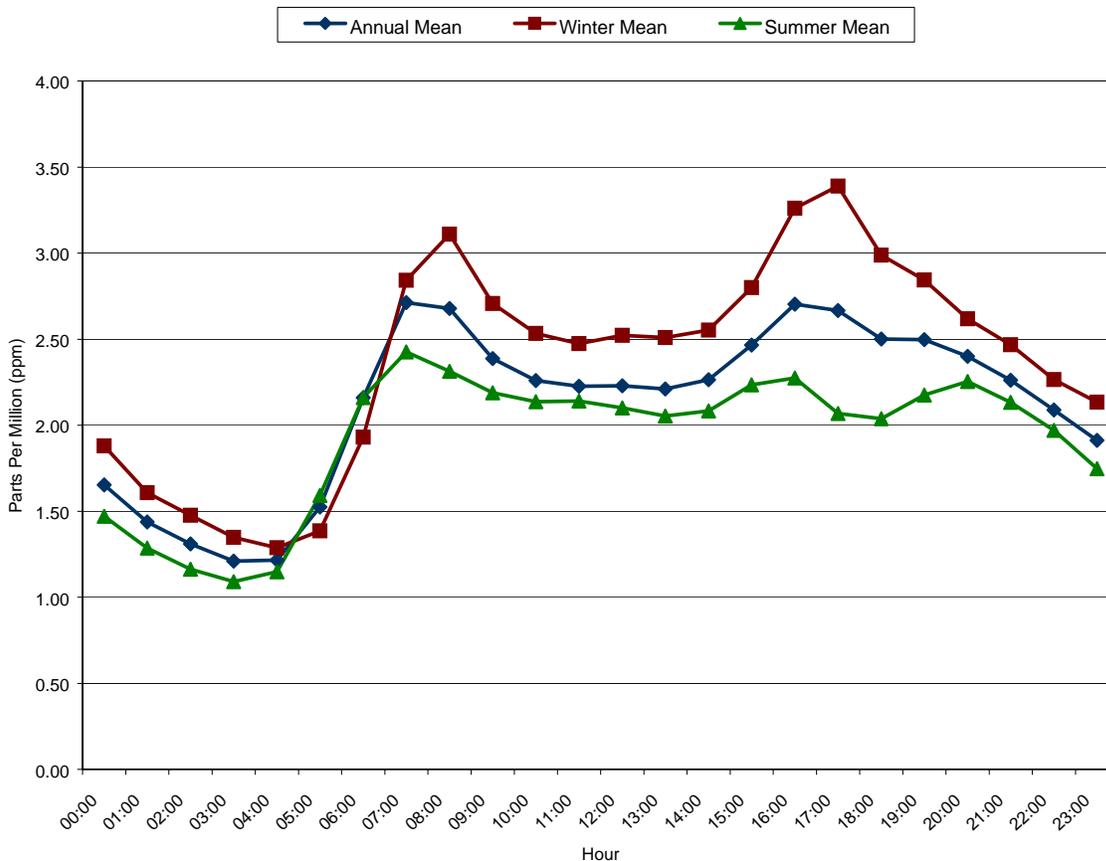
New Jersey state standards for CO are based on different units (milligrams per cubic meter as

Table 1
National and New Jersey Ambient Air Quality Standards for Carbon Monoxide

mg/m³ = Milligrams Per Cubic Meter
ppm = Parts per Million

Averaging Period	Type	New Jersey	National
1-Hour	Primary	40 mg/m ³ (35 ppm)	35 ppm
1-Hour	Secondary	40 mg/m ³ (35 ppm)	----
8-Hour	Primary	10 mg/m ³ (9 ppm)	9 ppm
8-Hour	Secondary	10 mg/m ³ (9 ppm)	----

Figure 3
Carbon Monoxide Concentrations – New Jersey
1967-1999
Seasonal and Hourly Variations



MONITORING LOCATIONS

The state monitored CO levels at 12 locations in 2005. These sites are shown in the map in Figure 4. The site in Fort Lee was shut down from October 2004 through March 2005 to allow for renovations to the overpass on which it was located.

CO LEVELS IN 2005

None of the monitoring sites recorded exceedances of any CO standard during 2005. The maximum one-hour average concentration recorded was 5.8 ppm at the site in Jersey City. The highest 8-hour average level recorded was 3.6 ppm, at the downtown Elizabeth site. Summaries of the 2005 data are provided in Figure 5 and Table 2 (page 4).

Figure 4
2005 Carbon Monoxide
Monitoring Network

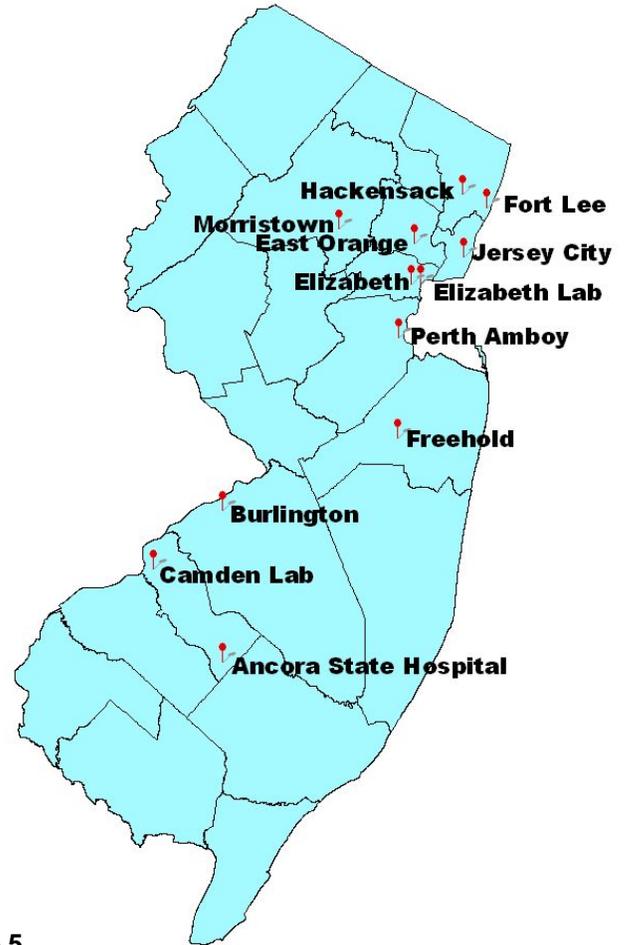


Figure 5
Highest and 2nd Highest 8-Hour Averages
of Carbon Monoxide in New Jersey - 2005

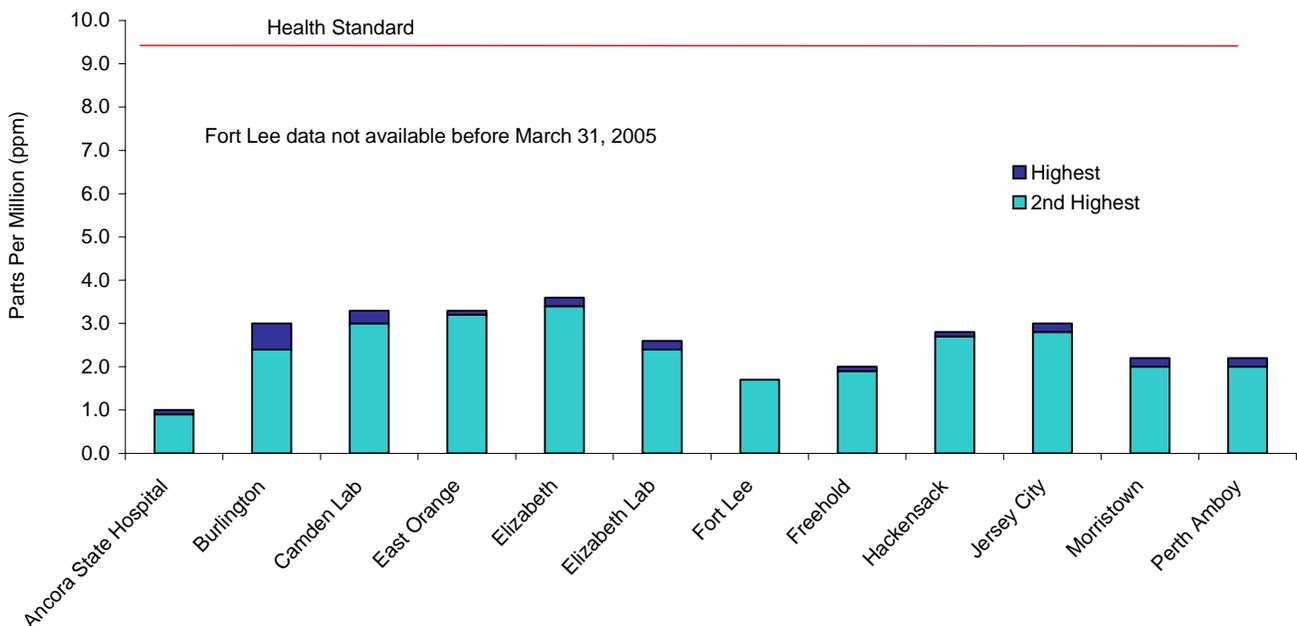


Table 2
Carbon Monoxide Data – 2005
1-Hour and 8-Hour Averages

Parts Per Million (ppm)
 1-hour standard = 35 ppm
 8-hour standard = 9 ppm

Monitoring Sites	Maximum 1-Hour Average	2 nd Highest 1-Hour Average	Maximum 8-Hour Average	2 nd Highest 8-Hour Average
Ancora State Hospital	1.3	1.2	1.0	0.9
Burlington	4.4	4.3	3.0	2.4
Camden Lab	4.0	3.9	3.3	3.0
East Orange	4.2	4.0	3.3	3.2
Elizabeth	4.8	4.6	3.6	3.4
Elizabeth Lab	3.4	3.0	2.6	2.4
Fort Lee ¹	2.1	2.1	1.7	1.7
Freehold	5.4	3.9	2.0	1.9
Hackensack	3.4	3.4	2.8	2.7
Jersey City	5.8	4.8	3.0	2.8
Morristown	2.8	2.7	2.2	2.0
Perth Amboy	3.7	3.0	2.2	2.0

¹ Data not available before March 31, 2005

Trends

Carbon monoxide levels have improved dramatically over the past 20 years. The last time the CO standard was exceeded in New Jersey was in January of 1995 (see Figure 6, page 5), and the entire state was officially declared as having attained the CO standard on August 23, 2002. At one time unhealthy levels of CO were recorded on a regular basis – as much as a hundred days a year at some sites. The reduction in CO levels is due primarily to cleaner running cars which are by far the largest source of this pollutant. A trend graph of CO levels showing the maximum, minimum and average concentrations recorded since 1975 is provided in Figure 7 (page 5). The graph depicts the second highest 8-hour value recorded, as this is the value that determines if the health standard is being met (one exceedance per site is allowed each year).

Figure 6
Carbon Monoxide
Unhealthy Days 1985-2005

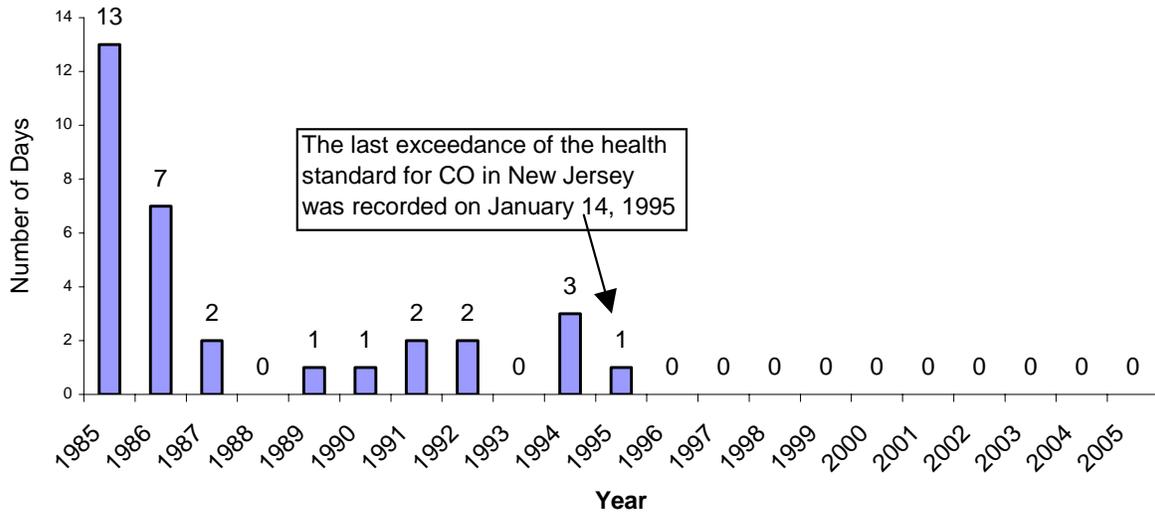
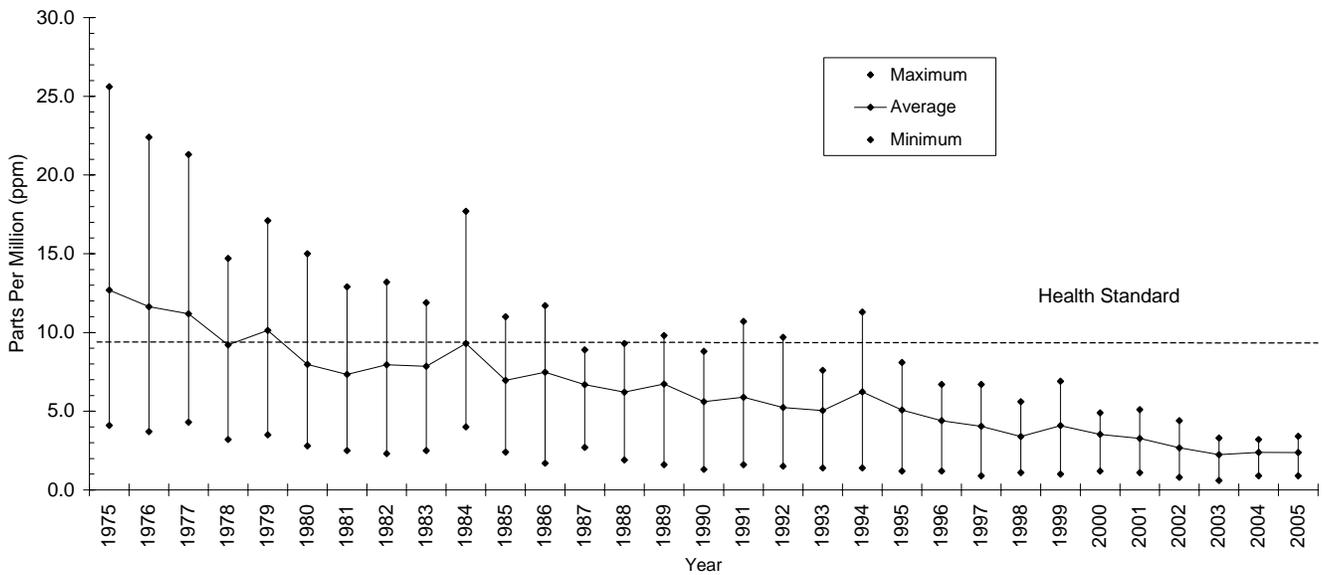


Figure 7
Carbon Monoxide Air Quality, 1975-2005
2nd Highest 8-Hour Average



REFERENCES

CO – How Carbon Monoxide Affects the Way We Live and Breathe, USEPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC November 2000, URL: <http://www.epa.gov/air/urbanair/co/index.html>

Automobiles and Carbon Monoxide, OMS Fact Sheet, USEPA, January 1993, EPA-400/F-92-005, URL: <http://www.epa.gov/oms/03-co.htm>

National Air Quality and Emissions Trend Report, 1999, EPA-454/R-01-004, USEPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC, March 2001, URL: www.epa.gov/oar/aqtrnd99/

Latest Findings on National Air Quality: 2000 Status and Trends, EPA-454/K-01-002, USEPA, Office of Air Quality Planning and Standards, RTP, September 2001, URL: www.epa.gov/oar/aqtrnd00/

Latest Findings on National Air Quality: 2002 Status and Trends, EPA-454/K-03-001, USEPA, Office of Air Quality Planning and Standards, RTP, September 2001, URL: www.epa.gov/airtrends/carbon.html

National Air Quality and Emissions Trend Report, 2003 Special Studies Edition, EPA-454/R-03-005, USEPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC, September 2003, URL: <http://www.epa.gov/oar/aqtrnd03/>.

National Primary Ambient Air Quality Standards for Carbon Monoxide, 40 CFR 50.8, US Government Printing Office, Washington DC, July 2001.



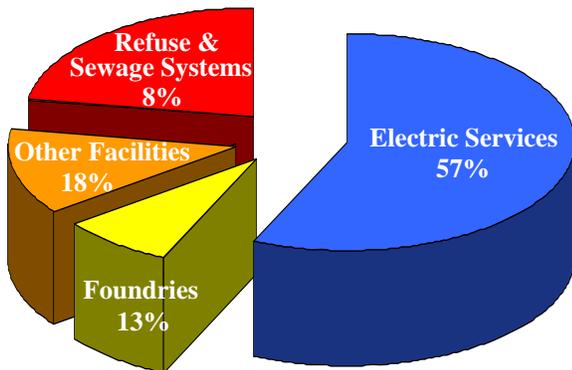
2005 Lead Summary

New Jersey Department of Environmental Protection

NATURE AND SOURCES

Lead (Pb) is a metal that occurs naturally in the environment as well as being produced by a variety of human activities. Historically, the major sources of lead in the air have been motor vehicles and industrial facilities. With the phase out of lead in gasoline, however, the industrial sources now predominate. Because of the reductions in lead emissions from cars and trucks, levels in the air have decreased dramatically. When high levels do occur, they are usually near industrial sources. The pie chart below shows the major industrial sources of lead in New Jersey. The industrial sources include Electric Services (Energy generating facilities), Foundries (Metal casting facilities), and Refuse and Sewage systems.

Figure 1
New Jersey's Summary of Lead Emissions by Industrial Category



Source: NJDEP, Air Quality Planning Data 2004

HEALTH AND ENVIRONMENTAL EFFECTS

Lead accumulates in the blood, bones, muscles, and fat. People are mainly exposed to lead by breathing it from the air

or by ingesting food, water, soil, or dust that has been contaminated with lead. Infants and small children are especially sensitive to lead, even at low levels. Lead can damage the kidneys, liver, brain, and nerves and very high exposures can result in mental retardation, behavioral disorders, memory problems, and seizures. Lower levels of lead can damage the brain and nerves in fetuses and young children, resulting in learning disabilities. Lead can also cause high blood pressure and increase the risk of heart disease.

Animals can ingest lead while grazing and may experience health effects similar to those seen in humans. Lead can enter water systems through runoff and from sewage and industrial waste streams. Elevated levels of lead in water can cause reproductive damage in aquatic life and may cause changes in the blood and nerves of fish.

STANDARDS

The primary (health based) and secondary (welfare based) standards for lead are the same. The national standards are set at a maximum quarterly average concentration of 1.5 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$). The table below shows the National and New Jersey Ambient Air Quality Standards (NAAQS and NJAAQS) for lead. The difference between the national and state standards is that the national standards are based on calendar quarters (Jan-Mar, Apr-Jun, Jul-Sep, Oct-Dec) while the state standards are based on concentrations recorded over any three consecutive months.

Table 1
National and New Jersey Ambient Air Quality Standards for Lead

$\mu\text{g}/\text{m}^3$ = Micrograms Per Cubic Meter

Averaging Period	Type	New Jersey	National
3-Month Arithmetic Mean	Primary and Secondary	1.5 $\mu\text{g}/\text{m}^3$	
Calendar Quarter Arithmetic Mean	Primary and Secondary		1.5 $\mu\text{g}/\text{m}^3$

MONITORING LOCATIONS

Lead concentrations in recent years have been so low that many of the monitoring sites have been discontinued. As a result, New Jersey monitored lead at only one location in 2005. This location, near a battery manufacturing plant in New Brunswick, is shown on the map in Figure 2.

LEAD LEVELS IN 2005

A summary of the lead levels monitored in 2005 is shown in Table 2 and Figure 3. No exceedances of the primary or secondary standards were recorded. The maximum 3-month average was 0.298 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$), less than one fifth of the health standard.

Figure 2
2005 Lead
Monitoring Network



Figure 3
2005 New Jersey Quarterly Average Lead Concentration

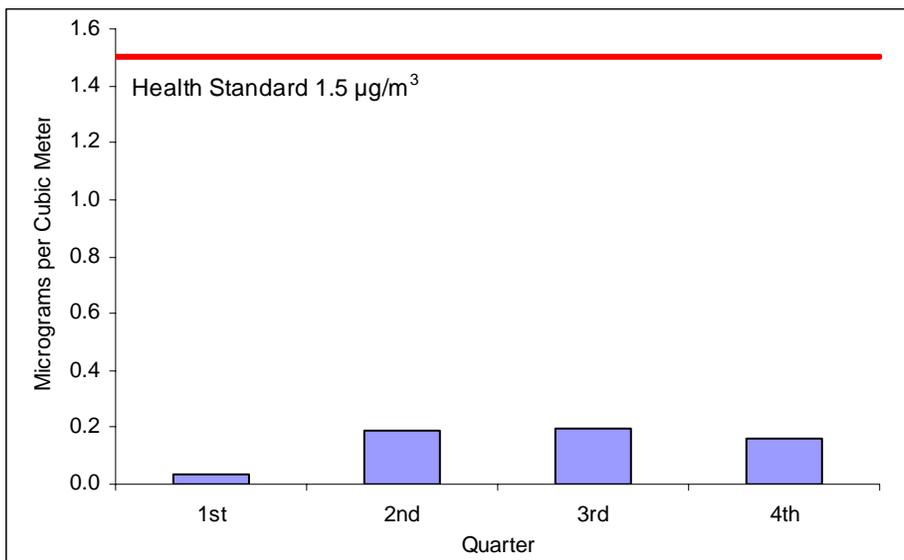


Table 2
Lead Data – 2005
3-Month and Calendar Quarter Averages

$\mu\text{g}/\text{m}^3$ = Micrograms Per Cubic Meter

Monitoring Site	3-Month Average $\mu\text{g}/\text{m}^3$		Calendar Quarter Averages $\mu\text{g}/\text{m}^3$			
	Maximum	Month ¹	1 st Quarter	2 nd Quarter	3 rd Quarter	4 th Quarter
New Brunswick	.298	Aug.	.032	.189	.194	.159

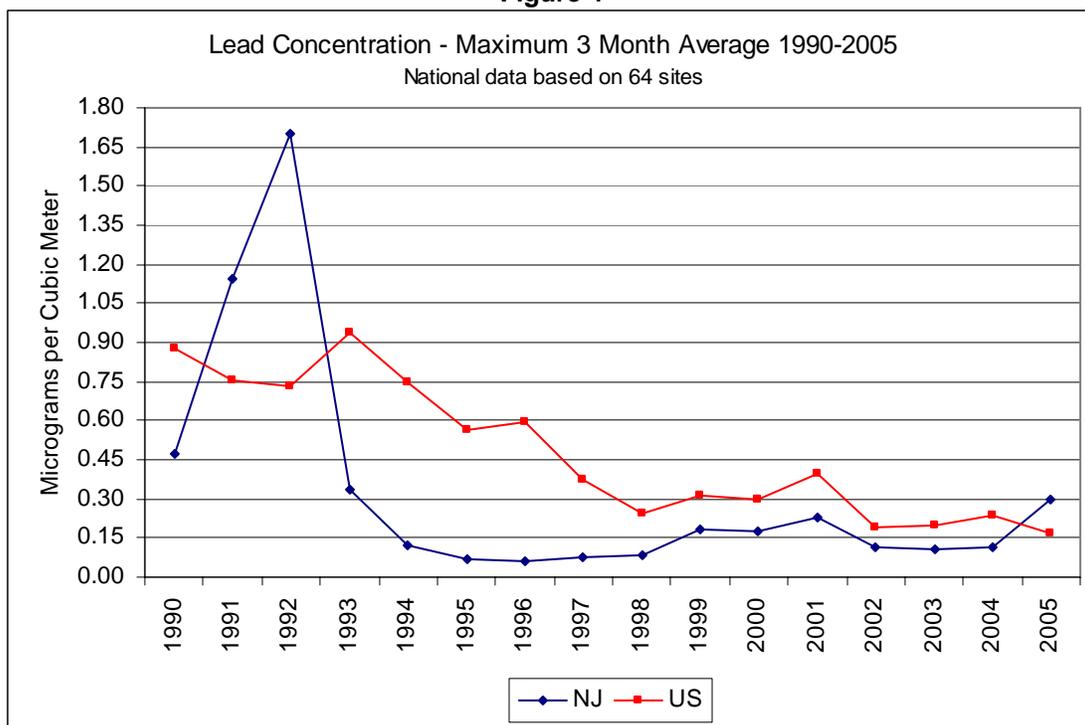
¹ The month indicates the last month in the 3-month period

TRENDS

The phase out of lead in gasoline has resulted in substantial improvements in air quality, and lead levels in New Jersey are now well within the air quality standards. The trend graph below (Figure 4) shows New Jersey's Annual Maximum 3-Month Average concentrations from 1990 to 2005, compared to EPA's national Annual Maximum 3-Month Average (based on 64 sites). New Jersey's lead levels have decreased steadily since 1990 to about 27% of the levels seen in previous years. National concentrations have declined consistently over the same

time span. New Jersey values are based on data from one site, New Brunswick, which has been the only Lead monitoring site in operation since 2002. While meeting the NAAQS for lead is no longer a major environmental issue in New Jersey, concern still exists over lead exposure via routes other than direct inhalation. Lead may have accumulated in the soil over time and children playing in such areas may ingest the lead directly.

Figure 4



REFERENCES

Daily Lead Data from the New Brunswick air monitoring site, sampler 057, United States Environmental Protection Agency (USEPA), AQS Data Mart, URL: <http://www.epa.gov/ttn/airs/aqsdatamart/access.htm>

National Trends in Lead Levels, Lead Air Quality 1990-2008, United States Environmental Protection Agency (USEPA), URL: <http://www.epa.gov/airtrends/lead.html>

2004 Lead Emission Inventory, New Jersey Department of Environmental Protection (NJDEP), Air Quality Planning

Lead in Air, United States Environmental Protection Agency (USEPA), URL: <http://www.epa.gov/air/lead/index.html>

Health Assessment of Exposure to Developmental Toxicants, Kimmel, Carole A., United States Environmental Protection Agency (USEPA), 1987, EPA-600/D-87-210, URL: <http://nepis.epa.gov/EPA/html/Pubs/pubtitleOAR.htm>

Health Effects Assessment for Lead., United States Environmental Protection Agency (USEPA), 1984, EPA -540/1-86-055, URL: <http://nepis.epa.gov/EPA/html/Pubs/pubtitleOAR.htm>

National Air Quality and Emissions Trend Report, 1999, United States Environmental Protection Agency (USEPA), March 2001, EPA-454/R-01-004 URL: <http://nepis.epa.gov/EPA/html/Pubs/pubtitleOAR.htm>

Latest Findings on National Air Quality - Status and Trends through 2006 - LEAD (Pb), United States Environmental Protection Agency (USEPA), URL: <http://www.epa.gov/air/airtrends/2007/report/lead.pdf>



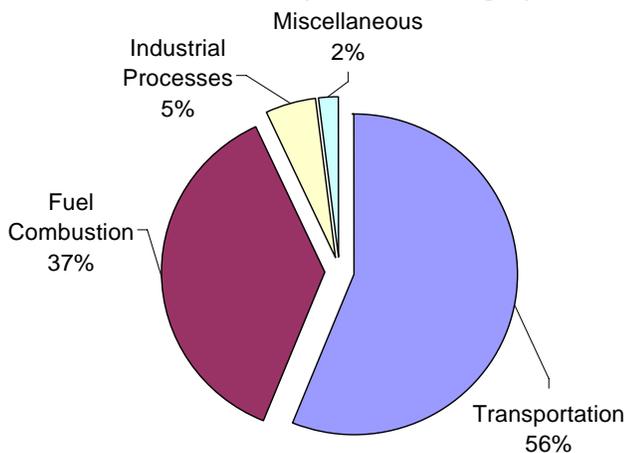
2005 Nitrogen Dioxide Summary

New Jersey Department of Environmental Protection

NATURE AND SOURCES

Nitrogen Dioxide (NO_2) is a reddish-brown, highly reactive gas that is formed in the air through the oxidation of Nitric Oxide (NO). When NO_2 reacts with other chemicals, it can form ozone, particulate matter, and other compounds which can contribute to regional haze and acid rain. Nitrogen Oxides (NO_x) is a mixture of gases which is mostly comprised of NO and NO_2 . These gases are emitted from the exhaust of motor vehicles, the burning of coal, oil or natural gas, and during industrial processes such as welding, electroplating, and dynamite blasting. Although most NO_x is emitted as NO, it is readily converted to NO_2 in the atmosphere. In the home, gas stoves and heaters produce substantial amounts of nitrogen dioxide. A pie chart summarizing the major sources of NO_x is shown below (Figure 1). As much of the NO_x in the air is emitted by motor vehicles, concentrations tend to peak during the morning and afternoon rush hours. This is shown in the graph in Figure 2 (page 2), which also indicates that concentrations tend to be higher in the winter than the summer. This is due in part to poorer local dispersion conditions caused by light winds and other weather conditions that are more prevalent in the colder months of the year.

Figure 1
National Summary of 2002
 NO_x Emissions by Source Category



Source: USEPA National Air Quality Emissions Trends Report, 2003 Special Studies, September 2003

HEALTH AND ENVIRONMENTAL EFFECTS

Short-term exposures (less than 3 hours) to low levels of nitrogen dioxide may aggravate pre-existing respiratory illnesses, and can cause respiratory illnesses, particularly in children ages 5-12. Symptoms of low level exposure to NO and NO_2 include irritation to eyes, nose, throat and lungs, coughing, shortness of breath, tiredness and nausea. Long-term exposures to NO_2 may increase susceptibility to respiratory infection and may cause permanent damage to the lung. NO and NO_2 are found in tobacco smoke, so people who smoke or breathe in second-hand smoke may be exposed to NO_x . The U.S. Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC), and the U.S. Environmental Protection Agency (EPA) have determined that, with the available information, no conclusion can be made as to the carcinogenicity of NO or NO_2 to human beings.

Nitrogen Oxides contribute to a wide range of environmental problems. These include potential changes in the composition of some plants in wetland and terrestrial ecosystems, acidification of freshwater bodies, eutrophication of estuarine and coastal waters, increases in levels of toxins harmful to fish and other aquatic life, and visibility impairment.

STANDARDS

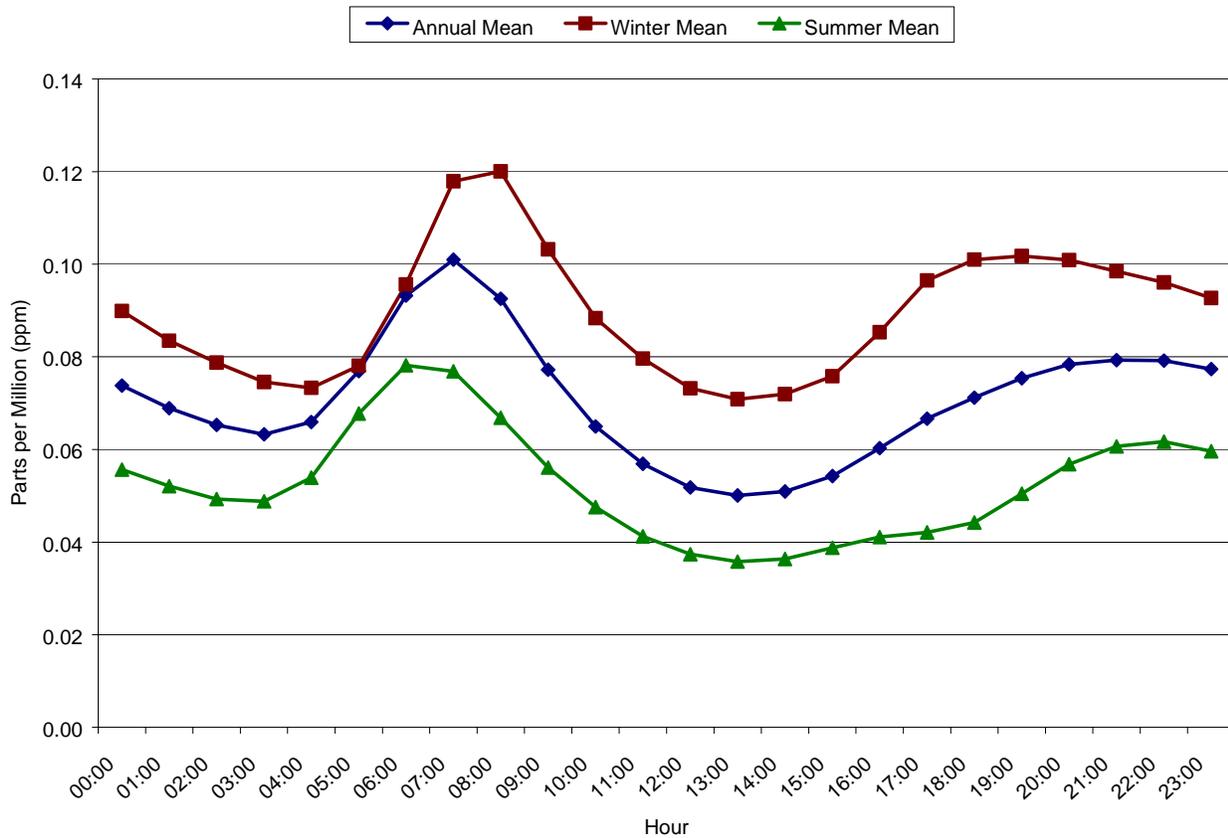
The primary (health based) and secondary (welfare based) National Ambient Air Quality Standards (NAAQS) for NO_2 are the same. They are set at a calendar year average concentration of 0.053 parts per million (ppm). The New Jersey Ambient Air Quality Standards (NJAAQS) are identical to the NAAQS except micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) are the standard units and the state standard applies to any 12-month period, not just the calendar year. The state of California has a one-hour average standard of $470 \mu\text{g}/\text{m}^3$ that New Jersey uses as a guideline in assessing short-term impacts from specific sources. Table 1 provides a summary of the NO_2 standards.

Table 1
National and New Jersey Ambient Air Quality Standards for Nitrogen Dioxide

Parts Per Million (ppm)
 Micrograms Per Cubic Meter ($\mu\text{g}/\text{m}^3$)

Averaging Period	Type	New Jersey	National	California
12-month average	Primary	100 $\mu\text{g}/\text{m}^3$ (0.05 ppm)		
Annual average	Primary		0.053 ppm (100 $\mu\text{g}/\text{m}^3$)	
12-month average	Secondary	100 $\mu\text{g}/\text{m}^3$ (0.05 ppm)		
Annual average	Secondary		0.053 ppm (100 $\mu\text{g}/\text{m}^3$)	
1-hour average	Primary			470 $\mu\text{g}/\text{m}^3$ (0.25 ppm)

Figure 2
Nitrogen Dioxide & Nitric Oxide Concentrations – New Jersey
1967-1999
Seasonal and Hourly Variation



MONITORING LOCATIONS

The state monitored NO₂ levels at 9 locations in 2005. These sites are shown in the map to the right.

NO₂ LEVELS IN 2005

None of the monitoring sites recorded exceedances of either the National or New Jersey Air Quality Standards for NO₂ during 2005. The maximum annual average concentration recorded was 0.032 ppm at the Elizabeth Lab site located at Exit 13 of the New Jersey Turnpike. While national health and welfare standards have not been established for Nitric Oxide (NO), it is considered to be an important pollutant that contributes to the formation of ozone, fine particles and acid rain. The maximum annual average concentration of NO recorded in 2005 was 0.042 ppm, also at the Elizabeth Lab site (see Table 2 and Figure 4, page 4).

