2007 Network Summary

New Jersey Department of Environmental Protection

Network Design

In 2007, the Bureau of Air Monitoring maintained 45 Ambient Air Monitoring Sites in New Jersey. These monitoring sites are designed to fulfill the following monitoring objectives for federal and state regulated pollutants: measure maximum pollutant concentrations, assess population exposure, determine the impact of major pollution sources, measure background levels, determine the extent of regional pollutant transport, and measure secondary impacts in rural areas. In addition, monitoring data is provided to various public and media outlets and is used to provide hourly updates on air quality to the Bureau's web page at http://www.njaqinow.net/Default.htm. 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 site located at the Elizabeth Lab in Union County.

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. 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 zones 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 (O_3), sulfur dioxide (SO_2), particulate matter, and meteorological data by automated instruments (not all pollutants are measured at all sites). Last year, the Bureau of Air Monitoring installed a new data acquisition system primarily for its continuous monitoring network. The system uses wireless communication technology to transmit data to a centralized computer station located in Trenton, NJ. The information is transmitted once every minute, thus providing real-time data retrieval capability. 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
2007 – Continuous Monitoring Network

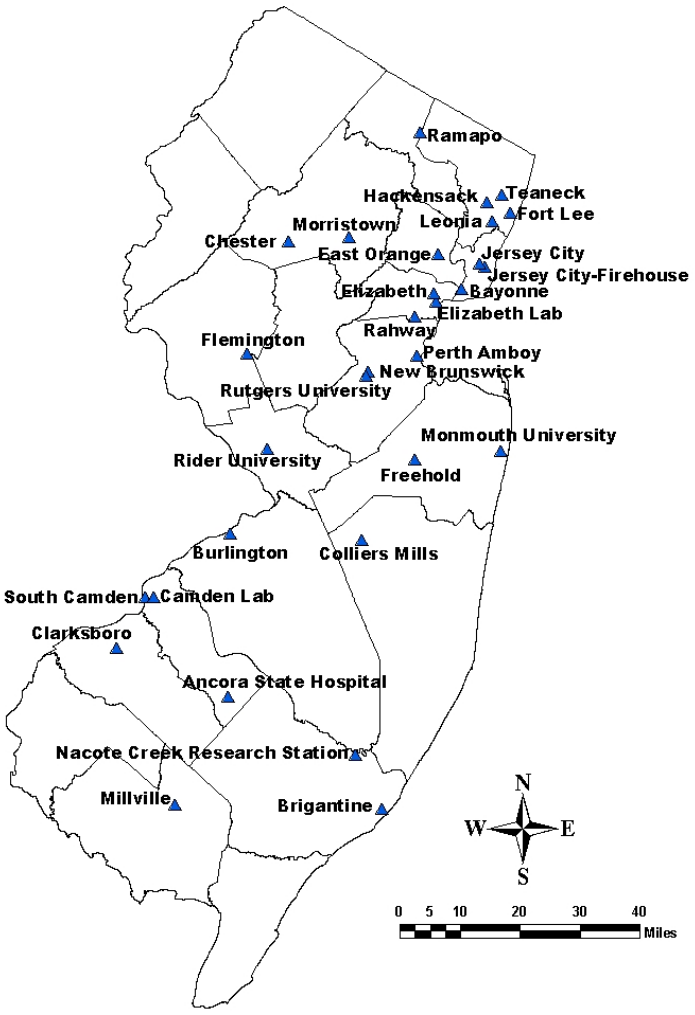

Table 1

2006-2007 Continuous Network Changes			
Monitoring Site	**Parameter(s)**	**Action**	**Date**
Brigantine	O_3 SO_2 TEOM Nephelometer	Start-up	04/01/07 08/30/07 08/10/07 09/06/07
Elizabeth	CO, SO_2, Smoke	Temporary Shutdown	03/07/07
Flemington	Smoke	Shutdown	04/05/06
Leonia	NO_x O_3	Start-up	12/07/07 12/08/07
Nacote Creek Research Station	O_3, SO_2	Shutdown	12/18/07
Teaneck	NO_x, O_3	Shutdown	01/17/07

