# Forsyth County
# Office of Environmental Assistance and Protection

April 27, 2012

Mr. Todd Rinck
U.S. Environmental Protection Agency
Region 4
Atlanta Federal Building
61 Forsyth Street
Atlanta, GA 30303-8960

Dear Mr. Rinck:

This letter and accompanying Annual Network Plan reports on the status of the **Ambient Air Monitoring** commitments for the FY-10 105 Grant Work plan for Forsyth County, North Carolina (Reporting Organization 37-002). The entire Plan follows the Executive Summary, complete with staff field reviews as well as a copy of the published public notice.

I certify the ambient concentration data and the quality assurance data are completely submitted to AQS and the ambient data are accurate to the best of my knowledge taking into consideration the quality assurance findings. If you need additional information concerning these matters, please contact me at (336)-703-2447.

Sincerely,

Patrick A. Reagan, Program Manager
Monitoring and Mobile Sources Division

Enclosures

cc: Keith F. Tart (FCEAP)
Donnie Redmond (NCDENR)
Katherine Snyder, PhD (EPA-Region IV)

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# Executive Summary

### *Submit by May 1, 2012 an evaluation to demonstrate the requirements of 40 CFR Part 58.10 (a)(1) (Annual Network Evaluation) have been met.*

This review was conducted in the winter of 2011 and will be discussed in more detail at the end of this letter.

### *Quality Assurance Procedures.*

On September 26, 2007, the Forsyth County Office of Environmental Assistance and Protectionsubmitted notification that the agency was currently following the NCDENR's QMP. The Department continues to follow and update, when necessary, all SOPs associated with our equipment.

### *Categorization of Ambient Monitors and Auxiliary Equipment.*

The evaluation was completed in November 2011. The 1400 "A" series TEOM from the Peter's Creek site was rated as Poor. No other equipment was rated as Poor. The current emphasis remains replacement of monitoring buildings and consolidation of the network. Capital funds are available in limited quantity and are available if needed for replacement equipment.

### *Notify EPA within 30 days after exceedances/violations of NAAQS.*

The Forsyth County Office of Environmental Assistance and Protection remained an active participant in the AirNow program. Part of that program ensures that all local and regional exceedances/violations of the NAAQS are submitted to EPA and all others affected in a timely fashion.

### *Comply with Exceptional Events Policy.*

No situations requiring exceptional event flagging occurred since the last Annual Network Review period.

### *Submit list of urban areas for which AQI is reported.*

Forsyth County reports the AQI for our part of the Greensboro-Winston-Salem-High Point MSA. AQI statistics are available in local newspapers, on the Department's web site at http://www.co.forsyth.nc.us/EnvAffairs/, and through the NC-DAQ's recorded 888-RU4NCAIR phone system. Real time data (updated hourly) are also available at: http://www.co.forsyth.nc.us/envaffairs/AutoReports/default.htm

### *Attend Region 4 QA Meeting & AIRS Conference.*

Mr. Patrick Reagan and Mr. Lawrence Akoje attended the Region 4 QA meeting in Tampa, FL during spring 2011.

### *Submit air quality forecasts for MSA's >500,000 population to EPA AIRNOW.*

Forsyth County has been a leader in this area and submits air quality forecasts for multiple pollutants to AIRNOW on a year-round basis. Several presentations on this program have been given at recent EPA National Forecasting and Outreach Conferences.

### *Changes in the SLAMS/NAMS Network*

In August 2011, the PM10 sampler at the Peter's Creek Station malfunctioned. This specific series of analyzer is no longer supported by the manufacturer making repairs of the unit difficult, at best. In November 2011, we concluded this instrument was not repairable. We will seek permission to discontinue PM10 monitoring at this site, as duplicate data is still available at a separate location. This information has been provided to our EPA Region IV contact person.

### *Data Submittal Criteria*

All SLAMS/PARS data were submitted to AIRS within 90 days after each quarter.

### *National Performance Audit Program*

No NPAP Audits were performed during 2011.

### *Continued-Annual Network Evaluation*

Forsyth County has realigned the local monitoring network in recent years to account for changes in population, land use, and traffic patterns.

#### OZONE

The Shiloh Church site (37-067-0028) was established in 1996 to serve as the primary direction urban fringe monitor for Forsyth County. The maximum impact downwind site is operated by the State program in Rockingham County (Bethany School, 37-157-0099). The secondary wind direction is measured by the Union Cross site (37-067-1008). In addition, the Clemmons Middle site (37-067-0030), established in 2005, monitors the southwest sector of Forsyth County. An SPM ozone monitor at Hattie Avenue (37-067-0022) has operated since 1993 as part of North Carolina's ozone precursor network.

#### CARBON MONOXIDE

The microscale Peters Creek site (37-067-0023) has served as the maximum impact site for Forsyth County since 1988. A middle scale site (Hanes Mall 37-067-0029) was established in November 2000 as a companion maximum impact site to Peters Creek (the site could not be categorized as microscale due to a 25m road setback caused by RR tracks). This site has since been removed from the network due to budget cuts.

#### SULFUR DIOXIDE/NITROGEN OXIDES

Sulfur dioxide levels have been measured at the Hattie Avenue site (37-067-0022) since 1983. Readings are considered to be characteristic of background levels in Forsyth County. On occasion, the site is impacted by plume touchdowns from the Duke Energy Belews Creek Generating Station located approximately 20 miles to the north in Stokes County. In compliance with the most recent monitoring data requirements, 5-minute SO2 averaged data from this site is reported along with 1-hour data.

Nitrogen oxide levels have been measured at the Hattie Avenue site (37-067-0022) since 1984. Readings represent the neighborhood impact of major transportation related emissions from inter-city and intra-city traffic on Business I-40 and U.S. 52 bisecting Winston-Salem.

#### PARTICULATE

Continuous PM10 (TEOM) is measured at the Peters Creek site (37-067-0023) and Hattie Avenue site (37-067-0022). These readings are representative of a maximum impact particulate site influenced by background emissions and locally generated transportation emissions.

##### FRM STATUS

CORE PM2.5 sites have been established at Hattie Avenue (37-067-0022; 1/1 frequency) and Clemmons Middle (37-067-0030; 1/3 frequency + 1/6 collocated) as part of North Carolina's EPA approved PM2.5 monitoring plan. Data collection has been quite successful and validated concentration and QA information has been reported to AIRS through December 2006. County construction of a new animal shelter required the relocation of the North Forsyth site during 2004 to the Clemmons (37-067-0030) site beginning 2005.