TRENDS

Routine monitoring for NO₂ began in 1966, and 1974 was the last year that concentrations exceeded the NAAQS in New Jersey. A graph of NO₂ levels provided in Figure 5 shows the statewide average annual mean concentrations recorded from 1975 to 2005 in the form of a trendline. The graph also includes the levels of the

Figure 3
2005 Oxides of Nitrogen
Monitoring Network

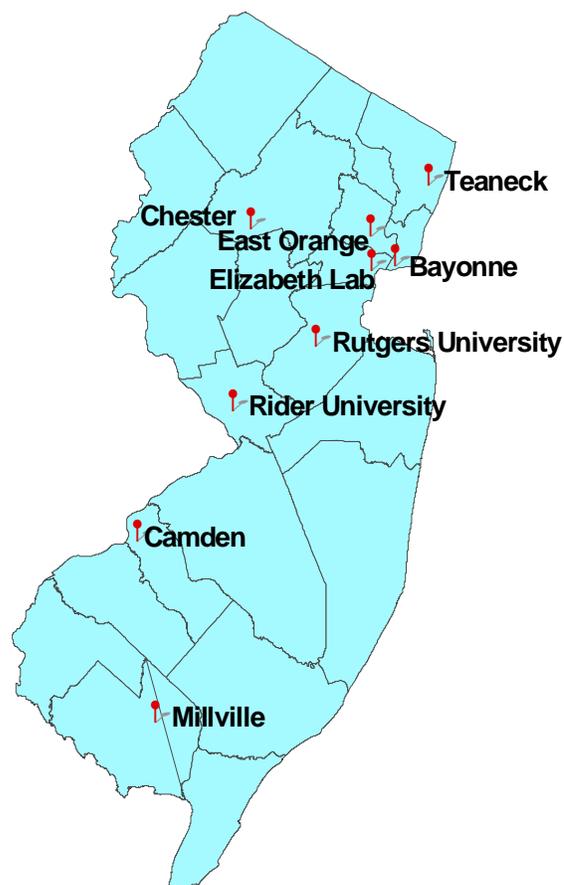


Table 2
Nitrogen Dioxide and Nitric Oxide Data-2005
1-Hour and 12-Month Averages

Parts Per Million (ppm)
California 1-Hour Standard = 0.25 ppm
National 12-Month Standard = 0.053 ppm

Monitoring Sites	Nitrogen Dioxide 1-Hour Average (ppm)		Nitrogen Dioxide 12-Month Average (ppm)		Nitric Oxides Annual Average(ppm)
	Maximum	2nd Highest	Maximum	Calendar year	
Bayonne	0.107	0.094	0.023	0.023	0.018
Camden Lab	0.089	0.083	0.022	0.021	0.012
Chester	0.056	0.056	0.011	0.011	0.004
East Orange	0.115	0.115	0.026	0.026	0.023
Elizabeth Lab	0.102	0.100	0.032	0.032	0.042
Millville	0.058	0.057	0.013	0.013	0.011
Rider University	0.064	0.063	0.016	0.016	0.011
Rutgers University	0.079	0.078	0.019	0.018	0.011
Teaneck	0.114	0.112	0.022	0.022	0.020

Figure 4
Annual Average NO and NO₂ Concentrations
in New Jersey - 2005

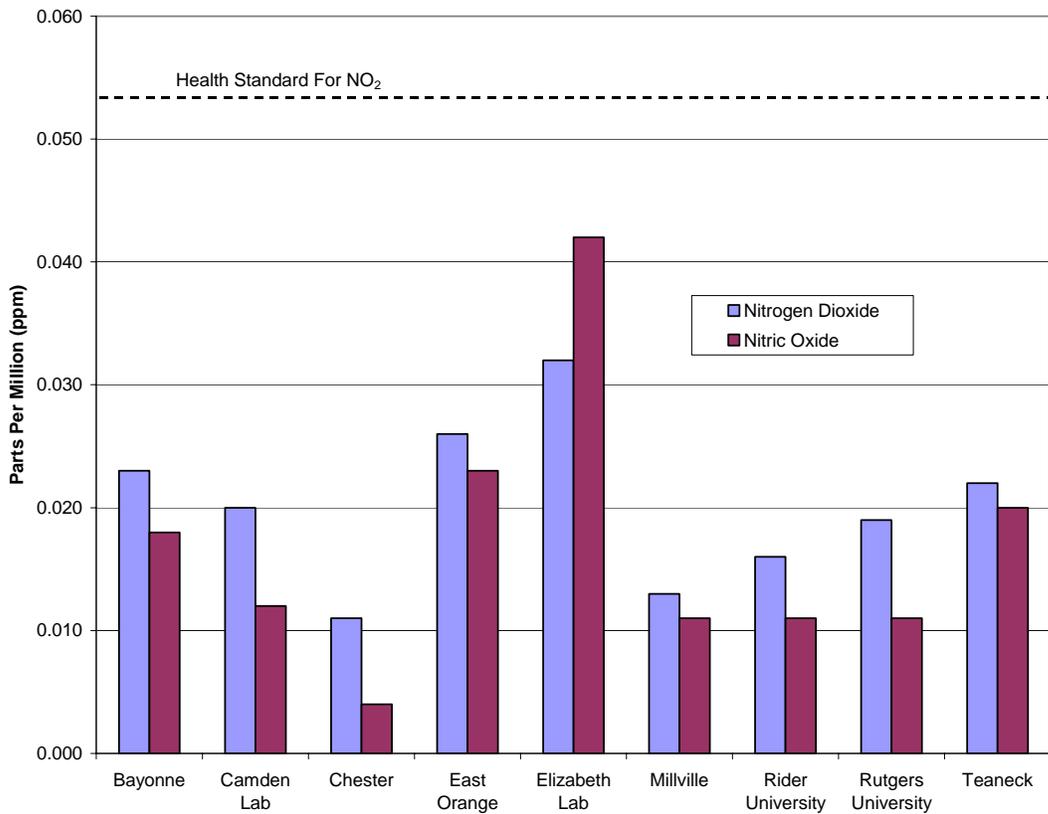
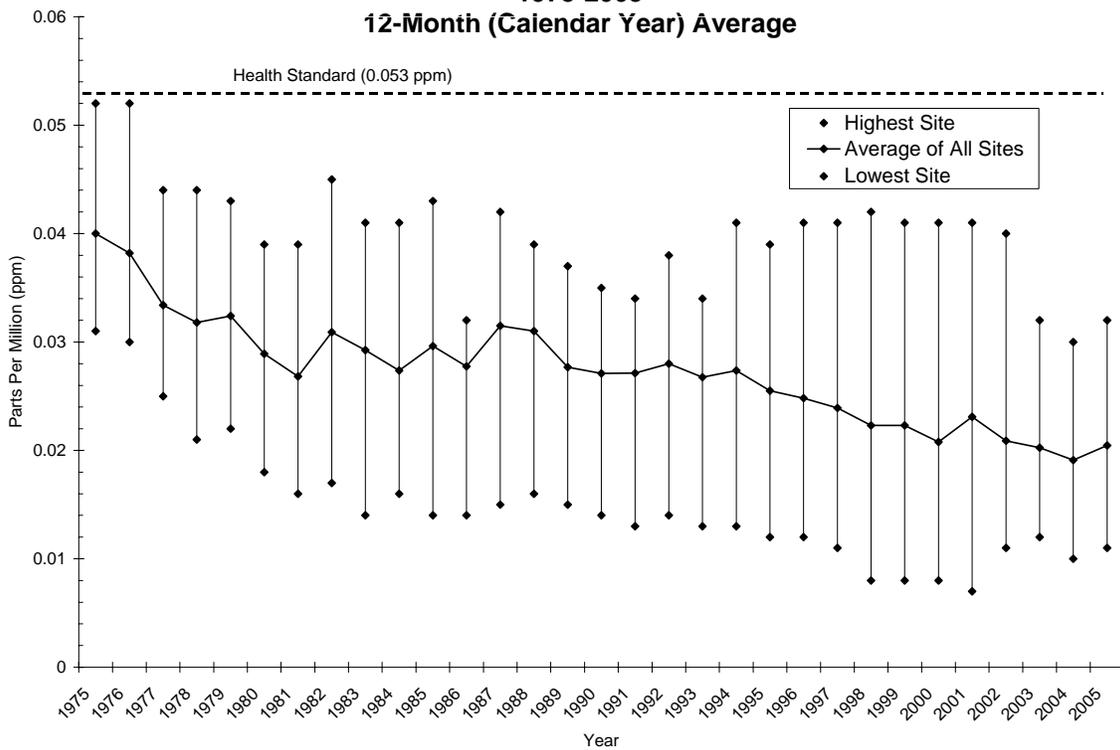


Figure 5
Nitrogen Dioxide Concentrations in New Jersey
1975-2005
12-Month (Calendar Year) Average



sites that measured the highest annual mean and lowest annual mean in each year as points above and below this trendline. Although NO_2 concentrations are well within the NAAQS, there is still a great deal of interest in oxides of nitrogen because of their role in the formation of other pollutants – most notably ozone and fine particles. Both these pollutants are of concern over much of the northeastern United States and efforts to reduce levels of ozone and fine particles are likely to require reductions in NO emissions.

TOTAL REACTIVE OXIDES OF NITROGEN (NO_y)

Although not specifically defined, there is a broad group of nitroxy compounds in the ambient air that react in the troposphere and contribute to the formation of ozone. These compounds, called Total Reactive Oxides of Nitrogen (NO_y), include nitrogen oxides (NO_x), peroxyacyl nitrates (RC(O)OONO_2 or PAN), peroxyntic acid (HO_2NO_2), nitrous acid (HONO), nitric acid (HNO_3), dinitrogen pentoxide (N_2O_5) and nitrate radicals ($\bullet\text{NO}_3$). NO_y can also be described as the sum of the nitrogen oxides (NO_x) and the atmospheric NO_x oxidation products. Although measuring NO_y is not required by the federal regulations, it is strongly recommended by the EPA to supplement the data collected by Photochemical Assessment Monitoring Stations (PAMS) Network. NO_y measurements may provide valuable information for evaluating chemical mechanisms in ozone (O_3) prediction models, indicate NO and NO_2 emission trends, and assist in developing regional control strategies for O_3 .

The identification and measurement of individual NO_y compounds is technically difficult and expensive, however, a few manufacturers have introduced analyzers that measure total NO_y concentrations. The NJDEP evaluated one of these commercially available NO_y analyzers at the Rider University station starting in March 2002. The Rider University station was selected as the testing location for the NO_y analyzer because it is also a PAMS station.

After a lengthy period of testing, it was determined that there are significant uncertainties in the NO_y concentrations due to technical problems with the analytical method. The NJDEP has decided to postpone further NO_y monitoring until more accurate measurement technologies are established and become available.

REFERENCES

Latest Findings on National Air Quality: 2000 Status and Trends, EPA-454/K-01-002, USEPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC, September 2001, URL: <http://www.epa.gov/oar/aqtrnd00/>.

National Air Quality and Emissions Trend Report, 2003 Special Studies Edition, EPA-454/R-03-005, USEPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC, September 2003, URL: <http://www.epa.gov/oar/aqtrnd03/>.

Meyer, Edwin L., Sennet, Donald H., Cole, Henry S., Richter, Harold G., *Technical Basis for Developing Control Strategies for High Ambient Concentrations of Nitrogen Dioxide*, EPA-450/4-80-017, USEPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC, 1980.

National Air Quality and Emissions Trend Report, 1999, EPA-454/R-01-004, USEPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC, March 2001, URL: <http://www.epa.gov/oar/aqtrnd99/>.

National Primary and Secondary Ambient Air Quality Standards for Nitrogen Dioxide, 40 CFR 50.11, US Government Printing Office, Washington DC, July 2001.

Nitrogen Dioxide and Respiratory Illness in Children, Health Effects Institute, 1994.

NO_x – How Nitrogen Oxides Affect the Way We Live and Breathe, USEPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC, September 1998, URL: <http://www.epa.gov/air/urbanair/nox/index.html>.

The Regional Transport of Ozone, New EPA Rulemaking on Nitrogen Oxide Emissions, EPA-456/F-98-006, USEPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC, URL: <http://www.epa.gov/air/noxfacts.pdf>.

Review Of The National Ambient Air Quality Standards For Nitrogen Dioxide Assessment Of Scientific And Technical Information, EPA-452/R-95-005, OAQPS staff paper, USEPA, Office of Air and Radiation, Office of Air Quality Planning and Standards, 1995.

Sittig, M., *Handbook of Toxic and Hazardous Chemicals and Carcinogens Third Edition, Volume 2*, Noyes Publications, Park Ridge, NJ, 1991.

ToxFaQs for Nitrogen Oxides, U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, April 2002, URL: <http://www.atsdr.cdc.gov/tfacts175.pdf>.

Utell, Mark J., *Mechanisms of Nitrogen Dioxide Toxicity in Humans*, Health Effects Institute, 1991.



2005 Ozone Summary

New Jersey Department of Environmental Protection

NATURE AND SOURCES

Ozone (O₃) is a gas consisting of three oxygen atoms. It occurs naturally in the upper atmosphere (stratospheric ozone) where it protects us from harmful ultraviolet rays (see Figure 1). However, at ground-level (tropospheric ozone) it is considered an air pollutant and can have serious adverse health effects. Ground-level ozone is created when nitrogen oxides (NO_x) and volatile organic compounds (VOC's) react in the presence of sunlight and heat. NO_x is primarily emitted by motor vehicles, power plants, and other sources of combustion. VOC's are emitted from sources such as motor vehicles, chemical plants, factories, consumer and commercial products, and even natural sources such as trees. Ozone and the pollutants that form ozone (precursor pollutants) can also be transported into an area from sources hundreds of miles upwind.

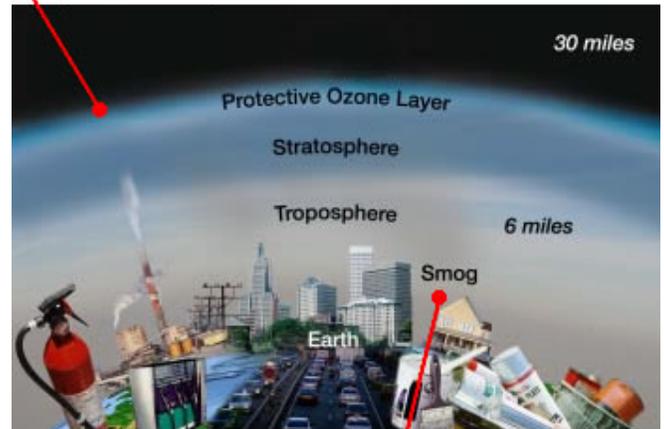
Since ground-level ozone needs sunlight to form, it is mainly a daytime problem during the summer months. Weather patterns have a significant effect on ozone formation and hot, dry summers will result in more ozone than cool, wet ones. In New Jersey, the ozone monitoring season runs from April 1st to October 31st, although unhealthy conditions are rare before mid-May or after the first few weeks of September. For a more complete explanation of the difference between ozone in the upper and lower atmosphere, see the U.S. Environmental Protection Agency (EPA) publication "Ozone: Good Up High, Bad Nearby".

ENVIRONMENTAL EFFECTS

Ground-level ozone damages plant life and is responsible for 500 million dollars in reduced crop production in the United States each year. It interferes with the ability of plants to produce and store food, making them more susceptible to disease, insects, other pollutants, and harsh weather. "Bad" ozone damages the foliage of trees and other plants, sometimes marring the landscape of cities, national parks and forests, and recreation areas. The black areas on the leaves of the blackberry bush and sassafras tree shown in Figure 2 and Figure 3 are damage caused by exposure to ground-level ozone. (Figure 2 and 3 Photos by: Teague Prichard, Wisconsin Department of Natural Resources)

Figure 1: Good and Bad Ozone

Ozone is good up here... Many popular consumer products like air conditioners and refrigerators involve CFCs or halons during either manufacturing or use. Over time, these chemicals damage the earth's protective ozone layer.



Ozone is bad down here... Cars, trucks, power plants and factories all emit air pollution that forms ground-level ozone, a primary component of smog.

Source: EPA

Figure 2: Ozone Damage to Blackberry Bush



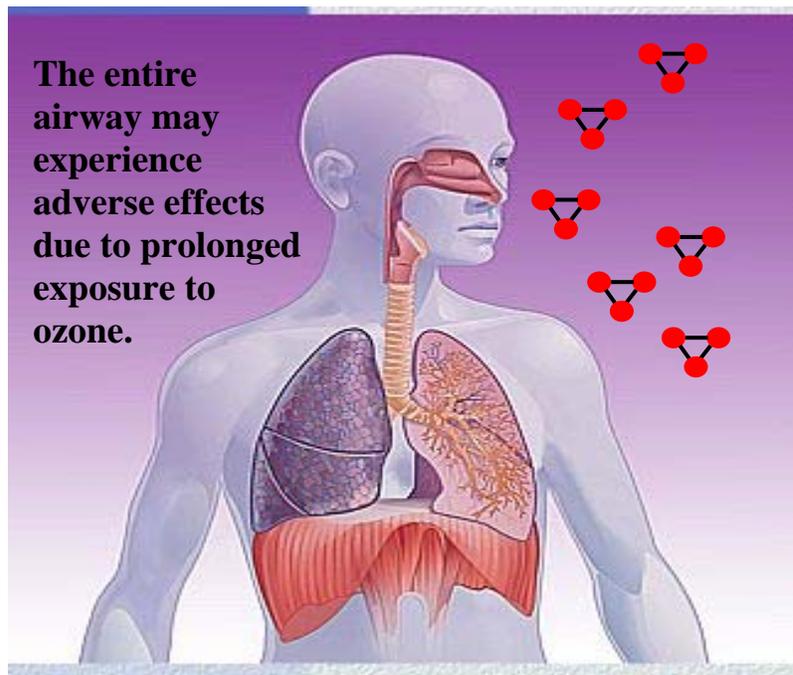
Figure 3: Ozone Damage to Sassafras Tree



HEALTH EFFECTS

Repeated exposure to ozone pollution may cause permanent damage to the lungs. Even when ozone is present in low levels, inhaling it can trigger a variety of health problems including chest pains, coughing, nausea, throat irritation, and congestion. Ozone also can aggravate other health problems such as bronchitis, heart disease, emphysema, and asthma, and can reduce lung capacity. People with pre-existing respiratory ailments are especially prone to the effects of ozone. For example, asthmatics affected by ozone may have more frequent or severe attacks during periods when ozone levels are high. As shown in Figure 4 ozone can irritate the entire respiratory tract. Children are also at risk for ozone related problems. Their respiratory systems are still developing and they breathe more air per pound of body weight than adults. They are also generally active outdoors during the summer when ozone levels are at their highest. Anyone who spends time outdoors in the summer can be affected and studies have shown that even healthy adults can experience difficulty in breathing when exposed to ozone. Anyone engaged in strenuous outdoor activities, such as jogging, should limit activity to the early morning or late evening hours on days when ozone levels are expected to be high.

Figure 4



**The entire
airway may
experience
adverse effects
due to prolonged
exposure to
ozone.**

**Area of the Respiratory Tract that
may be Affected by Ozone**

AMBIENT AIR QUALITY STANDARDS FOR OZONE

National and state air quality standards have been established for ground-level ozone. There are both primary standards, which are based on health effects, and secondary standards, which are based on welfare effects (e.g. damage to trees, crops and materials). For ground-level ozone, the primary and secondary National Ambient Air Quality Standards (NAAQS) are the same (see Table 1). The ozone NAAQS were revised in 1997 because EPA had determined that the old standard of 0.12 parts per million (ppm) maximum daily one-hour average was not sufficiently protective of public health. They set a revised standard of 0.08 ppm maximum daily 8-hour average. The standard changes were challenged in court but eventually upheld. As many people are accustomed to the old standards, summary information relative to that standard will be provided in this report along with summaries based on the new standard.

OZONE NETWORK

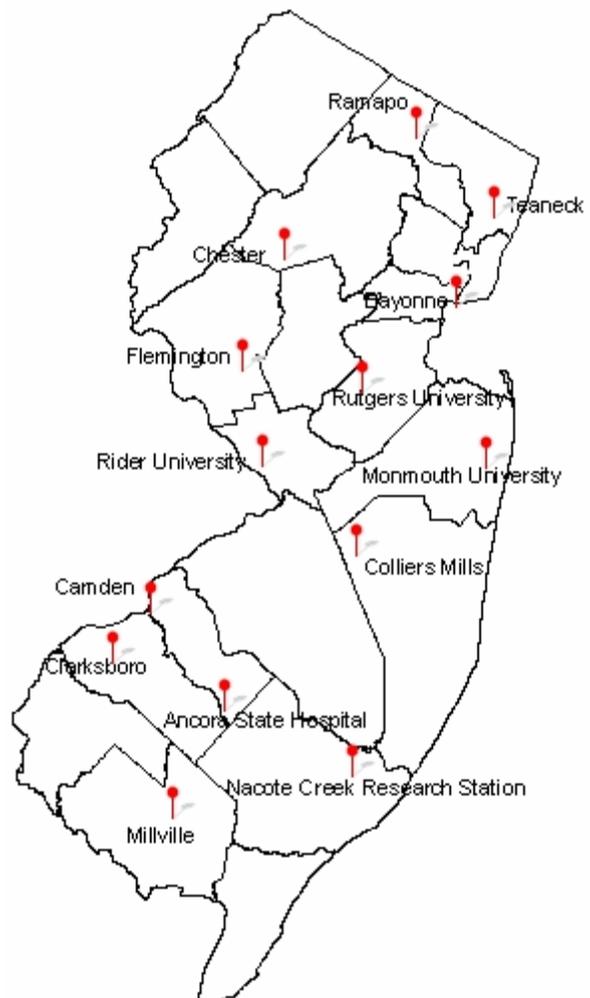
Ozone was monitored at 14 locations in New Jersey during 2005. Of those 14 sites, 11 operated year round and 3 operated only during the ozone season (April 1st through October 31st). Site locations are shown in Figure 5.

Table 1
National and New Jersey Ambient Air Quality Standards for Ozone

ppm = Parts per Million

Averaging Period	Type	New Jersey	National
1-Hour	Primary	0.12 ppm	0.12 ppm
1-Hour	Secondary	0.08 ppm	0.12 ppm
8-Hour	Primary	-----	0.08 ppm
8-Hour	Secondary	-----	0.08 ppm

Figure 5
2005 Ozone Monitoring Network

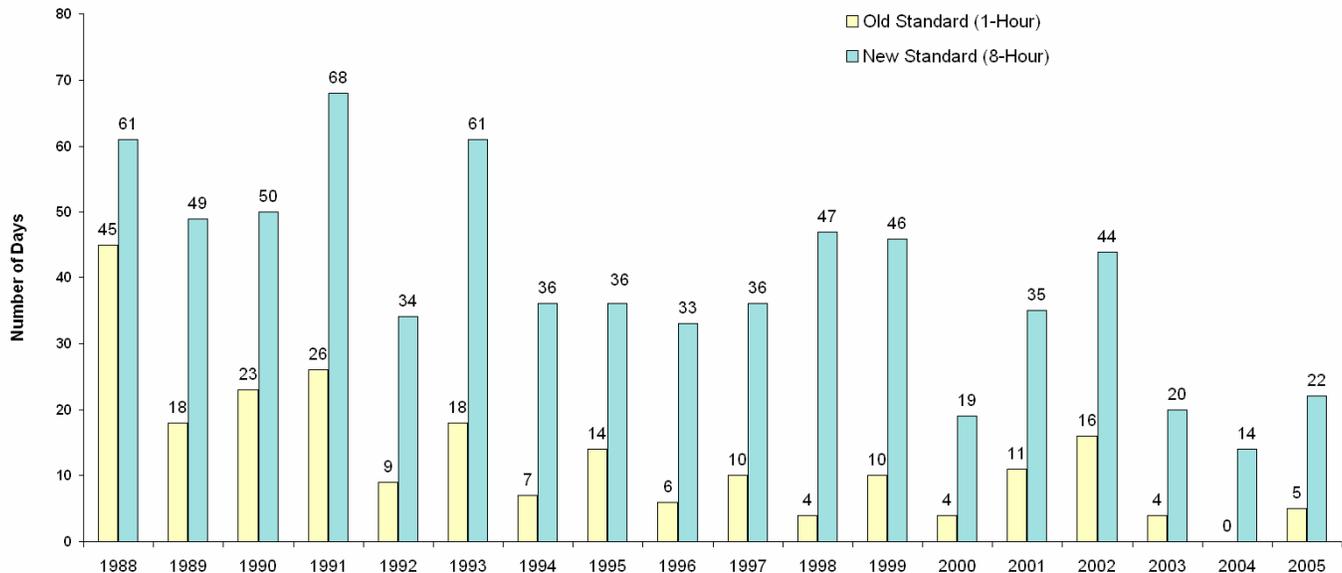


HOW THE CHANGES TO THE OZONE STANDARDS AFFECT AIR QUALITY RATINGS

In 2005 there were five days on which the old standard was exceeded in New Jersey and 22 days on which the new standard was exceeded. Significant progress is being made towards meeting the old standard (see Figure 6 below). There are fewer days on which that standard is exceeded, and when it is, fewer sites tend to be involved. Also, the maximum levels reached are not as high as they were in the past. The maximum 1-hour average concentration recorded in 1988 was 0.218 ppm, compared to a maximum of 0.141 ppm in 2005.

It is apparent, however, that the current standard is significantly more stringent than the old one (see Figure 6 below). As a result, additional control measures to reduce ozone levels will be needed. These measures will have to be implemented over a wide area and will require the cooperative effort of many states and the federal government if they are to be successful.

Figure 6
Days on Which the Old and New
Ozone Standards Have Been Exceeded in New Jersey
1988 - 2005



DESIGN VALUES

The NAAQS for ozone are set in such a way that determining whether they are being attained is not based on a single year. For example, an area was considered to be attaining the old 1-hour average standard if the average number of times the standard was exceeded over a three-year period was 1 or less (after correcting for missing data). Thus it was the fourth highest daily maximum 1-hour concentration that occurred over a three-year period that determined if an area would be in attainment. If the fourth highest value was above 0.12 ppm then the average number of exceedances would be greater than 1. The fourth highest value is also known as the design value.

Under the new standard, attainment is determined by taking the average of the fourth highest daily maximum 8-hour average concentration that is recorded each year for three years. This becomes the design value for an area under the new standard. When plans are developed for reducing ozone concentrations, an area must demonstrate that the ozone reduction achieved will be sufficient to ensure the design value will be below the NAAQS, as opposed to ensuring that the standards are never exceeded. This avoids having to develop plans based on extremely rare events.

Figures 7 and 8 show the design value for the 1 and 8-hour standards starting with the 1986-1988 period. Design values are calculated for all ozone sites in the network and the median, maximum and minimum for each year were used in the graphics.

Figure 7
1 Hour Ozone Air Quality, 1986 - 2005
(Based on 4th Highest 1-hour average - Design Values)

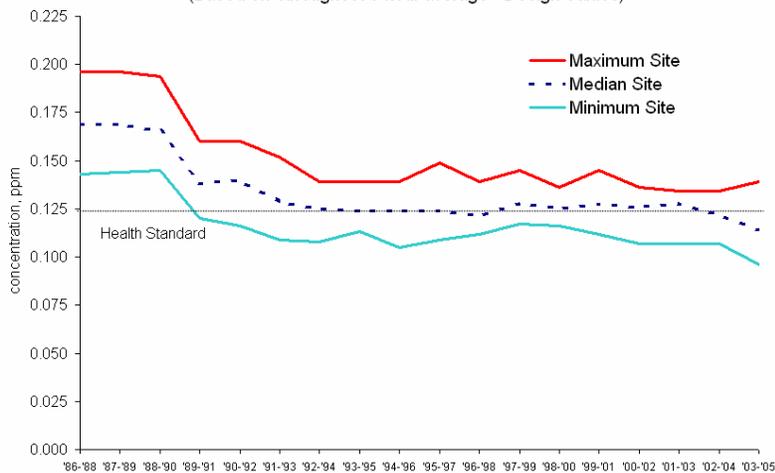
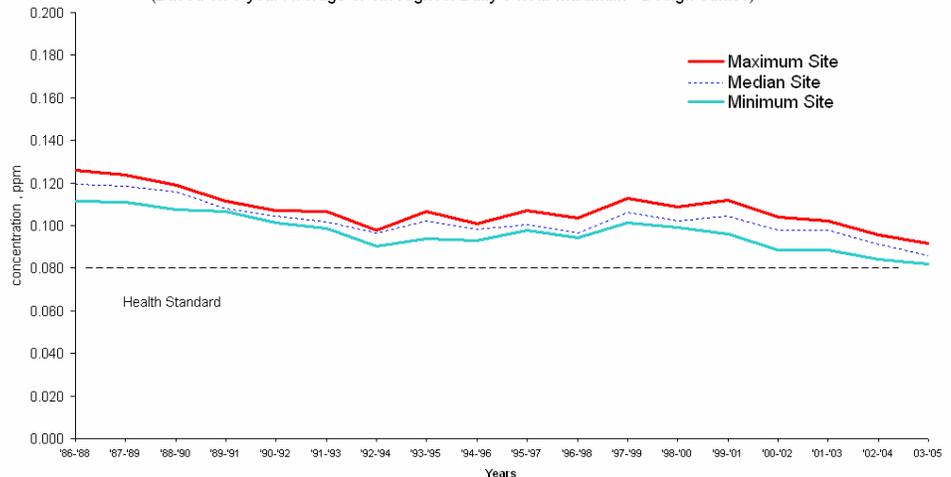


Figure 8

8-Hour Ozone Air Quality, 1986 - 2005

(Based on 3 year Average of 4th Highest Daily 8-hour Maximum - Design Values)

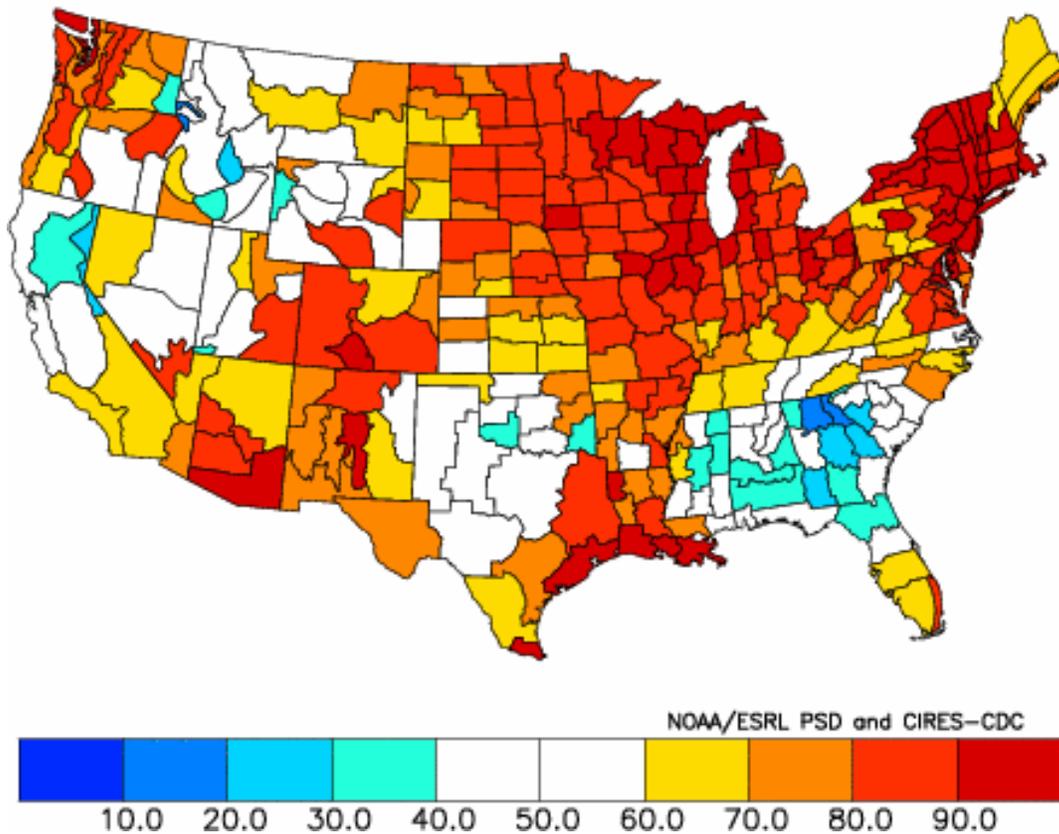


MAJOR OZONE EPISODES

Historically, several ozone episodes occur throughout the New Jersey summer. The 2005 ozone season, unlike a typical New Jersey ozone season, produced no major ozone episodes. An ozone episode is loosely defined as two or more consecutive days of widespread ozone concentrations above the health standard. There were 5 exceedance days above the 0.12 ppm level and 22 exceedance days of the 0.08 ppm standard. Both July 21st and September 13th produced the most single day exceedances as 10 sites went above the 0.08 ppm standard with Colliers Mills and Camden being the highest, respectively with 0.104 ppm and 0.098 ppm 8-hour averages. As recently as 1998, there were 47 days when ozone concentrations were above the 8-hour standard. Unlike 2005, the 1998 exceedance days were more widespread with typically more than half of the monitors exceeding the standard on each exceedance day. There were instances in 2005 when several consecutive days recorded exceedances of the 8-hour standard, but they were not widespread occurrences. August 11th -14th were all exceedance days but at no more than 5 monitors per day and at only 1 monitor exceeded the standard on August 14th.

The summer of 2005 showed typical weather characteristics of an ordinary New Jersey ozone season. Figure 9 below illustrates the average temperature throughout the summer and how it deviated from typical averages. Besides the Southeast, most of the nation experienced near standard summer temperatures. Ozone exceedances remained relatively low, despite normal hot and humid conditions.

Figure 9
Temperature Percentile Value Relative to 1895–1999
Apr to Sep 2005



SUMMARY OF 2005 Ozone Data Relative to the 1-HOUR STANDARD

Of the 14 monitoring sites that operated during the 2005 ozone season, 5 recorded levels above the old 1-hour standard of 0.12 ppm during the year. The highest 1-hour concentration was 0.141 ppm at the Bayonne monitor on July 22nd. In the 2004 ozone season no sites recorded levels above the 1-hour standard.

Figure 10
Highest and Second Highest Daily 1-Hour Averages

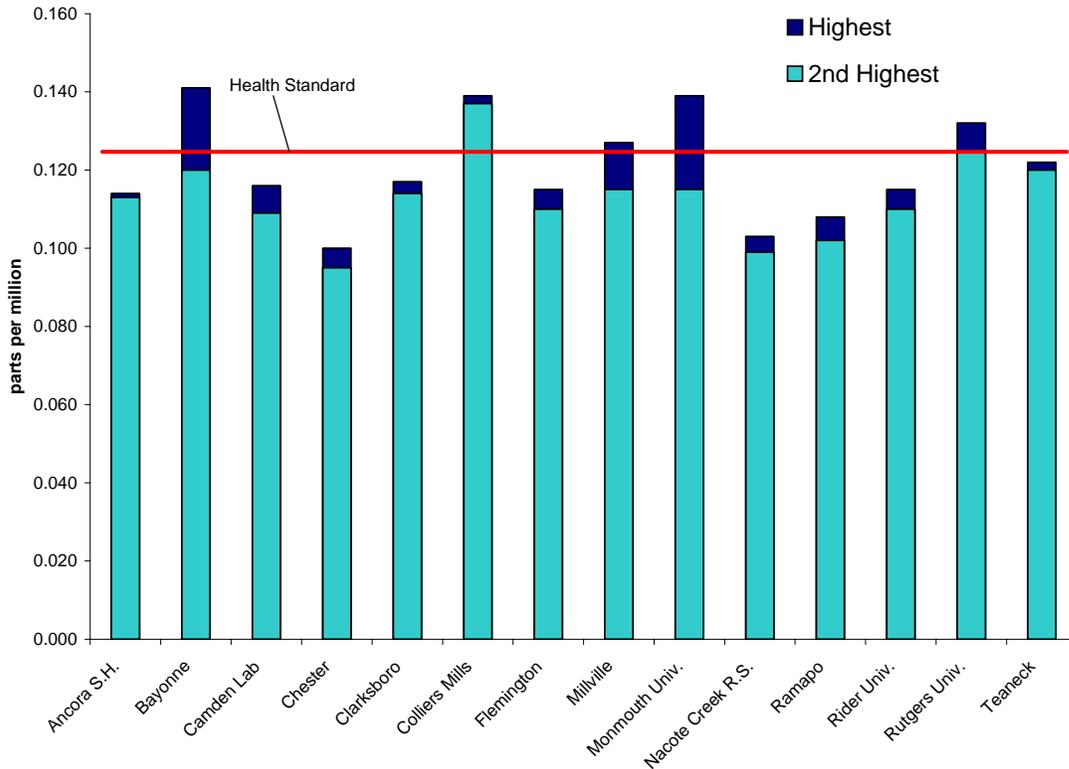


Table 3
Ozone Data – 2005
1-Hour Averages

Parts Per Million (ppm)

1-hour standard is 0.12 ppm

Monitoring Site	1-hr Max	2nd Highest 1-hr Max	4th Highest ¹ 1-hour Average 2003-2005	# of days with 1-hour Averages above 0.12ppm
Ancora S.H.	0.114	0.113	0.114	0
Bayonne	0.141	0.120	0.115	1
Camden Lab	0.116	0.109	0.114	0
Chester	0.100	0.095	0.096	0
Clarksboro	0.117	0.114	0.117	0
Colliers Mills	0.139	0.137	0.122	2
Flemington	0.115	0.110	0.114	0
Millville	0.127	0.115	0.113	1
Monmouth Univ.	0.139	0.115	0.139	1
Nacote Creek R.S.	0.103	0.099	0.101	0
Ramapo	0.108	0.102	0.102	0
Rider University	0.115	0.110	0.110	0
Rutgers University	0.132	0.125	0.120	2
Teaneck	0.122	0.120	0.110	0
Statewide	0.141	0.139	0.139	5

SUMMARY OF 2005 OZONE DATA RELATIVE TO THE 8-HOUR STANDARD

All 14 monitoring sites that operated during the 2005 ozone season recorded levels above the 8-hour standard of 0.08 ppm. Colliers Mills recorded the most exceedances with 14. The highest 8-hour concentration recorded was 0.110 ppm at the Millville site on July 22nd. 12 of 14 sites recorded levels above the 8-hour standard in 2004, with a maximum concentration of 0.103 ppm, recorded at the Ancora S.H. site on July 21st. Design values for the 8-hour standard were also above the standard at 10 of 14, indicating that the ozone standard is being violated throughout most of New Jersey.

