

2020 FIVE-YEAR NETWORK ASSESSMENT FOR NORTH CAROLINA



July 1, 2020

North Carolina Division of Air Quality
A Division of the North Carolina Department
of Environmental Quality
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CERTIFICATION

By the signatures below, the North Carolina Division of Air Quality, DAQ, certifies that the information contained in the 2020 Five-Year Network Assessment for North Carolina is complete and accurate at the time of submittal to EPA Region 4. However, due to circumstances that may arise due to changes in the monitoring regulations, population growth and air quality, some network information may change. DAQ will discuss these changes in the annual network plans submitted each year.

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Executive Summary

The North Carolina Division of Air Quality, DAQ, and its local program partners, Forsyth County Office of Environmental Assistance and Protection, or Forsyth County, Mecklenburg County Air Quality, or MCAQ, and Western North Carolina Regional Air Quality Agency, or WNC, operate a network of monitors to measure various air pollutants. These monitors are located in a variety of locations across the state to determine:

- Population exposure,
- Maximum concentrations,
- Background concentrations and
- Air pollution transported from other regions.

The most well-known air pollutants are ozone, or O₃, and particulate matter, but DAQ also monitors for nitrogen oxides, sulfur dioxide and carbon monoxide.

The United States Environmental Protection Agency, EPA, has for years required the state to publish an annual plan of changes to its monitoring network. Since 2010, there is an additional requirement to publish a five-year network assessment. The annual plan contains details of the monitoring network; this five-year network assessment is a look forward at the projected needs of the ambient air monitoring program. A number of factors drive the need for changes to the program, including:

- Changes to the national ambient air quality standards, or NAAQS, due to better understanding of the science,
- Increases in population or shifts in that population,
- New emission sources,
- Changes in technology and
- The availability of funding and other resources.

As the rest of this document, and the associated annual network plan, discuss in detail, DAQ anticipates the following changes to the monitoring network over the next five years:

- One O₃ monitoring station is no longer required and will be evaluated to determine if it should be shut down;
- The adequacy of the O₃ monitoring network in the Charlotte-Concord-Gastonia Metropolitan Statistical Area, or MSA, needs to be evaluated to see if changes should be proposed;
- Two sulfur dioxide sites installed to meet EPA rules for source-oriented monitoring are no longer needed and will be shut down as soon as EPA approval is received;
- Two photochemical assessment monitoring stations are required to begin operation on June 1, 2021, in Charlotte and Raleigh;
- The manual fine particle federal reference method, FRM, monitors will be replaced with automated federal equivalent method, or FEM, monitors;
- Other sites may be added or upgraded to improve our understanding of the impact of emissions control measures, industrial expansion, population growth patterns, or the transport of pollutants into or out of a region;

- Miscellaneous moves of existing sites are expected because of construction or other activities near the monitoring site or to comply with new EPA rules;
- Mature networks will continue to be evaluated and downsized as appropriate to free up resources for new monitoring initiatives; and
- DAQ also expects to continue a significant effort to replace its aging monitoring shelters and equipment.

Finally, it is important to note that despite what all this additional monitoring might suggest, the air in North Carolina is getting cleaner and DAQ expects the trend to continue well into the future. The monitoring network is vital to demonstrate that the state is providing a healthy environment for its citizens in the face of tightened national standards and increased population and industrial expansion.

Contents

Executive Summary	3
List of Figures	7
Chapter 1 Introduction	8
Chapter 2 Status of Network Monitoring Objectives Defined in Appendix D.....	9
2.1 Design Criteria for National Core, NCore, Monitoring Sites	9
2.2 Pollutant-Specific Design Criteria for State and Local Air Monitoring Station, SLAMS, Sites.....	9
2.2.1 Ozone, O ₃ , Design Criteria.....	10
2.2.2 Carbon Monoxide, CO, Design Criteria	11
2.2.3 Nitrogen Dioxide, NO ₂ , Design Criteria	12
2.2.4 Reactive Oxides of Nitrogen, NO _y , Design Criteria.....	15
2.2.5 Sulfur Dioxide, SO ₂ , Design Criteria	15
2.2.6 Lead, Pb, Design Criteria.....	19
2.2.7 Particulate Matter, PM ₁₀ , Design Criteria.....	20
2.2.8 Fine Particulate Matter, PM _{2.5} , Design Criteria.....	21
2.2.9 Coarse Particulate Matter, PM _{10-2.5} , Design Criteria.....	23
2.3 Network Design for Photochemical Assessment Monitoring Stations, PAMS and Enhanced Ozone Monitoring	23
Chapter 3 Need for New Sites.....	23
3.1 NCORE Sites	28
3.2 Pollutant-Specific SLAMS Sites	28
3.2.1 Ozone, O ₃ , Sites	28
3.2.2 Carbon Monoxide, CO, Sites.....	28
3.2.3 Nitrogen Dioxide, NO ₂ , Sites	28
3.2.4 Reactive Oxides of Nitrogen, NO _y Sites.....	29
3.2.5 Sulfur Dioxide, SO ₂ , Sites.....	29
3.2.6 Lead, Pb, Sites.....	30
3.2.7 Particulate Matter, PM ₁₀ , Sites	30
3.2.8 Fine Particulate Matter, PM _{2.5}	30
3.2.9 Coarse Particulate Matter, PM _{10-2.5}	31
3.3 Photochemical Assessment Monitoring Stations, PAMS	31
Chapter 4 Existing Sites That Are No Longer Needed and Can Be Terminated	31
4.1 NCORE Sites	33
4.2 Pollutant-Specific Slams Sites.....	33

