Forsyth County
Office of Environmental Assistance and Protection

June 28, 2018

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 report on the status of the **Ambient Air Monitoring** commitments for the FY-18 105 Grant Work plan for Forsyth County, North Carolina (Reporting Organization 37-067). The entire Plan follows the Executive Summary, complete with staff field reviews as well as a copy of the published public notice.

Sincerely,

Jason R. Bodenhamer, Program Manager
Analysis and Monitoring Division
Forsyth County Office of Environmental Assistance and Protection

Enclosures

cc: Bob Ragland (FCEAP)
Minor Barnette (FCEAP)
Ryan Brown (EPA-Region IV)
Gregg Worley (EPA-Region IV)

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Executive Summary

Submit by July 1, 2018 an evaluation to demonstrate the requirements of 40 CFR Part 58.10 (a)(1) (Annual Network Evaluation) have been met.

This review was conducted and submitted by July 1, 2018.

Quality Assurance Procedures.

On December 5, 2017, this Office submitted the QMP and received comments on May 21, 2018. The edits were made to the QMP and resubmitted for approval on May 25, 2018. This Office has also received approval of the Criteria Pollutant QAPP on September 7, 2017. SOPs are up to date and approved within our network including: SO2, NO2, Ozone, PM 2.5 (FRM), Calibrators, and Zero Air Supplies. One document (Data Handling SOP) has been submitted to EPA but due to EPA being focused on QAPP updates, has yet to be approved.

Categorization of Ambient Monitors and Auxiliary Equipment.

The evaluation was completed in January 2018. We currently have backup equipment for each monitoring device stored in our office in the case of equipment failure. The current emphasis remains maintenance of the monitoring buildings and consolidation of the network. Capital funds are available in limited quantity and are available for proper planning for future network needs.

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 Office's web site at http://www.forsyth.cc/EAP/, Real time data (updated hourly) are also available at: http://www.forsyth.cc/EAP/airmonitoringdata.aspx

Attend Region 4 QA Meeting & AIRS Conference.

Jason Bodenhamer and Cary Gentry attended the 2018 EPA Region 4 Ambient Monitoring Workshop in Athens, Georgia. Minor Barnette, Jordan Payne and Cary Gentry attended the National Air Quality Conference in Austin, Texas.

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

We switched from the older TEOM PM 2.5 & 10 samplers to the newer TAPI 640 PM 2.5, CR, and 10 samplers since the last annual network plan. This switch occurred on January 1, 2018.

Data Submittal Criteria

All SLAMS and PARS data were submitted to AQS within 90 days of the end of each quarter. AQS data reports were also reviewed after data submittal was completed to verify AQS data was correct. All data was certified by May 1, 2018.

National Performance Audit Program

All NPAP audits were completed by an EPA contractor and the results were submitted into AQS.

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 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. Another ozone monitor at Hattie Avenue (37-067-0022) has operated since 1993.

CARBON MONOXIDE

We no longer operate a CO monitor. The microscale Peters Creek site (37-067-0023) was shut down December 31, 2015.

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 northeast 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. Both monitors satisfy the most recent monitoring criteria related to the 1-hour SO2 and NO2 standards.

PARTICULATE

Continuous PM10 (TEOM/TAPI 640X) concentrations continue to be recorded at the 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

FRM PM2.5 samplers have been established at Hattie Avenue (37-067-0022; 1/3 frequency + 1/6 collocated) as part of Forsyth County's EPA approved PM2.5 monitoring plan. Data collection has been quite successful and validated concentration and QA information has been reported to AQS through March 2017.

CONTINUOUS STATUS

A new continuous PM2.5 TAPI 640 was installed at the Hattie Avenue site in January 2018. This unit measures PM 2.5, CR, and 10. It replaced the older TEOM units from October 1999. The data set from the new 640 continues to indicate excellent agreement between the FRM PM2.5 data and 24-hour averages. An additional PM2.5 TAPI 640 unit replaced the older TEOM unit in the Clemmons area of Forsyth County.

SPECIATION STATUS

A speciated PM2.5 monitor (1/6 frequency) began operation on September 22, 2001 and a carbon speciated PM2.5 monitor (1/6 frequency) began operation on February 28, 2007 at Hattie Avenue. Validated data sets have been received from RTI through December 2016.