Figure 11
Ozone Design Values for 2003-2005
 3 Year Average of the 4th Highest 8-Hour Value

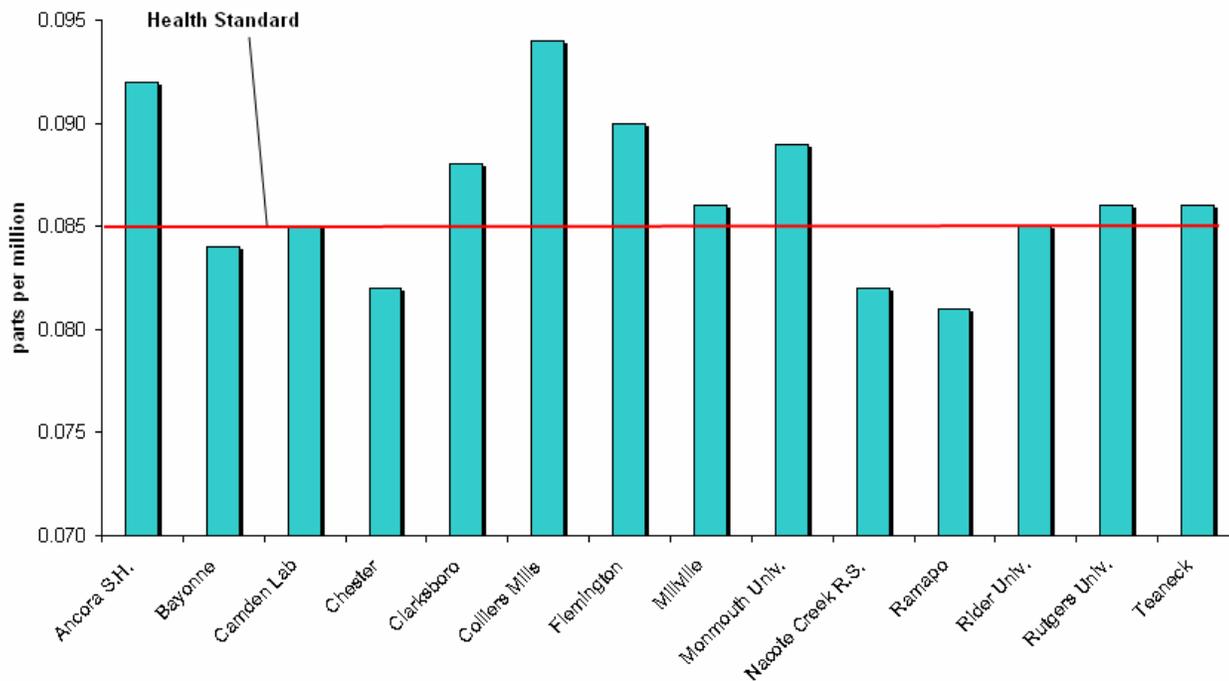
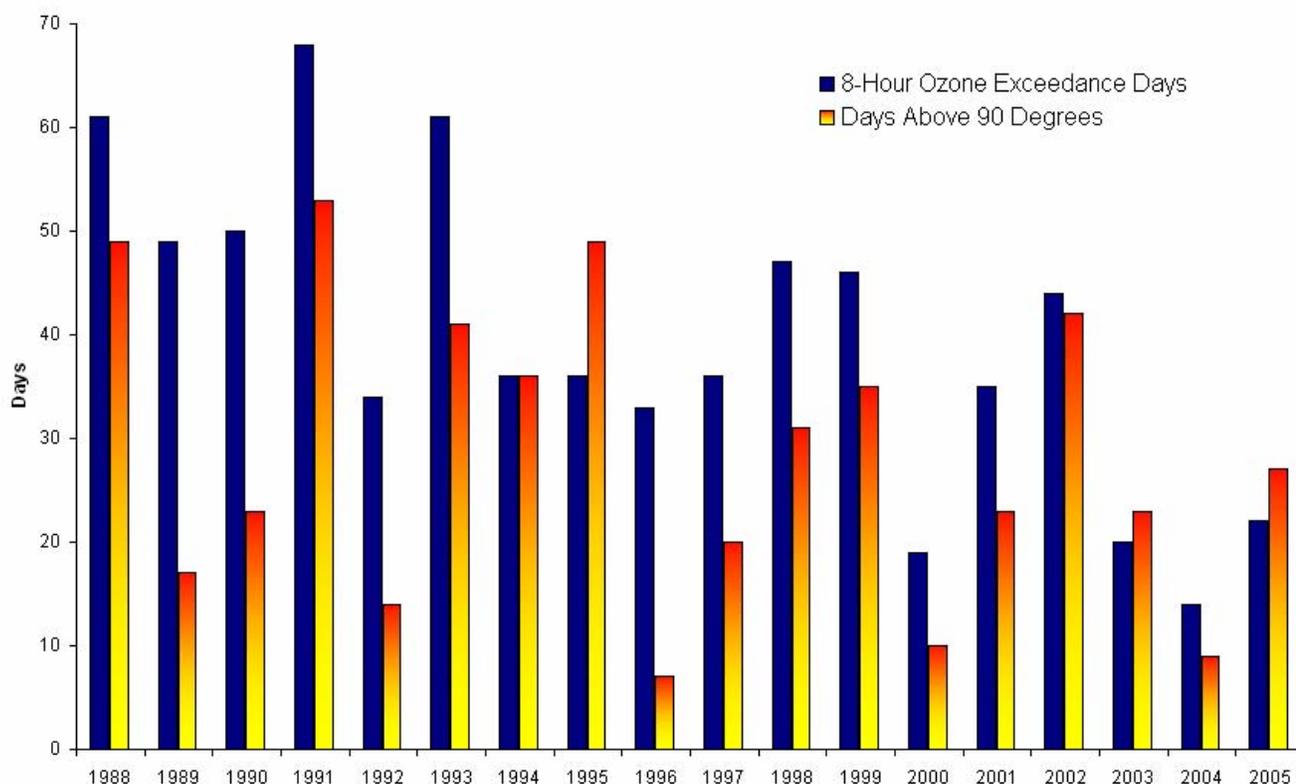


Table 4
Ozone Data – 2005
8-Hour Averages
Parts Per Million (ppm)
 8-hour standard is 0.08 ppm

Monitoring Site	1 st Highest	2 nd Highest	3 rd Highest	4 th Highest	Avg. of 4 th Highest 8-hour Averages 2003-2005	# of days with 8-hour above 0.08ppm
Ancora S.H.	0.097	0.096	0.093	0.092	0.092	12
Bayonne	0.096	0.093	0.092	0.091	0.084	6
Camden Lab	0.100	0.098	0.092	0.087	0.085	5
Chester	0.091	0.088	0.085	0.081	0.082	3
Clarksboro	0.097	0.094	0.091	0.091	0.088	6
Colliers Mills	0.109	0.104	0.104	0.100	0.094	14
Flemington	0.100	0.093	0.093	0.093	0.090	13
Millville	0.110	0.092	0.088	0.085	0.086	4
Monmouth Univ.	0.100	0.096	0.089	0.088	0.089	8
Nacote Creek R.S.	0.091	0.087	0.086	0.084	0.082	3
Ramapo	0.095	0.091	0.091	0.088	0.081	8
Rider University	0.099	0.094	0.093	0.089	0.085	7
Rutgers University	0.097	0.095	0.095	0.093	0.086	10
Teaneck	0.100	0.094	0.093	0.091	0.086	8
Statewide	0.110	0.109	0.104	0.104	0.100	22

Figure 12

**Number of Days 8-Hour Ozone Standard was Exceeded and
Number of Days Above 90 Degrees in New Jersey 1988 - 2005**



ACCOUNTING FOR THE INFLUENCE OF WEATHER

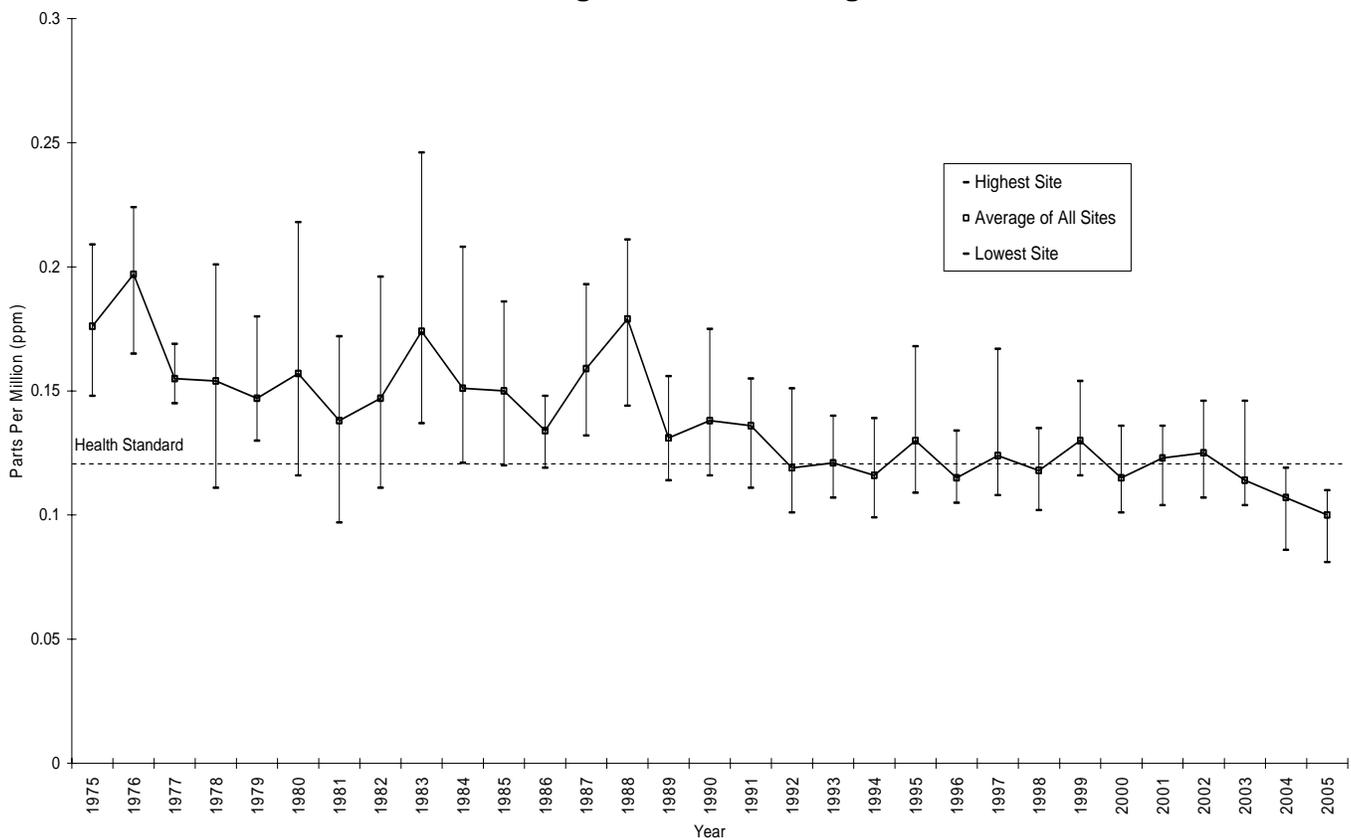
Trends in ground level ozone are influenced by many factors including weather conditions, transport, growth, and the state of the economy, in addition to changes brought about by regulatory control measures. Of these factors, weather probably has the most profound effect on year to year variations in ozone levels. Several methods have been developed to try to account for the effect of weather on ozone levels so that the change due to emissions could be isolated. While none of these methods are completely successful they do show that over the long term, real reductions in ozone levels have been achieved. A

simple way of showing the changing effect of weather on ozone is shown above in Figure 12. The number of days each year on which the ambient temperature was 90 degrees or greater is shown next to the number of days the ozone standard was exceeded. In the earliest years shown (1981-1985) there are significantly more days with high ozone than days above 90 degrees. But this pattern gradually changes and for the most recent years there are more "hot" days than "ozone" days. This is an indication that on the days when conditions are suitable for ozone formation, unhealthy levels are being reached less frequently.

OZONE TRENDS

The primary focus of efforts to reduce concentrations of ground-level ozone in New Jersey has been on reducing emissions of volatile organic compounds (VOCs). Studies have shown that such an approach should lower peak ozone concentrations, and it does appear to have been effective in achieving that goal. Maximum 1-hour concentrations have not exceeded 0.200 ppm since 1988 and the last time levels above 0.180 ppm were recorded was in 1990 (Figure 13). Improvements have leveled off in recent years, especially with respect to maximum 8-hour average concentrations. Significant further improvements will require reductions in both VOCs and NO_x. The NO_x reductions will have to be achieved over a very large region of the country because levels in New Jersey are dependent on emissions from upwind sources.

Figure 13
Ozone Concentrations in New Jersey
1975 – 2005
Second Highest 1-Hour Averages

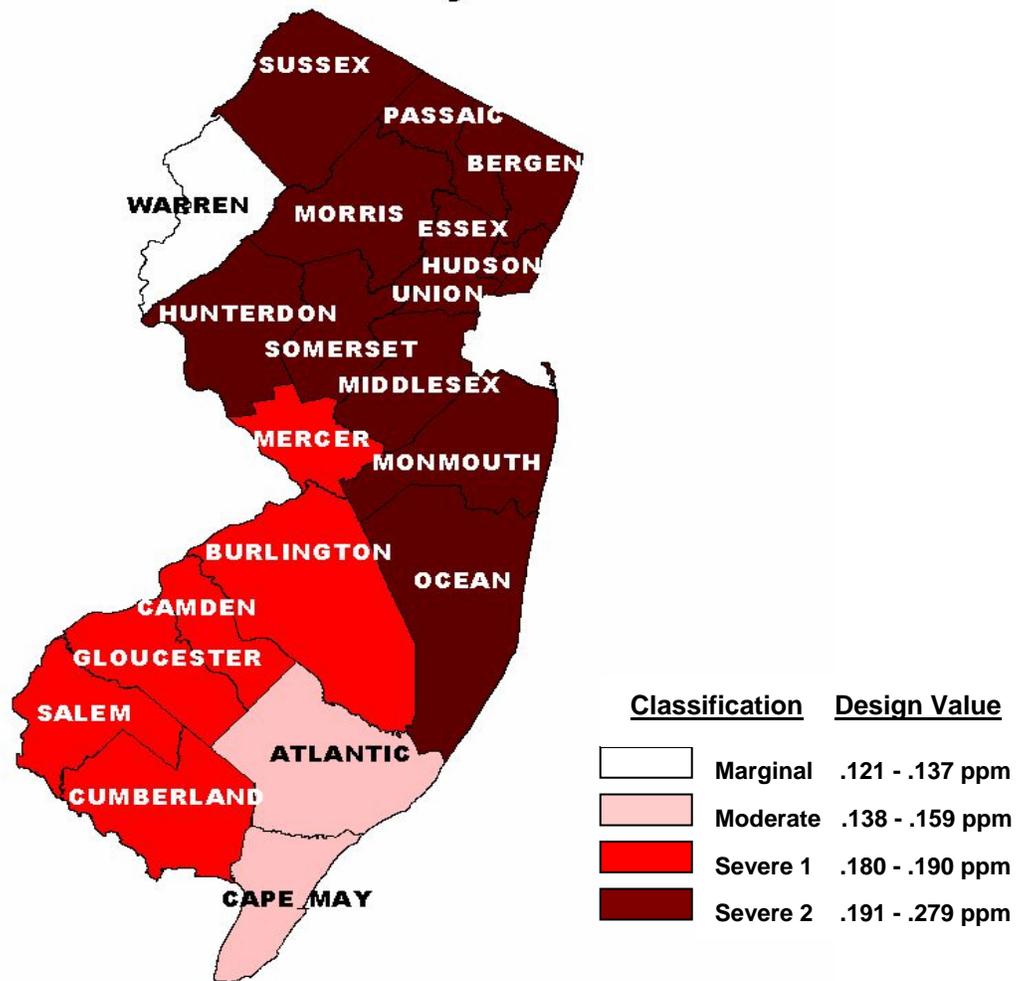


OZONE NON-ATTAINMENT AREAS IN NEW JERSEY

The Clean Air Act requires that all areas of the country be evaluated and then classified as attainment or non-attainment areas for each of the National Ambient Air Quality Standards. Areas can also be found to be “unclassifiable” under certain circumstances. The 1990 amendments to the act required that areas be further classified based on the severity of non-attainment. The classifications range from “marginal” to “extreme” and are based on “design values”. The design value is the value that actually determines whether an area meets the standard. For the 1-hour ozone standard for example, the design value is the fourth highest daily maximum 1-hour average concentration recorded over a three year period. Note that these classifications did not take into account the transport of ozone and its precursors and missed the concept of multi-state controls.

New Jersey is part of four planning areas, the New York, Philadelphia, Atlantic City and Allentown/Bethlehem areas. Their classification with respect to the old 1-hour standard is shown on the map below. Now that the new 8-hour average standard for ozone has been upheld by the courts, new designations will have to be made.

Figure 14
Ozone Non-Attainment Areas
in New Jersey



REFERENCES

Ozone: Good Up High, Bad Nearby, USEPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC October 1997, URL: www.epa.gov/oar/oaqps/gooduphigh/

USEPA Fact Sheet: *Health and Environmental Effects of Ground Level Ozone*, USEPA, Office of Air and Radiation, July 1997, URL: www.epa.gov/ttn/oarpg/naaqsfm/o3health.html

USEPA Ozone Map Archives, U RL: www.epa.gov/airnow/maparch.html

Enhanced Ozone Monitoring – PAMS General Information, USEPA,, 1994, URL: www.epa.gov/air/oaqps/pams/general.html

Guidelines for Developing an Air Quality (Ozone and PM2.5) Forecasting Program, EPA-456/R-03-002, June 2003

National Air Quality and Emissions Trend Report, 1999, EPA-454/R-01-004, USEPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC, March 2001, URL: www.epa.gov/oar/aqtrnd99/

Latest Findings on National Air Quality: 2000 Status and Trends, EPA-454/K-01-002, USEPA , Office of Air Quality Planning and Standards, RTP, September 2001, URL: www.epa.gov/oar/aqtrnd00/

Smog – Who Does it Hurt?, EPA-452/K-99-001, USEPA, Air and Radiation, Washington, DC, July 1999, URL: www.epa.gov/airnow/health/

Ozone and Your Health, EPA-152/F-99-000, USEPA, Air and Radiation, Washington, DC, September 1999, URL: www.epa.gov/airnow/brochure.html

Air Quality Guide for Ozone, EPA-456/F-002, Air and Radiation, Washington, DC, July 1999, URL: www.epa.gov/airnow/consumer.html



2005 Particulate Summary

New Jersey Department of Environmental Protection

NATURE AND SOURCES

Particulate air pollution is a complex mixture of organic and inorganic substances, present in the atmosphere as either liquids or solids. Particulates may be as large as 70 microns in diameter or smaller than 1 micron in diameter. Most Particulates are small enough that individual particles are undetectable by the human eye. Particles may travel hundreds of miles suspended in the atmosphere from their sources before reaching ground level.

Generally particulate pollution is categorized by size. Particles with diameters less than 2.5 microns are considered fine Particulates, often referred to as $PM_{2.5}$ (Figure 1). Particles with diameters greater than 2.5 microns are considered to be coarse Particulates. Coarse particles are further divided into Total Suspended Particulates (TSP) and PM_{10} . TSP consists of all suspended particles including the largest ones. PM_{10} consists of particles that are 10 microns in diameter or less. Particles smaller than 10 microns are considered to be inhalable and are a greater health risk. Particles of all sizes have an impact on the environment.

Particulates can occur naturally or be man made. Examples of naturally occurring particulates are windblown dust and sea salt. Man made particulates come from sources such as fossil fuel combustion and industrial processes. Man made sources can be divided into two categories Primary Particulates and Secondary Particulates. Primary Particulates are directly emitted from their sources while Secondary Particulates are created in the atmosphere through reactions of gaseous emissions.

ENVIRONMENTAL EFFECTS

Particulate matter is the major cause of reduced visibility in many parts of the United States. Figure 2a provides an example of reduced visibility due to particulate pollution recorded by our WebCam site in Newark. Figure 2b is an example of a day with low particulate pollution and good visibility. The backdrop is the New York City sky-line. Airborne particles can also impact vegetation and aquatic ecosystems, and can cause damage to paints and building

materials. More information is provided in the Regional Haze section of this report.

Figure 1
Size of $PM_{2.5}$ Particle Compared to a Human Hair

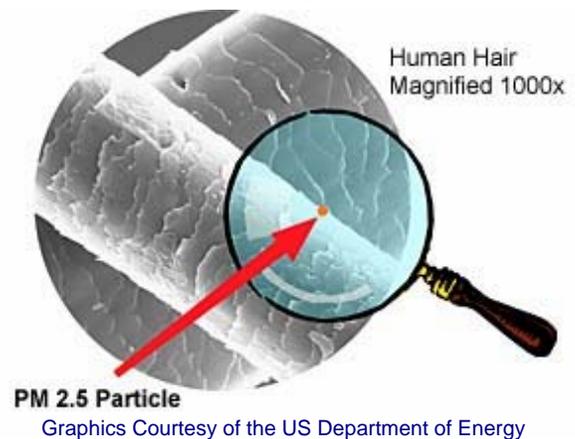


Figure 2a



Figure 2b



HEALTH EFFECTS

Inhalable particles (smaller than 10 microns) and especially fine particles (PM_{2.5}) are a health concern because they are easily breathed into the lungs. Various health problems are associated with both long and short-term exposures. When inhaled, these particles can accumulate in the respiratory system and are responsible for heart and lung conditions, such as asthma, bronchitis, cardiac arrhythmias, heart attacks, and can even be attributed to premature death. Groups that appear to be at the greatest risk from particulates include children, the elderly, and individuals with heart and lung diseases, such as asthma (*US EPA, 2001*).

STANDARDS

In 1971, EPA set primary (health based) and secondary (welfare based) standards for total suspended particulate matter (TSP). These standards, known as the National Ambient Air Quality Standards (NAAQS), were based on maximum 24-hour and annual concentrations (*US EPA, 1997*). The annual standards were based on the geometric mean concentrations over a calendar year, and the 24-hour standards were based on the arithmetic average concentration from midnight to midnight. The primary 24-hour average standard for TSP was set at 260 micrograms per cubic meter (µg/m³) and the annual geometric mean health standard was set at 75 µg/m³. The 24-hour secondary standard was set at 150 µg/m³. While EPA did not establish a secondary annual standard for TSP they did

set a guideline of 60 µg/m³ to be used to ensure that the secondary 24-hour standard was being met throughout the year. Although New Jersey still maintains state standards for TSP, the national standards have been replaced with standards for smaller particles as described below. As a result, monitoring for TSP has largely been discontinued, with the exception of one station, where TSP samples are taken to analyze for lead (Pb). See the Lead Summary section for more details.

In 1987, EPA replaced the TSP standards with standards that focused only on inhalable particles. Inhalable particles are defined as particles less than 10 microns in diameter (PM₁₀). The 24-hour PM₁₀ primary and secondary standards were set at 150 µg/m³, and the annual primary and secondary standards were set at 50 µg/m³. The annual standard for PM₁₀ is based on the arithmetic mean, as opposed to the geometric mean that was used for TSP.

In 1997, EPA promulgated new standards for fine particulates, which it defined as particles less than 2.5 microns in diameter (PM_{2.5}). They kept the existing standards for PM₁₀ as well. The PM_{2.5} annual primary and secondary standards were set at 15 µg/m³ and the 24-hour standard was set at 65 µg/m³. Table 1 provides a summary of the Particulate Matter standards.

Table 1
National and New Jersey
Ambient Air Quality Standards for Particulate Matter

Micrograms Per Cubic Meter (µg/m³)

Standard	Averaging Period	Type	New Jersey	National
Total Suspended Particulates (TSP)	12-Month [‡]	Primary	75 µg/m ³	---
	24-Hour	Primary	260 µg/m ³	---
	12-Month [‡]	Secondary	60 µg/m ³	---
	24-Hour	Secondary	150 µg/m ³	---
Inhalable Particulates (PM ₁₀)	Annual [†]	Primary & Secondary	---	50 µg/m ³
	24-Hour Average	Primary & Secondary	---	150 µg/m ³
Fine Particulates (PM _{2.5})	Annual [†]	Primary & Secondary	----	15 µg/m ³
	24-Hour Average	Primary & Secondary	----	65 µg/m ³

[‡] Annual Geometric Mean

[†] Annual Arithmetic Mean

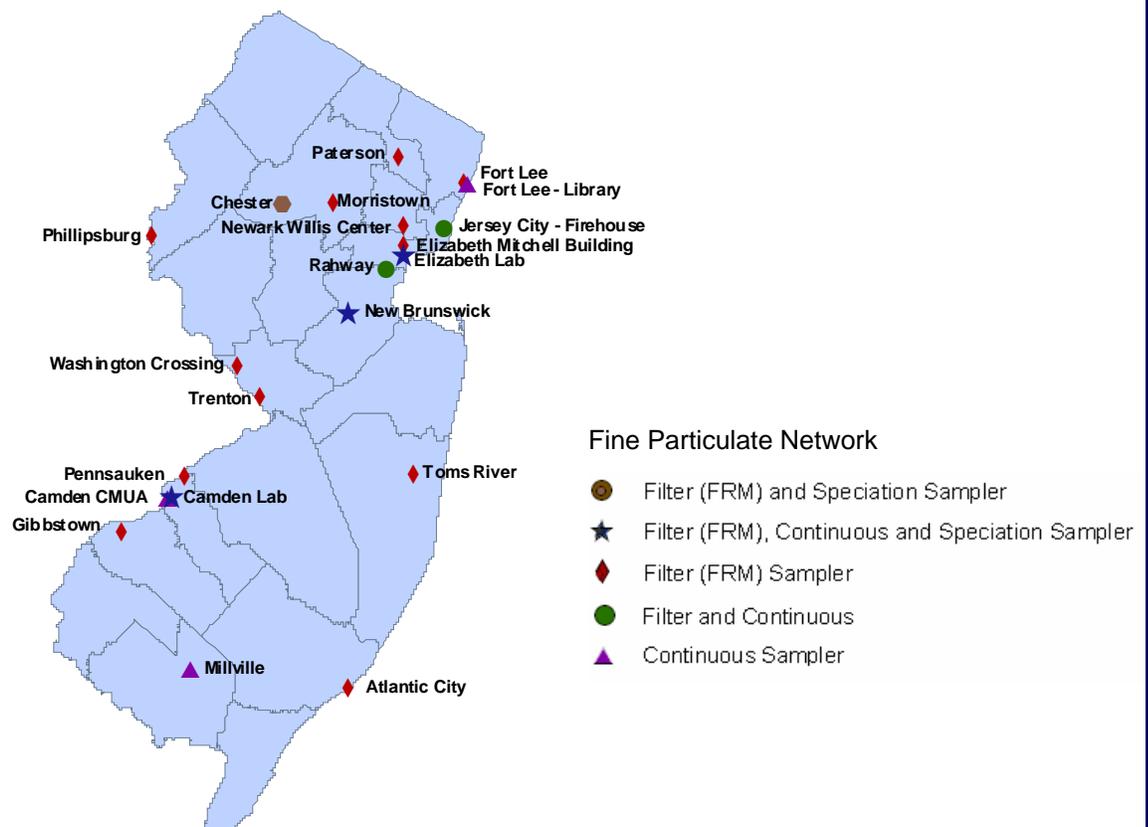
PARTICULATE MONITORING NETWORK

New Jersey's Particulate Monitoring Network consists of 22 fine particulate monitoring sites, 6 PM₁₀ monitoring sites, 1 TSP monitoring site, and 10 sites where smoke shade is monitored.

Samplers that comply with strict EPA specifications are used for collecting data that is submitted to a national database maintained by the EPA. These samplers pull a predetermined amount of air through a filter for a 24-hour period capturing particles on the filter. Different sample inlets determine what size particles will be captured. The filters are weighed before and after sampling under controlled environmental conditions to determine the concentration. The data is then used by the NJDEP and EPA to determine whether the state, or portions of the state, meet the federal health and welfare standards for particulate matter. Because these samplers are required to run for 24-hour period and can not provide data in real time the NJDEP employs additional samplers that continuously measure particulate concentrations. These

samplers are used by the NJDEP to report current air quality to the public through the Air Quality Index (www.state.nj.us/dep/airmon). The NJDEP uses Tapered Element Oscillating Microbalance (TEOM) analyzers and smoke shade instruments for real-time particle reporting. The TEOM analyzers collect a sample of fine particles on an oscillating filter, and determine the concentration based on the change in the frequency at which the filter oscillates. Smoke shade instruments collect a sample of particles on a paper tape for one hour. At the end of each hour the amount of light that will pass through the spot that has formed on the tape is measured, the tape advanced, and the cycle started over. The amount of light transmittance measured is used as an estimate of actual particle concentrations.

Figure 3
2005 PM_{2.5}
Monitoring Network



FINE PARTICLE SUMMARY

FINE PARTICLE MONITORING SITES

There are 19 monitoring sites in New Jersey where a filter-based sampler routinely collects 24-hour PM_{2.5} samples (see Figure 3). At 7 sites, continuous particulate monitors (TEOMs) measure the concentration of fine particles every minute and transmit the data to the Bureau of Air Monitoring's central computer, where it is made available on the Bureau's Public Website (www.state.nj.us/dep/airmon). Additionally, at four of these locations a separate 24-hour filter based sampler collects fine particles on three types of filter media which are subsequently analyzed using ion chromatography (IC), X-ray fluorescence (XRF), and Thermal Optical Analysis (TOA) to determine the concentrations of the chemical analytes that constitute the sample.

FINE PARTICLE CONCENTRATION SUMMARY

The annual mean concentration of PM_{2.5} ranged from 10.8 µg/m³ in Chester to 15.2 µg/m³ at Elizabeth Lab. The maximum 24-hour concentrations ranged from 26.5 µg/m³ at Atlantic City to 51.4 µg/m³ at Fort Lee Library.

Figure 4 and Table 2 depicts the mean and maximum concentrations at each site.

None of the sites exceeded the 24-hour standard of 65 µg/m³. Two sites, Elizabeth Lab and Jersey City Firehouse exceeded the annual standard of 15.0 µg/m³. The annual mean concentration at Elizabeth Lab was 15.2 µg/m³ and the annual mean concentration at Jersey City Firehouse was 15.1 µg/m³. The annual mean concentration at Union City was 16.9 µg/m³, but not enough data was collected to calculate an annual average. In 2005 non-attainment designations were made in areas of the state that did not meet AQS guidelines for fine particulates. For more detail see page 8.

Figure 4
2005 Fine Particulate (PM_{2.5})

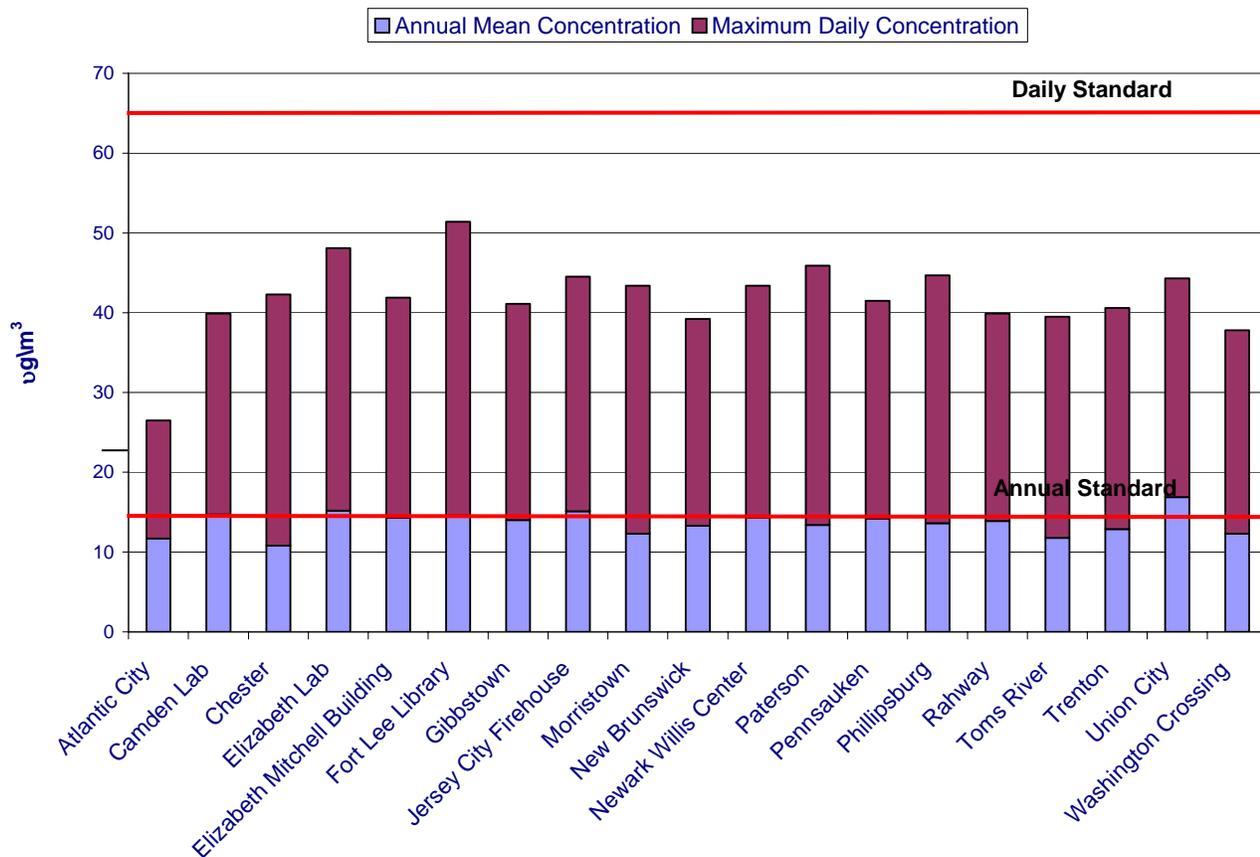


Table 2
PM_{2.5} Summary Data – 2005

Monitoring Site	Number of Samples	24-Hour Maximum µg/m ³	Second Highest 24-Hour Maximum µg/m ³	Annual Mean µg/m ³
Atlantic City	84	26.5	25.4	11.7
Camden Lab	106	39.9	38.1	14.7
Chester	110	42.3	37.5	10.8
Elizabeth Lab	326	48.1	44.4	15.2
Elizabeth Mitchell Building	103	41.9	39.3	14.3
Fort Lee Library	109	51.4	44.0	14.6
Gibbstown	106	41.1	38.8	14.0
Jersey City Firehouse	107	44.5	41.1	15.1
Morristown	112	43.4	39.8	12.3
New Brunswick	108	39.2	34.7	13.3
Newark Willis Center	106	43.4	40.5	14.3
Paterson	104	45.9	42.1	13.4
Pennsauken	114	41.5	38.3	14.2
Phillipsburg	117	44.7	35.8	13.6
Rahway	104	39.9	38.7	13.9
Toms River	118	39.5	35.8	11.8
Trenton	107	40.6	36.0	12.9
Union City *	50	44.3	43.5	16.9
Washington Crossing	103	37.8	33.5	12.3

* Site did not start collecting data until July

Table 3
2005 Summary of Continuous PM_{2.5} Data

Concentration in Micrograms Per Cubic Meter (µg/m³)

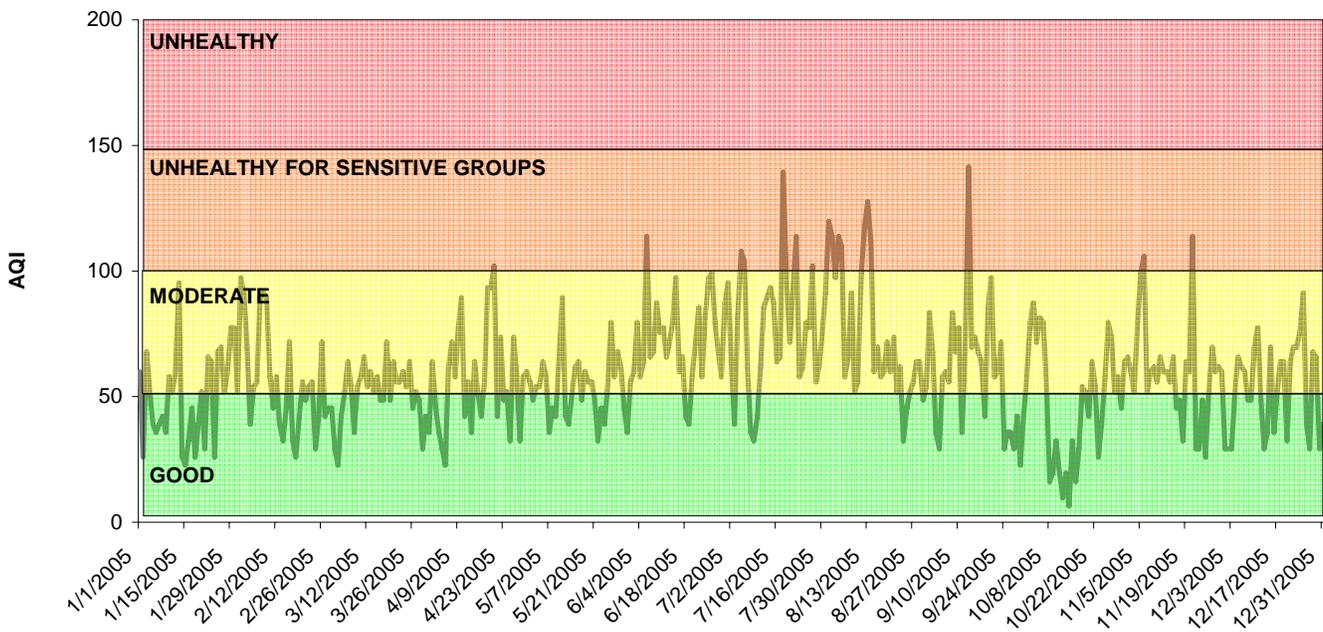
Monitoring Site	Annual Mean	Maximum Daily Concentration	2 nd Highest Daily Concentration
Camden Lab	13	50	47
Elizabeth Lab	14	48	41
Fort Lee *	20	61	60
Jersey City-Firehouse	13	54	44
Millville *	13	47	41
New Brunswick	11	46	40
South Camden	14	49	48

* TEOM did not run entire year

PM_{2.5} REAL-TIME MONITORING

New Jersey's continuous PM_{2.5} monitoring network consists of 7 sites: Camden Lab, Elizabeth Lab, Fort Lee, Jersey City, Millville, New Brunswick, and South Camden. The data is transmitted once a minute to a central computer in Trenton, where it is averaged and automatically updated on the bureau's website every hour. Table 3 provides a summary of the data from these sites, and Figure 5 depicts the health level associated with the maximum daily fine particulate concentration recorded in the state each day for the entire year.

