2003 Network Summary

New Jersey Department of Environmental Protection

Network Design

In 2003, the Bureau of Air Monitoring maintained 44 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.

Figure 1: Ambient air monitoring trailer located at the Camden Lab site

Spatial Scales

There are many factors and constraints, which affect the design of a monitoring network. Among other 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. 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 were 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 automated sites which measure carbon monoxide (CO), oxides of nitrogen (NO_x), ozone (O_3), sulfur dioxide (SO_2), particulate matter, and meteorological data (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
2003 – Continuous Monitoring Network

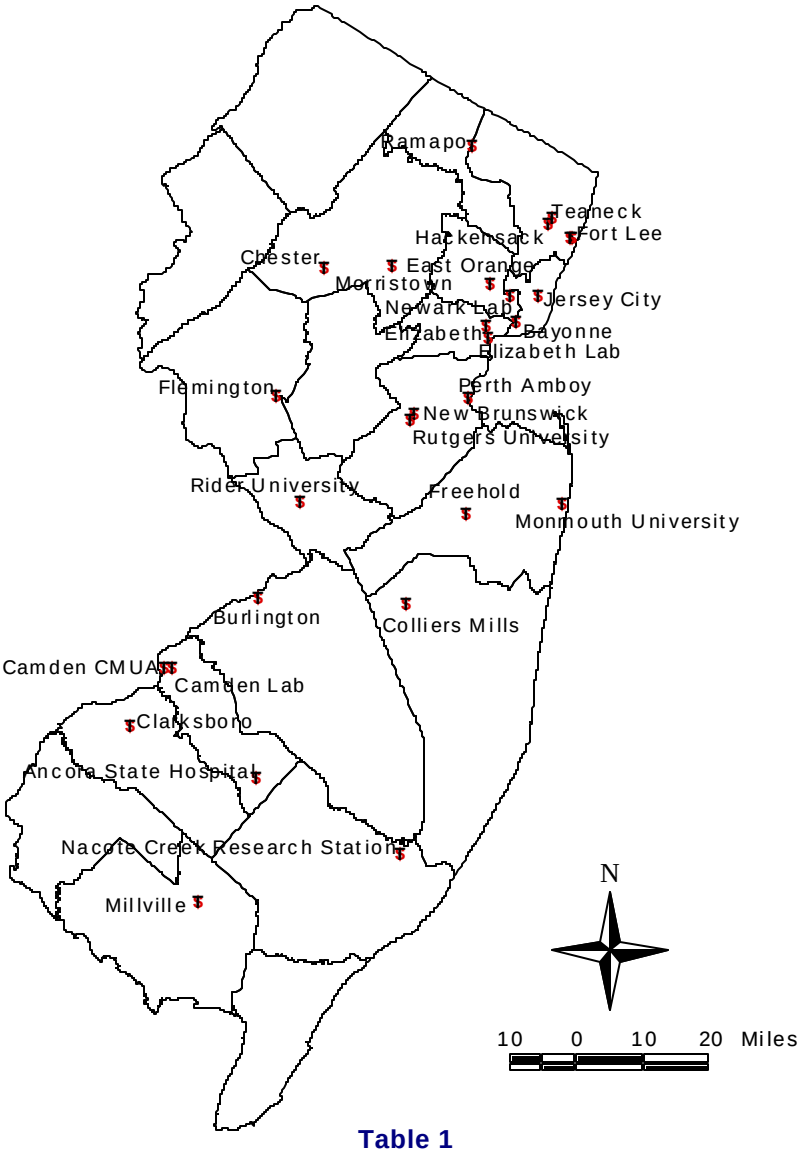

Table 1

2002-03' Continuous Network Changes			
Monitoring Site	**Parameter(s)**	**Action**	**Date**
Camden CMUA	TEOM	Start-up	11/20/03
[1] Camden Lab	CO, NO_2, O_3, SO_2, SS,TEOM,MET	Temporary shutdown	09/22/03
Middlesex	CO	Discontinued	01/31/02
[2] Newark Lab	CO, NO_2, O_3, SO_2, SS,TEOM	Temporary shutdown	06/04/03
North Bergen	CO	Discontinued	07/02/02
Somers Point	NO_2, SO_2	Discontinued	03/05/02

[1] The site was temporarily shutdown to replace the old monitoring shelter. (Photo of new trailer, figure 1)
[2] The area where the site was located is under redevelopment. The station is in the process of being relocated.

Table 2
2003 – Continuous Air Monitoring Network

Continuous Parameter Codes

CO - Carbon Monoxide
NO_x - Nitrogen Dioxide and Nitric Oxide
O_3 - Ozone
SO_2 - Sulfur Dioxide
SS - Smoke Shade
TEOM - Continuous $PM_{2.5}$ Analyzer
MET - Meteorological Parameters

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	Mi			N	N		
Millville		N	N	N			
Monmouth University			N				
Morristown	Mi				N		
Nacote Creek Research Station			U	U			
Newark Lab	N	N	N	N	N	N	
New Brunswick						N	
Perth Amboy	N			N	N		
Ramapo			U				
Rider University		N	N				U
Rutgers University		N	N				U
Teaneck		N	N				
TOTAL	**13**	**10**	**15**	**14**	**11**	**6**	**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 equipment that collects 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 (PM_{10}), lead (Pb), total suspended particulates (TSP), several parameters associated with atmospheric deposition, pollutants important in the formation of ground level ozone (ozone precursors), and numerous organic compounds that are considered toxic pollutants. Sites that measure ozone precursors are part of the national Photochemical Assessment Monitoring Station (PAMS) program. While some ozone precursors are automatically measured every hour, the data are usually only retrieved once a day. 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 in shown in Table 4 (page 5).