### CONTINUOUS STATUS

A continuous PM2.5 (TEOM) was installed at the Hattie Avenue site in June 1999 and it was joined by an additional PM10 TEOM in October 1999. The data set continues to indicate excellent agreement between the FRM PM2.5 data and 24-hour averages obtained from the TEOM. An additional PM2.5 TEOM was established in the Clemmons area of Forsyth County. Installation occurred in the spring of 2005.

### SPECIATION STATUS

A speciated PM2.5 monitor (1/6 frequency) began operation on September 22, 2001 at Hattie Avenue. Validated data sets have been received from RTI through April 2005.

## AIR TOXICS

A (1/6) day air toxic sampler operated in conjunction with the NC-DAQ has been resident at the Hattie Avenue site since 2000. Program support has been erratic but there has been an improvement in the past year with a greater reliability of delivered canisters. Air toxic data has been delivered for 2003 and part of 2004, however, most of the data values are below quantification limit. Toxics data was entered into AIRS in July 2005 with data fields dating back to 1999.

## LEAD

No lead monitors are currently in place at any sites within the County. Based on the interpretation of the lead monitoring requirements, recent population data, and recent source emission inventory data, there are no sources that emit more than 700 lbs of lead per year. Therefore, there are no immediate plans for lead monitoring in the County.

## VISIBILITY PROGRAM

With financial assistance from Region 4 and the NC-DAQ, a visibility camera system was established for the Triad area during 2002. The associated web site combines pictures of two mountain scenes with hourly updated ozone and PM2.5 AQI statistics. A nephelometer was installed in 2004 to provide visual range data. The information is available at: http://www.sehazecam.net.

# 2012 Annual Monitoring Network Plan

## Forsyth County
## Office of Environmental Assistance and Protection

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© Forsyth County Office of Environmental Assistance and Protection
201 North Chestnut Street, 5th Floor
Winston-Salem, NC 27101
Phone 336-703-2440 • Fax 336-727-2777
April 27, 2012

## CERTIFICATION

By the signatures below, the Forsyth County Office of Environmental Assistance and Protection (FCEAP) certifies that the information contained in the 2012 Annual Monitoring Network Plan is complete and accurate at the time of submittal to EPA Region 4. However, due to circumstances that may arise during the sampling year, some network information may change. A notification of change and a request for approval will be submitted to EPA Region 4 at that time.

Print Name: Patrick A. Reagan Signature: Pat A. Reagan Date: 4-30-2012
Program Manager, Monitoring and Mobile Sources, FCEAP

Print Name: W. Minor Barnette Signature: WMBarnette Date: 4/30/12
Director, FCEAP

# 2012 ANNUAL MONITORING NETWORK PLAN

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## *Introduction*

The Forsyth County Office of Environmental Assistance and Protection (FCEAP) monitoring program provides air quality monitoring services in Forsyth County, NC. FCEAP is a state "certified local air pollution program" whose purpose(s) are to improve and maintain ambient air quality and reduce exposure to unhealthful air pollutants.

FCEAP has operated an air quality monitoring program since the early 1970's. The air monitoring services provided by the program are conducted to measure concentrations of criteria air pollutants (CO, $NO_2$, $SO_2$, PM, lead, and $O_3$) in accordance with USEPA regulatory requirements. Measurements are used to assess compliance with National Ambient Air Quality Standards (NAAQS). The NAAQS define air pollutant concentration level thresholds judged necessary to protect the public health and welfare.

The FCEAP air monitoring program operates a network of state and local air monitoring stations (SLAMS) in Forsyth County. The current network configuration consists of seven monitoring stations that measure concentrations of criteria air pollutants. In addition to the SLAMS network the county network also includes monitoring for meteorological parameters and visibility conditions.

The annual monitoring network plan, as provided for in 40 CFR Part 58.10, *Annual Monitoring Network Plan and Periodic Network Assessment* must contain the following information for each monitoring station in the network:

1. The Air Quality System (AQS) site identification number for existing stations.
2. The location, including the street address and geographical coordinates, for each monitoring station.
3. The sampling and analysis method used for each measured parameter.
4. The operating schedule for each monitor.
5. Any proposal to remove or move a monitoring station within a period of eighteen months following the plan submittal.
6. The monitoring objective and spatial scale of representativeness for each monitor.
7. The identification of any sites that are suitable and sites that are not suitable for comparison against the annual $PM_{2.5}$ NAAQS.
8. The Metropolitan Statistical Area (MSA), Core-Based Statistical Area (CBSA), Combined Statistical Area (CSA) or other area represented by the monitor.

The following information below replicates the Forsyth County Air Quality ambient air monitoring network plan and continues in the following sections outlined below:

**II. Site Description Background Information and Definitions**: An outline of the designations, parameters, monitoring methods, and the basis for site selection.

**III. Network Summary**: This section presents an overview of the total number of sites and monitors in Forsyth County. Also included is a listing of all proposed changes to the current network.

**IV. Air Monitoring Station Description**: Each air monitoring station is described in detail as per the outline in (II.) above. Modification to the network as determined by an annual review process will be made each year to maintain a current up-to-date network description document.

## *Site Description Background Information and Definitions*

### *1. Site Description*

Specific information is provided to show the location of the monitoring equipment at the site, if the site is located in a CSA/MSA, the AQS identification number, the GPS coordinates, and evidence that monitors and monitor probes conform to the siting criteria.

### *2. Date Established*

The date when each existing monitoring station was established is shown in the description. For those stations, which are proposed, a date is provided when it is expected for the station to be in operation.

### *3. Site Approval Status*

Each monitoring station in the existing network has been reviewed with the purpose of determining whether it meets all design criteria for inclusion in the SLAMS network. Stations that do not meet the criteria will either be relocated in a nearby area or, when possible, re-sited at the present location.

### *4. Monitoring Objectives*

Per 40 CFR 58 Appendix D, Section 1.1:

> *"The ambient air monitoring networks must be designed to meet three basic monitoring objectives. These basic objectives are listed below. The appearance of any one objective in the order of this list is not based upon a prioritized scheme. Each objective is important and must be considered individually."*

The objectives are summarized below:

(a) Provide air pollution data to the general public in a timely manner.

(b) Support compliance with ambient air quality standards and emissions strategy development. Data from FRM (Federal Reference Method), FEM (Federal Equivalent Method), and ARM (Approved Regional Method) monitors for NAAQS pollutants will be used for comparing an area's air pollution levels against the NAAQS.

(c) Support for air pollution research studies.