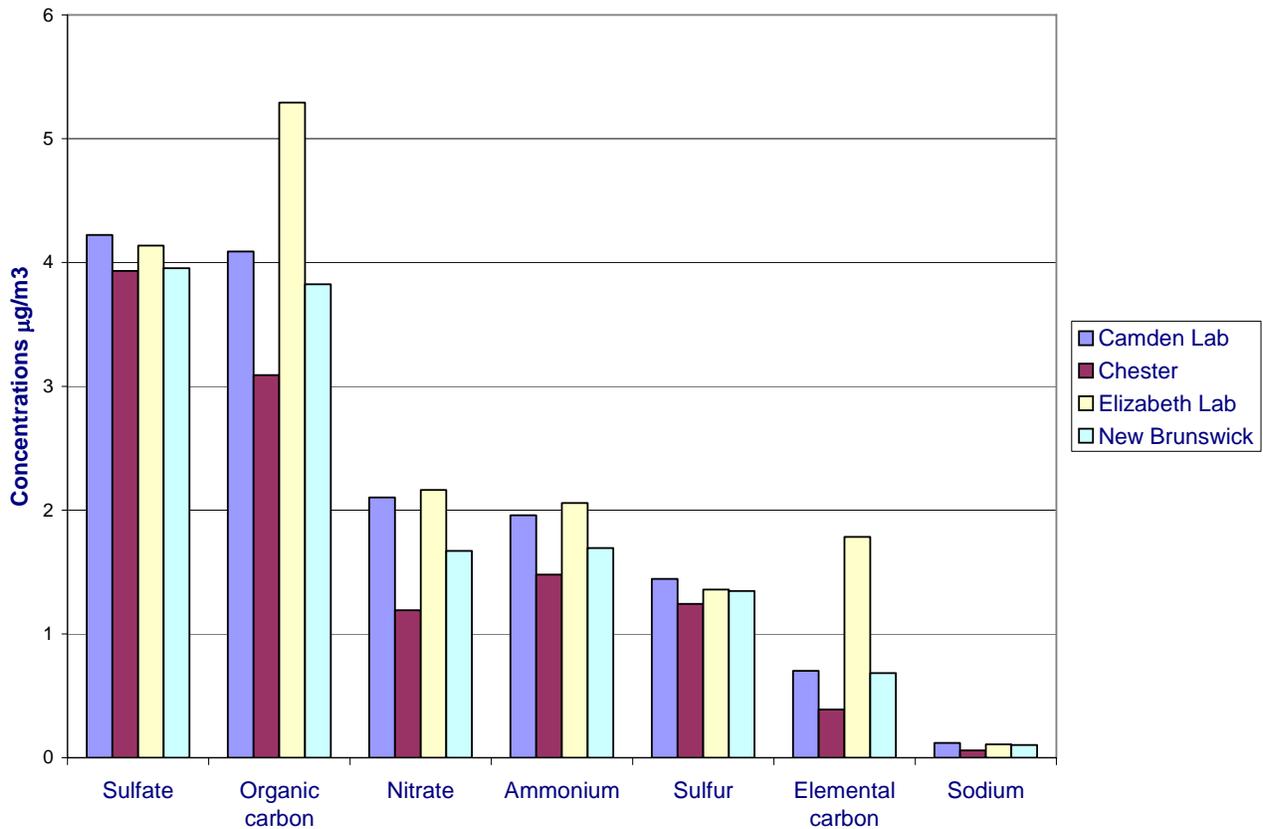
Figure 5
2005 Maximum Daily Fine Particulate Concentration
(Highest site)
Air Quality Index (AQI)



FINE PARTICLE SPECIATION SUMMARY

New Jersey's Fine Particulate Speciation Network consists of 4 monitoring sites: Camden Lab, Elizabeth Lab, New Brunswick, and Chester. Samplers run every third day on a schedule concurrent with the FRM sampling network. Of the 55 measured analytes, organic carbon and sulfate combined make up 56% of the total mass. Nitrate, ammonium, sulfur and elemental carbon make up an additional 39% of the mass. Figure 6 depicts the average concentration of each analyte at all the sites, with only the seven most prevalent constituents depicted. Appendix B shows the average, maximum, and 2nd highest concentrations for each compound for 2005.

Figure 6
2005 Fine Particulate Analyte Composition
(Highest 7 Analytes Depicted)

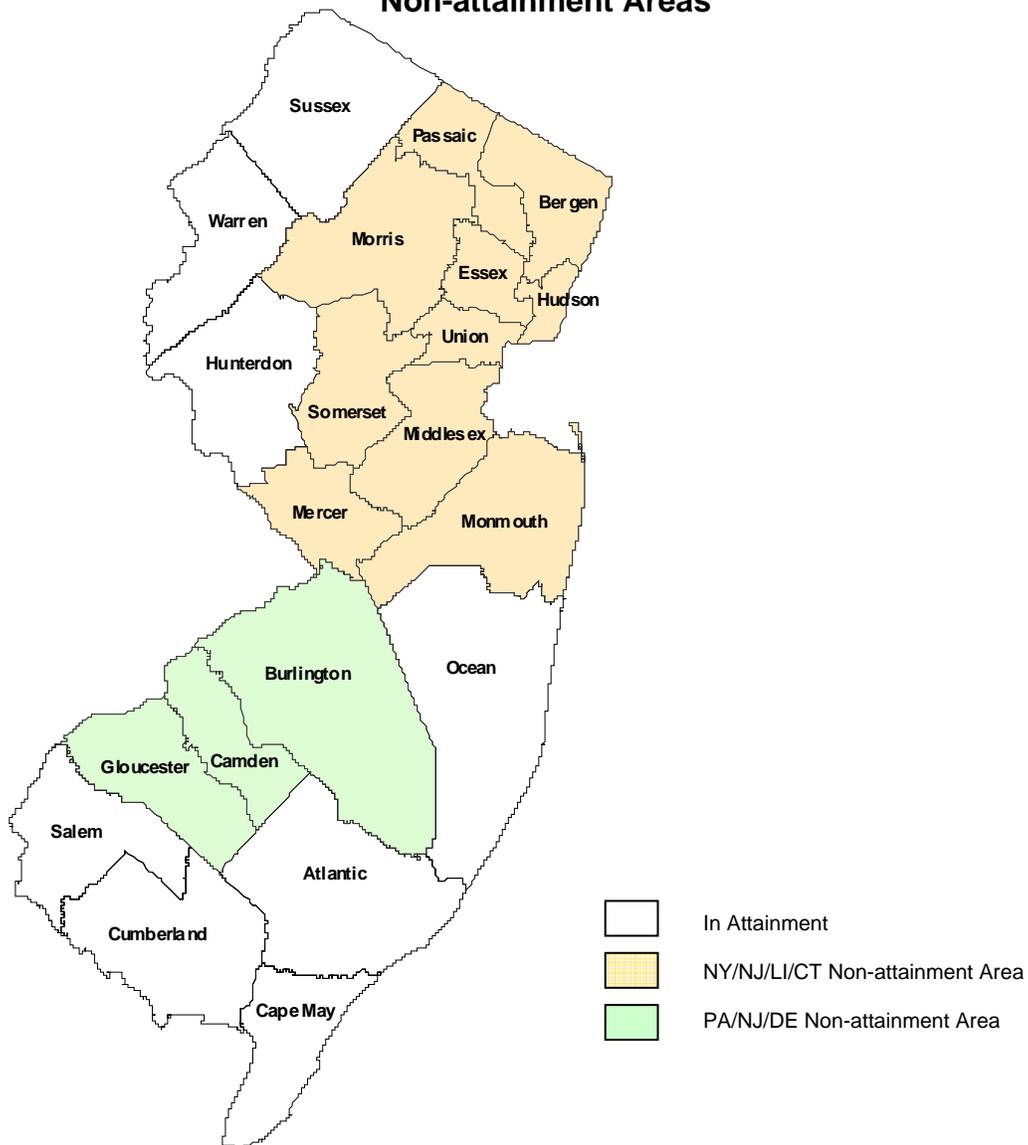


FINE PARTICULATE NON-ATTAINMENT AREAS

In 2005 thirteen New Jersey counties were classified as non-attainment areas. Non-attainment classification is given to an area in which a monitor records a violation of the Ambient Air Quality Standards (see table 1). Areas surrounding a monitor that record a violation of the AQS can also be designated as non-attainment if PM_{2.5} generated there is believed to contribute to the violation. While the Elizabeth Trailer PM_{2.5} monitor was the only New Jersey monitor to exceed the AQS (15.9 µg/m³), a 10 county area in the Northeast section of the state has been

classified as non-attainment because of its contributing factor to both the violations at the Elizabeth Trailer monitor and violations at monitoring sites in New York City. Similarly, 3 counties in the southwestern part of the state have been classified as non-attainment due to their contribution to PM_{2.5} violations in the city of Philadelphia. Data from sampling years 2000-2002 was used to make these designations. NJDEP is currently devising a strategy to lower PM_{2.5} levels in these affected areas.

Figure 7
New Jersey Particulate Matter (PM_{2.5})
Non-attainment Areas



2005 COARSE PARTICLE SUMMARY

COARSE PARTICLE MONITORING SITES

The coarse particulate monitoring network is composed of 6 PM₁₀ sampling sites and 1 TSP sampling sites. Samples are collected on a filter, which is weighed before and after sampling to determine the concentration. Figure 8 depicts the PM₁₀ particulate monitoring network in New Jersey.

Figure 8
2005 PM₁₀
Monitoring Network



TSP CONCENTRATION SUMMARY

New Jersey currently operates one TSP monitoring site, located in New Brunswick. In 2005, the annual geometric mean concentration of TSP in New Brunswick was 33.6 $\mu\text{g}/\text{m}^3$, and the maximum 24-hour concentration recorded was 62.7 $\mu\text{g}/\text{m}^3$. The site was in attainment for the primary and secondary annual TSP standards of 75 $\mu\text{g}/\text{m}^3$ and 60 $\mu\text{g}/\text{m}^3$ respectively, and the site did not surpass the 24-hour primary standard of 260 $\mu\text{g}/\text{m}^3$ or the 150 $\mu\text{g}/\text{m}^3$ secondary standard.

PM₁₀ CONCENTRATION SUMMARY

In 2005, the annual mean concentration of PM₁₀ ranged from 23 $\mu\text{g}/\text{m}^3$ at Atlantic City to 40 $\mu\text{g}/\text{m}^3$ at Camden RRF. Table 4 and Figure 9 show the annual mean and 24-hour maximum PM₁₀ concentrations throughout the state. All areas of the state are in attainment for the both the annual PM₁₀ standards of 50 $\mu\text{g}/\text{m}^3$ and the 24-hour standard of 150 $\mu\text{g}/\text{m}^3$.

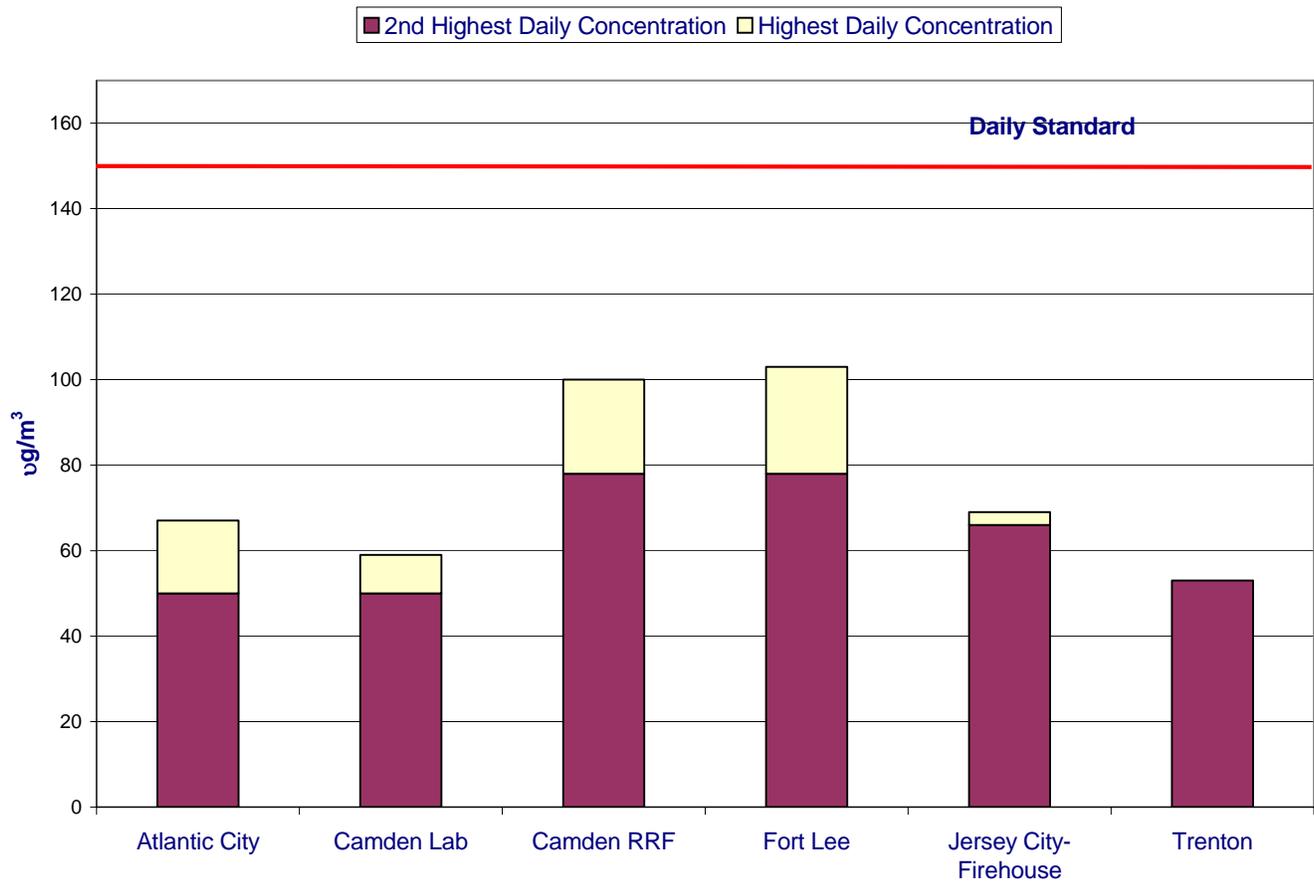
Table 4
PM₁₀ Data - 2005
Daily and Annual Averages

Micrograms Per Cubic Meter ($\mu\text{g}/\text{m}^3$)
Daily Standard = $150 \mu\text{g}/\text{m}^3$
Annual Standard = $50 \mu\text{g}/\text{m}^3$

Monitoring Site	Number of Samples	Daily Maximum	Second Highest Daily Maximum	Annual Mean
Atlantic City	54	67	50	23
Camden Lab	47	59	50	25
Camden RRF	56	100	78	40
Fort Lee *	44	103	78	35
Jersey City-Firehouse	55	69	66	30
Trenton	57	59	59	26

* Sampler did not run entire year

Figure 9
Summary of PM₁₀ Concentrations, New Jersey 2005



* At Trenton the highest daily and second highest daily were both 59

**Figure 10
2005 Smoke Shade
Monitoring Network**

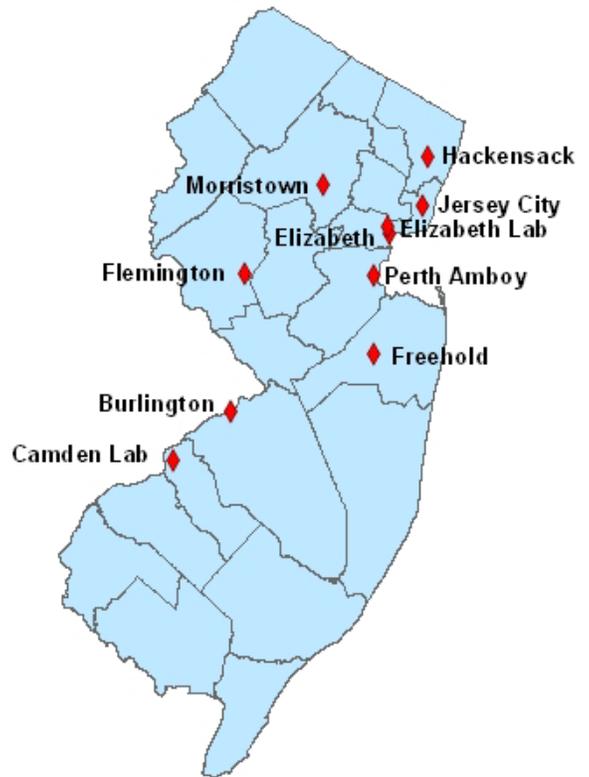
SMOKE SHADE SUMMARY

SMOKE SHADE MONITORING SITES

In addition to fine and coarse particulate monitoring, smoke shade is also monitored at 10 stations around the state. Smoke shade, which is an indirect measurement of particles in the atmosphere, has been monitored in New Jersey for over 30 years. Smoke shade is primarily used for the daily reporting of particulate levels in the Air Quality Index. The sites monitoring smoke shade are shown in Figure 10.

SMOKE SHADE CONCENTRATION SUMMARY

In 2005, the annual mean concentration of smoke shade ranged from 0.17 Coefficient of Haze units (COH) at Flemington and Camden Lab to 0.60 COH at Elizabeth Lab. COH are units of light transmittance and smoke shade is not a direct measure of particle mass. A 24-hour average level of 2.0 COH is used as a benchmark. Readings above the 2.0 COH benchmark are reported as Unhealthy for Sensitive Groups on the daily Air Quality Index. For more details see the Air Quality Index section of this report. Table 5 lists the maximum and second highest daily average and annual mean smoke shade levels recorded at the monitoring sites in 2005.



**Table 5
Smoke Shade - 2005**

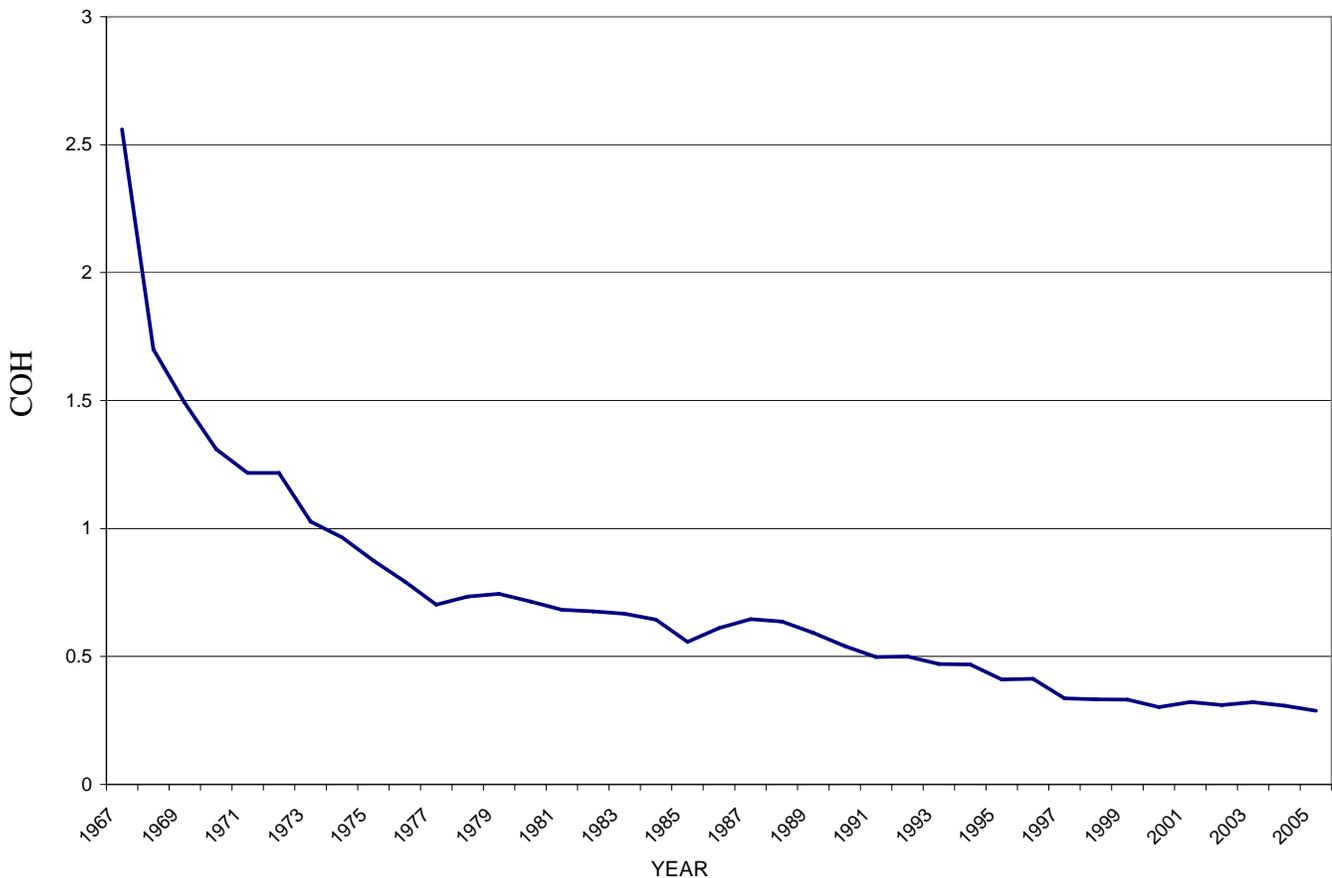
Coefficient of Haze (COHs)
No Standard

Site	Maximum Daily Average	2nd Highest Daily Average	Annual Mean
Burlington	1.02	0.69	0.18
Camden Lab	0.58	0.54	0.17
Elizabeth	1.41	1.23	0.39
Elizabeth Lab	1.85	1.71	0.60
Flemington	0.61	0.56	0.17
Freehold	0.54	0.51	0.19
Hackensack	1.25	1.05	0.23
Jersey City	1.60	1.31	0.54
Morristown	0.58	0.56	0.21
Perth Amboy	1.19	0.94	0.29

TRENDS IN PARTICULATE CONCENTRATIONS

The longest continuously operating particle monitoring network in the state that is suitable for looking at trends is the smoke shade network. As noted earlier, this monitoring program has been in effect for over thirty years and still has 10 active sites. The trend graph for smoke shade, shown in Figure 11 indicates that particulate levels have steadily declined over the past thirty years. Smoke shade is not a direct measurement of particle mass, but can be related to TSP, PM₁₀ and PM_{2.5} health standards.

Figure 11
Long Term Trend in Particulate
State Average
1967- 2005



REFERENCES

PM – How Particulate Matter Affects the Way We Live and Breathe, USEPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC November 2000, URL: www.epa.gov/air/urbanair/pm/index.html

Air Quality Criteria for Particulate Matter, USEPA, Office of Research and Development, EPA-600/P-99-002A and B, March 2001

Environmental Health Threats to Children, USEPA, Office of the Administrator, EPA-176/F-96-001, September 1996.

National Ambient Air Quality Standards for Particulate Matter, Final Rule, USEPA, Part 50 of Title 40 of the Code of Federal Regulations, July 1997.

National Air Quality and Emissions Trend Report, 1999, EPA-454/R-01-004, USEPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC, March 2001, URL: www.epa.gov/airtrends/reports.html

Latest Findings on National Air Quality: 2000 Status and Trends, EPA-454/K-01-002, USEPA, Office of Air Quality Planning and Standards, Research Triangle Park, September 2001, URL: www.epa.gov/airtrends/reports.html



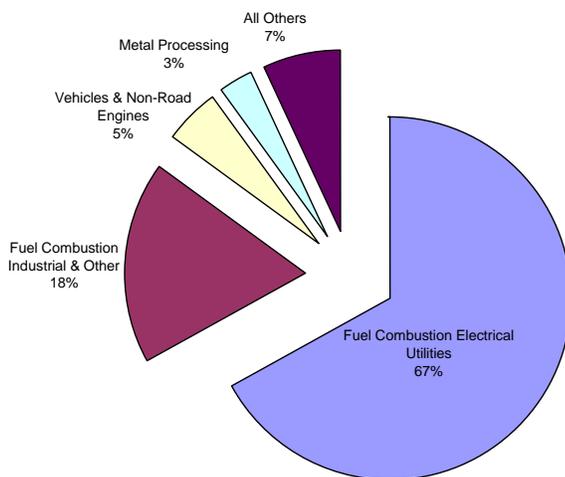
2005 Sulfur Dioxide Summary

New Jersey Department of Environmental Protection

NATURE AND SOURCES

Sulfur dioxide (SO₂) is a heavy, colorless gas with a suffocating odor that easily dissolves in water to form sulfuric acid. SO₂ gases can be formed when fuels containing sulfur are burned, or when gasoline is extracted from oil. Most of the sulfur dioxide released into the air comes from electric utilities, especially those that burn coal with a high sulfur content. Sulfur is found in raw materials such as crude oil, coal, and ores that contain metals such as aluminum, copper, zinc, lead and iron. Industrial facilities that derive their products from these materials may also release SO₂. A pie chart summarizing the major sources of SO₂ is shown in Figure 1.

Figure 1
National Summary
SO₂ Emissions by Source Category



Source: USEPA website
<http://www.epa.gov/air/urbanair/so2/what1.html>
Last updated, Monday, July 23, 2007

SO₂ concentrations in New Jersey are generally higher in the winter than in the summer due to higher emissions from space heating and other sources. This is shown in the chart depicted in Figure 2 (page 2). The chart also shows that SO₂ levels tend to peak in the morning as emissions accumulate prior to being more effectively dispersed when wind speeds increase and atmospheric mixing increases later in the day.

HEALTH AND ENVIRONMENTAL EFFECTS

Sulfur dioxide causes irritation of the mucous membranes. This is probably the result of the action of sulfurous acid that is formed when the highly soluble SO₂ dissolves at the surface of the membranes. Groups that are especially susceptible to the harmful health effects of SO₂ include children, the elderly, and people with heart or lung disorders such as asthma. When SO₂ concentrations in the air become elevated, people belonging to these sensitive groups and those who are active outdoors may have trouble breathing. The International Agency for Research on Cancer (IARC) evaluated SO₂ and based on available information, determined that no conclusion can be made as to the carcinogenicity of SO₂ to human beings.

Sulfur dioxide reacts with other gases and particles in the air to form sulfates that can be harmful to people and the environment. Sulfate particles are the major cause of reduced visibility in the eastern United States. SO₂ can also react with other substances in the air to form acids, which fall to the earth in rain and snow. Acid rain damages forests and crops, can make lakes and streams too acidic for fish, and speeds up the decay of building materials and paints.

STANDARDS

There are three National Ambient Air Quality Standards (NAAQS) for SO₂. There is an annual average health standard of 0.030 parts per million (ppm). This is based on a calendar year average of continuously monitored levels. There is also a 24-hour average health based standard of 0.14 ppm which is not to be exceeded more than once a year, and a secondary (welfare based) standard of 0.5 ppm, 3-hour average concentration that is also not to be exceeded more than once per year.

New Jersey has also set state air quality standards for SO₂. They are similar to the federal standards but are expressed in micrograms per cubic meter (µg/m³) instead

of ppm. They are also based on rolling averages rather than block averages. So, for example, the state's primary 12-month standard is based on any twelve-month average recorded during the year, while the federal standard is based solely on the calendar

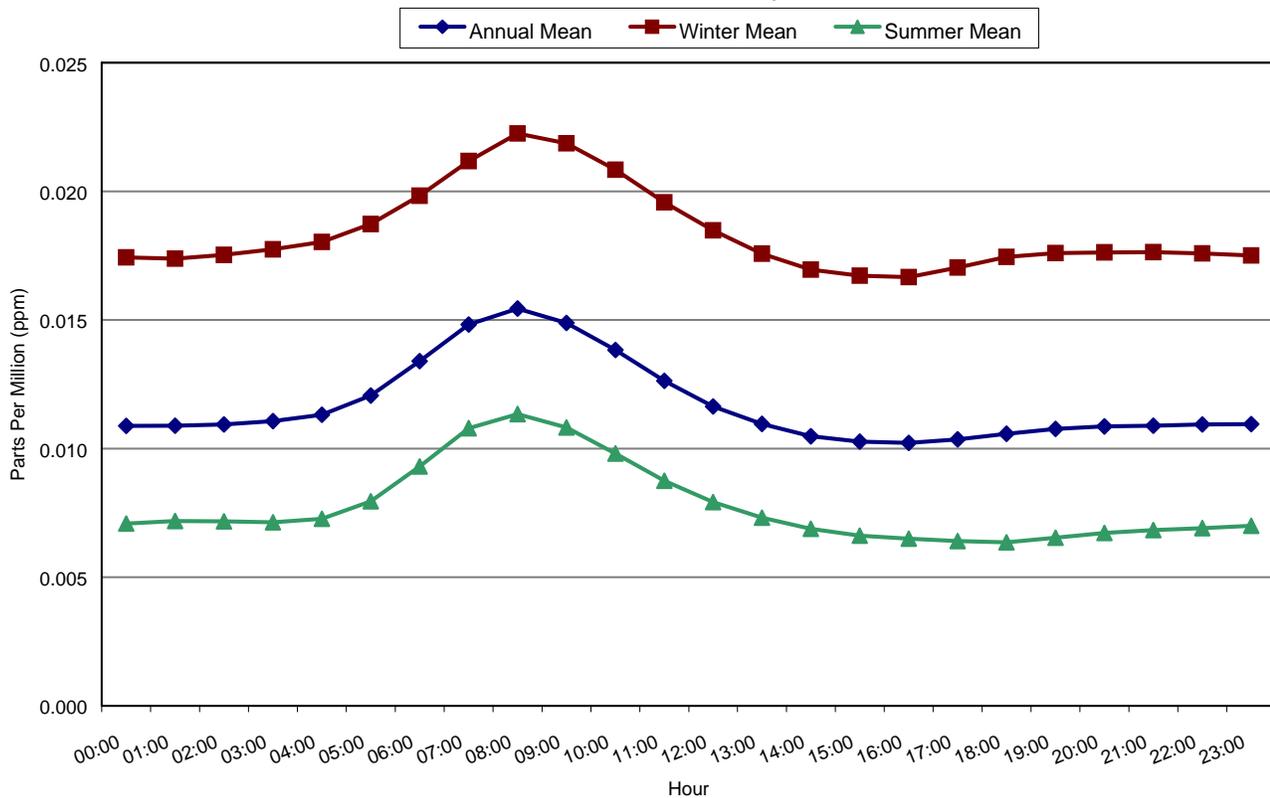
year average. The state also has secondary 12-month, 24-hour, and 3-hour average standards. Table 1 summarizes the NAAQS and the New Jersey Ambient Air Quality Standards (NJAAQS) for SO₂.

Table 1
National and New Jersey Ambient Air Quality Standards for Sulfur Dioxide

Averaging Period	Type	Parts Per Million (ppm)	
		Micrograms Per Cubic Meter ($\mu\text{g}/\text{m}^3$)	
		New Jersey	National ^a
12-month average	Primary	80 $\mu\text{g}/\text{m}^3$ (0.03 ppm)	0.030 ppm
12-month average	Secondary	60 $\mu\text{g}/\text{m}^3$ (0.02 ppm)	---
24-hour average	Primary	365 $\mu\text{g}/\text{m}^3$ (0.14 ppm)	0.14 ppm
24-hour average	Secondary	260 $\mu\text{g}/\text{m}^3$ (0.10 ppm)	---
3-hour average	Secondary	1300 $\mu\text{g}/\text{m}^3$ (0.5 ppm)	0.5 ppm

^a – National standards are block averages rather than moving averages

Figure 2
Sulfur Dioxide Concentration - New Jersey
1967-1999
Seasonal and Hourly Variation



MONITORING LOCATIONS

The state monitored SO₂ levels at 13 locations in 2005. These sites are shown in the map in Figure 3.

SO₂ LEVELS IN 2005

None of the monitoring sites recorded exceedances of the primary or secondary SO₂ standards during 2005. The maximum 12-month average concentration recorded was 0.008 ppm in Bayonne, Elizabeth Lab, and Jersey City. The maximum 24-hour average level recorded was 0.044 ppm which was recorded in Clarksboro. The highest 3-hour average recorded was 0.164 ppm at Clarksboro. Summaries of the 2005 data are provided in Table 2 below, Table 3 (page 4) and Figure 4 (page 4).

