Forsyth County
Office of Environmental Assistance and Protection

July 6, 2020

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-19 105 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:
Steve Lyda (FCEAP)
Minor Barnette (FCEAP)
Ryan Brown (EPA-Region IV)
Patrick Butler (NCDAQ)

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Executive Summary

Submit by July 1, 2020 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 on July 6, 2020 to allow for the entire 30-day public comment period to take place.

Quality Assurance Procedures.

This Office has received approval of the Criteria Pollutant QAPP on September 7, 2017 and the QMP on June 18, 2018. SOPs are up to date and approved within our network including: SO2, NO2, Ozone, PM 2.5 (FRM), Calibrators, Zero Air Supplies, and Data Handling. We are using the EPA suggested SOP for our new PM monitors (T640x & T640) but will be customizing them for our specific office.

Categorization of Ambient Monitors and Auxiliary Equipment.

The evaluation was completed in January 2020. 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.

The 2019 EPA Region 4 Ambient Monitoring Workshop in Athens, Georgia was cancelled this year due to the federal government shutdown. The 2020 EPA Region 4 Ambient Monitoring Workshop in Chattanooga, Tennessee was cancelled this year due to the Coronavirus outbreak.

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

There were no changes in our SLAMS network.

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, 2020.

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 continued to review the local monitoring network 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 most recently run 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 (TAPI 640X & T640) concentrations continue to be recorded at the Hattie Avenue site (37-067-0022) and the Clemmons Middle site (37-067-0030), 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 and the Clemmons Middle site (37-067-0030); 1/6 frequency collocated with FRM samplers (ref meth 145) 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 February 2020.

CONTINUOUS STATUS

A continuous PM2.5 TAPI 640x sampler runs at the Hattie Avenue site. This unit measures PM 2.5, CR, and 10 (STP). The data set from the new 640x continues to indicate excellent agreement between the FRM PM2.5 data and 24-hour averages. An additional PM2.5 (only) TAPI 640 unit is operated at the Clemmons Middle site (37-067-0030), Data collection includes validated measurements and QA information reported to AQS through February 2020.

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 February 2019.

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 readings available. A nephelometer was installed in 2004 to provide visual range data. The information is available at: http://www.forsyth.cc/EAP/hazecam.aspx.

2020 Annual Monitoring Network Plan

Forsyth County

Office of Environmental Assistance and Protection

♥ 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
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: 5/26/20

Program Manager, Analysis and Monitoring Division, FCEAP

Print Name: W. Minor Barnette Signature: Date: 5/26/20

Director, FCEAP

2020 ANNUAL MONITORING NETWORK PLAN

TABLE OF CONTENTS

EXECUTIVE SUMMARY **3**

CERTIFICATION **7**

2019 ANNUAL MONITORING NETWORK PLAN **8**

INTRODUCTION **9**

SITE DESCRIPTION BACKGROUND INFORMATION AND DEFINITIONS **10**

1. Site Description 10
2. Date Established 10
3. Site Approval Status 10
4. Monitoring Objectives 10
5. Monitoring Stations' Designations 10
SLAMS 11
NAMS 11
SPM 11
NCORE 11
6. Monitoring Methods 11
Particulate Matter 10 microns in size (PM_{10}) 12
Particulate Matter 2.5 microns in size ($PM_{2.5}$) 12
Particulate Matter 10-2.5 microns in size ($PM_{10-2.5}$) 12
$PM_{2.5}$ Speciation sampling and analysis 12
Sulfur Dioxide 12
Ozone 13
Nitrogen Dioxide 13
Air Toxics 13
7. Quality Assurance Status 13
8. Scale of Representativeness 13
9. Data Processing and Reporting 14
Network Summary *15*
1. Site Table and Criteria Pollutants Monitored 15
2. Site Map 16
3. Monitoring Methods 17

AIR MONITORING STATION DESCRIPTIONS **18**

1. Clemmons Middle School 18
(a) Site Table 18
(b) Site Description and Statement of Purpose 18
(c) Site Photographs 19
2. Hattie Avenue 20
(a) Site Table 20
(b) Description and Statement of Purpose 20
(c) Site Photographs 23
3. Union Cross 24
(a) Site Table 24
(b) Site Description and Statement of Purpose 24
(c) Site Photographs 25
REFERENCES 26

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
T640 PM Mass Monitor w/640X Option	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
T640 PM Mass Monitor w/640X Option	EQPM-0516-238	238
TAPI Model T640 PM Mass Monitor	EQPM-0516-236	236

Particulate Matter 10-2.5 microns in size ($PM_{10-2.5}$)

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
T640 PM Mass Monitor w/640X Option	EQPM-0516-240	240

$PM_{2.5}$ 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
Teledyne API T100U	EQSA-0495-100	600