### *5. Monitoring Stations' Designations*

Most stations described in the air quality surveillance network are designated as State and Local Air Monitoring Stations (SLAMS). In addition, some of these stations fulfill other requirements, which must be identified. In this description of the network, designations are also made for National Air Monitoring Stations (NAMS), Special Purpose Monitors (SPM), and National Core (community oriented) stations (NCore). The following is the criteria used for each of these designations.

### *SLAMS*

Requirements for air quality surveillance systems provide for the establishment of a network of monitoring stations designated as State and Local Air Monitoring Stations (SLAMS) that measure ambient air concentrations of those pollutants for which standards have been established. These stations must meet requirements that relate to four major areas: quality assurance, monitoring methodology, sampling interval and siting of instruments and instrument probes.

### *NAMS*

Within the SLAMS network certain monitors are selected to provide the USEPA with timely data for use in national trends analysis. These NAMS monitors are identified in the summary of network stations.

### *SPM*

Not all monitors and monitoring stations in the air quality surveillance network are included in the SLAMS network. In order to allow the capability of providing monitoring for various reasons such as: special studies, modeling verification and compliance status, and other objectives; certain monitors are designated as Special Purpose Monitors (SPM). These monitors are not committed to any one location or for any specified time period. They may be located as separate monitoring stations or be included at SLAMS locations. Monitoring data may be reported, provided that the monitors and stations conform to all requirements of the SLAMS network.

### *NCORE*

National Core (community-oriented) multi-pollutant monitoring station data will be used to evaluate the regional air quality models used in developing emission strategies, and to track trends in air pollution abatement control measures' impact on improving air quality.

## *6. Monitoring Methods*

Sampling and analytical procedures for criteria air pollutant monitoring performed in the FCEAP ambient air monitoring network are conducted in accordance with applicable USEPA Designated Federal Reference (FRM) or Equivalent (FEM) Methods unless otherwise noted. Analytical techniques for non-criteria air pollutant monitoring (methods employed that are not USEPA Designated Federal Reference (FRM) or Equivalent (FEM) Methods) are documented in the applicable FCEAP Quality Assurance Project Plans (QAPP), FCEAP Standard Operating Procedures (SOP), or the appropriate North Carolina Division of Air Quality (NCDAQ) QAPP or SOP. Methods used by FCEAP for criteria pollutant monitoring are listed below:

### *Particulate Matter 10 microns in size ($PM_{10}$)*

All $PM_{10}$ samplers operated by FCEAP are operated as federal reference method (FRM) or equivalent samplers and are operated according to the requirements set forth in 40 CFR 50 and 40 CFR 53. Listed below is the

USEPA Designated Reference or Equivalent Method used in the FCEAP monitoring network:

| Method | Designation Number | Method Code |
|---|---|---|
| R&P TEOM Series 1400a | EQPM-1090-079 | 079 |

### *Particulate Matter 2.5 microns in size ($PM_{2.5}$)*

With the exception of continuous samplers and speciation samplers all $PM_{2.5}$ samplers operated by FCEAP are either FRM or FEM samplers. Listed below is the USEPA Designated Reference or Equivalent Method used in the FCEAP monitoring network:

| Method | Designation Number | Method Code |
|---|---|---|
| R & P Partisol-Plus 2025 PM-2.5 Seq. | RFPS-0498-118 | 118 |

### *$PM_{2.5}$ Speciation sampling and analysis*

In addition to operating $PM_{2.5}$ samplers that determine only $PM_{2.5}$ mass values, FCEAP also operates $PM_{2.5}$ speciation samplers that collect samples that are analyzed to determine the chemical makeup of $PM_{2.5}$. Data collected using this method cannot be compared to the NAAQS. Listed below is the method used in the FCEAP monitoring network:

| Method | Designation Number | Method Code |
|---|---|---|
| MetOne SASS | NA | NA |
| URG | NA | NA |

### *Sulfur Dioxide*

Instruments used to continuously monitor sulfur dioxide levels in the atmosphere employ the pulsed UV fluorescence method. Listed below is the USEPA Designated Reference or Equivalent Method used in the FCEAP monitoring network:

| Method | Designation Number | Method Code |
|---|---|---|
| Thermo Electron 43A, 43C-TLE, 43i | EQSA-0486-060 | 100 |

### *Carbon Monoxide*

Continuous monitoring for carbon monoxide is performed by use of the non-dispersiveinfrared (gas filter correlation) method. Listed below is the USEPA Designated Reference or Equivalent Method used in the FCEAP monitoring network:

| Method | Designation Number | Method Code |
|---|---|---|
| Thermo Electron or Thermo Environmental Instruments 48, 48C, 48i | RFCA-0981-054 | 054 |

### *Ozone*

Ozone is monitored using the UV photometry method. Listed below is the USEPA Designated Reference or Equivalent Method used in the FCEAP monitoring network:

| Method | Designation Number | Method Code |
|---|---|---|
| Teledyne – Advanced Pollution Instrumentation, Inc. Model 400E | EQOA-0992-087 | 047 |

### *Nitrogen Dioxide*

The chemiluminescence method is used in monitoring the nitrogen dioxide level in the ambient air. Listed below is the USEPA Designated Reference or Equivalent Method used in the FCEAP monitoring network:

| Method | Designation Number | Method Code |
|---|---|---|
| Teledyne – Advanced Pollution Instrumentation, Inc Model 200A, 200AU, 200E, 200EU | RFNA-1194-099 | 099 |

### *Air Toxics*

Air toxics sampling is conducted in Forsyth County using equipment on loan from the State of North Carolina, Division of Air Quality. Listed below is the USEPA Designated Reference or Equivalent Method used in the FCEAP monitoring network:

| Method | Designation Number | Method Code |
|---|---|---|
| Compendium Method for Toxic Organics | Compendium Method TO-15 | 150 |

## *7. Quality Assurance Status*

FCEAP has an extensive quality assurance program to ensure that all air monitoring data collected meets established criteria for precision and accuracy. FCEAP operates according to EPA approved Quality Assurance Project Plans (QAPP) and Standard Operating Procedures. Staff members audit instrumentation on a scheduled basis to ensure that each instrument is calibrated and operating properly. Data validation is performed monthly to ensure data reported by each instrument is recorded accurately in the air quality monitoring database.

## *8. Scale of Representativeness*

Each station in the monitoring network must be described in terms of the physical dimensions of the air parcel nearest the monitoring station throughout which actual pollutant concentrations are reasonably similar. Area dimensions or scales of representativeness used in the network description are:

(a) Microscale - defines the concentration in air volumes associated with area dimensions ranging from several meters up to about 100 meters.