Figure 3
2005 Sulfur Dioxide
Monitoring Network

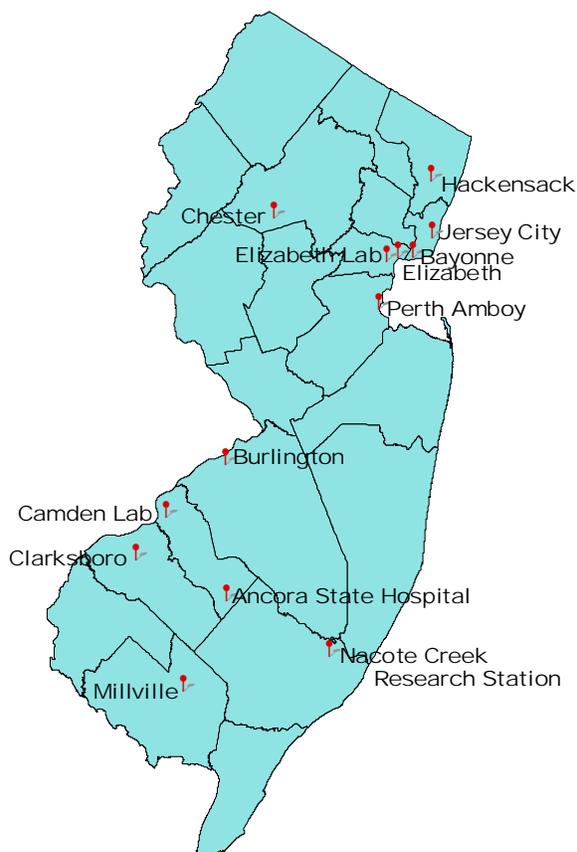


Table 2
Sulfur Dioxide Data – 2005
3-Hour and Annual Averages

Parts Per Million (ppm)

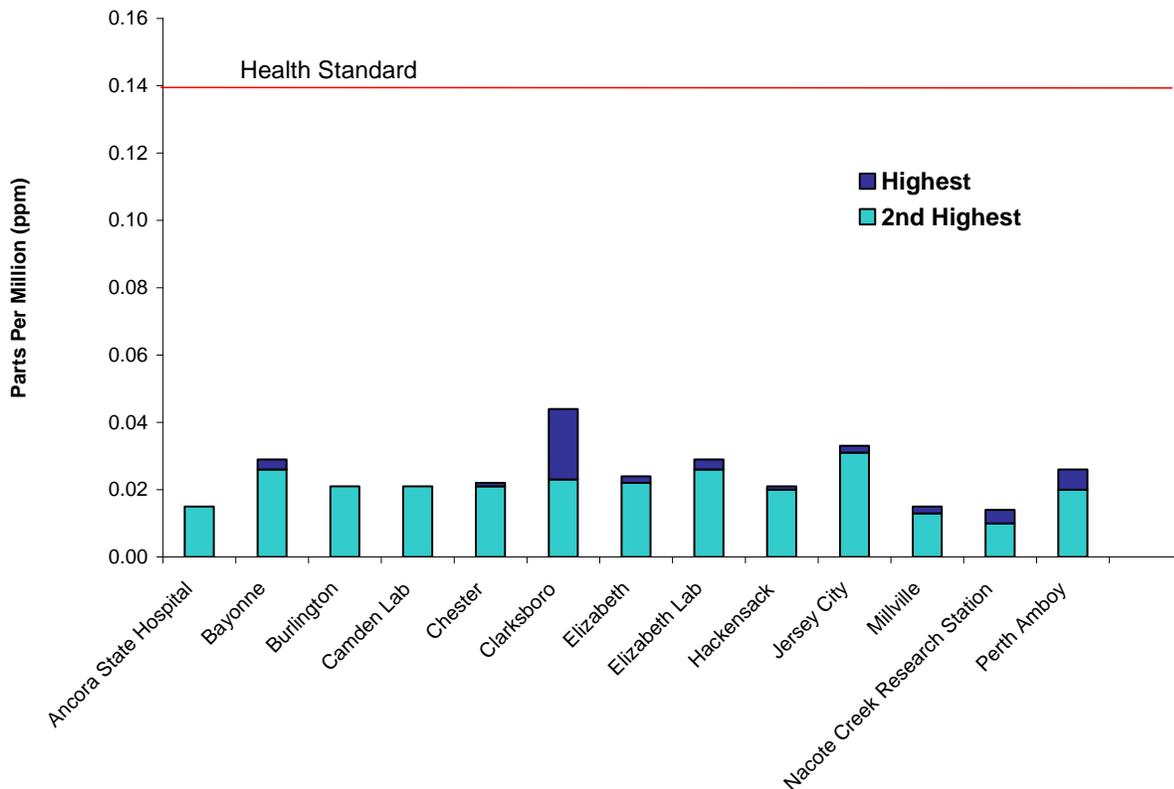
Monitoring Sites	3-Hour Average Maximum	3-Hour Average 2 nd Highest	12-Month Average Maximum	Average Calendar Year
Ancora State Hospital	0.031	0.025	0.003	0.003
Bayonne	0.055	0.051	0.008	0.008
Burlington	0.035	0.031	0.004	0.004
Camden Lab	0.038	0.036	0.006	0.005
Chester	0.051	0.047	0.004	0.004
Clarksboro	0.164	0.128	0.005	0.005
Elizabeth	0.045	0.045	0.006	0.006
Elizabeth Lab	0.048	0.045	0.008	0.007
Hackensack	0.034	0.032	0.004	0.004
Jersey City	0.055	0.050	0.008	0.008
Millville	0.025	0.024	0.004	0.004
Nacote Creek Research Center	0.032	0.019	0.002	0.002
Perth Amboy	0.054	0.042	0.004	0.004

Table 3
Sulfur Dioxide Data – 2005
24-Hour and Daily Averages

Parts Per Million (ppm)

Monitoring Sites	24-Hour Average Maximum	24-Hour Average 2 nd Highest	Daily Average Maximum	Daily Average 2 nd Highest
Ancora State Hospital	0.015	0.015	0.015	0.014
Bayonne	0.029	0.026	0.029	0.026
Burlington	0.021	0.021	0.017	0.016
Camden Lab	0.021	0.021	0.020	0.018
Chester	0.022	0.021	0.021	0.018
Clarksboro	0.044	0.023	0.044	0.017
Elizabeth	0.024	0.022	0.024	0.021
Elizabeth Lab	0.029	0.026	0.028	0.027
Hackensack	0.021	0.020	0.019	0.016
Jersey City	0.033	0.031	0.032	0.029
Millville	0.015	0.013	0.013	0.013
Nacote Creek Research Station	0.014	0.010	0.012	0.009
Perth Amboy	0.026	0.020	0.025	0.021

Figure 4
Highest and 2nd Highest 24-Hour Averages
of SO₂ in New Jersey - 2005



TRENDS

Since the implementation of regulations requiring the use of low sulfur fuels in New Jersey, SO₂ concentrations have improved significantly. The last time an exceedance of any of the National SO₂ standards was recorded in the state was in 1980. A trend graph of SO₂ levels showing the daily average concentrations recorded since 1975 from the highest, average, and lowest of all sites is shown in Figure 5 below. The graph uses the second highest daily value, as this is the value that determines if the national

health standard is being met (one exceedance per site is allowed each year).

Although there has not been a measured exceedance of the NAAQS in over two decades, there is still a small area of New Jersey that is classified as a non-attainment area for SO₂. This is the result of air quality modeling studies that predicted non-attainment of the standard within a small area of Warren County. The area is shown in the map in Figure 6 (page 6).

Figure 5
Sulfur Dioxide Concentrations in New Jersey
1975-2005
Second Highest Daily Average

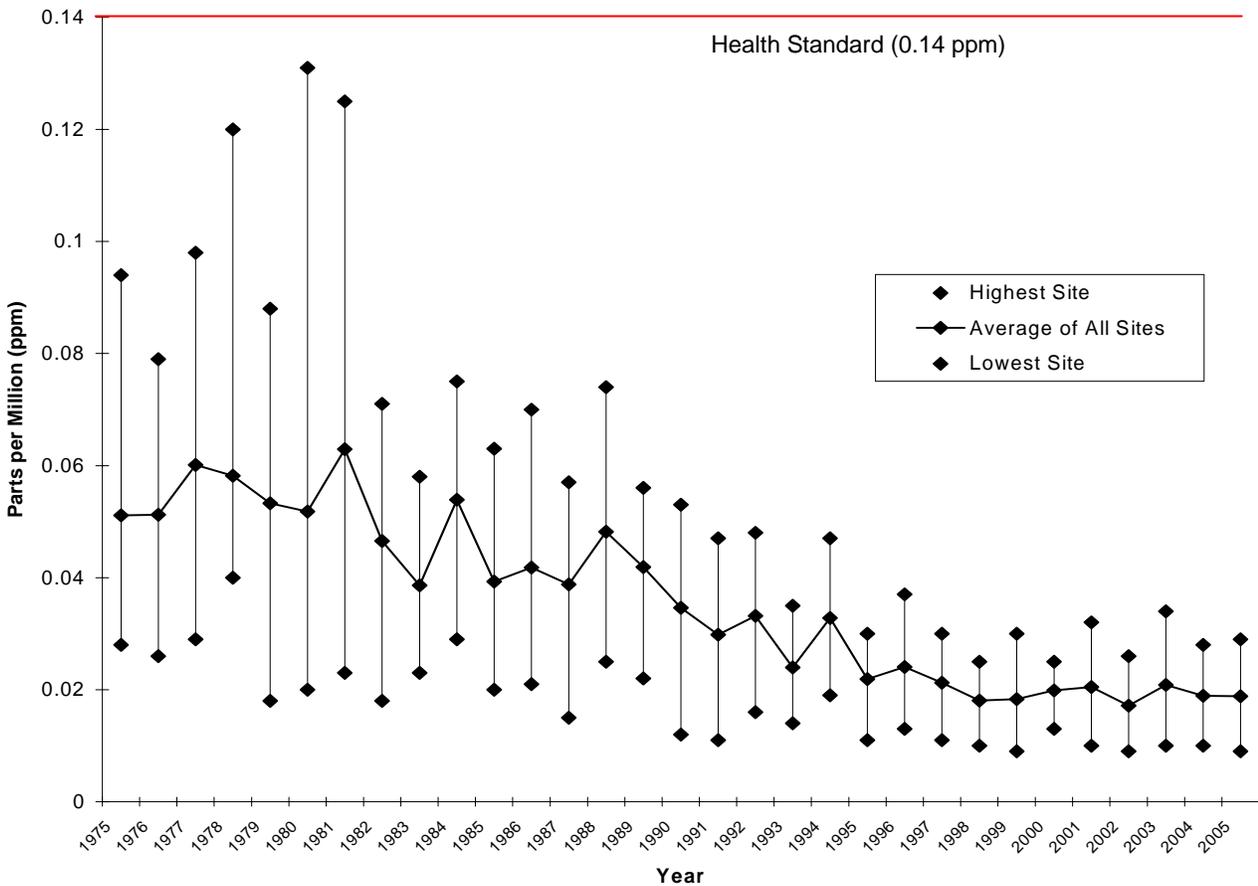
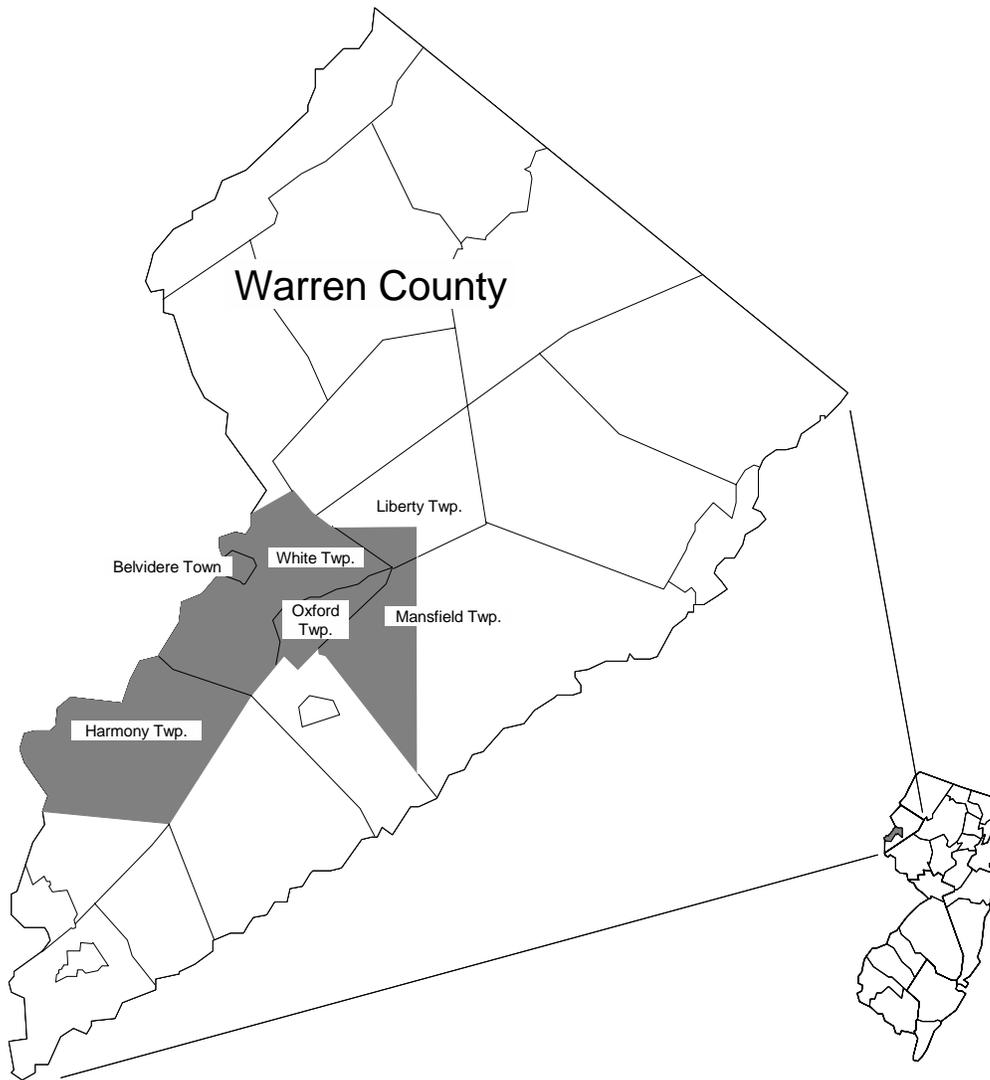


Figure 6
Sulfur Dioxide Non-Attainment Areas* in New Jersey



Legend

■ Sulfur Dioxide Nonattainment Area
(includes Belvidere Town; Harmony Township; Oxford Township;
White Township; the portion of Liberty Township south of
UTM northing 4,255,000 and west of UTM easting 505,000;
and the portion of Mansfield Township west of UTM easting 505,000).

*Nonattainment of the National Primary (Health) and Secondary (Welfare) Standards

FIVE MINUTE AVERAGE SO₂ MONITORING

A 1992 court decision compelled the USEPA to review, and if appropriate, revise the NAAQS for SO₂. After soliciting comments from the public and evaluating several options, the USEPA determined that high short-term SO₂ concentrations are a local problem rather than a widespread national concern. The USEPA Administrator decided in May 1996 not to revise the NAAQS for SO₂, but concluded that in some local areas, 5-minute SO₂ concentrations greater than 0.6 ppm pose a health threat to sensitive persons. In January 1997, the USEPA published proposed revisions to the regulations that would establish “concern and intervention levels (IL).” This IL would have a lower range of 0.6 ppm and an upper range of 2.0 ppm of SO₂. These levels are based on a 5-minute SO₂ concentration that is the highest of the 5-minute averages from the 12 possible non-overlapping periods during a clock hour. Under the proposed regulations, the USEPA would leave the responsibility of assessing the health risk and implementing corrective measures to the States. Also, the USEPA recommended that States evaluate the need to monitor 5-minute SO₂ averages around sources based on citizen complaints, the actual emissions of a source, the population in the vicinity of the source, and environmental justice issues.

The USEPA published a draft “Guideline Document for Ambient Monitoring of 5-Minute SO₂ Concentrations” on July 20, 2000. This guidance is intended to assist State and local agencies in determining whether 5-minute SO₂ monitoring should be established in their jurisdictions, and how to redesign an existing SO₂ network to fulfill these additional needs.

In October 2002, an air monitoring project was established in Warren County, New Jersey to evaluate the feasibility of monitoring 5-minute SO₂ concentrations in the vicinity of local point source. This is the first time since the publication of USEPA’s draft “Guideline Document for Ambient Monitoring of 5-Minute SO₂ Concentrations” that SO₂ concentrations anywhere in New Jersey are being directly compared to the 5-minute SO₂ guideline IL. Warren County was selected for this study as the Belvidere area of the county is the only SO₂ non-attainment area in the state (see Figure 6 – page 6). The study had broad community involvement in its design and implementation. It is primarily being supported by a local industrial facility as part of a Supplemental Environmental

Project (SEP). SEPs are sometimes part of settlement agreements between the DEP and a regulated facility. They are projects deemed to have an environmental benefit for the community, and are supported by a facility in lieu of, or in addition to, direct monetary penalties. The results of the monitoring study are available on the World Wide Web at www.airgap.com

REFERENCES

Air Quality Criteria for Particulate Matter and Sulfur Oxides (1982): Assessment of New Findings on Sulfur Dioxide Acute Exposure Health Effects in Asthmatic Individuals, Supplement to the Second Addendum (1986), U.S. Environmental Protection Agency, Office of Health and Environmental Assessment, Research Triangle Park, NC, 1994.

Draft Guideline Document for Ambient Monitoring of 5-minute SO₂ Concentrations, USEPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC, July 20, 2000.

Horstman, D., Roger, L. J., Kehrl, H. and Hazucha, M., *Airway Sensitivity of Asthmatics to Sulfur Dioxide*, EPA-600/J-86-282, Health Effects Research Lab, Research Triangle Park, NC, Clinical Research Branch, Environmental Monitoring and Services, Inc., Chapel Hill, NC, North Carolina University at Chapel Hill, NC, Prepared for USEPA, Research Triangle Park, NC, 1986.

Latest Findings on National Air Quality: 2000 Status and Trends, EPA-454/K-01-002, USEPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC, September 2001, URL: <http://www.epa.gov/oar/aqtrnd00/>.

National Air Quality and Emissions Trend Report, 1999, EPA-454/R-01-004, USEPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC, March 2001, URL: <http://www.epa.gov/oar/aqtrnd99/>.

SO₂ – How Sulfur Dioxide Affects the Way We Live and Breath, USEPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC, November 2000, URL: <http://www.epa.gov/air/urbanair/so2>

National Primary Ambient Air Quality Standards for Sulfur Dioxide, 40 CFR 50.4, US Government Printing Office, Washington DC, July 2001.

National Secondary Ambient Air Quality Standards for Sulfur Dioxide, 40 CFR 50.5, US Government Printing Office, Washington DC, July 2001.

Sittig, M., *Handbook of Toxic and Hazardous Chemicals and Carcinogens Third Edition, Volume 2*, Noyes Publications, Park Ridge, NJ, 1991.

ToxFaQs for Sulfur Dioxide, U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, April 2002, URL: <http://www.atsdr.cdc.gov/tfacts116.pdf>.



2005 Air Toxics Summary

New Jersey Department of Environmental Protection

INTRODUCTION

Air pollutants can be divided into two categories: the criteria pollutants (ozone, sulfur dioxide, carbon monoxide, nitrogen dioxide, particulate matter, and lead); and air toxics. The criteria pollutants have been addressed at the national level since the 1970's. The United States Environmental Protection Agency (USEPA) has set National Ambient Air Quality Standards (NAAQS) for them, and they are subject to a standard planning process that includes monitoring, reporting, and control requirements. Each of these pollutants is discussed in its own section of this New Jersey Department of Environmental Protection (NJDEP) 2005 Air Quality Report.

Air toxics are basically all the other chemicals released into the air that have the potential to cause adverse health effects in humans. These effects cover a wide range of conditions, from lung irritation to birth defects to cancer. There are no NAAQS for these pollutants, but in 1990 the U.S. Congress directed the USEPA to begin to address a list of almost 200 air toxics by developing control technology standards for specific categories of sources that emit them. These air toxics are known as the Clean Air Act Hazardous Air Pollutants (HAPs). You can get more information about HAPs at the USEPA Air Toxics web site at www.epa.gov/ttn/atw. NJDEP also has several web pages dedicated to air toxics. They can be accessed at www.state.nj.us/dep/airtoxics.

HEALTH EFFECTS

People exposed to significant amounts of air toxics may have an increased chance of getting cancer or experiencing other serious health effects. The non-cancer health effects can range from respiratory, neurological, reproductive, developmental, or immune system damage, to irritation and effects on specific organs. In addition to inhalation exposure, there can be risks from the deposition of toxic pollutants onto soils or surface waters. There, they can be taken up by plants and animals, which are later consumed by humans.

The effects on human health resulting from exposure to

specific air toxics can be estimated by using chemical-specific "health benchmarks." These toxicity values are developed by the USEPA and other agencies, using health studies for a chemical. For carcinogens, the health benchmark is the concentration of the pollutant that corresponds to a one in a million increase in the risk of getting cancer if a person was to breathe that concentration over his or her entire lifetime. The health benchmark for non-carcinogens is a concentration at which no adverse health effects are expected to occur (this is also known as a reference concentration). Not all air toxics have health benchmarks because of a lack of toxicity studies. Available health benchmarks, for the air toxics monitored in New Jersey are listed in Tables 5 through 8. If ambient air concentrations exceed the health benchmarks then some action, such as a reduction in emissions, should be considered.

SOURCES OF AIR TOXICS

A number of years ago, USEPA began the National-Scale Air Toxics Assessment (NATA). Starting with the year 1996, they set out on a three-year cycle to determine people's exposure to air toxics around the country. To do this, USEPA first prepared a comprehensive inventory of air toxics emissions from all man-made sources. The emissions inventory is then reviewed and revised by each state. Although there are likely to be some errors in the details of such a massive undertaking, the emissions inventory still can give us a reasonable indication of the most important sources of air toxic emissions in our state. The pie chart in Figure 1, based on the 1999 NATA emissions estimates, shows that mobile sources are the largest contributors of air toxics emissions in New Jersey.

On-road mobile sources (cars and trucks) account for 36% of the air toxics emissions, and non-road mobile sources (airplanes, trains, construction equipment, lawnmowers, boats, dirt bikes, etc.) contribute 25%. Area sources (residential, commercial, and small industrial sources) represent 27% of the inventory, and major point sources (such as factories and power plants) account for the

remaining 12%.

Air toxics come from many different sources, not only manufacturing, but also other kinds of human activity. When New Jersey's emissions estimates are broken down by county (see Figure 2) it is evident that the areas with the largest air toxic emissions are generally those with the largest populations. This is directly related to high levels of vehicle use, solvent use, heating, and other population-related activities in those counties.

ESTIMATING AIR TOXICS EXPOSURE

The second step in USEPA's NATA project is to use the emissions information in an air dispersion model to estimate air toxic concentrations in the different parts of the country. The map in Figure 3 shows the predicted concentrations of benzene throughout New Jersey. The high concentration areas tend to overlap the more densely populated areas of the state, following the pattern of emissions. Not all air toxics follow this pattern, as some are more closely associated with individual point sources,

Figure 1
1999 Air Toxics Emissions
Estimates for New Jersey

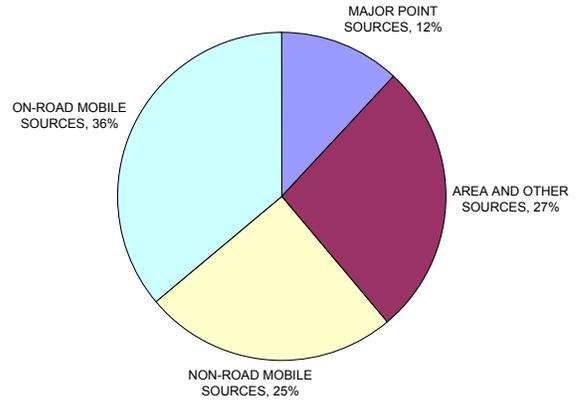
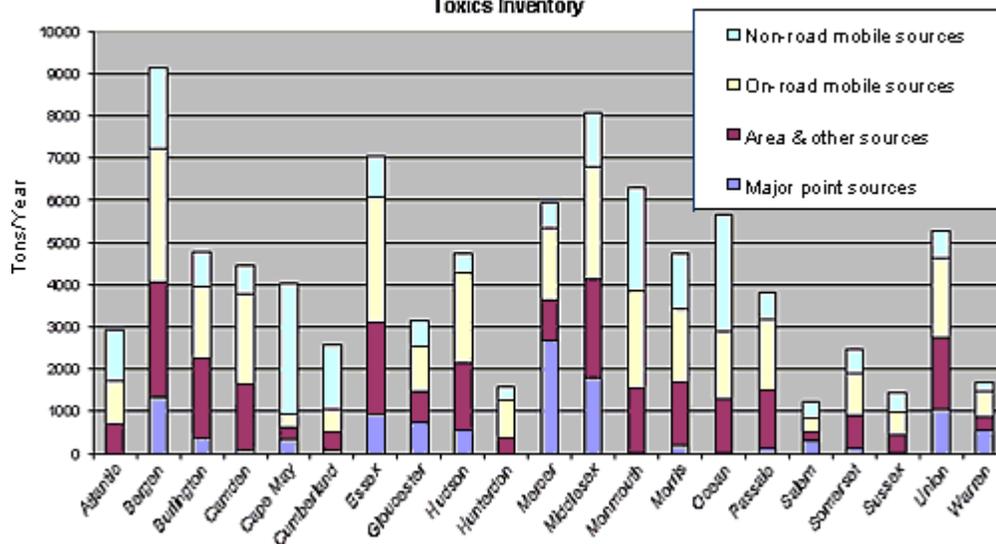


Figure 2

Estimated Air Toxics Emissions for 178 Compounds in New Jersey, by County Based on U.S.EPA's 1999 Air Toxics Inventory



but in general, larger populations result in greater emissions of, and exposure to, air toxics.

Analysis of the NATA state and county average air toxics concentrations indicates that twenty-two chemicals were predicted to exceed their health benchmarks, or level of concern, in one or more counties in 1999. Twenty-one of these are considered to be cancer causing (carcinogenic) chemicals, and one (acrolein) is not. Estimated air concentrations of these 22 pollutants vary around the state, depending on the types of sources that emit them. This is summarized in Table 1.

Figure 3
NATA Predicted concentrations in
New Jersey for 1999

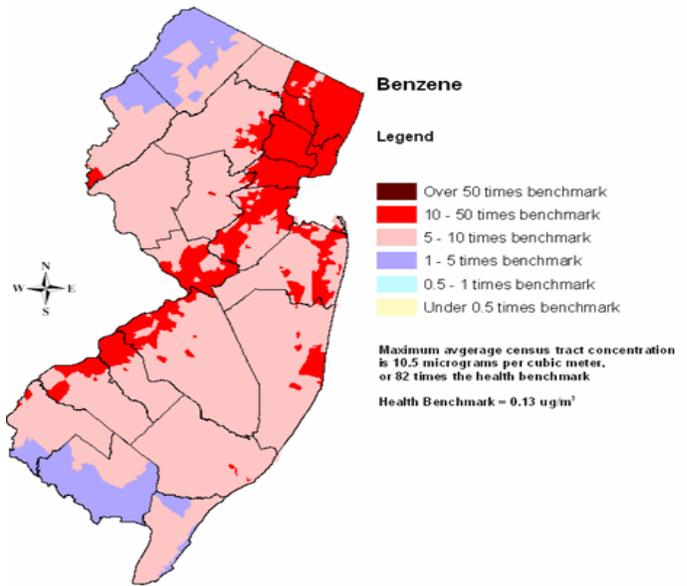


Table 1
Air Toxics of Greatest Concern in New Jersey
Based on 1999 National Air Toxics Assessment

Pollutant of Concern	Number of Counties Above Health Benchmarks	Primary Source of Emissions
Acetaldehyde	Statewide	On-road, background
Acrolein	Statewide	Mobile, area
Arsenic Compounds	4	Major, area
Benzene	Statewide	Mobile
Bis(2-ethylhexyl) phthalate	Statewide	Background
1,3-Butadiene	Statewide	On-road, background
Cadmium Compounds	1	Area
Carbon Tetrachloride	Statewide	Background
Chloroform	20	Area, background
Chromium VI	14	Area
1,4-Dichlorobenzene	4	Area
1,3-Dichloropropene	1	Area
Diesel Particulate Matter	Statewide	Mobile
Ethylene Dibromide	Statewide	Background
Ethylene Dichloride	11	Background
Ethylene Oxide	2	Area
Formaldehyde	Statewide	Mobile, background
Methyl Chloride	Statewide	Background
Naphthalene	14	Area
Nickel Compounds	1	Area, major
Perchloroethylene	10	Area, background
1,1,2,2-Tetrachloroethane	Statewide	Background

NJ AIR TOXICS MONITORING PROGRAM RESULTS FOR 2005

NJDEP has established four air toxics monitoring sites around the state. They are located in Camden, Elizabeth, New Brunswick and Chester (see Figure 4). The Camden site has been measuring several toxic volatile organic compounds (VOCs) since 1989. The Elizabeth site began measuring VOCs in 2000, and the New Brunswick and Chester sites became operational in July 2001. Analysis of toxic metals at all four sites also began in 2001. Metals data can be found in Appendix B (Fine Particulate Speciation Summary 2005) of this Air Quality Report (<http://www.state.nj.us/dep/airmon/appb05.pdf>)

2005 air toxic monitoring results for VOCs are shown in Table 2. This table contains the average concentration for each air toxic measured at the four New Jersey monitoring sites. All values are in micrograms per cubic meter ($\mu\text{g}/\text{m}^3$). More detail can be found in Tables 5 through 8, including additional statistics, detection limit information, health benchmarks used by NJDEP, risk ratios, and concentrations in parts per billion by volume (ppbv). The ppbv units are more common for monitoring results, while $\mu\text{g}/\text{m}^3$ units are generally used in modeling and health studies. Many of the compounds that were tested for were below the detection limit of the method used. These are listed separately in Table 9.

Reported averages for which a significant portion of the data (more than 50%) were below the detection limit should be viewed with extreme caution. Median values (the value of the middle sample value when the results are ranked) are reported along with the mean (average) concentrations because for some compounds only a single or very few high values were recorded. These high values will tend to increase the average concentration significantly but would have less effect on the median value. In such cases, the median value may be a better indicator of long term exposures, on which most of the health benchmarks for air toxics are based.

The Chester site has the lowest concentrations for the majority of the prevalent air toxics. However on September 4th, 2005, many compounds not detected anywhere else in the state were measured at Chester at low concentrations. This is in contrast to previous years when Chester had the fewest compounds detected. The reason for this change is currently being investigated.

**Figure 4
2005 Air Toxics
Monitoring Network**

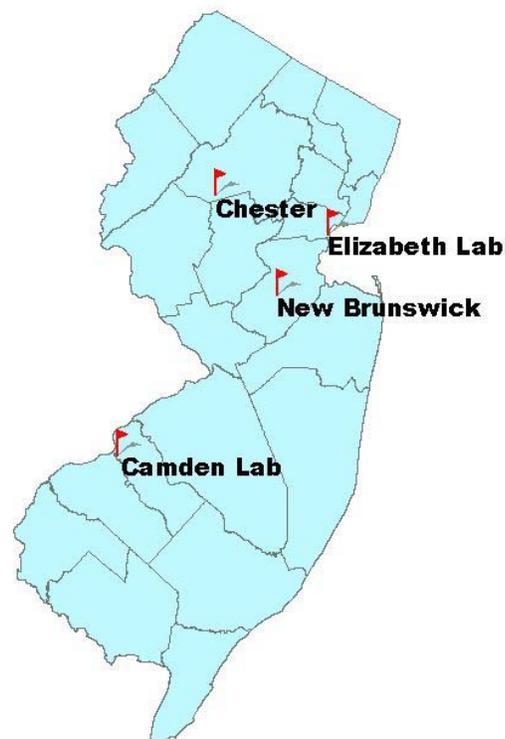


Table 2
New Jersey Air Toxics Summary – 2005

Annual Average Concentration
micrograms per cubic meter ($\mu\text{g}/\text{m}^3$)^a

Pollutant	Camden	Chester	Elizabeth	New Brunswick
Acetaldehyde	2.88	1.53	5.03	6.20
Acetone	2.92	2.28	3.09	4.05
Acetonitrile	(24.42)	(3.26)	(0.85)	(6.05)
Acetylene	1.54	0.61	1.65	1.21
Acrylonitrile	-	-	(0.02)	-
Acrolein	(0.29)	1.19	(0.43)	1.44
tert-Amyl Methyl Ether	(0.00)	(0.00)	(0.00)	(0.00)
Benzaldehyde	0.32	0.09	0.20	0.12
Benzene	1.57	0.65	1.59	0.99
Bromochloromethane	-	(0.01)	-	-
Bromodichloromethane	-	(0.01)	-	-
Bromoform	-	(0.02)	-	-
Bromomethane	0.71	(0.03)	(0.03)	(0.02)
1,3-Butadiene	0.10	(0.02)	0.13	0.05
Butyraldehyde	0.34	0.24	0.36	0.48
Carbon Tetrachloride	0.52	0.47	0.55	0.50
Chlorobenzene	-	(0.01)	-	-
Chloroethane	0.04	(0.03)	(0.06)	(0.02)
Chloroform	(0.07)	(0.04)	(0.09)	(0.08)
Chloromethane	1.36	1.23	1.31	1.30
Chloromethylbenzene	-	(0.00)	-	-
Chloroprene	-	(0.00)	-	-
Crotonaldehyde	0.32	0.41	0.28	0.33
Dibromochloromethane	-	(0.02)	-	(0.00)
1,2-Dibromoethane	-	(0.01)	-	-
m-Dichlorobenzene	(0.00)	(0.01)	(0.00)	-
o-Dichlorobenzene	(0.00)	(0.01)	(0.00)	-
p-Dichlorobenzene	0.15	(0.02)	(0.08)	0.42
1,1-Dichloroethane	-	(0.01)	-	-
1,1-Dichloroethene	-	(0.01)	-	-
cis-1,2-Dichloroethylene	(0.01)	(0.02)	-	-
trans-1,2-Dichloroethylene	-	(0.01)	-	-
Dichlorodifluoromethane	3.31	2.95	3.14	3.12
1,2-Dichloroethane	(0.00)	(0.01)	(0.00)	(0.01)
Dichloromethane	0.57	0.62	0.81	0.55
1,2-Dichloropropane	-	-	-	-
cis-1,3-Dichloropropene	-	(0.00)	-	-
trans-1,3-Dichloropropene	-	-	-	-
Dichlorotetrafluoroethane	0.08	0.08	(0.07)	(0.07)
2,5-Dimethylbenzaldehyde	(0.00)	(0.00)	(0.01)	-

^a Numbers in parenthesis indicate averages based on less than 50% detection

Table 2 (Continued)
New Jersey Air Toxics Summary – 2005

Annual Average Concentration
micrograms per cubic meter ($\mu\text{g}/\text{m}^3$)^a

Pollutant	Camden	Chester	Elizabeth	New Brunswick
Ethyl Acrylate	-	-	-	-
Ethylbenzene	0.56	0.20	0.70	0.60
Ethyl tert-Butyl Ether	(0.00)	-	-	-
Formaldehyde	4.31	2.44	4.69	5.34
Hexachloro-1,3-butadiene	(0.03)	(0.03)	(0.03)	(0.03)
Hexaldehyde	0.30	0.10	0.13	0.06
Isovaleraldehyde	(0.03)	(0.01)	(0.01)	(0.01)
Methyl Ethyl Ketone	(0.64)	(0.87)	(1.39)	(1.11)
Methyl Isobutyl Ketone	(0.02)	(0.02)	(0.13)	(0.04)
Methyl Methacrylate	-	-	(0.01)	(0.00)
Methyl tert-Butyl Ether	1.50	(0.07)	2.68	(0.49)
n-Octane	0.26	(0.26)	0.72	(0.14)
Propionaldehyde	0.31	0.24	0.34	0.42
Propylene	1.87	0.63	6.58	1.06
Styrene	0.22	0.07	0.16	0.16
1,1,2,2-Tetrachloroethane	-	(0.01)	(0.00)	-
Tetrachloroethylene	0.59	(0.09)	0.31	0.24
Tolualdehydes	0.15	0.09	0.14	0.09
Toluene	3.73	1.00	3.91	2.90
1,2,4-Trichlorobenzene	(0.03)	(0.01)	(0.01)	(0.01)
1,1,1-Trichloroethane	0.09	0.08	0.09	(0.07)
1,1,2-Trichloroethane	-	(0.01)	-	-
Trichloroethylene	(0.38)	(0.01)	(0.08)	(0.05)
Trichlorofluoromethane	1.81	1.55	1.71	1.72
Trichlorotrifluoroethane	0.83	0.81	0.80	0.93
1,2,4-Trimethylbenzene	0.49	(0.09)	0.51	0.60
1,3,5-Trimethylbenzene	0.15	(0.03)	0.18	0.24
Valeraldehyde	0.17	0.07	0.19	0.12
Vinyl chloride	(0.02)	(0.01)	(0.01)	(0.00)
m,p-Xylene	1.48	0.42	1.77	1.11
o-Xylene	0.67	0.20	0.81	0.50

^a Numbers in parenthesis indicate averages based on less than 50% detection

ESTIMATING HEALTH RISK

A simplified way to determine whether the ambient concentration of an air toxic could pose a potential human health risk is to compare the air concentration to its health benchmark. The number that we get when we divide the air concentration by the benchmark is called a **risk ratio**. If the risk ratio is less than one, the air concentration should not pose a health risk. If it is greater than one, it may be of concern. The risk ratio also indicates how much higher or lower the estimated air concentration is than the health benchmark.

Camden, Elizabeth, and New Brunswick all had nine compounds with annual average concentrations that exceeded their health benchmarks, while Chester only had six. The toxic air pollutants that exceeded their health benchmarks at all sites include acetaldehyde, benzene, carbon tetrachloride, chloromethane, and formaldehyde. Camden, New Brunswick and Elizabeth all exceeded the health benchmarks for 1,3-butadiene and tetrachloroethylene.

The top five toxic compounds of concern based on annual risk ratios are listed in Table 3. Formaldehyde contributed the highest risk at every site, but note that the magnitude of the risk was much lower at Chester. Benzene, carbon tetrachloride, and acetaldehyde were common to all four sites as well.

TRENDS AND COMPARISONS

The site in Camden is the only monitoring location that has been measuring air toxics for an extended period. The graph in Figure 5 shows the change in concentrations for three of the most prevalent air toxics (benzene, toluene, and xylene) from 1990 to 2005. The graph shows that while average concentrations can vary significantly from year to year, the overall trend is downward. High individual samples may also result in high annual averages in some years. Concentrations of most air toxics have declined significantly over the last ten years. Because air toxics comprise such a large and diverse group of compounds, however, these general trends may not hold for other compounds.