AIR TOXICS

A (1/6) day air toxic sampler operated in conjunction with the NCDAQ has been resident at the Hattie Avenue site since 2000. Air toxic data remains under NCDAQ control. This Office does not review or upload this data to AQS.

LEAD

No lead monitors are currently in place at any sites within Forsyth 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 NCDAQ, 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.forsyth.cc/EAP/hazecam.aspx.

2018 Annual Monitoring Network Plan

Forsyth County

Office of Environmental Assistance and Protection

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201 North Chestnut Street, 5th Floor
Winston-Salem, NC 27101
Phone 336-703-2440 • Fax 336-727-2777
May 22, 2017

CERTIFICATION

By the signatures below, the Forsyth County Office of Environmental Assistance and Protection (FCEAP) certifies that the information contained in the 2017 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: Jason R.Bodenhamer Signature: _____ Date: 5/25/18
Program Manager, Analysis and Monitoring Division, FCEAP

Print Name: W. Minor Barnette Signature: _____ Date: 5/25/18
Director, FCEAP

2016 ANNUAL MONITORING NETWORK PLAN

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Introduction

The Forsyth County Office of Environmental Assistance and Protection's (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 (NO_2, SO_2, PM, 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
TAPI 640X	EQPM-0516-239	239

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 2025i PM-2.5 Seq.	EQPM-0202-145	145

$PM_{2.5}$ 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	060

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	087

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 procedure 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	
Hattie Avenue "B"	37-067-0022					X	X		X
Union Cross	37-067-1008			X					