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
TAPI. Model 400E, T400	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
TAPI Model 200EU, T200U	RFNA-1194-599	599

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 on the Achilles Server managed by the Forsyth County MIS (IT) deparment located on the 3rd floor of the Forsyth County Government Center, FCEAP, 201 N. Chestnut Street, Winston-Salem, North Carolina. The AirVision SQL based database is accessed from computers located on the 5th floor of the Forsyth County Government Center, FCEAP, 201 N. Chestnut Street, Winston-Salem, North Carolina. On a daily basis, All 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&B	37-067-0022		X	X		X	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

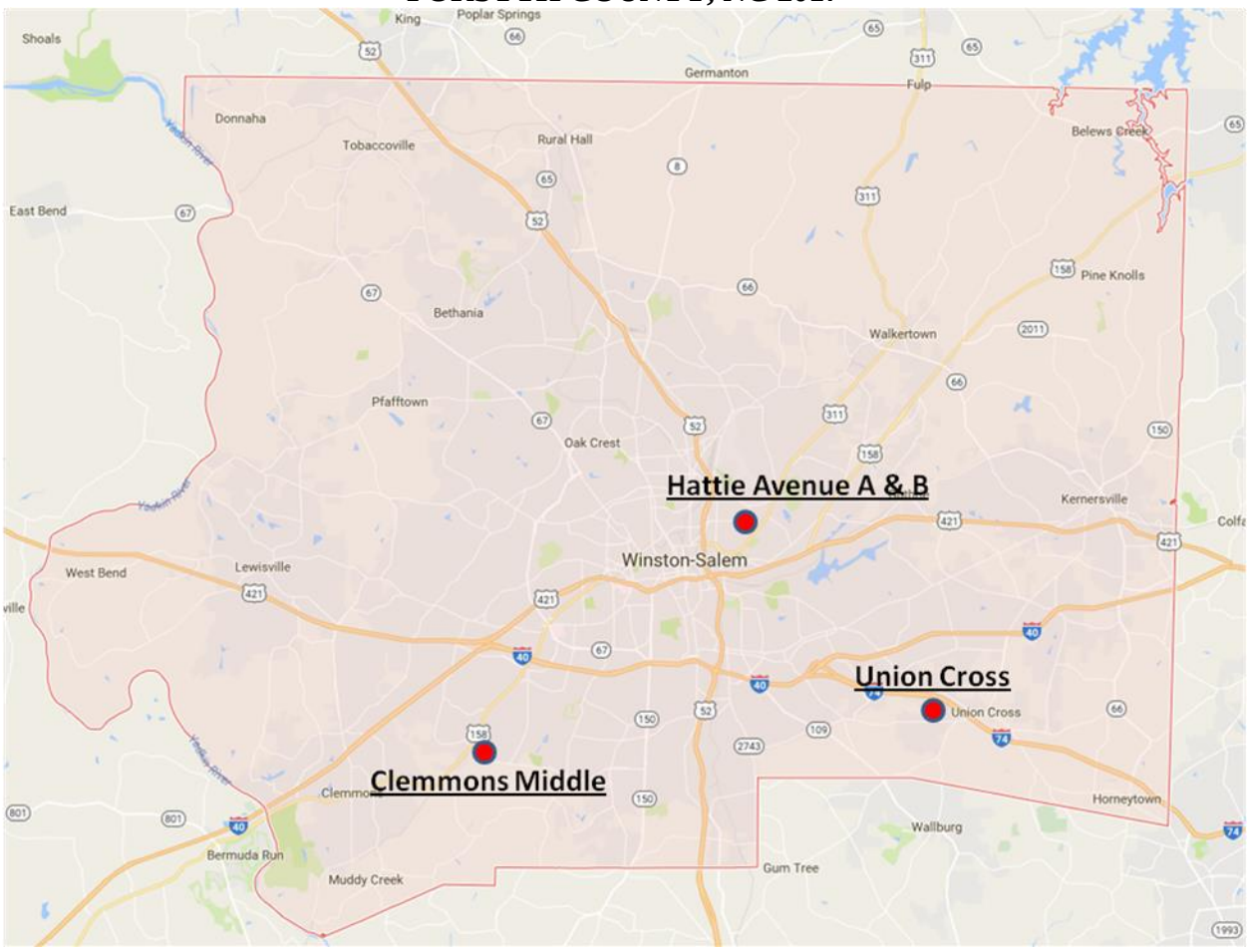

Figure 1 - Forsyth County Monitor Locations

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	3093	2017	2027	Good
37-067-0022	SO2	Pulsed UV Fluorescent	600	42401	SLAMS	179	2017	2027	Good
37-067-0022	NO	Chemi-luminescence	599	42601	SLAMS	T200U-214	2017	2027	Good
37-067-0022	NO_2	Chemi-luminescence	599	42602	SLAMS	T200U-214	2017	2027	Good
37-067-0022	NO_x	Chemi-luminescence	599	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		
37-067-0022	PM2.5	FRM	145	88101	SLAMS	2025I203541302	2014	2024	Good
37-067-0022	PM2.5	Speciation	118	Multiple	SLAMS	A2591	2001	2024	Fair
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	2024	Good
37-067-0022	PM10	T640x	239	81102	SLAMS	96	2017	2027	Good
37-067-0030	Ozone	UV Photometric	087	44201	SLAMS	4061	2018	2028	Good
37-067-0030	PM2.5	T640	236	88101	SLAMS		2017	2027	Good
37-067-0030	PM2.5	FRM	145	88101	SLAMS	2025B217080407	2010	2020	Good
37-067-1008	Ozone	UV Photometric	087	44201	SLAMS	4060	2018	2028	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 Id #:	37-067-0030		
Location:	Fraternity Church Road		
	Winston-Salem, NC		
Latitude:	N 36.026612		
Longitude:	W 80.341962		
Elevation:	245 meters		
Date Monitor Established:	Ozone	April 27, 2005	
Date Monitor Established:	PM2.5 T640	Jan. 1, 2018	
Date Monitor Established:	PM2.5 FRM	Oct 1, 2018	
Nearest Road:	Fraternity Church Road	Distance to Road: 40 meters	
Traffic Count[3]:	4400	Year of Count:	2017
MSA[4]:	Winston-Salem, NC Metropolitan Statistical Area	MSA #:	49180

Parameter	Method	Method Number	Sampling Schedule
Ozone	UV Photometric	087	March 1 – Oct. 31, (Continuous)
PM2.5	T640	236	Continuous
PM2.5	FRM Gravimetric	145	1/6 day

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 (2017) at a distance of 40 meters from the sample inlet.

The inlet of the samplers is approximately 3 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) Site Table

Site Name:	Hattie Avenue (Two buildings {A & B} at one location)		