(b) Middle scale - defines the concentration typical of areas up to several city blocks in size with dimensions ranging from about 100 meters to 0.5 kilometers.

(c) Neighborhood scale – defines concentrations within an extended area of a city that has relatively uniform land use with dimensions ranging from about 0.5 to 4.0 kilometers.

(d) Urban scale - defines an overall citywide condition with dimensions on the order of 4 to 50 kilometers.
(e) Regional Scale - defines air quality levels over areas having dimensions of 50 to hundreds of kilometers.

Closely associated with the area around the monitoring station where pollutant concentrations are reasonably similar are the basic monitoring exposures of the station. There are six basic exposures:

(a) Sites located to determine the highest concentrations expected to occur in the area covered by the network.
(b) Sites located to determine representative concentrations in areas of high population density.
(c) Sites located to determine the impact on ambient pollution levels of significant sources or source categories.
(d) Sites located to determine general background concentration levels.
(e) Sites located to determine the extent of regional pollutant transport among populated areas; and in support of secondary standards.
(f) Sites located to measure air pollution impacts on visibility, vegetation damage, or other welfare-based impacts.

The design intent in siting stations is to correctly match the area dimensions represented by the sample of monitored air with the area dimensions most appropriate for the monitoring objective of the station. The following relationship of the six basic objectives and the scales of representativeness are appropriate when siting monitoring stations:

| Site Type | Appropriate Siting Scales |
|---|---|
| 1. Highest concentration | Micro, middle, neighborhood (sometimes urban or regional for secondarily formed pollutants). |
| 2. Population oriented | Neighborhood, urban. |
| 3. Source impact | Micro, middle, neighborhood. |
| 4. General/background & regional transport | Urban, regional. |
| 5. Welfare-related impacts | Urban, regional. |

Table 1 - Siting Objectives and Scales

## *9. Data Processing and Reporting*

All ambient air quality data are stored in the Environmental Data Acquisition System (EDAS) database located on the 5th floor of the Forsyth County Government Center, FCEAP, 201 N. Chestnut Street, Winston-Salem, North Carolina. On a daily basis the EDAS data are backed up and maintained at an off-site location. After all monthly data validation procedures are successfully completed, data is transmitted to the USEPA's national Air Quality System (AQS) database. The AQS database is maintained by EPA as the official repository of the fully quality assured ambient air quality dataset.

## Network Summary

### *1. Site Table and Criteria Pollutants Monitored*

| Site | AQS ID # | CO | $NO_2$ | $O_3$ | Pb | $PM_{2.5}$ | $PM_{10}$ | $SO_2$ | Air Toxics |
|---|---|---|---|---|---|---|---|---|---|
| Clemmons Middle School | 37-067-0030 | | | X | | X | | | |
| Hattie Avenue "A" | 37-067-0022 | | X | X | | | | X | X |
| Hattie Avenue "B" | 37-067-0022 | | | | | X | X | | |
| Peter's Creek | 37-067-0023 | X | | | | | X | | |
| Shiloh Church | 37-067-0028 | | | X | | | | | |
| Union Cross | 37-067-1008 | | | X | | | | | |