Figure 3
2003 – Manual Monitoring Network

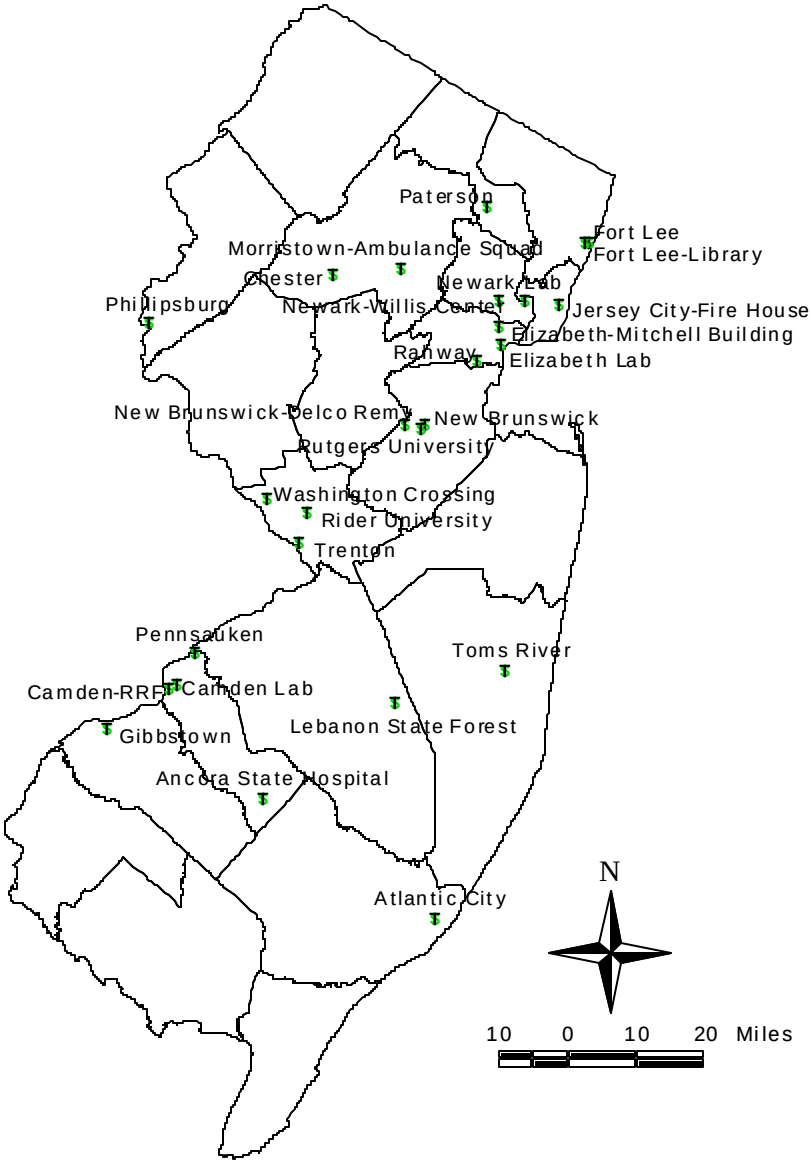

Table 3

2002-03' Manual Network Changes			
Monitoring Site	**Parameter(s)**	**Action**	**Date**
[3] Camden Lab	$PM_{2.5}$, PM_{10}	Temporary shutdown	09/12/03
Elizabeth Lab	PM_{10}	Discontinued	12/16/02
[4] Newark Lab	$PM_{2.5}$, PM_{10}	Temporary shutdown	06/04/03
Union City	$PM_{2.5}$	Discontinued	03/12/02

[3] The site was temporarily shutdown to replace the old monitoring shelter. (Photo of new trailer, figure 1)
[4] The area where the site was located is under redevelopment. The station is in the process of being relocated.

Table 4
2003 - Manual Air Monitoring Network

Manual Parameter Codes

$PM_{2.5}$ - FRM (Federal Reference Method) Manual $PM_{2.5}$ Sampler

PM_{10} - FRM Manual PM_{10} Sampler

Pb - Particulates Analyzed for Lead

TSP - Total Suspended Particulates

$PM_{2.5}$ Spec - $PM_{2.5}$ Speciation Trends Network Sampler

PAMS - Photochemical Assessment Monitoring Station (Ozone Precursors)

CARB - Carbonyls

VOCs - Volatile Organic Compounds

SVOCs - Semi-Volatile Organic Compounds

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								
Lebanon State Forest										U
Morristown-Ambulance Squad	N									
New Brunswick	N				N		N	N		
New Brunswick-Delco Remy			Mi	Mi						
Newark Lab	N	N								
Newark-Willis Center	N									
Paterson	N									
Pennsauken	N									
Phillipsburg	N									
Rahway	N									
Rider University						N				
Rutgers University						N				
Toms River	N									
Trenton	N	N								
Washington Crossing	N									U
TOTAL	**19**	**7**	**1**	**1**	**4**	**3**	**4**	**4**	**2**	**3**

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

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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.

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