AQS Site Id #:	37-067-0022		
Location:	1300 Hattie Avenue		
	Winston-Salem, NC		
Latitude:	N 36.110940		
Longitude:	W 80.224501		
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:	$PM_{2.5}$ – FRM	January 1, 1999	
Date Monitor Established:	$PM_{2.5}$ - PM_{10} - $PM_{10-2.5}$	January 1, 2018	
Date Monitor Established:	Air Toxics	January 1, 2000	
Date Monitor Established:	Speciation	January 1, 2001	
Date Monitor Established:	Carbon Speciation	January 1, 2007	
Nearest Road:	Hattie Avenue	Distance to Road:	27 meters
Traffic Count[3]:	6000	Year of Count:	2017
MSA[4]:	Winston-Salem, NC Metropolitan Statistical Area	MSA #:	49180

Parameter	Method	Method Number	Sampling Schedule
Ozone	UV Photometric	087	March 1 – Oct. 31, (Continuous)
NO_2	Chemiluminescence	599	Continuous
SO_2	UV Pulsed Fluorescence	560	Continuous
$PM_{2.5}$ FRM	FRM Gravimetric	145	1/3 day
$PM_{2.5}$ PM_{10} $PM_{10-2.5}$	T640x, Continuous	238-239-240	Continuous
Air Toxics	Compendium Method for Toxic Organics (TO) 15	150	1/6 day
Speciation	MET-one	118	1/6 day
Carbon Speciation	URG Sampler	118	1/6 day

Table 5 - Hattie Avenue "A" Monitoring Station Summary

(b) Description and Statement of Purpose

The Hattie Avenue A site monitors ozone, sulfur dioxide, oxides of nitrogen, $PM_{2.5}$, PM_{10}, PM $_{10-2.5}$, toxics, speciation, and carbon speciation. 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 (2017). 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 $PM_{2.5,}$ PM_{10}, and PM_{10}-2.5 T640x instruments operate continuously.

The $PM_{2.5}$ primary monitor is a continuous sampler and the co-located FRM is on the 1 in 3 day schedule. The FRM sampling interval is 24 hours, from midnight to midnight every third 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.

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. 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 (unable to update due to locked gate)		EAST
SOUTH		WEST

3. 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:	N 36.051805		
Longitude:	W 80.144933		
Elevation:	285 meters		
Date Monitor Established:	Ozone	April 1, 1998	
Nearest Road:	Piedmont Memorial Dr.	Distance to Road:	55 meters
Traffic Count[3]:	670	Year of Count:	2017
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 6 - 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 670 vehicles (2017) at a distance of 55 meters from the sample inlet.

The inlet is approximately 3 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. All equipment has been moved from the old building (green exterior) to the new building (white exterior). The old building will be moved from this location and disposed of.

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.

Appendix A

No comments were received.