Table 2 - Forsyth County Monitoring Sites

## *2. Site Map*

**AIR QUALITY MONITORING STATIONS**
**FORSYTH COUNTY, NC 2012**

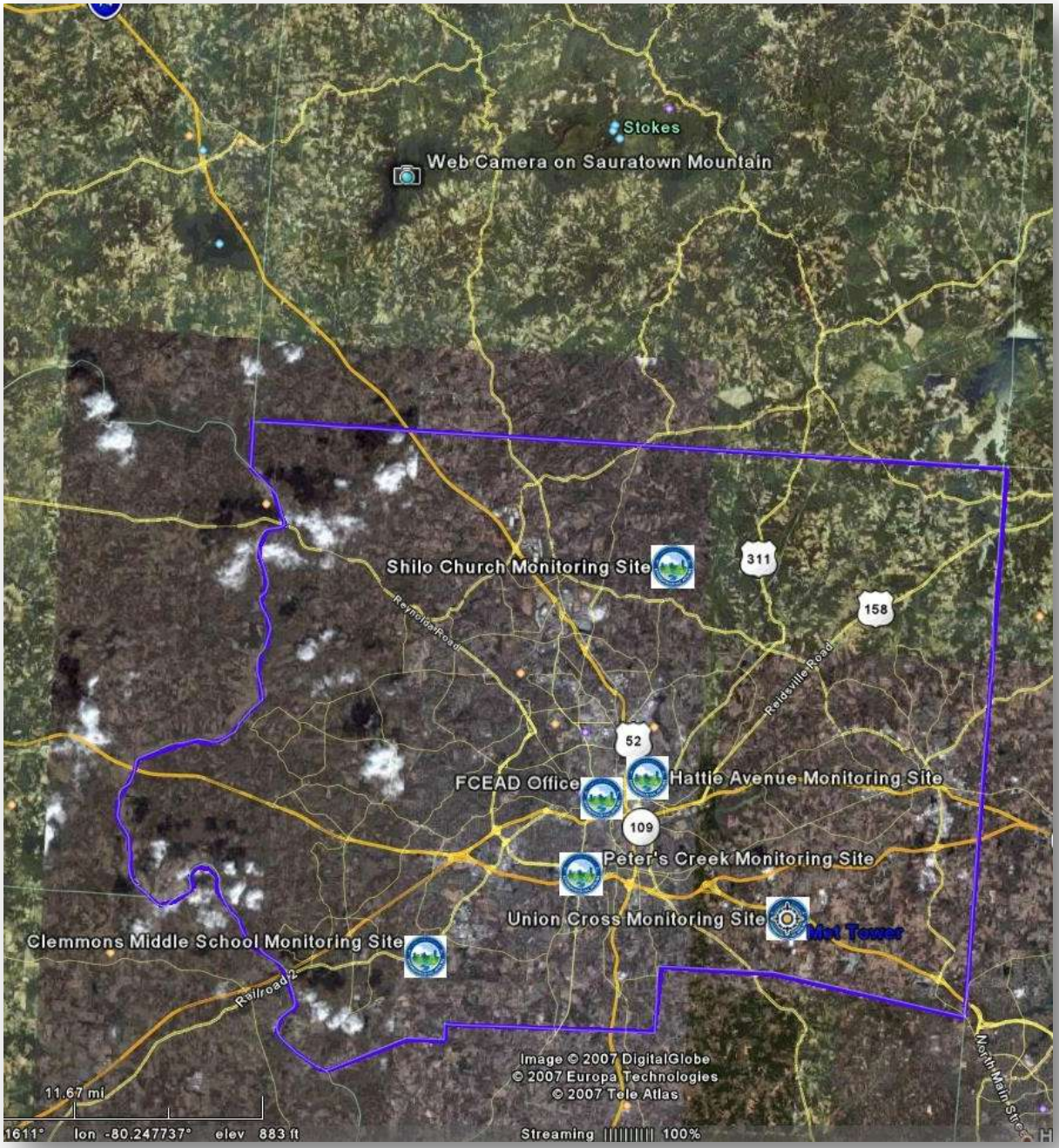


Figure 1 - Forsyth County Monitor Locations

### *3. Monitoring Methods*

| Site | Parameter | Instrument / Method | Method Number | Parameter Number | Monitor Type† | Serial Number | Purchase Date | Replace Date | Condition |
|---|---|---|---|---|---|---|---|---|---|
| 37-067-0022 | Ozone | UV Photometric | 047 | 44201 | SLAMS | 2621 | 2009 | 2019 | New |
| 37-067-0022 | SO2 | Pulsed UV Fluorescent | 100 | 42401 | SLAMS | 819230552 | 2008 | 2018 | New |
| 37-067-0022 | NO | Chemi-luminescence | 099 | 42601 | SLAMS | 200A | 2007 | 2017 | Good |
| 37-067-0022 | $NO_2$ | Chemi-luminescence | 099 | 42602 | SLAMS | 200A | 2007 | 2017 | Good |
| 37-067-0022 | $NO_x$ | Chemi-luminescence | 099 | 42603 | SLAMS | 200A | 2007 | 2017 | Good |
| 37-067-0022 | Air Toxics | Compendium Method for Toxic Organics (TO) 15 | 150 | Multiple | NON | 4518<br>3603 | NCDENR Owned Equipment | | |
| 37-067-0022 | PM2.5 | FRM | 118 | 88101 | SLAMS | 2025A202849805 | 1999 | 2009 | Fair |
| 37-067-0022 | PM2.5 | Speciation | 118 | Multiple | SLAMS | A2591 | 2001 | 2011 | Fair |
| 37-067-0022 | PM2.5 | TEOM | 701 | 88501 | SLAMS | 140AB223509812 | 2000 | 2010 | Fair |
| 37-067-0022 | PM2.5 | TEOM | 702 | 88502 | SLAMS | 140AB223509812 | 2000 | 2010 | Fair |
| 37-067-0022 | PM2.5 | Carbon Speciation | 118 | 88101 | SLAMS | 3NB0191 | 2007 | 2017 | Good |
| 37-067-0022 | PM10 | TEOM | 079 | 81102 | SLAMS | 140AB226379906 | 2000 | 2010 | Fair |
| 37-067-0023 | PM10 | TEOM | 079 | 81102 | SLAMS | 140A-2212 | 1999 | 2009 | Fair |
| 37-067-0023 | CO | Gas Filter Correlation | 054 | 42101 | SLAMS | 819230553 | 2008 | 2018 | New |
| 37-067-0028 | Ozone | UV Photometric | 047 | 44201 | SLAMS | 2217 | 2009 | 2019 | New |
| 37-067-0030 | Ozone | UV Photometric | 047 | 44201 | SLAMS | 2218 | 2009 | 2019 | New |
| 37-067-0030 | PM2.5 | TEOM | 701 | 88501 | SLAMS | 140AB252230406 | 2000 | 2010 | Fair |
| 37-067-0030 | PM2.5 | TEOM | 702 | 88502 | SLAMS | 140AB252230406 | 2000 | 2010 | Fair |
| 37-067-0030 | PM2.5 | FRM | 116 | 88101 | SLAMS | 2025A205999808 | 1999 | 2009 | Fair |
| 37-067-0030 | PM2.5 | FRM | 118 | 88101 | SLAMS | 2025B217080407 | 2004 | 2014 | Fair |
| 37-067-1008 | Ozone | UV Photometric | 047 | 44201 | SLAMS | 2219 | 2009 | 2019 | New |
| 37-067-1008 | Temp | R. M. Young | 020 | 61101 | SLAMS | | | | Fair |
| 37-067-1008 | Humidity | R. M. Young | 020 | 61103 | SLAMS | | | | Fair |
| 37-067-1008 | WD | Climatronics | 020 | 61104 | SLAMS | 102779 | 2008 | 2018 | New |
| 37-067-1008 | WS | Climatronics | 020 | 61103 | SLAMS | 102779 | 2008 | 2018 | New |
| 37-067-1008 | Pressure | R. M. Young | 011 | 64101 | SLAMS | | | | Fair |

Table 3 - Forsyth County Monitoring Methods

†- Monitor Type:

SLAMS- State and Local Air Monitoring Station
SPM- Special Purpose
NON- Non-regulatory
TRENDS- Trends Speciation

## Air Monitoring Station Descriptions

### *1. Clemmons Middle School*

### *(a) Site Table*

Site Name: Clemmons Middle School
AQS Site Identification Number: 37-067-0030
Location: Fraternity Church Road
Winston-Salem, NC
Latitude: N36.026º
Longitude: W80.342º
Elevation: 245 meters
Date Monitor Established: Ozone April 27, 2005
Date Monitor Established: PM2.5 TEOM April 27, 2005
Date Monitor Established PM2.5 FRM April 27, 2005
Nearest Road: Fraternity Church Road Distance to Road: 40 meters
Traffic Count[3]: 4100 Year of Count: 2005
MSA[4]: Winston-Salem, NC Metropolitan Statistical Area (2006) MSA #: 49180

| Parameter | Method | Method Number | Sampling Schedule |
|---|---|---|---|
| Ozone | UV Photometric | 047 | April 1 – Oct. 31, Continuous |
| PM2.5 | TEOM | 701 | Continuous |
| PM2.5 | Gravimetric | 116 | 1 in 3 day |
| PM2.5 | Gravimetric | 118 | 1 in 6 day |

Table 4 - Clemmons Middle School Monitoring Station Summary

### *(b) Site Description and Statement of Purpose*

An ozone monitor, $PM_{2.5}$ TEOM, and $PM_{2.5}$ FRM have been located at a manufactured structure since April 27, 2005. A collocated $PM_{2.5}$ FRM sampler has been located less than 3m N of the reporting sampler since the same date. The site is located in a mixed use environment at latitude N36.026º and longitude W80.342º. The site elevation is 245 meters above sea level. The nearest road is Fraternity Church Road with a daily traffic volume of 4100 vehicles (2005) at a distance of 40 meters from the sample inlet. This site combined the $PM_{2.5}$ equipment from site 37-067-0024 and the ozone equipment from site 37-067-0027 when these sites were forced to relocate.