Table 2 - Forsyth County Monitoring Sites

2. Site Map

AIR QUALITY MONITORING STATIONS
FORSYTH COUNTY, NC 2017

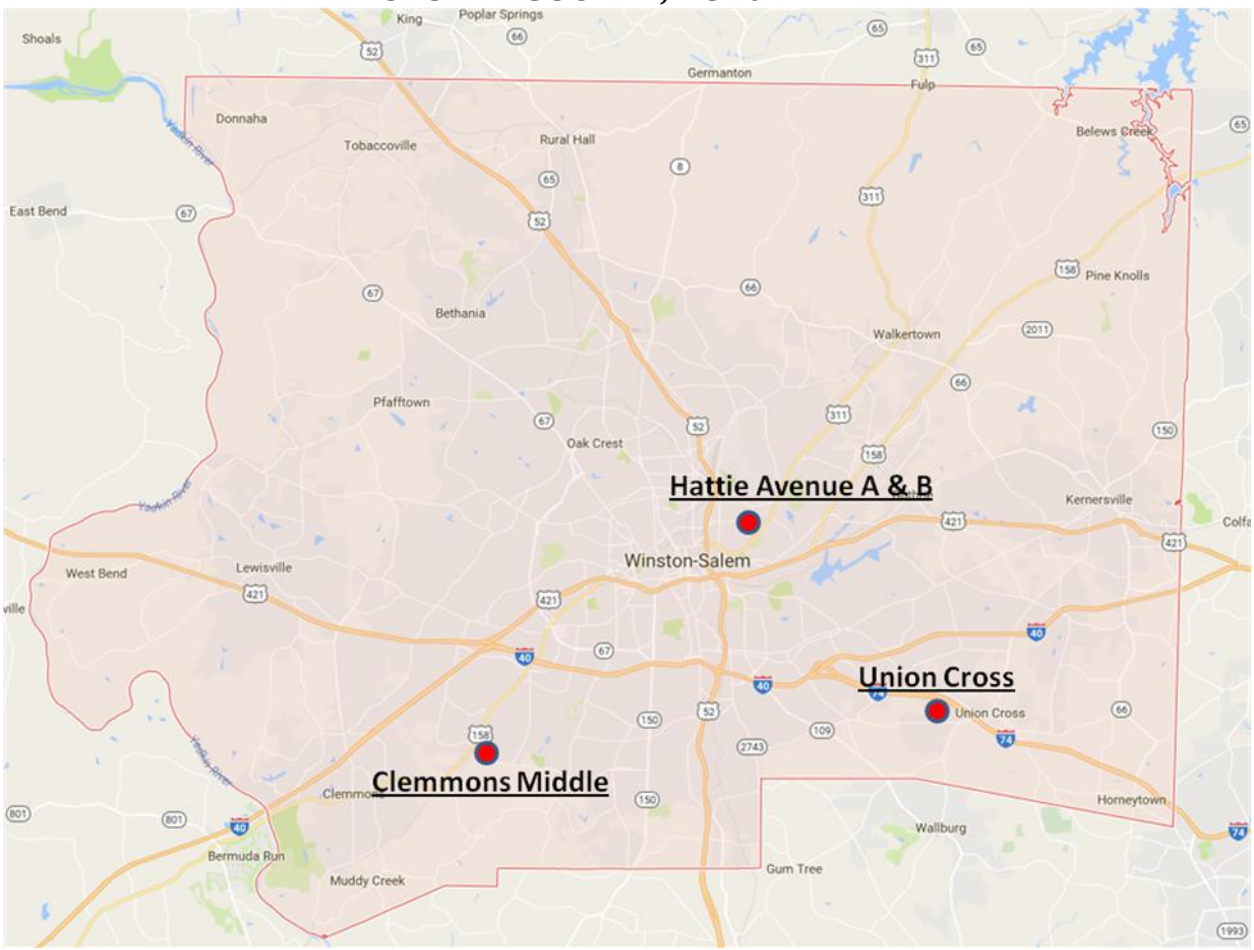

Figure 1 - Forsyth County Monitor Locations

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	087	44201	SLAMS	2621	2009	2019	Good
37-067-0022	SO2	Pulsed UV Fluorescent	100	42401	SLAMS	819230552	2008	2018	Fair
37-067-0022	NO	Chemi-luminescence	099	42601	SLAMS	T200U-214	2017	2027	Good
37-067-0022	NO_2	Chemi-luminescence	099	42602	SLAMS	T200U-214	2017	2027	Good
37-067-0022	NO_x	Chemi-luminescence	099	42603	SLAMS	T200U-214	2017	2027	Good
37-067-0022	Air Toxics	Compendium Method for Toxic Organics (TO) 15	150	Multiple	NON	4518 3603	NCDENR Owned Equipment		
37-067-0022	PM2.5	FRM	145	88101	SLAMS	2025A202849805	2014	2020	Good
37-067-0022	PM2.5	Speciation	118	Multiple	SLAMS	A2591	2001	2018	Good
37-067-0022	PM2.5	T640x	238	88101	SLAMS	96	2017	2027	Good
37-067-0022	PM2.5CR	T640x	240	86101	SLAMS	96	2017	2027	Good
37-067-0022	PM2.5	Carbon Speciation	118	88101	SLAMS	3NB0191	2007	2018	Good
37-067-0022	PM10	T640x	239	81102	SLAMS	96	2017	2027	Good
37-067-0030	Ozone	UV Photometric	087	44201	SLAMS	2218	2009	2019	Good
37-067-0030	PM2.5	T640	236	88101	SLAMS		2017	2027	Good
37-067-1008	Ozone	UV Photometric	087	44201	SLAMS	2219	2009	2019	Good
37-067-1008	Temp	Climatronics	020	61101	SLAMS		2016	2026	Good
37-067-1008	Humidity	Climatronics	020	61103	SLAMS		2016	2026	Good
37-067-1008	WD	Climatronics	020	61104	SLAMS	102779	2016	2026	Good
37-067-1008	WS	Climatronics	020	61103	SLAMS	102779	2016	2026	Good
37-067-1008	Pressure	Climatronics	011	64101	SLAMS		2016	2026	Good

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: N36.025931º
Longitude: W80.342257º
Elevation: 245 meters

Date Monitor Established:	Ozone	April 27, 2005
Date Monitor Established:	PM2.5 TEOM	April 27, 2005, T640 - Jan. 1, 2018
Nearest Road:	Fraternity Church Road	Distance to Road:
Traffic Count[3]:	4100	Year of Count: 40 meters
MSA[4]:	Winston-Salem, NC Metropolitan Statistical Area (2006)	MSA #: 2013

Parameter	Method	Method Number	Sampling Schedule
Ozone	UV Photometric	087	March 1 – Oct. 31, (Continuous)
PM2.5	T640	236	Continuous

Table 4 - Clemmons Middle School Monitoring Station Summary

(b) Site Description and Statement of Purpose

An ozone monitor and $PM_{2.5}$ continuous monitor have been located at a manufactured structure since April 27, 2005. The site is located in a mixed use environment at latitude N36.025931º and longitude W80.342257º. The site elevation is 245 meters above sea level. The nearest road is Fraternity Church Road with an annual traffic volume of 4100 vehicles (2013) 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. There were trees encroaching on the minimum distance from the inlet and those trees were removed during the summer of 2015. The area

is a transition zone of business (~50%) to residential (~50%) within a 1 km radius. The samplers are SLAMS.