**Table 3
Analytes with the 5 Highest Risk Ratios
(Based on Annual Mean Risk Ratio)
at Each Monitoring Site in 2005**

Rank	Camden		Chester		Elizabeth		New Brunswick	
	Analyte	Risk Ratio	Analyte	Risk Ratio	Analyte	Risk Ratio	Analyte	Risk Ratio
1	Formaldehyde	56 ^{a,b}	Formaldehyde	31	Formaldehyde	61	Formaldehyde	69
2	Benzene	12	Carbon Tetrachloride	7	Benzene	12	Acetaldehyde	14
3	Carbon Tetrachloride	8	1,2 Dibromoethane	6	Acetaldehyde	11	Benzene	8
4	Acetaldehyde	6	Benzene	5	Carbon Tetrachloride	8	Carbon Tetrachloride	8
5	Tetrachloroethylene	4	Acetaldehyde	3	1,3 Butadiene	4	p-dichlorobenzene	5

^a The risk ratio for a chemical is a comparison of the annual mean air concentration to the long-term health benchmark

^b The long-term health benchmark is defined as the chemical-specific air concentration above which there may be human health concerns. For a carcinogen (cancer-causing chemical), the health benchmark is set at the air concentration that would cause no more than a one in a million increase in the likelihood of getting cancer, even after a lifetime of exposure. For a non-carcinogen, the health benchmark is the maximum air concentration to which exposure is likely to cause no harm, even if that exposure occurs on a daily basis for a lifetime. These toxicity values are not available for all chemicals. For more information, go to www.nj.gov/dep/aqpp/risk.html

Figure 5
Annual Averages for Selected Hazardous Air
Pollutants (HAPs) at Camden Lab from 1990-2005

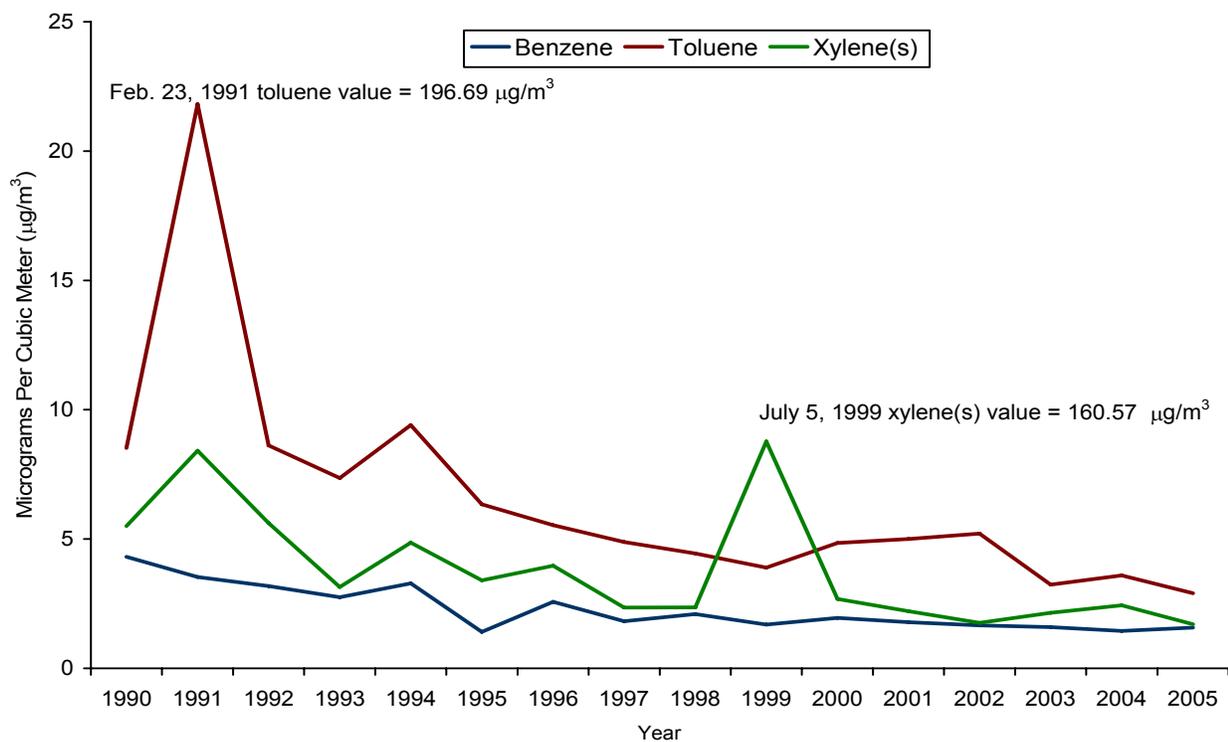


Figure 6 shows a comparison of the concentrations in Camden predicted by NATA for 1999 and the concentrations actually measured in Camden in 1999 for twelve compounds. Table 4 compares the 1999 NATA predictions with the measured concentrations for 1999 and 2005. It appears from this analysis that the agreement between predicted and monitored concentrations is fairly good. Finally, for the majority of the air toxics in Table 4, the 2005 levels measured at Camden were substantially lower than the concentrations measured in 1999.

Figure 6
Air Toxics Levels Measured in 1999 at Camden,
New Jersey Compared to NATA Predicted Levels

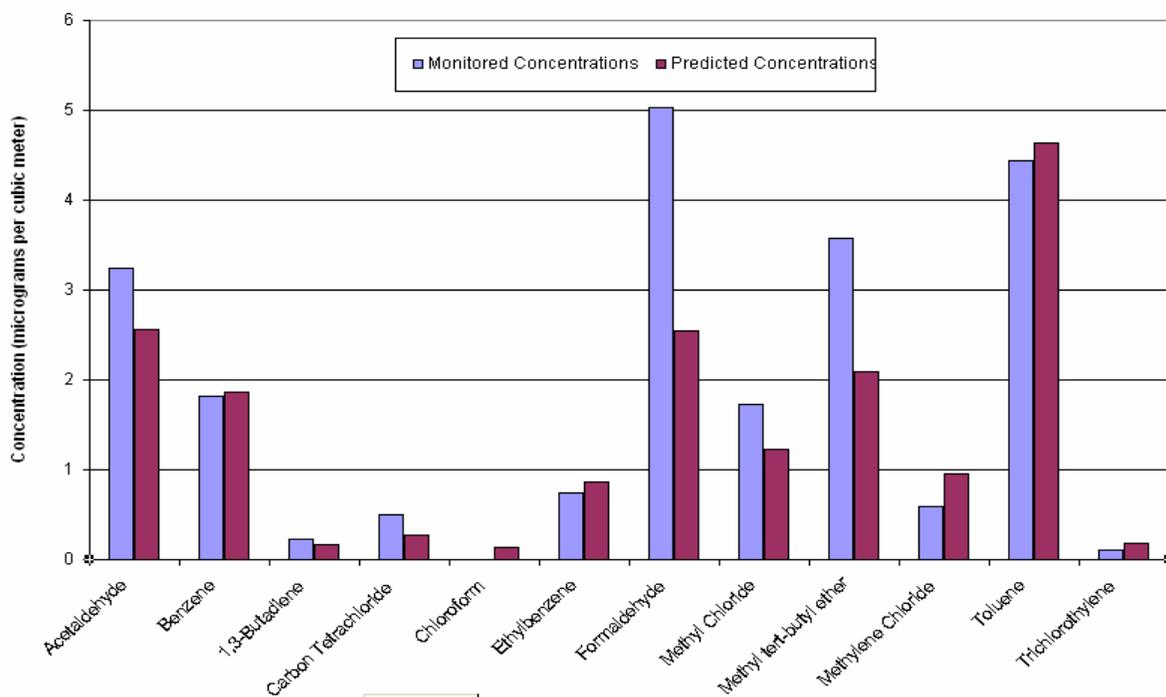


Table 4
Comparison of NATA Predicted to Measured Levels in Camden, NJ
µg/m³ – Micrograms Per Cubic Meter

Pollutant (HAP)	NATA Predicted 1999, µg/m ³	Measured 1999 Level, µg/m ³	Measured 2005 Level, µg/m ³
Acetaldehyde	2.56	3.24	2.88
Benzene	1.87	1.82	1.57
1,3-Butadiene	0.17	0.22	0.10
Carbon Tetrachloride	0.28	0.50	0.52
Chloroform	0.14	0.002	0.07
Ethylbenzene	0.74	0.87	0.56
Formaldehyde	2.54	5.03	4.31
Methyl Chloride	1.23	1.73	1.36
Methyl tert-butyl ether	2.09	3.57	1.5
Methylene Chloride	0.95	0.59	0.57
Toluene	4.63	4.44	3.73
Trichloroethylene	0.18	0.11	0.38

Table 5. 2005 Air toxics data for Camden, NJ

ANALYTE ^a	CAS #	Annual	Annual	24-hour	Annual	Annual	24-hour	Long-term	Annual	Detection	% above	
		Mean	Median	Max	Mean	Median	Max	Health	Mean Risk	Limit	minimum	
		(ppbv) ^{b,c}	(ppbv) ^b	(ppbv)	($\mu\text{g}/\text{m}^3$) ^{b,c}	($\mu\text{g}/\text{m}^3$) ^c	($\mu\text{g}/\text{m}^3$)	Benchmark	Ratio ^e	($\mu\text{g}/\text{m}^3$)	detection	limit ^f
Acetaldehyde	75-07-0	1.6	1.49	4.84	2.88	2.68	8.72	0.45	6	0.03	100	
Acetone	67-64-1	1.23	1.1	2.92	2.92	2.61	6.94	31000	0.0001	0.02	100	
Acetonitrile	75-05-8	(14.55)	0	385	(24.42)	0	646.39	60	0.41	0.22	35	
Acetylene	74-86-2	1.45	1.18	4.45	1.54	1.25	4.74			0.05	100	
Acrolein	107-02-8	(0.13)	0	0.78	(0.29)	0	1.79			0.07	33	
tert-Amyl Methyl Ether	994-05-8	(0)	0	0.04	(0)	0	0.17			0.29	2	
Benzaldehyde	100-52-7	0.07	0.05	1.13	0.32	0.23	4.9			0.01	100	
Benzene	71-43-2	0.49	0.4	1.73	1.57	1.26	5.53	0.13	12	0.16	100	
Bromomethane	74-83-9	0.18	0.03	2.73	0.71	0.1	10.6	5	0.14	0.19	74	
1,3-Butadiene	106-99-0	0.04	0.02	0.25	0.1	0.04	0.55	0.033	3	0.13	56	
Butyraldehyde	123-72-8	0.11	0.09	0.77	0.34	0.27	2.27			0.01	100	
Carbon Tetrachloride	56-23-5	0.08	0.1	0.16	0.52	0.63	1.01	0.067	8	0.38	83	
Chloroethane	75-00-3	0.01	0.01	0.12	0.04	0.03	0.32			0.26	52	
Chloroform	67-66-3	(0.01)	0	0.06	(0.07)	0	0.29	0.043	1.5	0.2	43	
Chloromethane	74-87-3	0.66	0.66	0.91	1.36	1.36	1.88	0.56	2	0.1	100	
Crotonaldehyde	123-73-9	0.11	0.05	0.62	0.32	0.13	1.79			0.01	96	
m-Dichlorobenzene	541-73-1	(0)	0	0.02	(0)	0	0.12			0.42	2	
o-Dichlorobenzene	95-50-1	(0)	0	0.03	(0)	0	0.18	200	N.A.	0.24	2	
p-Dichlorobenzene	106-46-7	0.03	0.01	0.11	0.15	0.06	0.66	0.091	1.7	0.36	54	
Dichlorodifluoromethane	75-71-8	0.67	0.64	1.31	3.31	3.17	6.48	200	0.02	0.15	100	
1,2-Dichloroethane	107-06-2	(0)	0	0.04	(0)	0	0.16	0.038	0.08	0.24	2	
cis-1,2-Dichloroethylene	156-59-2	(0)	0	0.08	(0.01)	0	0.32			0.24	2	
Dichloromethane	75-09-2	0.16	0.13	0.95	0.57	0.45	3.3	2.1	0.27	0.28	91	
Dichlorotetrafluoroethane	1320-37-2	0.01	0.02	0.02	0.08	0.14	0.14			0.21	56	
2,5-Dimethylbenzaldehyde	5799-94-2	(0.01)	0	0.47	(0.05)	0	2.55			0.02	9	
Ethyl tert-Butyl Ether	637-92-3	(0)	0	0.01	(0)	0	0.04			0.21	2	
Ethylbenzene	100-41-4	0.13	0.11	0.37	0.56	0.48	1.61			0.17	98	
Formaldehyde	50-00-0	3.51	2.66	23.1	4.31	3.27	28.37	0.077	56	0.02	100	
Hexachloro-1,3-butadiene	87-68-3	(0)	0	0.02	(0.03)	0	0.21	0.045	0.61	1.71	17	
Hexaldehyde	66-25-1	0.07	0.05	1.27	0.3	0.2	5.2			0.01	100	
Isovaleraldehyde	590-86-3	(0.01)	0	0.08	(0.03)	0	0.27			0.01	32	
Methyl Ethyl Ketone	78-93-3	(0.22)	0	1.17	(0.64)	0	3.45			0.44	43	
Methyl Isobutyl Ketone	108-10-1	(0)	0	0.07	(0.02)	0	0.29			0.33	13	
Methyl tert-Butyl Ether	1634-04-4	0.42	0.21	1.88	1.5	0.74	6.78	3.8	0.39	0.25	61	
n-Octane	111-65-9	0.05	0.04	0.35	0.26	0.19	1.64			0.28	61	
Propionaldehyde	123-38-6	0.13	0.11	0.57	0.31	0.26	1.35			0.01	87	
Propylene	115-07-1	1.09	0.82	4.72	1.87	1.4	8.12	3000	0.0006	0.12	100	
Styrene	100-42-5	0.05	0.04	0.33	0.22	0.17	1.41	1.8	0.12	0.17	87	
Tetrachloroethylene	127-18-4	0.09	0.04	1.74	0.59	0.27	11.8	0.17	3	0.34	74	
Tolualdehydes	1334-78-7	0.03	0.02	0.17	0.15	0.11	0.82			0.02	91	
Toluene	108-88-3	0.99	0.77	3.86	3.73	2.9	14.54	400	0.01	0.19	100	
1,2,4-Trichlorobenzene	102-82-1	(0)	0	0.16	(0.03)	0	1.19	200	0.0002	1.34	6	
1,1,1-Trichloroethane	71-55-6	0.02	0.02	0.05	0.09	0.11	0.27			0.27	54	
Trichloroethylene	79-01-6	(0.07)	0	0.58	(0.38)	0	3.12	0.5	0.75	0.27	48	
Trichlorofluoromethane	75-69-4	0.32	0.3	0.52	1.81	1.69	2.92	700	0.0026	0.22	100	
Trichlorotrifluoroethane	26523-64-8	0.11	0.1	0.16	0.83	0.77	1.23			0.31	100	
1,2,4-Trimethylbenzene	95-63-6	0.1	0.09	0.33	0.49	0.44	1.62			0.29	81	
1,3,5-Trimethylbenzene	108-67-8	0.03	0.03	0.1	0.15	0.15	0.49			0.2	74	
Valeraldehyde	110-62-3	0.05	0.04	0.63	0.17	0.13	2.23			0.01	96	
Vinyl chloride	75-01-4	(0.01)	0	0.13	(0.02)	0	0.33	0.11	0.14	0.1	22	
m,p-Xylene	1330-20-7	0.34	0.28	1.1	1.48	1.19	4.78	100	0.01	0.22	100	
o-Xylene	95-47-6	0.15	0.12	0.45	0.67	0.52	1.95	100	0.01	0.17	98	

^a Analytes in bold text had annual means above the long-term health benchmark

^b Numbers in parentheses are arithmetic means (or averages) based on less than 50 percent detection

^c For a valid 24-hour sampling event when the analyzing laboratory reports the term "Not Detected" for a particular pollutant, the concentration of 0.0 ppbv or 0.0 $\mu\text{g}/\text{m}^3$ is assigned to that pollutant. These zero concentrations were included in the calculation of annual averages and medians for each pollutant regardless of percent detection as zeros

^d The long-term health benchmark is defined as the chemical-specific air concentration above which there may be human health concerns. For a carcinogen (cancer-causing chemical), the health benchmark is set at the air concentration that would cause no more than a one in a million increase in the likelihood of getting cancer, even after a lifetime of exposure. For a non-carcinogen, the health benchmark is the maximum air concentration to which exposure is likely to cause no harm, even if that exposure occurs on a daily basis for a lifetime. These toxicity values are not available for all chemicals. For more information, go to www.nj.gov/dep/aqpp/risk.html

^e The risk ratio for a chemical is a comparison of the annual mean air concentration to the long-term health benchmark. If the annual mean is 0, then the annual mean risk ratio is displayed as N.A. (not applicable)

^f There were 54 total VOC samples, 53 total carbonyl samples, and 30 total samples for acrolein collected in 2005

Table 6. 2005 Air toxics data for Chester, NJ

ANALYTE ^a	CAS #	Annual	Annual	24-hour	Annual	Annual	24-hour	Long-term	Annual	Detection	% above	
		Mean	Median	Max	Mean	Median	Max	Health	Mean Risk	Limit	minimum	
		(ppbv) ^{b,c}	(ppbv) ^b	(ppbv)	(µg/m ³) ^{b,c}	(µg/m ³) ^c	(µg/m ³)	Benchmark	Ratio ^e	(µg/m ³)	detection	limit ^f
Acetaldehyde	75-07-0	0.85	0.79	4.64	1.53	1.43	8.36	0.45	3	0.03	100	
Acetone	67-64-1	0.96	0.93	1.81	2.28	2.21	4.3	31000	0.0001	0.02	100	
Acetonitrile	75-05-8	(1.94)	0	56.9	(3.26)	0	95.53	60	0.05	0.22	27	
Acetylene	74-86-2	0.58	0.51	1.31	0.61	0.54	1.39			0.05	100	
Acrolein	107-02-8	0.52	0.27	2.53	1.19	0.62	5.8			0.07	52	
tert-Amyl Methyl Ether	994-05-8	(0)	0	0.05	(0)	0	0.21			0.29	2	
Benzaldehyde	100-52-7	0.02	0.02	0.07	0.09	0.08	0.31			0.01	96	
Benzene	71-43-2	0.2	0.18	0.49	0.65	0.58	1.57	0.13	5	0.16	98	
Bromochloromethane	74-97-5	(0)	0	0.08	(0.01)	0	0.42			0.48	2	
Bromodichloromethane	75-27-4	(0)	0	0.08	(0.01)	0	0.54			0.27	2	
Bromoform	75-25-2	(0)	0	0.08	(0.02)	0	0.83	0.91	0.02	0.62	2	
Bromomethane	74-83-9	(0.01)	0	0.1	(0.03)	0	0.39	5	0.01	0.19	47	
1,3-Butadiene	106-99-0	(0.01)	0	0.1	(0.02)	0	0.22	0.033	0.51	0.13	35	
Butyraldehyde	123-72-8	0.08	0.08	0.31	0.24	0.23	0.91			0.01	100	
Carbon Tetrachloride	56-23-5	0.08	0.09	0.17	0.47	0.57	1.07	0.067	7	0.38	78	
Chlorobenzene	108-90-7	(0)	0	0.09	(0.01)	0	0.41	1000	0.00001	0.18	2	
Chloroethane	75-00-3	(0.01)	0	0.21	(0.03)	0	0.55			0.26	39	
Chloroform	67-66-3	(0.01)	0	0.1	(0.04)	0	0.49	0.043	0.98	0.2	29	
Chloromethane	74-87-3	0.6	0.6	0.85	1.23	1.24	1.76	0.56	2	0.1	100	
Chloromethylbenzene	100-44-7	(0)	0	0.04	(0)	0	0.21			0.26	2	
Chloroprene	126-99-8	(0)	0	0.07	(0)	0	0.25	1	N.A.	0.18	2	
Crotonaldehyde	123-73-9	0.14	0.04	1.1	0.41	0.11	3.15			0.01	98	
Dibromochloromethane	594-18-3	(0)	0	0.08	(0.02)	0	0.79			0.69	2	
1,2-Dibromoethane	106-93-4	(0)	0	0.07	(0.01)	0	0.54	0.0017	6	0.38	2	
m-Dichlorobenzene	541-73-1	(0)	0	0.05	(0.01)	0	0.3		0.00	0.42	6	
o-Dichlorobenzene	95-50-1	(0)	0	0.05	(0.01)	0	0.3	200	0.0001	0.24	4	
p-Dichlorobenzene	106-46-7	(0)	0	0.05	(0.02)	0	0.3	0.091	0.19	0.36	22	
Dichlorodifluoromethane	75-71-8	0.6	0.59	0.83	2.95	2.92	4.1	200	0.01	0.15	100	
1,1-Dichloroethane	75-34-3	(0)	0	0.08	(0.01)	0	0.32	0.63	0.01	0.2	2	
1,2-Dichloroethane	107-06-2	(0)	0	0.07	(0.01)	0	0.28	0.038	0.25	0.24	4	
1,1-Dichloroethene	75-35-4	(0)	0	0.07	(0.01)	0	0.28	200	0.0001	0.2	2	
cis-1,2-Dichloroethylene	156-59-2	(0.02)	0	1.05	(0.08)	0	4.16			0.24	2	
trans-1,2-Dichloroethylene	156-60-5	(0)	0	0.08	(0.01)	0	0.32			0.2	2	
Dichloromethane	75-09-2	0.18	0.09	2.71	0.62	0.31	9.41	2.1	0.29	0.68	75	
cis-1,3-Dichloropropene	542-75-6	(0)	0	0.05	(0)	0	0.23	0.25	0.02	0.23	2	
Dichlorotetrafluoroethane	1320-37-2	0.01	0.02	0.09	0.08	0.14	0.63			0.21	53	
2,5-Dimethylbenzaldehyde	5799-94-2	(0)	0	0.02	(0)	0	0.13			0.02	2	
Ethylbenzene	100-41-4	0.05	0.05	0.13	0.2	0.22	0.56			0.17	86	
Formaldehyde	50-00-0	1.98	1.41	9.26	2.44	1.73	11.37	0.077	32	0.02	100	
Hexachloro-1,3-butadiene	87-68-3	(0)	0	0.04	(0.03)	0	0.43	0.045	0.74	1.71	16	
Hexaldehyde	66-25-1	0.02	0.02	0.05	0.1	0.09	0.21			0.01	100	
Isovaleraldehyde	590-86-3	(0)	0	0.03	(0.01)	0	0.12			0.01	28	
Methyl Ethyl Ketone	78-93-3	(0.3)	0	4.65	(0.87)	0	13.69			0.44	33	
Methyl Isobutyl Ketone	108-10-1	(0)	0	0.08	(0.02)	0	0.33			0.33	10	
Methyl tert-Butyl Ether	1634-04-4	(0.02)	0	0.22	(0.07)	0	0.79	3.8	0.02	0.25	20	
n-Octane	111-65-9	(0.06)	0	1.16	(0.26)	0	5.42			0.28	39	
Propionaldehyde	123-38-6	0.1	0.09	0.38	0.24	0.22	0.89			0.01	93	
Propylene	115-07-1	0.36	0.28	3.41	0.63	0.48	5.87	3000	0.0002	0.12	98	
Styrene	100-42-5	0.02	0.01	0.14	0.07	0.04	0.6	1.8	0.04	0.17	51	
1,1,2,2-Tetrachloroethane	79-34-5	(0)	0	0.08	(0.01)	0	0.55	0.017	0.71	0.34	4	
Tetrachloroethylene	127-18-4	(0.01)	0	0.09	(0.09)	0	0.61	0.17	0.55	0.34	49	
1,2,4-Trichlorobenzene	102-82-1	(0)	0	0.05	(0.01)	0	0.37	200	0.0001	1.34	4	
1,1,1-Trichloroethane	71-55-6	0.02	0.02	0.1	0.08	0.11	0.55	1000	0.0001	0.27	53	
1,1,2-Trichloroethane	79-00-5	(0)	0	0.07	(0.01)	0	0.38	0.063	0.12	0.44	2	
Trichloroethylene	79-01-6	(0)	0	0.07	(0.01)	0	0.38	0.5	0.03	0.27	14	
Trichlorofluoromethane	75-69-4	0.28	0.27	0.46	1.55	1.52	2.58	700	0.0022	0.22	100	
Trichlorotrifluoroethane	26523-64-8	0.11	0.1	0.17	0.81	0.77	1.3			0.31	100	
1,2,4-Trimethylbenzene	95-63-6	(0.02)	0	0.15	(0.09)	0	0.74			0.29	43	
1,3,5-Trimethylbenzene	108-67-8	(0.01)	0	0.06	(0.03)	0	0.29			0.2	37	
Tolualdehydes	1334-78-7	0.02	0.01	0.07	0.09	0.07	0.32			0.02	78	
Toluene	108-88-3	0.27	0.24	0.61	1	0.9	2.3	400	0.00	0.19	100	
Valeraldehyde	110-62-3	0.02	0.02	0.07	0.07	0.06	0.26			0.01	98	
Vinyl chloride	75-01-4	(0)	0	0.07	(0.01)	0	0.18	0.11	0.05	0.1	12	
m,p-Xylene	1330-20-7	0.1	0.09	0.25	0.42	0.39	1.09	100	0.0042	0.22	90	
o-Xylene	95-47-6	0.05	0.05	0.12	0.2	0.22	0.52	100	0.002	0.17	84	

^a Analytes in bold text had annual means above the long-term health benchmark

^b Numbers in parentheses are arithmetic means (or averages) based on less than 50 percent detection

^c For a valid 24-hour sampling event when the analyzing laboratory reports the term "Not Detected" for a particular pollutant, the concentration of 0.0 ppbv or 0.0 µg/m³ is assigned to that pollutant. These zero concentrations were included in the calculation of annual averages and medians for each pollutant regardless of percent detection as zeros

^d The long-term health benchmark is defined as the chemical-specific air concentration above which there may be human health concerns. For a carcinogen (cancer-causing chemical), the health benchmark is set at the air concentration that would cause no more than a one in a million increase in the likelihood of getting cancer, even after a lifetime of exposure. For a non-carcinogen, the health benchmark is the maximum air concentration to which exposure is likely to cause no harm, even if that exposure occurs on a daily basis for a lifetime. These toxicity values are not available for all chemicals.

For more information, go to www.nj.gov/dep/aqpp/risk.html

^e The risk ratio for a chemical is a comparison of the annual mean air concentration to the long-term health benchmark. If the annual mean is 0, then the annual mean risk ratio is displayed as N.A. (not applicable)

^f There were 54 total VOC samples, 51 total carbonyl samples, and 27 total samples for acrolein collected in 2005

Table 7. 2005 Air toxics data for Elizabeth, NJ

ANALYTE ^a	CAS #	Annual Mean (ppbv) ^{b,c}	Annual Median (ppbv) ^b	24-hour Max (ppbv)	Annual Mean (µg/m ³) ^{b,c}	Annual Median (µg/m ³) ^c	24-hour Max (µg/m ³)	Long-Term		Detection Limit (µg/m ³)	% above minimum detection limit ^f
								Health Benchmark (µg/m ³) ^d	Annual Mean Risk Ratio ^e		
Acetaldehyde	75-07-0	2.79	2.38	8.34	5.03	4.28	15.03	0.45	11	0.03	100
Acetone	67-64-1	1.3	1.18	3.35	3.09	2.8	7.96	31000	0.0001	0.02	100
Acetonitrile	75-05-8	(0.5)	0	11.8	(0.85)	0	19.81	60	0.01	0.22	17
Acetylene	74-86-2	1.55	1.36	4.28	1.65	1.44	4.55			0.05	100
Acrolein	107-02-8	(0.19)	0	1.65	(0.43)	0	3.78			0.07	30
Acrylonitrile	107-13-1	(0.01)	0	0.53	(0.02)	0	1.15	0.015	1.3	0.17	2
Benzaldehyde	100-52-7	0.05	0.04	0.12	0.2	0.17	0.52			0.01	100
Benzene	71-43-2	0.5	0.45	1.16	1.59	1.42	3.71	0.13	12	0.16	100
Bromomethane	74-83-9	(0.01)	0	0.06	(0.03)	0	0.23	5	0.01	0.19	40
1,3-Butadiene	106-99-0	0.06	0.06	0.18	0.13	0.13	0.4	0.033	4	0.13	68
Butyraldehyde	123-72-8	0.12	0.1	0.47	0.36	0.31	1.38			0.01	100
Carbon Tetrachloride	56-23-5	0.09	0.09	0.18	0.55	0.57	1.13	0.067	8	0.38	87
Chloroethane	75-00-3	(0.02)	0	0.39	(0.06)	0	1.03			0.26	38
Chloroform	67-66-3	(0.02)	0	0.12	(0.09)	0	0.59	0.043	2	0.2	43
Chloromethane	74-87-3	0.64	0.61	0.93	1.31	1.26	1.92	0.56	2	0.1	100
Crotonaldehyde	123-73-9	0.1	0.04	0.57	0.28	0.12	1.63			0.01	100
m-Dichlorobenzene	541-73-1	(0)	0	0.01	(0)	0	0.06			0.42	2
o-Dichlorobenzene	95-50-1	(0)	0	0.01	(0)	0	0.06	200	N.A.	0.24	5
p-Dichlorobenzene	106-46-7	(0.01)	0	0.13	(0.08)	0	0.78	0.091	0.93	0.36	45
Dichlorodifluoromethane	75-71-8	0.64	0.62	0.89	3.14	3.07	4.4	200	0.02	0.15	100
1,2-Dichloroethane	107-06-2	(0)	0	0.07	(0)	0	0.28	0.038	0.12	0.24	2
Dichloromethane	75-09-2	0.23	0.19	1.79	0.81	0.66	6.22	2.1	0.38	0.28	87
Dichlorotetrafluoroethane	1320-37-2	(0.01)	0	0.05	(0.07)	0	0.35			0.21	48
2,5-Dimethylbenzaldehyde	5799-94-2	(0)	0	0.03	(0.01)	0	0.15			0.02	7
Ethylbenzene	100-41-4	0.16	0.13	0.54	0.7	0.56	2.34			0.17	98
Formaldehyde	50-00-0	3.82	3.83	8.9	4.69	4.7	10.93	0.077	61	0.02	100
Hexachloro-1,3-butadiene	87-68-3	(0)	0	0.02	(0.03)	0	0.21	0.045	0.71	1.71	22
Hexaldehyde	66-25-1	0.03	0.03	0.09	0.13	0.11	0.36			0.01	100
Isovaleraldehyde	590-86-3	(0)	0	0.02	(0.01)	0	0.07			0.01	13
Methyl Ethyl Ketone	78-93-3	(0.47)	0	9.77	(1.39)	0	28.77			0.44	42
Methyl Isobutyl Ketone	108-10-1	(0.03)	0	1.02	(0.13)	0	4.18			0.33	15
Methyl Methacrylate	80-62-6	(0)	0	0.12	(0.01)	0	0.42	700	0.00001	0.39	5
Methyl tert-Butyl Ether	1634-04-4	0.74	0.52	7.29	2.68	1.87	26.28	3.8	0.71	0.25	72
n-Octane	111-65-9	0.15	0.06	4.76	0.72	0.28	22.24			0.28	70
Propionaldehyde	123-38-6	0.14	0.13	0.53	0.34	0.31	1.26			0.01	93
Propylene	115-07-1	3.83	1.75	27.4	6.58	3	47.16	3000	0.0022	0.12	100
Styrene	100-42-5	0.04	0.04	0.13	0.16	0.17	0.55	1.8	0.09	0.17	72
1,1,2,2-Tetrachloroethane	79-34-5	(0)	0	0.01	(0)	0	0.07	0.017	0.07	0.34	2
Tetrachloroethylene	127-18-4	0.05	0.05	0.16	0.31	0.31	1.09	0.17	1.8	0.34	70
Tolualdehydes	1334-78-7	0.03	0.02	0.1	0.14	0.12	0.47			0.02	93
Toluene	108-88-3	1.04	0.89	3.71	3.91	3.35	13.98	400	0.01	0.19	100
1,2,4-Trichlorobenzene	102-82-1	(0)	0	0.02	(0.01)	0	0.15	200	N.A.	1.34	12
1,1,1-Trichloroethane	71-55-6	0.02	0.02	0.06	0.09	0.11	0.33	1000	0.0001	0.27	52
Trichloroethylene	79-01-6	(0.02)	0	0.12	(0.08)	0	0.64	0.5	0.16	0.27	35
Trichlorofluoromethane	75-69-4	0.3	0.29	0.48	1.71	1.63	2.7	700	0.0024	0.22	100
Trichlorotrifluoroethane	26523-64-8	0.1	0.1	0.31	0.8	0.73	2.38			0.31	100
1,2,4-Trimethylbenzene	95-63-6	0.1	0.09	0.4	0.51	0.44	1.97			0.29	77
1,3,5-Trimethylbenzene	108-67-8	0.04	0.03	0.14	0.18	0.15	0.69			0.2	72
Valeraldehyde	110-62-3	0.06	0.04	0.45	0.19	0.12	1.59			0.01	100
Vinyl chloride	75-01-4	(0)	0	0.02	(0.01)	0	0.05	0.11	0.06	0.1	20
m,p-Xylene	1330-20-7	0.41	0.32	1.46	1.77	1.39	6.34	100	0.02	0.22	100
o-Xylene	95-47-6	0.19	0.15	0.6	0.81	0.63	2.61	100	0.01	0.17	98

^a Analytes in bold text had annual means above the long-term health benchmark

^b Numbers in parentheses are arithmetic means (or averages) based on less than 50 percent detection

^c For a valid 24-hour sampling event when the analyzing laboratory reports the term "Not Detected" for a particular pollutant, the concentration of 0.0 ppbv or 0.0 µg/m³ is assigned to that pollutant. These zero concentrations were included in the calculation of annual averages and medians for each pollutant regardless of percent detection as zeros

^d The long-term health benchmark is defined as the chemical-specific air concentration above which there may be human health concerns. For a carcinogen (cancer-causing chemical), the health benchmark is set at the air concentration that would cause no more than a one in a million increase in the likelihood of getting cancer, even after a lifetime of exposure. For a non-carcinogen, the health benchmark is the maximum air concentration to which exposure is likely to cause no harm, even if that exposure occurs on a daily basis for a lifetime. These toxicity values are not available for all chemicals. For more information, go to www.nj.gov/dep/aqpp/risk.html

^e The risk ratio for a chemical is a comparison of the annual mean air concentration to the long-term health benchmark. If the annual mean is 0, then the annual mean risk ratio is displayed as N.A. (not applicable)

^f There were 60 total VOC samples, 60 total carbonyl samples, and 30 total samples for acrolein collected in 2005