The inlet of the samplers is approximately 4 meters above ground level and 1 meter above roof level. The area is a transition zone of business (~50%) to residential (~50%) within a 1 km radius. The samplers are SLAMS.

The sampling frequency for $PM_{2.5}$ is 1 in 3 and 1 in 6 day sampling. The sampling interval is 24 hours, from midnight to midnight. The ozone instrument is operated during the North Carolina ozone monitoring season which begins April 1 and ends October 31. The ozone instrument operates continuously during this period.

The site complies with the siting requirements of 40CFR58 for criteria air pollutants. There are no proposed changes for this site. It is recommended that the current site status be maintained.

**OBJECTIVE AND SPATIAL SCALE**

The monitoring objectives of the instruments are to measure: 1) upwind background ambient concentrations and 2) population exposure.

The site is a neighborhood spatial scale for ozone and $PM_{2.5}$. Data from this site is used to assess compliance with the NAAQS for ozone and $PM_{2.5}$.

The site is located in the Winston-Salem, NC Metropolitan Statistical Area[4]. The principal cities and counties in the MSA are Winston-Salem, Davie County, Forsyth County, Stokes County, and Yadkin County, NC.

### *(c) Site Photographs*

NORTH

EAST

SOUTH

WEST

## *2. Hattie Avenue "A"*

### *(a) Site Table*

Site Name: Hattie Avenue "A"
AQS Site Identification Number: 37-067-0022
Location: 1300 Hattie Avenue
Winston-Salem, NC
Latitude: N36.110556º
Longitude: W80.226667º
Elevation: 284 meters
Date Monitor Established: Ozone May 21, 1993
Date Monitor Established: $NO_2$ January 1, 1984
Date Monitor Established $SO_2$ January 1, 1983
Date Monitor Established Air Toxics January 1, 2000
Nearest Road: Hattie Avenue Distance to Road: 27 meters
Traffic Count[3]: 3300 Year of Count: 2003
MSA[4]: Winston-Salem, NC Metropolitan Statistical Area (2006) MSA #: 49180

| Parameter | Method | Method Number | Sampling Schedule |
|---|---|---|---|
| Ozone | UV Photometric | 047 | Continuous |
| $NO_2$ | Chemiluminescence | 099 | Continuous |
| $SO_2$ | UV Pulsed Fluorescence | 100 | Continuous |
| Air Toxics | Compendium Method for Toxic Organics (TO) 15 | 150 | 1 in 6 day |

Table 5 - Hattie Avenue "A" Monitoring Station Summary

### *(b) Description and Statement of Purpose*

The Hattie Avenue site monitors ozone, sulfur dioxide, and oxides of nitrogen. The site is located in the 1300 block of Hattie Avenue in downtown Winston-Salem. The site is located approximately 2.2 km NE of downtown, 1.1 km E of US52 and approximately 1.8 km NNW of Interstate 40 Business in a residential district at latitude N36.110556º and longitude W80.226667º. The site elevation is 284 meters. The nearest road, Hattie Avenue, is 27 meters from the inlets and has a daily traffic flow of 3300 vehicles (2003). The nearest tallest building is St. Benedict's Church (approximately 10 meters). The inlets are approximately 43 meters from the shopping center. The inlets are approximately 4 meters above the ground and 1 meter above the roof of the monitoring station. The area is residential. The ozone, sulfur dioxide, and $NO_2$ monitors are all SLAMS.

The ozone instrument is operated during the North Carolina ozone monitoring season which begins April 1 and ends October 31. The ozone instrument operates continuously during this period.

The $SO_2$ and $NO_2$ instruments operate continuously.

Monitoring for Urban Air Toxics (UAT) is currently conducted at this site by the North Carolina Division of Air Quality (NC-DAQ), Toxics Protection Branch (TPB). Currently, the NC-DAQ TPB collects whole air samples in stainless steel 6 liter- pressurized canisters. The samples are then analyzed using cryogenic preconcentration gas chromatography with mass spectrometric detection (GC/MS) via the Compendium Method for Toxic Organics (TO) 15 for the list of 68 compounds (below).

- *Propene*
- *Freon 12*
- *Freon 22*
- *Freon 114*
- *Chloro Methane*
- *(Methylchloride)*
- *Isobutene*
- *Vinyl chloride*
- *1,3-Butadiene*
- *Bromomethane*
- *Chloroethane*
- *Freon 11*
- *Pentane*
- *Ethanol*
- *Isoprene*
- *Acrolein*
- *1,1-Dichloroethene*
- *(Vinylidene chloride)*
- *Freon 113*
- *Methyl Iodide*
- *Isopropyl Alcohol*
- *Carbon Disulfide*
- *Acetonitrile*
- *Methylene chloride*
- *Cyclopentane*
- *MTBE*
- *Hexane*
- *Methacrolein*
- *Vinyl Acetate*
- *1,1-Dichloroethane*
- *Methyl Vinyl Ketone*
- *Methyl Ethyl Ketone*
- *1,2 Dichloroethene*
- *Chloroform*
- *1,1,1-Trichloroethane*
- *(Methyl chloroform)*
- *Cyclohexane*
- *Carbon Tetrachloride*
- *Benzene*
- *1,2-Dichloroethane*
- *(ethylene dichloride)*
- *1-Butanol*
- *Trichloroethylene*
- *2-Pentanone*
- *3-Pentanone*
- *1,2-Dichloropropane*
- *1,4-Dioxane*
- *Bromodichloromethane*
- *trans-1,3 Dichloropropene*
- *Methyl Isobutyl Ketone*
- *Toluene*
- *cis-1,3 Dichloropropene*
- *1,1,2-Trichloroethane (vinyl trichloride)*
- *Ethylpropylketone*
- *Tetrachloroethylene*
- *(perchloroethylene)*
- *Methyl Butyl Ketone*
- *Dibromoethane*
- *Chlorobenzene*
- *(phenylchloride)*
- *Ethylbenzene*
- *m- & p-Xylene*
- *o-Xylene*
- *Styrene*
- *Bromoform*
- *1,1,2,2-Tetrachloroethane*
- *1,3,5-Trimethylbenzene*
- *(mesitylene)*
- *1,2,4-Trimethylbenzene*
- *(pseudocumene)*
- *m-Dichlorobenzene*
- *1,2,3-Trimethylbenzene*
- *p-Dichlorobenzene*
- *Benzylchloride*
- *o-Dichlorobenzene*
- *1,2,4-Trichlorobenzene*

The site complies with the siting requirements of 40CFR58 for criteria air pollutants. There are no proposed changes for this site. It is recommended that the current site status be maintained.