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

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: N36.110941º
Longitude: W80.224423º
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

Nearest Road: Hattie Avenue Distance to Road: 27 meters
Traffic Count[3]: 6000 Year of Count: 2013
MSA[4]: Winston-Salem, NC Metropolitan Statistical Area (2006) MSA #: 49180

Parameter	Method	Method Number	Sampling Schedule
Ozone	UV Photometric	087	March 1 – Oct. 31, (Continuous)
NO_2	Chemiluminescence	099	Continuous
SO_2	UV Pulsed Fluorescence	060	Continuous

Table 5 - Hattie Avenue "A" Monitoring Station Summary

(b) Description and Statement of Purpose

The Hattie Avenue A 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 N36.110941º and longitude W80.224423º. The site elevation is 284 meters. The nearest road, Hattie Avenue, is 27 meters from the inlets and has a daily traffic flow of 6000 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 March 1 and ends October 31. The ozone instrument operates continuously during this period.

The SO_2 and NO_2 instruments operate continuously.

The site complies with the siting requirements of 40CFR58 for criteria air pollutants. 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: N36.110892º
Longitude: W80.224432º
Elevation: 284 meters

Date Monitor Established:	$PM_{2.5}$ – FRM	January 1, 1999
Date Monitor Established:	$PM_{2.5}$ – FRM 1/6	April 1, 2016
Date Monitor Established	$PM_{2.5}$ - TEOM	Jun 16, 1999, T640x - Jan. 1, 2018
Date Monitor Established	PM_{10} - TEOM	Oct 18, 1999, T640x - Jan. 1, 2018
Date Monitor Established	Air Toxics	January 1, 2000

Traffic Count[3]: 6000 Year of Count: 2013

MSA[4]: Winston-Salem, NC Metropolitan Statistical Area (2006) MSA #: 49180

Parameter	Method	Method Number	Sampling Schedule
$PM_{2.5}$	FRM Gravimetric	145	1 in 3 day
$PM_{2.5}$	FRM Gravimetric	145	1 in 6 day
$PM_{2.5}$	MetOne, Speciation	701	1 in 6 day
$PM_{2.5}$	T640x, Continuous	238	Continuous
PM_{10}	T640x, Continuous	239	Continuous
Air Toxics	Compendium Method for Toxic Organics (TO) 15	150	1 in 6 day

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 N36.110892º and longitude W80.224432º. The site elevation is 284 meters. The nearest road, Hattie Avenue, is 27 meters from the inlets and has a daily traffic flow of 6000 vehicles (2013). 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 on the 1 in 3 day schedule and the co-located FRM is on the 1 in 6 day.. 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} T640x 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 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. 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: N36.050746º
Longitude: W80.143826º
Elevation: 285 meters
Date Monitor Established: Ozone April 1, 1998
Nearest Road: Piedmont Memorial Dr. Distance to Road: 55 meters
Traffic Count[3]: 650 Year of Count: 2011
MSA[4]: Winston-Salem, NC Metropolitan Statistical Area (2006) MSA #: 49180

Parameter	Method	Method Number	Sampling Schedule
Ozone	UV Photometry	087	March 1 – October 31 (Continuous)
Wind Speed	Climatronics	020	Continuous
Wind Direction	Climatronics	020	Continuous
Pressure	Climatronics	011	Continuous
Outdoor Temperature	Climatronics	020	Continuous
Relative Humidity	Climatronics	020	Continuous

Table 7 - 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 36.050746° and longitude -80.143826°. The site elevation is 285 meters above sea level. The nearest road is Piedmont Memorial Drive with an annual traffic volume of 650 vehicles (2011) 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 March 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. Current building replacement is scheduled for 2017 by the building placed next to it in the pictures.

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

1. Title 40 Code of Federal Regulations Part 58, Ambient Air Quality Surveillance. Part 58 and Part 58 Amended: Federal Register/Vol. 71 No. 200/Tuesday, October 17, 2006/Rules and Regulations.

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. Current Traffic Counts
Note: Traffic Count taken from nearest road providing most impact to site

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

2017 Annual Monitoring Network Plan

Appendix A

No comments were received.