Table 8. 2005 Air toxics data for New Brunswick, NJ

ANALYTE ^a	CAS #	Annual Mean (ppbv) ^{b,c}	Annual Median (ppbv) ^b	24-hour Max (ppbv)	Annual Mean ($\mu\text{g}/\text{m}^3$) ^{b,c}	Annual Median ($\mu\text{g}/\text{m}^3$) ^c	24-hour Max ($\mu\text{g}/\text{m}^3$)	Long-Term	Annual Mean Risk Ratio ^e	Detection Limit ($\mu\text{g}/\text{m}^3$)	% above minimum detection limit ^f
								Health Benchmark ($\mu\text{g}/\text{m}^3$) ^d			
Acetaldehyde	75-07-0	3.44	2.81	8.97	6.2	5.05	16.16	0.45	14	0.03	100
Acetone	67-64-1	1.7	1.59	3.89	4.05	3.77	9.24	31000	0.0001	0.02	100
Acetonitrile	75-05-8	(3.6)	0	32.8	(6.05)	0	55.07	60	0.10	0.22	32
Acetylene	74-86-2	1.14	0.91	4.43	1.21	0.97	4.71			0.05	100
Acrolein	107-02-8	0.63	0.37	4	1.44	0.85	9.17			0.07	67
Benzaldehyde	100-52-7	0.03	0.03	0.1	0.12	0.12	0.43			0.01	95
Benzene	71-43-2	0.31	0.26	1.03	0.99	0.83	3.29	0.13	8	0.16	100
Bromomethane	74-83-9	(0.01)	0	0.03	(0.02)	0	0.12	5	0.004	0.19	39
1,3-Butadiene	106-99-0	(0.02)	0	0.21	(0.05)	0	0.46	0.033	1.5	0.13	49
Butyraldehyde	123-72-8	0.16	0.12	0.73	0.48	0.36	2.15			0.01	100
Carbon Tetrachloride	56-23-5	0.08	0.09	0.14	0.5	0.57	0.88	0.067	7	0.38	86
Chloroethane	75-00-3	(0.01)	0	0.07	(0.02)	0	0.18			0.26	35
Chloroform	67-66-3	(0.02)	0	0.15	(0.08)	0	0.73	0.043	1.8	0.2	40
Chloromethane	74-87-3	0.63	0.63	0.87	1.3	1.3	1.8	0.56	2	0.1	100
Crotonaldehyde	123-73-9	0.12	0.05	0.63	0.33	0.13	1.81			0.01	100
Dibromochloromethane	594-18-3	(0)	0	0.01	(0)	0	0.1			0.69	2
p-Dichlorobenzene	106-46-7	(0.07)	0	3.64	(0.42)	0	21.89	0.091	5	0.36	32
Dichlorodifluoromethane	75-71-8	0.63	0.62	1.09	3.12	3.07	5.39	200	0.02	0.15	100
1,2-Dichloroethane	107-06-2	(0)	0	0.05	(0.01)	0	0.2	0.038	0.19	0.24	4
Dichloromethane	75-09-2	0.16	0.12	1.01	0.55	0.42	3.51	2.1	0.26	0.28	81
Dichlorotetrafluoroethane	1320-37-2	(0.01)	0	0.02	(0.07)	0	0.14			0.21	47
Ethylbenzene	100-41-4	0.14	0.11	0.38	0.6	0.48	1.65			0.17	100
Formaldehyde	50-00-0	4.34	3.57	11.8	5.34	4.38	14.49	0.077	69	0.02	100
Hexachloro-1,3-butadiene	87-68-3	(0)	0	0.03	(0.03)	0	0.32	0.045	0.71	1.71	16
Hexaldehyde	66-25-1	0.02	0.01	0.04	0.06	0.06	0.16			0.01	86
Isovaleraldehyde	590-86-3	(0)	0	0.02	(0.01)	0	0.08			0.01	29
Methyl Ethyl Ketone	78-93-3	(0.38)	0	9.55	(1.11)	0	28.12			0.44	42
Methyl Isobutyl Ketone	108-10-1	(0.01)	0	0.19	(0.04)	0	0.78			0.33	9
Methyl Methacrylate	80-62-6	(0)	0	0.05	(0)	0	0.18	700	N.A.	0.39	2
Methyl tert-Butyl Ether	1634-04-4	(0.14)	0	0.76	(0.49)	0	2.74	3.8	0.13	0.25	44
n-Octane	111-65-9	(0.03)	0	0.22	(0.14)	0	1.03			0.28	47
Propionaldehyde	123-38-6	0.18	0.13	0.61	0.42	0.32	1.46			0.01	97
Propylene	115-07-1	0.62	0.51	2.02	1.06	0.88	3.48	3000	0.0004	0.12	100
Styrene	100-42-5	0.04	0.03	0.3	0.16	0.13	1.28	1.8	0.09	0.17	58
Tetrachloroethylene	127-18-4	0.04	0.02	0.55	0.24	0.14	3.73	0.17	1.4	0.34	54
Tolualdehydes	1334-78-7	0.02	0.01	0.07	0.09	0.06	0.34			0.02	78
Toluene	108-88-3	0.77	0.52	8.61	2.9	1.96	32.44	400	0.01	0.19	100
1,2,4-Trichlorobenzene	102-82-1	(0)	0	0.04	(0.01)	0	0.3	200	0.0001	1.34	2
1,1,1-Trichloroethane	71-55-6	(0.01)	0	0.05	(0.07)	0	0.27	1000	0.0001	0.27	47
Trichloroethylene	79-01-6	(0.01)	0	0.06	(0.05)	0	0.32	0.5	0.09	0.27	32
1,2,4-Trimethylbenzene	95-63-6	0.12	0.07	1.23	0.6	0.34	6.05			0.29	67
1,3,5-Trimethylbenzene	108-67-8	0.05	0.02	0.48	0.24	0.1	2.36			0.2	63
Trichlorofluoromethane	75-69-4	0.31	0.29	0.66	1.72	1.63	3.71	700	0.0025	0.22	100
Trichlorotrifluoroethane	26523-64-8	0.12	0.1	0.88	0.93	0.77	6.74			0.31	100
Valeraldehyde	110-62-3	0.03	0.03	0.11	0.12	0.11	0.38			0.01	98
Vinyl chloride	75-01-4	(0)	0	0.06	(0)	0	0.15	0.11	0.04	0.1	11
m,p-Xylene	1330-20-7	0.25	0.22	0.76	1.11	0.96	3.3	100	0.01	0.22	100
o-Xylene	95-47-6	0.11	0.1	0.41	0.5	0.43	1.78	100	0.01	0.17	91

^a Analytes in bold text had annual means above the long-term health benchmark

^b Numbers in parentheses are arithmetic means (or averages) based on less than 50 percent detection

^c For a valid 24-hour sampling event when the analyzing laboratory reports the term "Not Detected" for a particular pollutant, the concentration of 0.0 ppbv or 0.0 $\mu\text{g}/\text{m}^3$ is assigned to that pollutant. These zero concentrations were included in the calculation of annual averages and medians for each pollutant regardless of percent detection as zeros

^d The long-term health benchmark is defined as the chemical-specific air concentration above which there may be human health concerns. For a carcinogen (cancer-causing chemical), the health benchmark is set at the air concentration that would cause no more than a one in a million increase in the likelihood of getting cancer, even after a lifetime of exposure. For a non-carcinogen, the health benchmark is the maximum air concentration to which exposure is likely to cause no harm, even if that exposure occurs on a daily basis for a lifetime. These toxicity values are not available for all chemicals. For more information, go to www.nj.gov/dep/aqpp/risk.html

^e The risk ratio for a chemical is a comparison of the annual mean air concentration to the long-term health benchmark. If the annual mean is 0, then the annual mean risk ratio is displayed as N.A. (not applicable)

^f There were 57 total VOC samples, 58 total carbonyl samples, and 27 total samples for acrolein collected in 2005

Table 9. Analytes with 100 percent non-detects in 2005

Analyte	CAS #	Detection Limit ($\mu\text{g}/\text{m}^3$)	Location			
			Camden	Chester	Elizabeth	New Brunswick
Acrylonitrile	107-13-1	0.17	X	X		X
tert-Amyl Methyl Ether	994-05-8	0.29			X	X
Bromochloromethane	74-97-5	0.48	X		X	X
Bromodichloromethane	75-27-4	0.27	X		X	X
Bromoform	75-25-2	0.62	X		X	X
Chlorobenzene	108-90-7	0.18	X		X	X
Chloromethylbenzene	100-44-7	0.26	X		X	X
Chloroprene	126-99-8	0.18	X		X	X
Dibromochloromethane	594-18-3	0.69	X		X	
m-Dichlorobenzene	541-73-1	0.42				X
o-Dichlorobenzene	95-50-1	0.24				X
1,1-Dichloroethane	75-34-3	0.2	X		X	X
1,1-Dichloroethene	75-35-4	0.2	X		X	X
1,2-Dibromoethane	106-93-4	0.38	X		X	X
cis-1,2-Dichloroethylene	156-59-2	0.24			X	X
trans-1,2-Dichloroethylene	156-60-5	0.20	X		X	X
1,2-Dichloropropane	78-87-5	0.32	X	X	X	X
cis-1,3-Dichloropropene	542-75-6	0.23	X		X	X
trans-1,3-Dichloropropene	542-75-6	0.23	X	X	X	X
2,5-Dimethylbenzaldehyde	5799-94-2	0.02				X
Ethyl Acrylate	140-88-5	0.25	X	X	X	X
Ethyl tert-Butyl Ether	637-92-3	0.21		X	X	X
Methyl Methacrylate	80-62-6	0.39	X	X		
1,1,2,2-Tetrachloroethane	79-34-5	0.34	X			X
1,1,2-Trichloroethane	79-00-5	0.44	X		X	X

In 2005, these chemicals were never collected above their respective detection limits, however they may be present in the air below the detection limit level.

REFERENCES

Air Pollution and Health Risk, EPA-450/3-90-022, USEPA Office of Air and Radiation, Technology Transfer Network, URL: http://www.epa.gov/ttn/atw/3_90_022.html

Air Toxics in New Jersey, NJDEP, Division of Air Quality (DAQ), URL: www.state.nj.us/dep/airtoxics

Clean Air Act Amendments of 1990, Title III – Hazardous Air Pollutants, 101st Congress 2nd Session, Report 101-952, US Government Printing Office, Washington DC, October 1990.

Evaluating Exposures to Toxic Air Pollutants: A Citizen's Guide, EPA-450/3-90-023, USEPA, Office of Air and Radiation, USEPA Office of Air and Radiation, Technology Transfer Network, URL: http://www.epa.gov/ttn/atw/3_90_023.html

Taking Toxics Out of the Air, EPA-452/K-00-002, USEPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC, August 2000, URL: <http://www.epa.gov/oar/oaqps/takingtoxics/airtox.pdf>

Risk Screening Tools, NJDEP, DAQ, Air Quality Permitting Program, URL: www.nj.gov/dep/aqpp/risk.html

Reference Concentrations for Inhalation, NJDEP, DAQ, Bureau of Technical Services, Air Quality Evaluation Section (AQEv), Trenton, NJ, May 2007, URL: <http://www.state.nj.us/dep/aqpp/downloads/risk/RfCs2007.pdf>

Reference Concentrations for Short-Term Inhalation Exposure, NJDEP, DAQ/AQEv, Trenton, NJ, May 2007, URL: <http://www.state.nj.us/dep/aqpp/downloads/risk/Acute2007.pdf>

Unit Risk Factors for Inhalation, NJDEP, DAQ/AQEv, Trenton, NJ, May 2007, URL: <http://www.state.nj.us/dep/aqpp/downloads/risk/URFs2007.pdf>

Risk Assessment for Toxic Air Pollutants, USEPA Office of Air and Radiation, Technology Transfer Network, URL: http://www.epa.gov/ttn/atw/3_90_024.html

1999 National-Scale Air Toxics Assessment, USEPA Office of Air and Radiation, Technology Transfer Network, URL: <http://www.epa.gov/ttn/atw/nata1999>.



2005 Atmospheric Deposition Summary

New Jersey Department of Environmental Protection

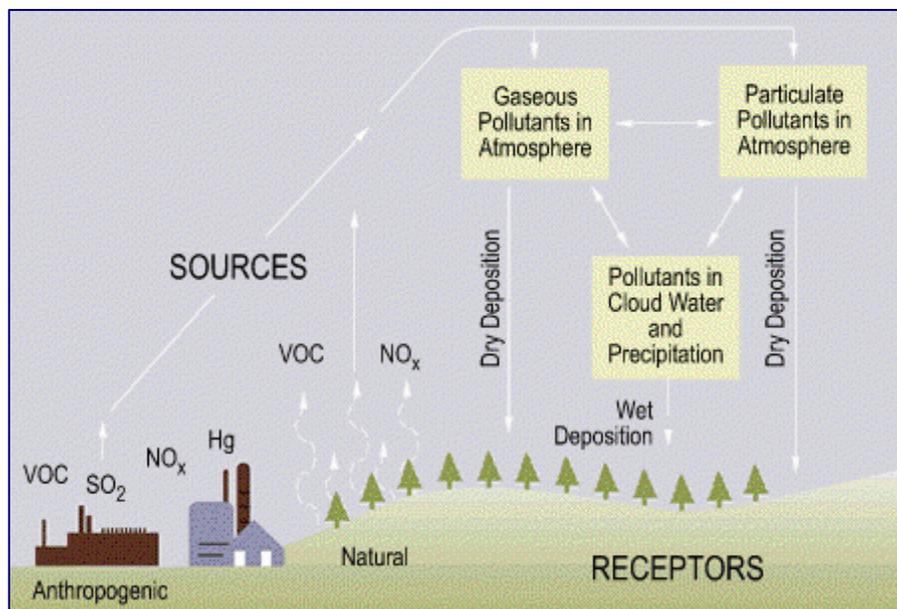
NATURE AND SOURCES

Atmospheric deposition refers to pollutants that are deposited on land or water from the air. Deposition is usually the result of pollutants being removed from the atmosphere and deposited by precipitation (wet deposition) or by the settling out of particulates (dry deposition). Dry deposition also includes gaseous pollutants that are absorbed by land or water bodies. Figure 1 shows the basic mechanisms of deposition and the major pollutants of concern. These include sulfur dioxide (SO₂), nitrogen oxides (NO_x), mercury (Hg), and volatile organic compounds (VOCs). SO₂ is a major contributor to acid deposition, which can reduce the ability of water bodies to support certain types of fish and other aquatic organisms. NO_x also contributes to the acid deposition problem and can contribute to eutrophication of water bodies as well. Hg will accumulate in fish by a process

known as bio-magnification. Small concentrations of Hg in water are concentrated in smaller organisms. These smaller organisms are in turn consumed by larger ones. As the Hg moves up the food chain, it becomes more concentrated. Fish in Hg contaminated water can become contaminated to the point where they are no longer safe for people to eat. For more information on Hg in fish see "A Guide to Health Advisories for Eating Fish and Crabs Caught in New Jersey Waters" which is available at www.state.nj.us/dep/dsr/njmainfish.htm. VOCs are a very diverse group of compounds, some of which are toxic, including known carcinogens.

Atmospheric deposition is the result of pollution from a wide variety of sources and in some cases the pollution can travel great distances before being deposited on the land or water. Some known sources of atmospheric deposition are power plants, motor vehicles, incinerators, and certain industries.

Figure 1



Source: USEPA Clean Air Markets

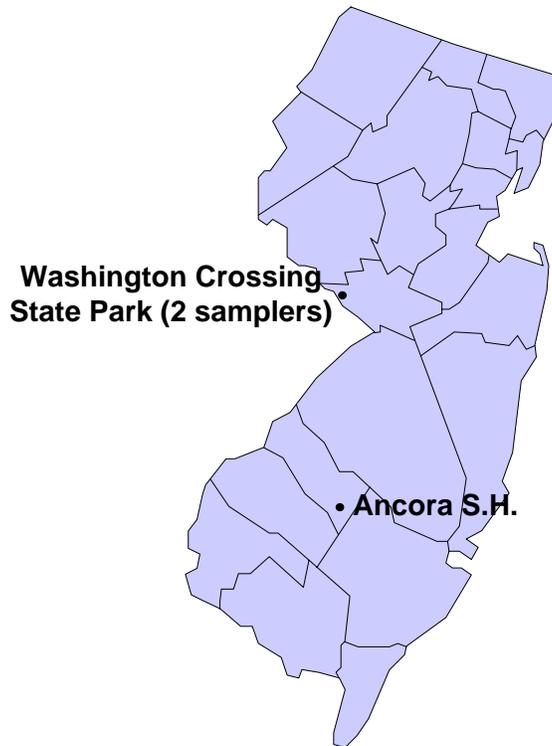
Web Site: <http://www.epa.gov/airmarkets/acidrain/index.html#what>

MONITORING LOCATIONS

The state monitored wet deposition levels at 2 locations in 2005. These sites are shown in Figure 2. A sample is collected each week from both sites and after each significant rain event at the Washington Crossing State Park site. The Washington Crossing site is also part of the National Atmospheric Deposition Program (NADP) network which is used by the U.S. Environmental Protection Agency to assess national deposition patterns and trends.

Both sites shown in Figure 2 have a sampler for collecting wet deposition (rain and snow) and a rain gauge for determining precipitation amounts. Due to the Lebanon monitor's remote location, it was phased out of operation during 2004.

**Figure 2
Acid Precipitation Monitoring
Network - 2005**



SUMMARY OF 2005 DATA

A summary of the 2005 wet deposition data is provided in Table 1. The table shows total deposition, pH, conductivity and concentrations of several important ions. When acidity is reported on the pH scale, neutral is considered a 7 with decreasing pH values corresponding to increasing acidity. Normal rainfall has a pH of approximately 5.6 due to the natural presence of carbonic acid in the air. The mean pH value recorded at the Washington Crossing State Park weekly sampler was 4.47 and the Ancora State Hospital sampler recorded a mean pH of 4.57.

Conductivity is a measure of the total density of ions in the water collected. It is used as an indicator of the total amount of pollution in the sample. Conductivity is the ability of the water to conduct electricity and generally increases as the concentration of ions in water increases.

Concentrations of specific ions considered important because they can affect the chemistry of lakes, streams and other water bodies, are also reported for each site. Summaries are provided for each season of the year along with annual averages in Table 1.

Table 1
Acid Precipitation Monitoring Network - 2005
Annual and Seasonal Averages

Weighted by Precipitation Amount

Ca ²⁺	- Calcium	PO ₄ ³⁻	- Phosphate
Mg ⁺	- Magnesium	Cond.	- Specific conductance
K ⁺	- Potassium	us/cm	- MicroSiemens per centimeter
Na ⁺	- Sodium	mg/l	- Milligrams per liter
NH ₄	- Ammonium	<MDL	- Below minimum detection limit
NO ₃ ⁻	- Nitrate	Winter	- January – March
Cl ⁻	- Chloride	Spring	- April – June
SO ₄ ²⁻	- Sulfate	Summer	- July – September
-	- No Data	Fall	- October – December

Ancora State Hospital – Weekly

	Precip. Inches	pH	Cond. us/cm	Ca ²⁺ mg/l	Mg ⁺ mg/l	K ⁺ mg/l	Na ⁺ mg/l	NH ₄ ⁻ mg/l	NO ₃ ⁻ mg/l	Cl ⁻ mg/l	SO ₄ ²⁻ mg/l	PO ₄ ³⁻ mg/l
Winter	8.28	4.37	25.6	0.081	0.046	0.045	0.346	0.424	1.734	0.599	1.974	< MDL
Spring	9.51	4.56	17.5	0.099	0.049	0.048	0.317	0.290	1.293	0.552	1.500	< MDL
Summer	8.09	4.39	23.3	0.113	0.039	0.027	0.176	0.353	1.280	0.413	2.301	< MDL
Fall	17.75	4.86	9.2	0.036	0.045	0.033	0.364	0.070	0.489	0.624	0.660	< MDL
Annual	43.63	4.57	16.7	0.072	0.045	0.037	0.315	0.238	1.047	0.564	1.397	< MDL

Washington Crossing State Park – Weekly

	Precip. Inches	pH	Cond. us/cm	Ca ²⁺ mg/l	Mg ⁺ mg/l	K ⁺ mg/l	Na ⁺ mg/l	NH ₄ ⁻ mg/l	NO ₃ ⁻ mg/l	Cl ⁻ mg/l	SO ₄ ²⁻ mg/l	PO ₄ ³⁻ mg/l
Winter	8.98	4.41	20.8	0.069	0.018	0.011	0.135	0.191	1.328	0.275	1.343	< MDL
Spring	9.28	4.52	16.7	0.071	0.025	0.016	0.161	0.232	1.017	0.319	1.424	< MDL
Summer	12.78	4.26	28.1	0.092	0.022	0.013	0.084	0.328	1.325	0.205	2.541	< MDL
Fall	15.59	4.81	11.5	0.134	0.051	0.123	0.280	0.115	0.687	0.522	1.010	0.054
Annual	46.63	4.47	18.9	0.097	0.031	0.050	0.175	0.211	1.051	0.347	1.576	0.022

Table 1 (Continued)
Acid Precipitation Monitoring Network – 2005
Annual and Seasonal Averages
 Weighted by Precipitation Amount

Ca ²⁺	- Calcium	PO ₄ ³⁻	- Phosphate
Mg ⁺	- Magnesium	Cond.	- Specific conductance
K ⁺	- Potassium	us/cm	- MicroSiemens per centimeter
Na ⁺	- Sodium	mg/l	- Milligrams per liter
NH ₄	- Ammonium	<MDL	- Below minimum detection limit
NO ₃ ⁻	- Nitrate	Winter	- January – March
Cl ⁻	- Chloride	Spring	- April – June
SO ₄ ²⁻	- Sulfate	Summer	- July – September
-	- No Data	Fall	- October – December

Washington Crossing State Park – Event

	Precip. Inches	pH	Cond. us/cm	Ca ²⁺ mg/l	Mg ⁺ mg/l	K ⁺ mg/l	Na ⁺ mg/l	NH ₄ ⁻ mg/l	NO ₃ ⁻ mg/l	Cl ⁻ mg/l	SO ₄ ²⁻ mg/l	PO ₄ ³⁻ mg/l
Winter	9.19	4.42	21.1	0.089	0.024	0.034	0.171	0.220	1.485	0.331	1.440	< MDL
Spring	9.10	4.52	17.7	0.073	0.030	0.034	0.177	0.254	1.133	0.358	1.523	< MDL
Summer	12.89	4.29	26.6	0.104	0.026	0.031	0.109	0.345	1.445	0.246	2.600	< MDL
Fall	15.74	4.76	12.2	0.157	0.064	0.134	0.303	0.106	0.866	0.486	1.149	< MDL
Annual	46.92	4.48	19.0	0.113	0.039	0.067	0.200	0.223	1.198	0.365	1.677	< MDL

TRENDS

Figure 3 shows the change in the amount of sulfate ion deposited over the last 15 years at the site in Washington Crossing State Park. The figure shows “wet deposition” only. It does not include dry particulate sulfate that was deposited when no precipitation was occurring.

Therefore, the total deposition is higher than what is shown here.

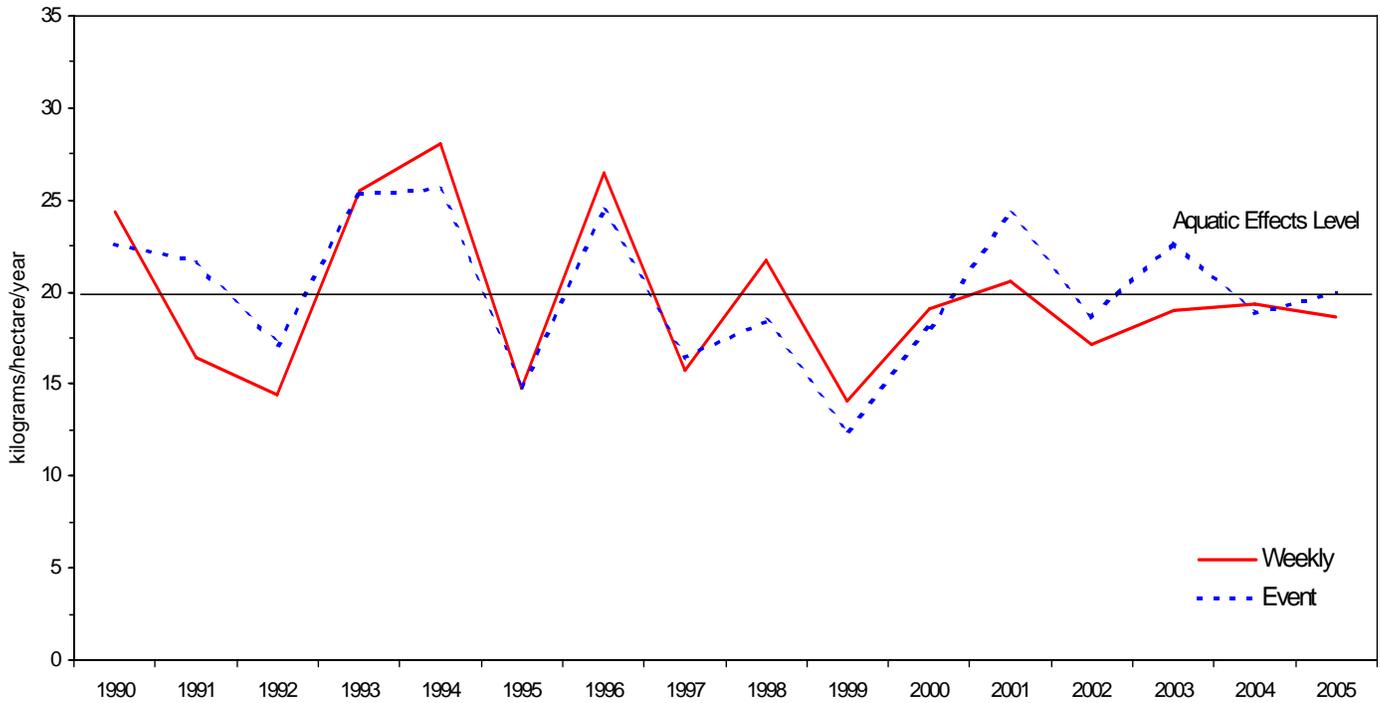
The factors controlling the trend are the sulfate concentrations in air and cloud droplets and the total amount of precipitation in a given year. For example, in 1991 and 1992, both the sulfate concentrations and the total precipitation were below normal, while they were high in 1993 and 1994. Since the values shown here are annual totals, they are also sensitive to loss of samples due to contamination or other factors.

Sulfate can alter soil and water chemistry, and a deposition level of 20 kilograms per hectare per year has been generally accepted as the limit above which damage to sensitive natural resources is likely to occur (i.e. Aquatic Effect Level). However, there are no national or New Jersey standards for sulfate deposition.

According to the New Jersey Comparative Risk Project Ecological Technical Work Group, streams and lakes with significant buffering capacity are somewhat protected from the effects of acid deposition. It is for this reason, that the risk assessment is based primarily on observation of reduced pH in streams and lakes, and on observed effects on aquatic species.

Sulfate deposition in rain and snow is expressed as mass per unit land area over time. To convert the values shown in Figure 3 to pounds per acre per year, multiply by 0.89 (since one kilogram equals 2.21 pounds and one hectare equals 2.47 acres).

Figure 3
Trend in Sulfate Deposition in Precipitation at
Washington Crossing State Park, New Jersey, 1990-2005:
Annual Loading



REFERENCES

FISH SMART, EAT SMART: A Guide to Health Advisories for Eating Fish & Crabs Caught in New Jersey Waters -2006, New Jersey Department of Environmental Protection (NJDEP), Division of Science, Research and Technology, 2006, URL: www.state.nj.us/dep/dsr/njmainfish.htm.

New Jersey Comparative Risk Project, Ecological Technical Work Group, NJDEP, Division of Science, Research and Technology, July 2003, URL: <http://www.state.nj.us/dep/dsr/njcrp/>.

United States Environmental Protection Agency (USEPA) Clean Air Markets, 2007, URL: <http://www.epa.gov/airmarkets/acidrain/index.html#what>.



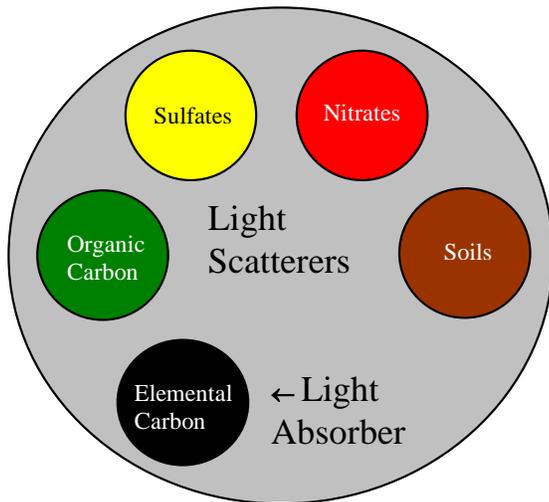
2005 Regional Haze & Visibility Summary

New Jersey Department of Environmental Protection

THE BASICS OF HAZE

Haze is caused when sunlight encounters tiny pollution particles in the air. Some light is absorbed by particles; other light is scattered away before it reaches an observer. Small particles and certain gaseous molecules in the atmosphere cause poor visibility by scattering or absorbing light (see Figure 1). More pollutants mean more absorption and scattering of light, which reduce the clarity and color of what we see. When high concentrations of such pollutants are well mixed in the atmosphere, they form a uniform haze that can obscure distant objects. Some types of particles such as sulfates scatter more light, particularly during humid conditions. Sometimes haze is the result of pollutants that have been transported considerable distances on the prevailing winds. While some visibility impairment occurs even under natural conditions, man-made aerosols are the primary cause. Air pollutants come from a variety of natural and manufactured sources. Natural sources can include windblown dust and soot from wildfires. Man-made sources can include motor vehicles, electric utility and industrial fuel burning, and manufacturing operations.

**Figure 1
Contributors to Visibility Impairment**



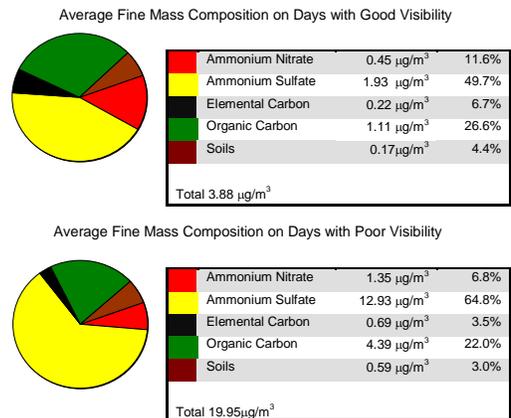
ANATOMY OF REGIONAL HAZE

Data collected over the last decade show that fine particle concentrations, and hence visibility impairment, are highest in the industrialized and densely populated areas of the Northeast and Mid-Atlantic. Sulfate (SO₄) is the primary culprit and typically constitutes 40% of the total fine mass in the region even on clear days. It can account for 60-80% of the total fine mass on very hazy days. Organic carbon usually accounts for the next largest portion of total fine particle mass. It can account for 20-30% on the haziest days. The remainder of the mass is made up primarily of nitrate (NO₃), elemental carbon, and fine soil particles.

PARTICLES AND VISIBILITY

Figure 2 shows the makeup of fine particles collected at the IMPROVE (Interagency Monitoring of Protective Visual Environments) site located north of Atlantic City in the Edwin B. Forsythe Wildlife Refuge (Brigantine).

**Figure 2
Composition of Fine Particles on
Days With Good Visibility Compared
to Days with Poor Visibility
Brigantine,
New Jersey, 2005**



Evaluations of the data for 2005 indicate that sulfates made up approximately half of the fine mass in the best conditions. Most visibility impairment is due to sulfate, which can have a greater effect on light extinction (a measure of visibility impairment) than all other types of fine particles combined. Higher sulfate values in the summer can be attributed to the greater photochemical conversion of SO₂ to SO₄ that results from the increased sunlight

HOW IS HAZE REGULATED?

In 1999, the U.S. Environmental Protection Agency announced a major effort to improve air quality in national parks and wilderness areas aimed at achieving national visibility goals by 2064. The Regional Haze Rule calls for state and federal agencies to work together to improve visibility in 156 National Parks and wilderness areas such as the Grand Canyon, Yosemite, the Great Smokies and Shenandoah. This "regional haze rule" addresses the combined visibility effects of numerous pollution sources over a wide geographic region and how they impact Class I areas. Class I areas as defined by the Clean Air Act, include national parks greater than 6,000 acres, wilderness areas and national memorial parks greater than 5,000 acres, and international parks that existed as of August 1977. The rule requires the states, in coordination with the Environmental Protection Agency, the National Park Service, U.S. Fish and Wildlife Service, the U.S. Forest Service, and other interested parties, to develop and implement air quality protection plans to reduce the pollution that causes visibility impairment. The first State plans for regional haze is due in the 2003-2008 timeframe. Five multi-state regional planning organizations are working together now to develop the technical basis for these plans.

SOURCES OF HAZE CONTRIBUTORS

The following categories of air pollutants are the major contributors to haze.

Sulfate particles form in the air from sulfur dioxide gas. Most of this gas is released from coal-burning power plants and other industrial sources, such as smelters, industrial boilers, and oil refineries. Sulfates are the largest contributor to haze in the eastern U.S., due to the large number of coal-fired power plants that affect the region. In

humid environments, sulfate particles grow rapidly to a size that is very efficient at scattering light, thereby exacerbating the problem in the East.

Organic carbon particles are emitted directly into the air and are also formed by the reaction of various gaseous hydrocarbons. Sources of direct and indirect organic carbon particles include vehicle exhaust, vehicle refueling, solvent evaporation (e.g., paints), food cooking, and various commercial and industrial sources. Gaseous hydrocarbons are also emitted naturally from trees and from fires, but these sources usually have only a small or short-term effect on overall visibility.

Nitrate particles form in the air from nitrogen oxide gas. This gas is released from virtually all combustion activities, especially those involving cars, trucks, off-road engines (e.g., construction equipment, lawn mowers, and boats), power plants, and other industrial sources. Like sulfates, nitrates scatter more light in humid environments.

Elemental carbon particles are very similar to soot. They are smaller than most other particles and tend to absorb rather than scatter light. The "brown clouds" often seen in winter over urban areas and in mountain valleys can be largely attributed to elemental carbon. These particles are emitted directly into the air from virtually all combustion activities, but are especially prevalent in diesel exhaust and smoke from the burning of wood and wastes.

Soils are very similar to dust. It enters the air from dirt roads, fields, and other open spaces as a result of wind, traffic, and other surface activities. Whereas other types of particles form from the condensation and growth of microscopic particles and gasses, crustal material results from the crushing and grinding of larger, earth-born material. Because it is difficult to reduce this material to microscopic sizes, crustal material tends to be larger than other particles and tends to fall from the air sooner, contributing less to the overall effect of haze.

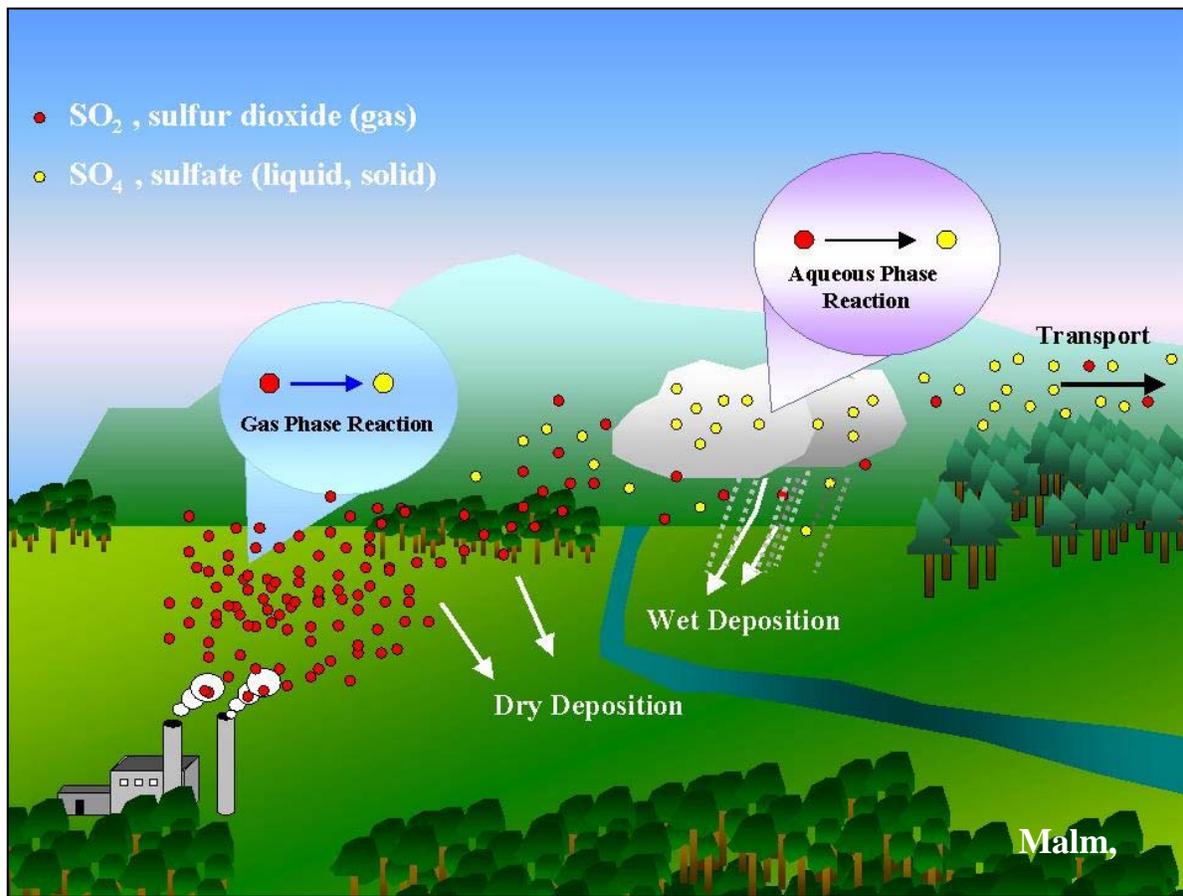
Source – www.hazecam.net

ENVIRONMENTAL EFFECTS

Regional haze is probably most closely associated with its effects on prized vistas such as the Grand Canyon or Acadia National Park. Its impacts may be difficult to quantify but it certainly has a negative overall effect on aesthetics and the outdoors, and how natural areas throughout the nation are enjoyed. But haze also affects urban area and scenes, and can obscure or eclipse the view of an urban skyline (see Figures 5 and 6) or other important urban landmarks such as the Washington Monument.

The pollution that causes regional haze has additional, multifaceted effects on the environment. The most abundant contributors to regional haze, sulfates and nitrates, eventually make their way into the ecosystem through deposition - that is, they are transferred from the air into the water and soils (see Figure 4). Too much deposition can have adverse environmental effects, upsetting the delicate balance of the ecosystem. Increased sulfates in the atmosphere leads to acid rain while increased nitrates promote eutrophication of streams and lakes by depleting available oxygen (see section on Atmospheric Deposition).

Figure 4
Illustration of How Sulfates and Nitrates Enter the Ecosystem by way of Deposition



MONITORING OF HAZE IN NEW JERSEY

Typical visual range in the eastern U.S. is 15 to 30 miles, or about one-third of what it would be without man-made air pollution. In the West, the typical visual range is 60 to 90 miles, or about one-half of the visual range under natural conditions. Haze diminishes the natural visual range. (www.hazecam.net)

Visibility and haze are monitored in two locations in New Jersey; Newark and Brigantine. The monitor in Newark measures the impact of haze on visibility by using a digital camera. The camera is located inside the New Jersey Transit building and is pointed at the New York City skyline. On clear days the entire skyline, as well as each individual building, is easily distinguishable (Figure 5). The Manhattan skyline appears non-existent when conditions conducive to haze formation are in place (Figure 6).

Visibility Camera – New Jersey Transit Building

Figure 5



Figure 6



The IMPROVE site located within the Brigantine National Wildlife Refuge monitors haze and visibility using several types of instruments. Figure 7 below is an example of a clear day in Brigantine as the Atlantic City skyline is easily distinguishable along the horizon. The example of a hazy

day in Brigantine is illustrated below in Figure 8 and not only has the skyline disappeared but the water that was visible in the foreground in the clear picture also seems to have vanished in the haze.