## OBJECTIVE AND SPATIAL SCALE

The monitoring objectives of the instruments are to measure: 1) background ambient concentrations and 2) population exposure.

The site is a neighborhood spatial scale. Data from this site is used to assess compliance with the NAAQS for ozone, sulfur dioxide, and nitrogen dioxide.

The site is located in the Winston-Salem, NC Metropolitan Statistical Area[4]. The principal cities and counties in the MSA are Winston-Salem, Davie County, Forsyth County, Stokes County, and Yadkin County, NC.

***(c)*** *Site Photographs*

NORTH

EAST

SOUTH

WEST

### *3. Hattie Avenue "B"*

## *(a) Site Table*

Site Name: Hattie Avenue "B"
AQS Site Identification Number: 37-067-0022
Location: 1300 Hattie Avenue
Winston-Salem, NC
Latitude: N36.110556º
Longitude: W80.226667º
Elevation: 284 meters
Date Monitor Established: $PM_{2.5}$ - FRM January 1, 1999
Date Monitor Established: $PM_{2.5}$ - Speciation January 1, 1999
Date Monitor Established $PM_{2.5}$ - TEOM June 16, 1999
Date Monitor Established $PM_{10}$ - TEOM October 18, 1999
Nearest Road: Hattie Avenue Distance to Road: 27 meters
Traffic Count[3]: 3300 Year of Count: 2003
MSA[4]: Winston-Salem, NC Metropolitan Statistical Area (2006) MSA #: 49180

| Parameter | Method | Method Number | Sampling Schedule |
|---|---|---|---|
| $PM_{2.5}$ | FRM Gravimetric | 118 | 1 in 1 day |
| $PM_{2.5}$ | MetOne, Speciation | 701 | 1 in 6 day |
| $PM_{2.5}$ | TEOM, Continuous | 701, 702 | Continuous |
| $PM_{10}$ | TEOM, Continuous | 079 | Continuous |

Table 6 - Hattie Avenue "B" Monitoring Station Summary

## *(b) Description and Statement of Purpose*

This Hattie Avenue site monitors $PM_{2.5}$ and $PM_{10}$. The site is located in the 1300 block of Hattie Avenue in Winston-Salem. The site is located approximately 2.2 km NE of downtown, 1.1 km E of US52 and approximately 1.8 km NNW of Interstate 40 Business in a residential district at latitude N36.110556º and longitude W80.226667º. The site elevation is 284 meters. The nearest road, Hattie Avenue, is 27 meters from the inlets and has a daily traffic flow of 3300 vehicles (2003). The nearest tallest building is St. Benedict's Church (approximately 10 meters). The inlets are approximately 43 meters from the shopping center. The inlets are approximately 4 meters above the ground and 1 meter above the roof of the monitoring station. The area is residential. The monitors are SLAMS.

The $PM_{2.5}$ FRM sampling frequency is everyday. The sampling interval is 24 hours, from midnight to midnight every day.

The $PM_{2.5}$ Speciation sampling frequency is 1 in 6 days. The sampling interval is 24 hours, from midnight to midnight every six days.

The $PM_{2.5}$ and $PM_{10}$ TEOM instruments operate continuously.

The site complies with the siting requirements of 40CFR58 for criteria air pollutants. There are no proposed changes for this site. It is recommended that the current site status be maintained.

## OBJECTIVE AND SPATIAL SCALE

The monitoring objective of the instruments is to measure population exposure.

The site is a neighborhood spatial scale. Data from this site is used to assess compliance with the NAAQS for $PM_{2.5}$ and $PM_{10}$.

The site is located in the Winston-Salem, NC Metropolitan Statistical Area[4]. The principal cities and counties in the MSA are Winston-Salem, Davie County, Forsyth County, Stokes County, and Yadkin County, NC.

### *(c) Site Photographs*

NORTH

EAST

SOUTH

WEST

### *4. Peter's Creek*

## *(a) Site Table*

Site Name: Peter's Creek
AQS Site Identification Number: 37-067-0023
Location: 1401 Corporation Parkway
Winston-Salem, NC
Latitude: N36.065833º
Longitude: W80.258333º
Elevation: 233 meters
Date Monitor Established: PM10 March 12, 1990
CO November 14, 1988
Nearest Road: Peter's Creek Parkway Distance to Road: 6 meters
Traffic Count[3]: 24000 Year of Count: 2005
MSA[4]: Winston-Salem, NC Metropolitan Statistical Area (2006) MSA #: 49180

| Parameter | Method | Method Number | Sampling Schedule |
|---|---|---|---|
| CO | Gas Filter Correlation | 054 | Continuous |
| PM10 | Gravimetric | 63 | Continuous |

Table 7 - Peter's Creek Monitoring Station Summary

## *(b) Site Description and Statement of Purpose*

A CO sampler was located at the Peter's Creek station on November 14, 1998. A $PM_{10}$ sampler has been located at 310 1401 Corporation Parkway since March 12, 1990. The site is located approximately 4 kilometers SW of the central business district at latitude N36.065833º and longitude W80.258333º. The site elevation above sea level is 233 meters. The nearest road is Peter's Creek Parkway at a distance of approximately 6 meters. The estimated daily traffic flow is 24,000 vehicles (2005). The inlet is approximately 4 meters above the ground and 1 meter from the roof. The area is commercial with several residential areas near the sampler. The CO sampler is SLAMS and the $PM_{10}$ sampler is a SPM.

The sampling frequency for CO and $PM_{10}$ is continuous.

The site complies with the siting requirements of 40CFR58 for criteria air pollutants. There are no proposed changes for this site. It is recommended that the current site status be maintained.

## OBJECTIVE AND SPATIAL SCALE

The monitoring objective of the Peter's Creek site is population exposure. The site is a micro spatial scale. Data is used to assess trends and compliance to the NAAQS.

The site is located in the Winston-Salem, NC Metropolitan Statistical Area[4]. The principal cities and counties in the MSA are Winston-Salem, Davie County, Forsyth County, Stokes County, and Yadkin County, NC.