Table 2
2007 – 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			
Brigantine			U	U		U	
Burlington	N			N	N		
Camden Lab	N	N	U	N	N	N	N
Chester		U	U	U			N
Clarksboro			U	U			
Colliers Mills			U				
East Orange	N	N					N
Elizabeth	Mi			M	N		
Elizabeth Lab	N	N		N	N	N	N
Flemington			U			N	N
Fort Lee	M					M	
Freehold	Mi				N		
Hackensack	N			N	N		
Jersey City-Firehouse						N	
Jersey City	Mi			N	N		
Leonia		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				N
Rutgers University		N	N				U*
South Camden						N	
Teaneck		N	N				
TOTAL	**12**	**10**	**16**	**14**	**9**	**10**	**7**

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

* Meteorological measurements at this site are collected by Rutgers University

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 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 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
2007 – Manual Monitoring Network

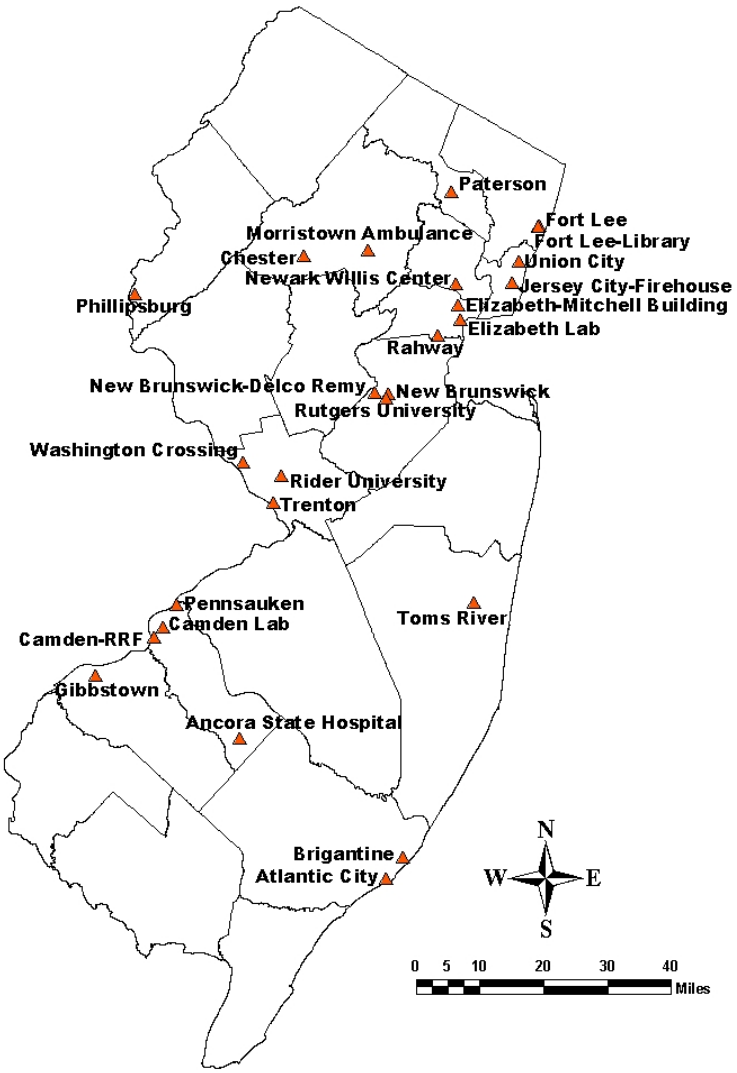

Table 3

2006-2007 Manual Network Changes			
Monitoring Site	**Parameter(s)**	**Action**	**Date**
Brigantine	$PM_{2.5}$	Start-up	01/06/07
Gibbstown	$PM_{2.5}$	Shutdown	04/05/06
Gibbstown (new location)	$PM_{2.5}$	Start-up	02/02/07

Table 4
2007 - 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 - Acidity (pH scale) in precipitation

SITE	$PM_{2.5}$	PM_{10}	Pb	TSP	$PM_{2.5}$ Spec	PAMS	CARB	VOCs	Acid Deposition
Ancora State Hospital									U
Atlantic City	N	N							
Brigantine	U								
Camden Lab	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							
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	**20**	**6**	**1**	**1**	**4**	**3**	**4**	**4**	**2**

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

REFERENCES

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