Visibility Camera – Brigantine National Wildlife Refuge

Figure 7



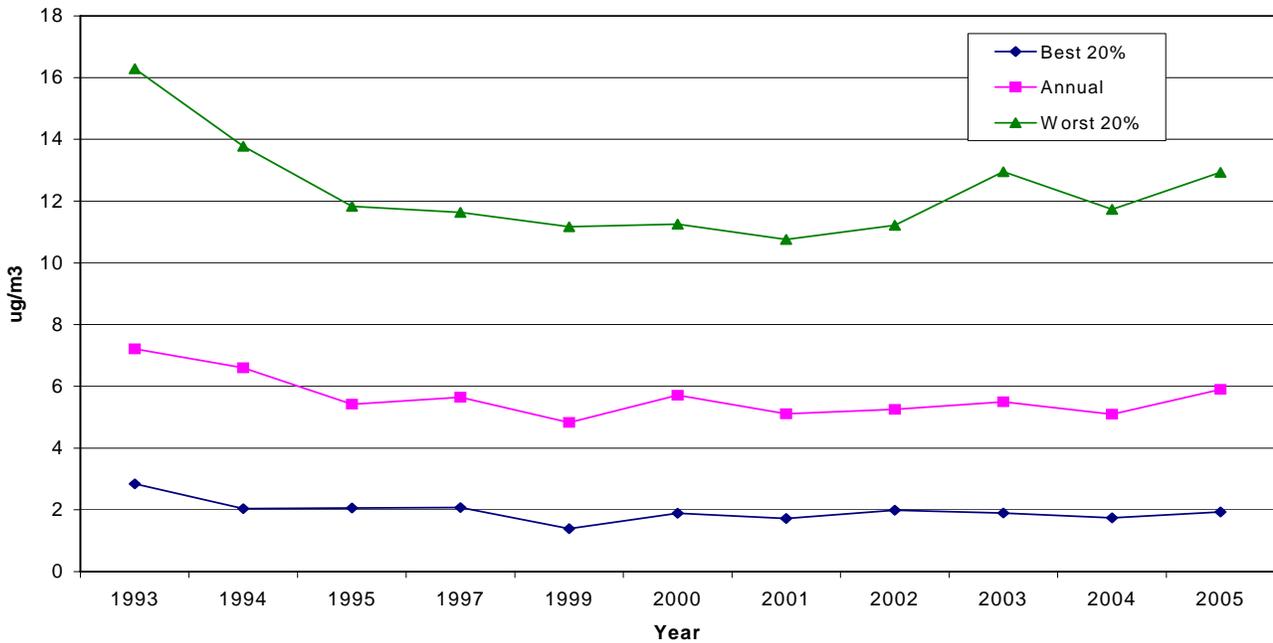
Figure 8



This last graph (Figure 9) represents the annual trend of sulfates expressed in micrograms per cubic meter measured at the Brigantine National Wildlife Refuge.

Besides the trend in annual average sulfate concentrations, the graph illustrates the trend in average sulfate concentrations for the 20 percent worst and 20 percent best visibility days.

Figure 9
Sulfate Trend Summary
Brigantine, NJ
1993-2005



Insufficient data available for 1996 and 1998

REFERENCES

Malm, *William, C., Introduction to Visibility*, Air Resources Division, National Park Service, Cooperative Institute for Research in the Atmosphere (CIRA), NPS Visibility Program, Colorado State University, Fort Collins, CO, May 1999.

Regional Haze and Visibility in the Northeast and Mid-Atlantic States, Northeast States for Coordinated Air Use Management, January, 2001

vista.cira.colostate.edu/views

www.hazecam.net



Appendix A

2005 Air Monitoring Sites

New Jersey Department of Environmental Protection

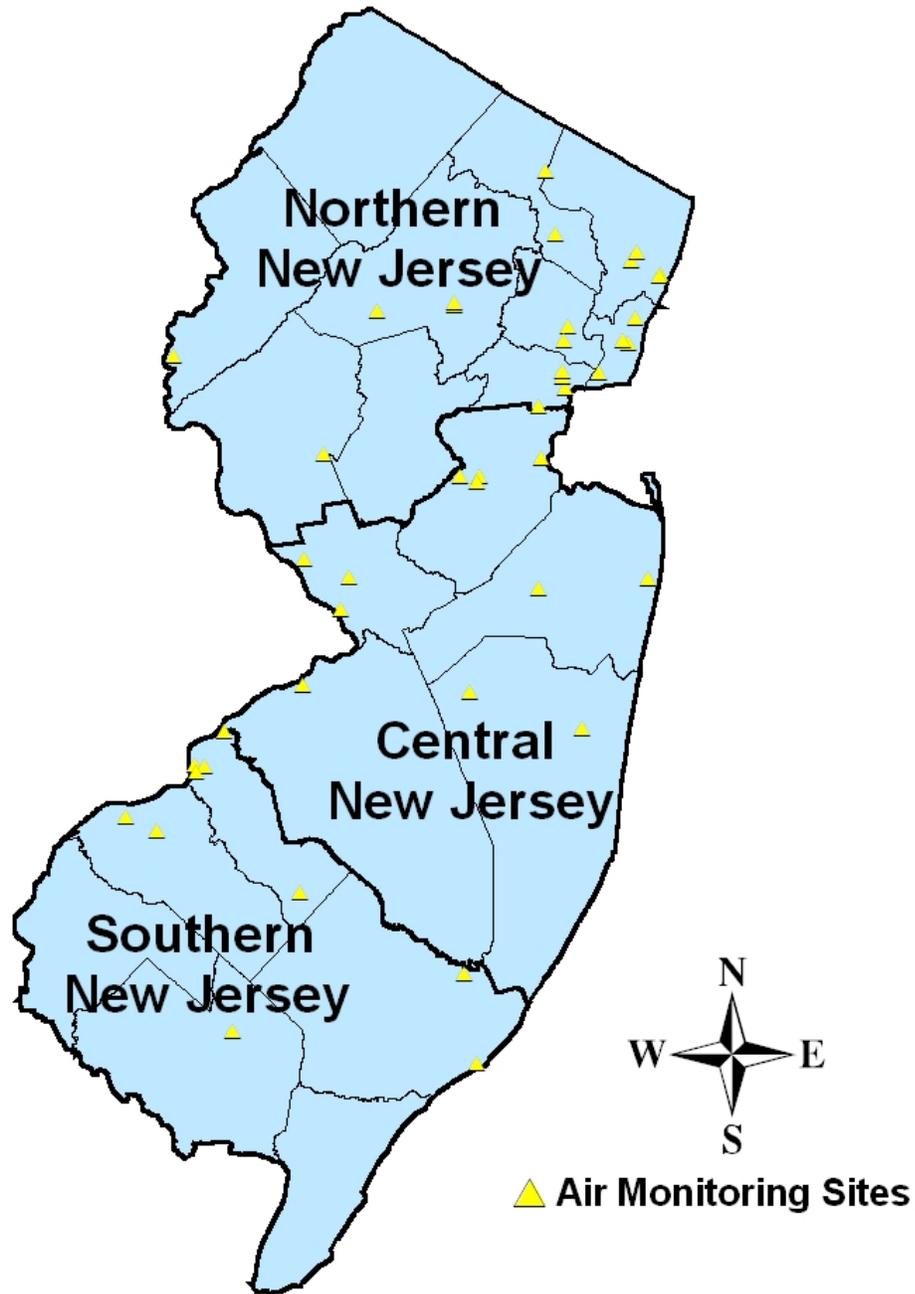
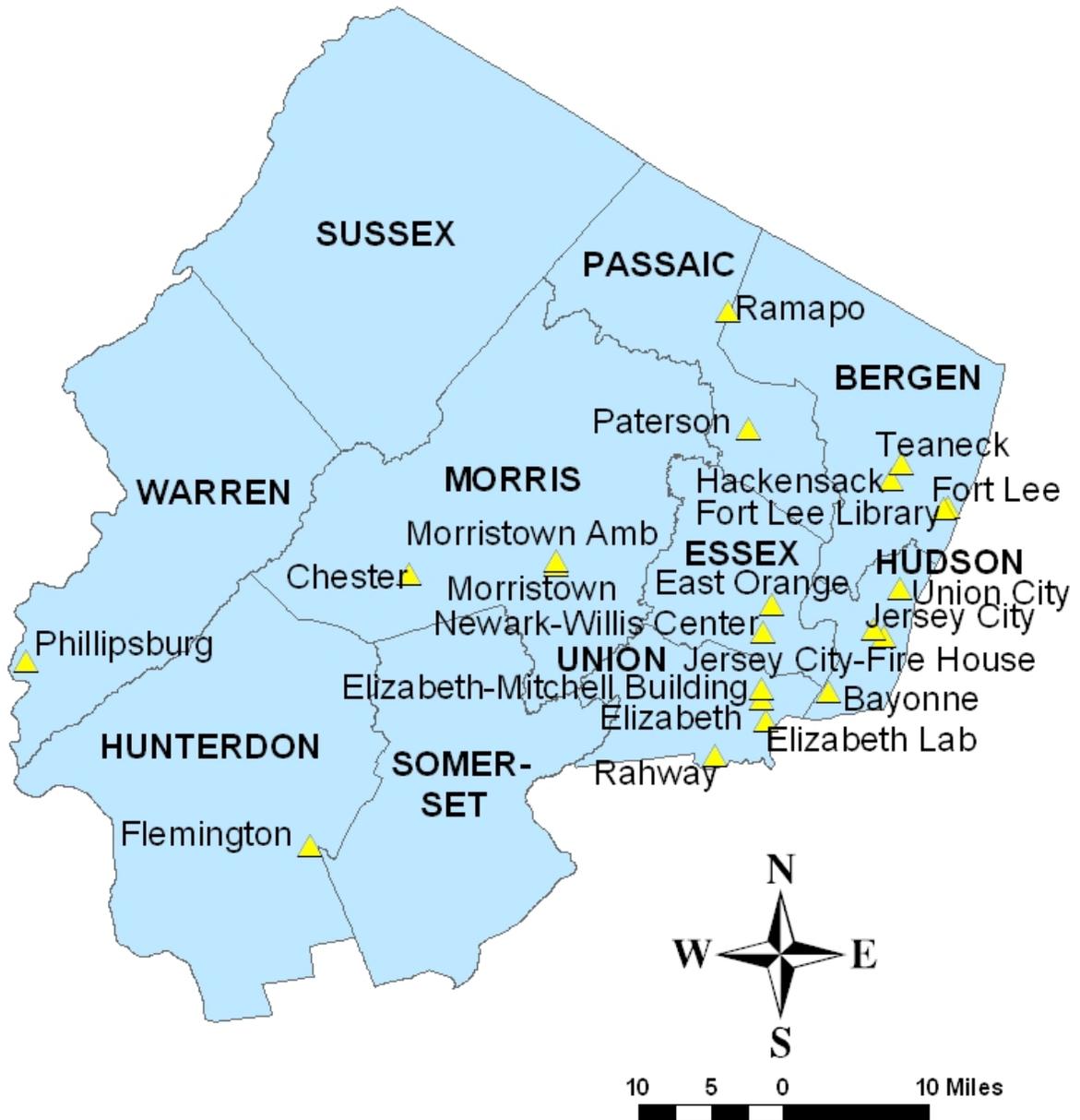


Figure 1
Northern New Jersey
Air Monitoring Sites

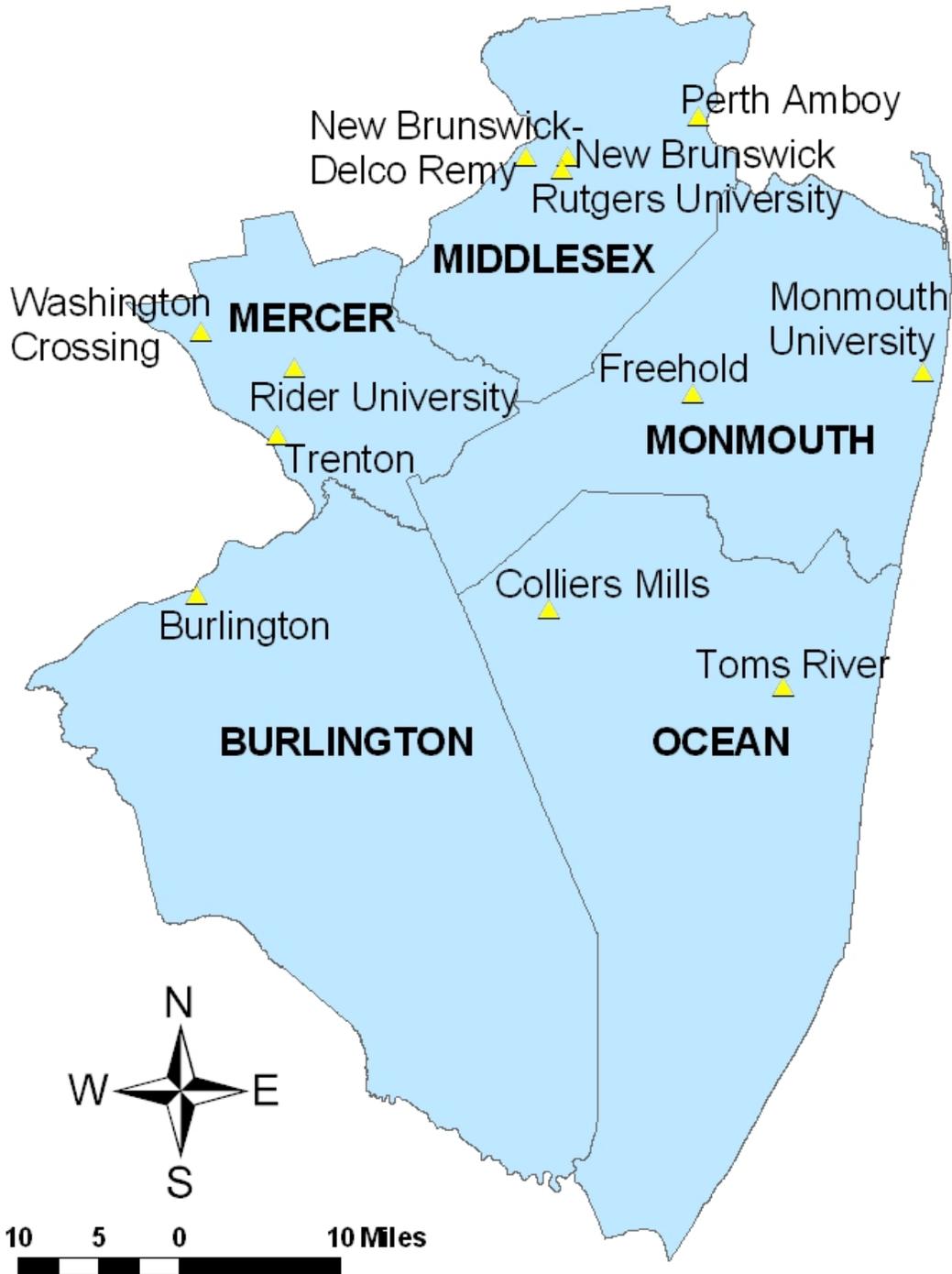


**Table 1
Northern New Jersey Air Monitoring Sites**

County	Monitoring Site	AIRS Code	Parameter(s) Measured ¹	Coordinates (Degrees-minutes-decimal seconds)		Address
				Latitude	Longitude	
BERGEN	Fort Lee	34 003 0004	CO, TEOM, PM ₁₀	40 51 15.7	- 73 58 05.7	Lemoine Avenue Overpass over I-95
	Fort Lee-Library	34 003 0003	PM _{2.5}	40 51 08.1	- 73 58 23.9	Fort Lee Public Library, 320 Main Street
	Hackensack	34 003 5001	CO, SO ₂ , SS	40 52 56.5	- 74 02 31.8	133 River St. near Moore & Mercer Streets
	Teaneck	34 003 0005	NO _x , O ₃	40 53 54.9	- 74 01 47.6	1000 River Road, Fairleigh Dickinson University
ESSEX	East Orange	34 013 1003	CO, NO _x , MET	40 45 27.0	- 74 12 02.0	Engine No. 2, Main Street & Greenwood
	Newark-Willis Center	34 013 0015	PM _{2.5}	40 43 49.0	- 74 12 45.9	Mary Willis Cultural Center 447 18 th Ave.
HUDSON	Bayonne	34 017 0006	NO _x , O ₃ , SO ₂	40 40 12.9	- 74 07 33.9	Veterans Park, 25 th St. near Park Road
	Jersey City	34 017 1002	CO, SO ₂ , SS	40 43 54.1	- 74 03 59.6	2828 Kennedy Blvd.
	Jersey City-Firehouse	34 017 1003	PM _{2.5} , PM ₁₀ , TEOM	40 43 31.6	- 74 03 08.2	Firehouse, 355 Newark Ave.
	Union City	34 017 2002	PM _{2.5}	40 46 21.9	-74 01 54.1	Health Department, 714 31 st Street
HUNTERDON	Flemington	34 019 0001	O ₃ , SS, MET	40 30 55.0	- 74 48 24.0	Raritan Twp. MUA, 365 Old York Road
MORRIS	Chester	34 027 3001	NO _x , O ₃ , SO ₂ , MET, PM _{2.5} , TOXICS	40 47 15.5	- 74 40 34.7	Bldg. #1, Lucent Tech., Route 513
	Morristown	34 027 0003	CO, SS	40 47 51.6	- 74 28 57.8	11 Washington St.
	Morristown-Ambulance Squad	34 027 0004	PM _{2.5}	40 48 05.7	- 74 29 01.7	Ambulance Squad, 16 Early St.
PASSAIC	Paterson	34 031 0005	PM _{2.5}	40 55 07.2	- 74 10 03.9	Health Department, 176 Broadway Ave.
	Ramapo	34 031 5001	O ₃	41 03 07.9	- 74 15 22.8	Access Road, off Skyline Drive, Wanaque Borough
UNION	Elizabeth	34 039 0003	CO, SO ₂ , SS	40 39 44.8	- 74 12 53.1	7 Broad St.
	Elizabeth Lab	34 039 0004	CO, NO _x , SO ₂ , SS, TEOM, MET, PM _{2.5} , TOXICS	40 38 29.2	- 74 12 30.1	Interchange 13, NJTP
	Elizabeth-Mitchell Building	34 039 0006	PM _{2.5}	40 40 24.3	- 74 12 50.7	Mitchell Bldg., 500 North Broad Street
	Rahway	34 039 2003	PM _{2.5} , TEOM	40 36 21.9	- 74 16 29.9	Fire Dept. Bldg., 1300 Main Street
WARREN	Phillipsburg	34 041 0006	PM _{2.5}	40 41 57.2	- 75 10 49.9	Municipal Bldg., 675 Corliss Avenue

¹ See Parameter Codes, Table 4 (page Appendix A-8)

Figure 2
Central New Jersey Air
Monitoring Sites



**Table 2
Central New Jersey Air Monitoring Sites**

County	Monitoring Site	AIRS Code	Parameter(s) Measured ¹	Coordinates (Degrees-minutes-decimal seconds)		Address
				Latitude	Longitude	
BURLINGTON	Burlington	34 005 1001	CO, SO ₂ , SS	40 04 41.0	- 74 51 27.8	1 East Broad Street
MERCER	Rider University	34 021 0005	NO _x , O ₃ , PAMS, MET	40 16 59.1	- 74 44 33.5	Athletic Fields, Route 206 South, Lawrenceville
	Trenton	34 021 0008	PM _{2.5} , PM ₁₀	40 13 20.2	- 74 45 47.3	Trenton Library, 120 Academy Street
	Washington Crossing	34 021 8001	PM _{2.5} , ACID	40 18 55.6	- 74 51 13.8	Washington Crossing State Park, off Church Road, Titusville
MIDDLESEX	New Brunswick	34 023 0006	TEOM, PM _{2.5} , TOXICS	40 28 22.0	- 74 25 21.1	Cook College, Log Cabin Road
	New Brunswick-Delco Remy	34 023 1003	Pb, TSP	40 28 22.6	- 74 28 15.0	End of 12 th Street, West of Joyce Kilmer Avenue
	Perth Amboy	34 023 2003	CO, SO ₂ , SS	40 30 32.0	- 74 16 05.5	130 Smith Street, Perth Amboy
	Rutgers University	34 023 0011	NO _x , O ₃ , MET, PAMS	40 27 43.9	- 74 25 46.0	Horticultural Farm #3, off Ryder's Lane, New Brunswick
MONMOUTH	Freehold	34 025 2001	CO, SS	40 15 35.6	- 74 16 28.9	5 West Main Street
	Monmouth University	34 025 0005	O ₃	40 16 42.5	- 74 00 19.2	Edison Science Bldg., 400 Cedar Ave., West Long Branch
OCEAN	Colliers Mills	34 029 0006	O ₃	40 03 53.4	- 74 26 38.5	Colliers Mills Wildlife Management Area
	Toms River	34 029 2002	PM _{2.5}	39 59 40.8	- 74 10 12.5	Elementary School, 1517 Hooper Avenue

¹ See Parameter Codes, Table 4 (page Appendix A-8)

Figure 3
Southern New Jersey
Air Monitoring Sites



**Table 3
Southern New Jersey Air Monitoring Sites**

County	Monitoring Site	AIRS Code	Parameter(s) Measured ¹	Coordinates (Degrees-minutes-decimal seconds)		Address
				Latitude	Longitude	
ATLANTIC	Atlantic City	34 001 1006	PM _{2.5} , PM ₁₀	39 21 45.5	- 74 25 45.6	Atlantic-Cape May Community College, 1535 Bacharach Blvd., Atlantic City
	Nacote Creek Research Station	34 001 0005	O ₃ , SO ₂	39 31 48.9	- 74 27 38.5	Brigantine National Wildlife Refuge near Smithville
CAMDEN	Ancora State Hospital	34 007 1001	CO, O ₃ , SO ₂ , ACID	39 41 03.3	- 74 51 41.4	Ancora State Hospital, 202 Spring Garden Road, Hammonton
	Camden CMUA	34 007 0010	TEOM	39 55 26.4	- 75 07 20.6	Camden County Sewage Treatment Plant, 1645 Ferry Avenue
	Camden Lab	34 007 0003	CO, NO _x , O ₃ , SO ₂ , SS, TEOM, MET, PAMS, PM _{2.5} , TOXICS	39 55 23.0	- 75 05 51.4	1667 Davis Street, corner of Copewood St.
	Camden-RRF	34 007 0009	PM ₁₀	39 54 44.9	- 75 07 04.0	Camden RRF, Morgan Blvd. & I-676
	Pennsauken	34 007 1007	PM _{2.5}	39 59 19.9	- 75 02 57.0	Morris-Delair WTP, near Griffith Morgan Lane
CUMBERLAND	Millville	34 011 0007	NO _x , O ₃ , SO ₂	39 25 20.2	- 75 01 30.7	Lincoln Avenue & Route 55
GLOUCESTER	Clarksboro	34 015 0002	O ₃ , SO ₂	39 48 01.2	- 75 12 43.6	Clarksboro Shady Lane Rest Home, County House Road
	Gibbstown	34 015 5001	PM _{2.5}	39 49 32.6	- 75 17 21.8	Municipal Building, 420 Washington Street

¹ See Parameter Codes, Table 4 (page Appendix A-8)

**Table 4
Parameter Codes**

ACID	Acid Deposition	PM _{2.5}	Fine Particles (2.5 Microns or less) collected by a Federal Reference Method PM _{2.5} Sampler
CO	Carbon Monoxide	TEOM	Continuous PM _{2.5} Analyzer
MET	Meteorological Parameters	SO ₂	Sulfur Dioxide
NO _x	Nitrogen Dioxide and Nitric Oxide	SS	Smoke Shade
O ₃	Ozone	Pb	Lead
PAMS	Photochemical Assessment Monitoring Station	TOXICS	Air Toxics
PM ₁₀	Coarse Particles (10 Microns or less) collected by a Federal Reference Method PM ₁₀ Sampler	TSP	Total Suspended Particulates



Appendix B

Fine Particulate Speciation Summary- 2005

New Jersey Department of Environmental Protection

Table 1
Fine Particulate Speciation Data – 2005
Camden Lab, New Jersey

Concentrations in Micrograms Per Cubic Meter ($\mu\text{g}/\text{m}^3$)

Pollutant	Annual Average Concentration	Daily Average Maximum Concentration	Daily Average 2nd Highest Concentration
Aluminum	0.0188	0.1341	0.1120
Ammonium	1.9596	6.4489	4.8040
Antimony	0.0072	0.0548	0.0537
Arsenic	0.0011	0.0060	0.0051
Barium	0.0166	0.2113	0.1202
Bromine	0.0040	0.0451	0.0117
Cadmium	0.0020	0.0160	0.0153
Calcium	0.0620	0.2679	0.2493
Cerium	0.0102	0.0768	0.0670
Cesium	0.0007	0.0217	0.0178
Chlorine	0.0222	0.5371	0.3115
Chromium	0.0032	0.0339	0.0146
Cobalt	0.0001	0.0011	0.0011
Copper	0.0056	0.0218	0.0215
Elemental carbon	0.7027	2.4036	2.3505
Europium	0.0017	0.0267	0.0191
Gallium	0.0007	0.0055	0.0048
Gold	0.0009	0.0061	0.0050
Hafnium	0.0017	0.0111	0.0101
Indium	0.0026	0.0153	0.0152
Iridium	0.0009	0.0086	0.0068
Iron	0.1169	0.4064	0.3724
Lanthanum	0.0074	0.0599	0.0562
Lead	0.0043	0.0175	0.0134
Magnesium	0.0050	0.0927	0.0544
Manganese	0.0028	0.0188	0.0156
Mercury	0.0024	0.0332	0.0117
Molybdenum	0.0002	0.0042	0.0038
Nickel	0.0039	0.0191	0.0126
Niobium	0.0003	0.0051	0.0041
Nitrate	2.1018	8.3617	8.1652

Table 1 (Continued)
Fine Particulate Speciation Data – 2005
Camden Lab, New Jersey

Concentrations in Micrograms Per Cubic Meter ($\mu\text{g}/\text{m}^3$)

Pollutant	Annual Average Concentration	Daily Average Maximum Concentration	Daily Average 2nd Highest Concentration
Organic carbon	4.0894	8.5234	8.4416
Phosphorus	0.0000	0.0032	0.0000
Potassium	0.0651	0.3358	0.2013
Rubidium	0.0003	0.0021	0.0019
Samarium	0.0021	0.0292	0.0153
Scandium	0.0001	0.0016	0.0016
Selenium	0.0015	0.0077	0.0049
Silicon	0.0770	0.5653	0.3563
Silver	0.0019	0.0165	0.0151
Sodium	0.1197	1.2464	0.5471
Strontium	0.0014	0.0059	0.0056
Sulfate	4.2237	17.5730	14.9241
Sulfur	1.4450	5.9500	5.2460
Tantalum	0.0012	0.0125	0.0120
Terbium	0.0055	0.0440	0.0305
Tin	0.0057	0.0420	0.0337
Titanium	0.0076	0.0393	0.0327
Total mass	16.1116	51.5836	49.3190
Vanadium	0.0061	0.0328	0.0221
Wolfram	0.0010	0.0071	0.0070
Yttrium	0.0006	0.0064	0.0035
Zinc	0.0136	0.0749	0.0422
Zirconium	0.0023	0.0476	0.0123

Table 2
Fine Particulate Speciation Data – 2005
Chester, New Jersey

Concentrations in Micrograms Per Cubic Meter ($\mu\text{g}/\text{m}^3$)

Pollutant	Annual Average Concentration	Daily Average Maximum Concentration	Daily Average 2nd Highest Concentration
Aluminum	0.0101	0.0502	0.0489
Ammonium	1.4786	5.5199	5.5104
Antimony	0.0059	0.0724	0.0685
Arsenic	0.0007	0.0040	0.0034
Barium	0.0112	0.2077	0.1050
Bromine	0.0028	0.0068	0.0067
Cadmium	0.0020	0.0186	0.0176
Calcium	0.0206	0.0725	0.0699
Cerium	0.0062	0.0572	0.0477
Cesium	0.0025	0.0263	0.0262
Chlorine	0.0031	0.0302	0.0249
Chromium	0.0035	0.1140	0.0300
Cobalt	0.0002	0.0015	0.0013
Copper	0.0018	0.0112	0.0057
Elemental carbon	0.3899	2.6056	1.0928
Europium	0.0012	0.0109	0.0085
Gallium	0.0007	0.0056	0.0055
Gold	0.0010	0.0126	0.0093
Hafnium	0.0012	0.0110	0.0099
Indium	0.0027	0.0238	0.0179
Iridium	0.0008	0.0070	0.0057
Iron	0.0451	0.3979	0.1235
Lanthanum	0.0039	0.0561	0.0351
Lead	0.0032	0.0134	0.0129
Magnesium	0.0044	0.1151	0.0652
Manganese	0.0011	0.0140	0.0060
Mercury	0.0017	0.0086	0.0077
Molybdenum	0.0003	0.0049	0.0044
Nickel	0.0025	0.0347	0.0182
Niobium	0.0006	0.0063	0.0052
Nitrate	1.1909	7.3583	5.1231
Organic carbon	3.0902	10.6298	7.4595
Phosphorus	0.0001	0.0054	0.0037
Potassium	0.0370	0.1695	0.0963
Rubidium	0.0003	0.0036	0.0016
Samarium	0.0015	0.0231	0.0121
Scandium	0.0002	0.0029	0.0019
Selenium	0.0011	0.0046	0.0044

Table 2 (Continued)
Fine Particulate Speciation Data – 2005
Chester, New Jersey

Concentrations in Micrograms Per Cubic Meter ($\mu\text{g}/\text{m}^3$)

Pollutant	Annual Average Concentration	Daily Average Maximum Concentration	Daily Average 2nd Highest Concentration
Silicon	0.0307	0.2078	0.1775
Silver	0.0026	0.0244	0.0181
Sodium	0.0591	0.2836	0.2002
Strontium	0.0008	0.0038	0.0031
Sulfate	3.9331	19.0725	18.2442
Sulfur	1.2423	6.4550	6.0356
Tantalum	0.0012	0.0182	0.0109
Terbium	0.0022	0.0380	0.0124
Tin	0.0050	0.0405	0.0299
Titanium	0.0024	0.0097	0.0088
Total mass	11.9954	44.1374	41.7140
Vanadium	0.0022	0.0100	0.0086
Wolfram	0.0014	0.0193	0.0118
Yttrium	0.0007	0.0034	0.0032
Zinc	0.0072	0.0196	0.0194
Zirconium	0.0025	0.0706	0.0462

Table 3
Fine Particulate Speciation Data – 2005
Elizabeth Lab, New Jersey

Concentrations in Micrograms Per Cubic Meter ($\mu\text{g}/\text{m}^3$)

Pollutant	Annual Average Concentration	Daily Average Maximum Concentration	Daily Average 2nd Highest Concentration
Aluminum	0.0307	0.8281	0.1561
Ammonium	2.0579	6.7192	6.4150
Antimony	0.0077	0.0734	0.0698
Arsenic	0.0010	0.0059	0.0042
Barium	0.0157	0.1360	0.1140
Bromine	0.0042	0.0292	0.0110
Cadmium	0.0022	0.0217	0.0191
Calcium	0.0600	0.2689	0.1936
Cerium	0.0096	0.0739	0.0512
Cesium	0.0008	0.0180	0.0162
Chlorine	0.0460	0.8680	0.5327
Chromium	0.0095	0.2794	0.1004
Cobalt	0.0002	0.0023	0.0020
Copper	0.0084	0.0651	0.0643
Elemental carbon	1.7846	5.7169	5.1478
Europium	0.0018	0.0227	0.0177
Gallium	0.0005	0.0058	0.0031
Gold	0.0010	0.0159	0.0097
Hafnium	0.0016	0.0122	0.0120
Indium	0.0021	0.0213	0.0143
Iridium	0.0007	0.0085	0.0057
Iron	0.1773	1.0332	0.5029
Lanthanum	0.0069	0.0671	0.0549
Lead	0.0051	0.0146	0.0142
Magnesium	0.0079	0.0834	0.0748
Manganese	0.0035	0.0144	0.0127
Mercury	0.0017	0.0204	0.0093
Molybdenum	0.0004	0.0123	0.0056
Nickel	0.0082	0.0912	0.0525
Niobium	0.0004	0.0048	0.0041
Nitrate	2.1636	9.3276	8.9357
Organic carbon	5.2929	12.6196	12.0494
Phosphorus	0.0001	0.0120	0.0000
Potassium	0.0598	0.7841	0.2384
Rubidium	0.0003	0.0026	0.0020
Samarium	0.0019	0.0236	0.0140
Scandium	0.0001	0.0020	0.0019
Selenium	0.0014	0.0054	0.0051

Table 3 (Continued)
Fine Particulate Speciation Data – 2005
Elizabeth Lab, New Jersey

Concentrations in Micrograms Per Cubic Meter ($\mu\text{g}/\text{m}^3$)

Pollutant	Annual Average Concentration	Daily Average Maximum Concentration	Daily Average 2nd Highest Concentration
Silicon	0.0642	0.5105	0.2238
Silver	0.0029	0.0177	0.0152
Sodium	0.1077	0.8023	0.5424
Strontium	0.0016	0.0131	0.0119
Sulfate	4.1368	16.8884	16.5916
Sulfur	1.3578	5.9537	5.3301
Tantalum	0.0012	0.0119	0.0116
Terbium	0.0071	0.0541	0.0343
Tin	0.0045	0.0385	0.0268
Titanium	0.0067	0.0248	0.0215
Total mass	0.0091	0.0378	0.0355
Vanadium	0.0016	0.0249	0.0164
Wolfram	0.0004	0.0044	0.0040
Yttrium	0.0207	0.1143	0.0913
Zinc	0.0013	0.0055	0.0055
Zirconium	0.0016	0.0131	0.0119

Table 4
Fine Particulate Speciation Data – 2005
New Brunswick, New Jersey

Concentrations in Micrograms Per Cubic Meter ($\mu\text{g}/\text{m}^3$)

Pollutant	Annual Average Concentration	Daily Average Maximum Concentration	Daily Average 2nd Highest Concentration
Aluminum	0.0167	0.2994	0.0934
Ammonium	1.6947	4.9548	4.6052
Antimony	0.0062	0.0629	0.0571
Arsenic	0.0012	0.0047	0.0046
Barium	0.0109	0.1635	0.1110
Bromine	0.0033	0.0151	0.0085
Cadmium	0.0025	0.0197	0.0186
Calcium	0.0285	0.1361	0.1163
Cerium	0.0084	0.0634	0.0505
Cesium	0.0014	0.0330	0.0313
Chlorine	0.0199	0.4803	0.4450
Chromium	0.0053	0.2358	0.0345
Cobalt	0.0002	0.0021	0.0018
Copper	0.0071	0.2485	0.0507
Elemental carbon	0.6836	2.7916	2.3039
Europium	0.0014	0.0134	0.0103
Gallium	0.0005	0.0034	0.0027
Gold	0.0007	0.0062	0.0062
Hafnium	0.0019	0.0130	0.0118
Indium	0.0025	0.0210	0.0201
Iridium	0.0003	0.0061	0.0038
Iron	0.0891	0.8622	0.2629
Lanthanum	0.0031	0.0565	0.0443
Lead	0.0052	0.0217	0.0216
Magnesium	0.0052	0.0734	0.0582
Manganese	0.0031	0.0257	0.0249
Mercury	0.0017	0.0103	0.0099
Molybdenum	0.0002	0.0051	0.0043
Nickel	0.0042	0.0776	0.0336
Niobium	0.0004	0.0049	0.0048
Nitrate	1.6697	7.8079	6.7919
Organic carbon	3.8247	8.2941	8.2222
Phosphorus	0.0001	0.0048	0.0046
Potassium	0.0548	0.6283	0.3315
Rubidium	0.0004	0.0026	0.0019
Samarium	0.0012	0.0169	0.0105
Scandium	0.0001	0.0022	0.0021
Selenium	0.0012	0.0052	0.0050

Table 4 (Continued)
Fine Particulate Speciation Data – 2005
New Brunswick, New Jersey

Concentrations in Micrograms Per Cubic Meter ($\mu\text{g}/\text{m}^3$)

Pollutant	Annual Average Concentration	Daily Average Maximum Concentration	Daily Average 2nd Highest Concentration
Silicon	0.0330	0.2820	0.1638
Silver	0.0023	0.0182	0.0122
Sodium	0.1028	0.7692	0.7667
Strontium	0.0010	0.0112	0.0067
Sulfate	3.9550	15.5291	14.8919
Sulfur	1.3471	6.1222	5.2079
Tantalum	0.0008	0.0097	0.0089
Terbium	0.0047	0.0785	0.0183
Tin	0.0045	0.0331	0.0315
Titanium	0.0044	0.0176	0.0155
Total mass	13.8028	39.6203	36.0239
Vanadium	0.0035	0.0204	0.0144
Wolfram	0.0009	0.0090	0.0084
Yttrium	0.0006	0.0043	0.0036
Zinc	0.0149	0.1820	0.0663
Zirconium	0.0013	0.0068	0.0062