### *(c) Site Photographs*

NORTH

EAST

SOUTH

WEST

### *5. Shiloh Church*

### *(a) Site Table*

Site Name: Shiloh Church
AQS Site Identification Number: 37-067-0028
Location: 6496 Baux Mountain Road
Winston-Salem, NC
Latitude: N36.203056º
Longitude: W80.215833º
Elevation: 294 meters
Date Monitor Established: Ozone April 1, 1996
Nearest Road: Baux Mountain Rd Distance to Road: 20 meters
Traffic Count[3]: 2000 Year of Count: 2003
MSA[4]: Winston-Salem, NC Metropolitan Statistical Area (2006) MSA #: 49180

| Parameter | Method | Method Number | Sampling Schedule |
|---|---|---|---|
| Ozone | UV Photometry | 47 | Continuous |

Table 8 - Shiloh Church Monitoring Station Summary

### *(b) Site Description and Statement of Purpose*

An ozone monitor has been located at this site since April 1, 1996. The site is located approximately 12 km NNE of the central business district at latitude N36.203056º and longitude W80.215833º. The site elevation is 294 meters above sea level. The nearest road is Baux Mountain Road with a daily traffic volume of 2000 vehicles (2003) at a distance of 20 meters from the sample inlet.

The inlet is approximately 4 meters above the ground and 1 meter from the roof. The area is residential. The ozone sampler is SLAMS.

The ozone instrument is operated during the North Carolina ozone monitoring season which begins April 1 and ends October 31. The ozone instrument operates continuously during this period.

The site complies with the siting requirements of 40CFR58 for criteria air pollutants. There are no proposed changes for this site. It is recommended that the current site status be maintained.

**OBJECTIVE AND SPATIAL SCALE**

The monitoring objective of the instrument is to measure population exposure.

The site is a neighborhood spatial scale for ozone. Data from this site is used to assess compliance with the NAAQS for ozone.

The site is located in the Winston-Salem, NC Metropolitan Statistical Area[4]. The principal cities and counties in the MSA are Winston-Salem, Davie County, Forsyth County, Stokes County, and Yadkin County, NC.

### *(c) Site Photographs*

NORTH

EAST

SOUTH

WEST

### *6. Union Cross*

## *(a) Site Table*

Site Name: Union Cross
AQS Site Identification Number: 37-067-1008
Location: 3656 Piedmont Memorial Drive
Winston-Salem, NC
Latitude: N36.050833º
Longitude: W80.143889º
Elevation: 285 meters
Date Monitor Established: Ozone April 1, 1998
Nearest Road: Piedmont Memorial Dr. Distance to Road: 55 meters
Traffic Count[3]: 820 Year of Count: 2005
MSA[4]: Winston-Salem, NC Metropolitan Statistical Area (2006) MSA #: 49180

| Parameter | Method | Method Number | Sampling Schedule |
|---|---|---|---|
| Ozone | UV Photometry | 047 | Continuous |
| Wind Speed | R. M. Young | 020 | Continuous |
| Wind Direction | R. M. Young | 020 | Continuous |
| Pressure | R. M. Young | 011 | Continuous |
| Outdoor Temperature | R. M. Young | 020 | Continuous |
| Relative Humidity | R. M. Young | 020 | Continuous |

Table 9 - Union Cross Monitoring Station Summary

## *(b) Site Description and Statement of Purpose*

An ozone monitor has been located at this site since April 1, 1998 along with a meteorological tower since 1997. The site is located approximately 10 km SE of the central business district at latitude N36.050833º and longitude W80.143889º. The site elevation is 285 meters above sea level. The nearest road is Piedmont Memorial Drive with an annual traffic volume of 820 vehicles (2005) at a distance of 55 meters from the sample inlet.

The inlet is approximately 4 meters above the ground and 1 meter from the roof. The area is residential. The ozone sampler is SLAMS.

The ozone instrument is operated during the North Carolina ozone monitoring season which begins April 1 and ends October 31. The ozone instrument operates continuously during this period.

The site complies with the siting requirements of 40CFR58 for criteria air pollutants. There are no proposed changes for this site. It is recommended that the current site status be maintained.

## OBJECTIVE AND SPATIAL SCALE

The monitoring objective of the instrument is to measure population exposure.

The site is a neighborhood spatial scale for ozone. Data from this site is used to assess compliance with the NAAQS for ozone.

The site is located in the Winston-Salem, NC Metropolitan Statistical Area[4]. The principal cities and counties in the MSA are Winston-Salem, Davie County, Forsyth County, Stokes County, and Yadkin County, NC.

### *(c) Site Photographs*

NORTH

EAST

SOUTH

WEST

## *References*

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2. Watson, John G., Chow, Judith C., DuBois, David, Green, Mark, Frank, Neil, Pitchford, Marc. Guidance for Network Design and Optimum Site Exposure for PM2.5 and PM10. Office of Air Quality Planning and Standards, U. S. Environmental Protection Agency, Research Triangle Park, NC 27711. December 15, 1997.

3. Winston-Salem Department of Transportation. Traffic Counts 1965-2005. http://www.cityofws.org/Home/Departments/Transportation/Planning/Articles/TrafficCounts. Winston-Salem, NC. 2007.

4. US Census Bureau. Current Lists of Metropolitan and Micropolitan Statistical Areas and Definitions. http://www.census.gov/population/www/estimates/metrodef.html. (301) 763-2419. 2006.

# 2012 Annual Monitoring Network Plan

# Appendix A

# Environmental Assistance and Protection
# Forsyth County,
# North Carolina

## 2012 Annual Monitoring Network Plan

Posted on 4/2/2012 by Patrick Reagan

In 2006 EPA amended the ambient air monitoring regulations. As part of this amendment, EPA is requiring monitoring agencies to conduct an annual network review. The purpose is to optimize U.S. air monitoring networks to achieve, with limited resources, the best possible scientific value and protection of public and environmental health and welfare.

View the 2012 Annual Monitoring Network Plan Comments on the network are encouraged to help the Department maintain adequate protection of public health and protection of the environment. Comments and suggestions must be made by May 1st. Please notify Patrick Reagan either by email or call him at (336)703-2440. You may also send written comments to:

Forsyth County Office of Environmental Assistance and Protection
Forsyth County Government Center
201 North Chestnut Street, 5th Floor
Winston-Salem, NC 27101-4120

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# 2012 Annual Monitoring Network Plan

# Appendix B

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No comments were received