4.2.1 Ozone, O ₃ , Sites	33
4.2.2 Carbon Monoxide, CO, Sites.....	37
4.2.3 Nitrogen dioxide, NO ₂ , sites.....	37
4.2.4 Reactive Oxides of Nitrogen, NO _y	37
4.2.5 Sulfur dioxide, SO ₂ , sites	37
4.2.6 Lead, Pb, sites	39
4.2.7 Particulate matter, PM ₁₀ , sites	39
4.2.8 Fine particulate matter, PM _{2.5}	39
4.2.9 Coarse Particulate Matter, PM _{10-2.5}	43
4.3 Photochemical Assessment Monitoring Stations, PAMS	43
Chapter 5 Evaluation of New Technologies to Benefit the Ambient Air Monitoring Network.....	43
5.1 Telemetry	43
5.2 Automated monitors	44
5.3 Data acquisition systems.....	44
5.4 Electronic logbooks.....	44
5.5 Handheld devices	44
5.6 Air Sensor Technologies.....	44
5.7 New monitors	45
Chapter 6 Ability of Existing and Proposed Sites to Support Air Quality Characterization of Areas with Relatively High Populations of Susceptible Individuals, e.g., Children with Asthma	45
Chapter 7 Effect on Data Users for Any Sites That Are Being Proposed For Discontinuation	45
Chapter 8 Needed Changes to PM _{2.5} Population-Oriented Sites	45
Chapter 9 Monitoring Network Infrastructure Needs	49

List of Figures

Figure 1. North Carolina national core, NCore, monitoring stations	9
Figure 2. 2020 Ozone monitoring network	11
Figure 3. Location in North Carolina of nitrogen dioxide monitors.	15
Figure 4. Map showing PWEI values for North Carolina and the location of the PWEI monitors ..	16
Figure 5. North Carolina SO ₂ monitoring sites for 2020.....	19
Figure 6. 2020 North Carolina PM ₁₀ network	20
Figure 7. Population projections for small North Carolina MSAs.....	24
Figure 8. Population projections for North Carolina MSAs between 250,000 and 500,000.....	25
Figure 9. Population projections for North Carolina MSAs between 500,000 and 1,000,000.....	25
Figure 10. Population projections for North Carolina MSAs with over 1,00,000 People.....	26
Figure 11. 2020 Continuous Fine Particle Network.....	40
Figure 12. Location of PM _{2.5} and O ₃ monitors compared to 2010 population density in the Asheville monitoring region.....	46
Figure 13. Location of PM _{2.5} and O ₃ monitors compared to 2010 population density in the Winston-Salem monitoring region.....	46
Figure 14. Location of PM _{2.5} and O ₃ monitors compared to 2010 population density in the Mooresville monitoring region.....	47
Figure 15. Location of PM _{2.5} and O ₃ monitors compared to 2010 population density in the Raleigh monitoring region.....	47
Figure 16. Location of PM _{2.5} and O ₃ monitors compared to 2010 population density in the Fayetteville monitoring region	48
Figure 17. Location of PM _{2.5} and O ₃ monitors compared to 2010 population density in the Washington monitoring region.....	48
Figure 18. Location of PM _{2.5} and O ₃ monitors compared to 2010 population density in the Wilmington monitoring region.....	49

Chapter 1 Introduction

The requirement to submit an assessment of the air quality surveillance system is provided for in 40 Code of Federal Regulations, or CFR, §58.10 (d) which states:

“The state, or where applicable local, agency shall perform and submit to the EPA Regional Administrator an assessment of the air quality surveillance system every 5 years to determine, at a minimum, if the network meets the monitoring objectives defined in appendix D to this part, whether new sites are needed, whether existing sites are no longer needed and can be terminated and whether new technologies are appropriate for incorporation into the ambient air monitoring network. The network assessment must consider the ability of existing and proposed sites to support air quality characterization for areas with relatively high populations of susceptible individuals (e.g., children with asthma) and, for any sites that are being proposed for discontinuance, the effect on data users other than the agency itself, such as nearby states and tribes or health effects studies. The state, or where applicable local, agency must submit a copy of this 5-year assessment, along with a revised annual network plan, to the Regional Administrator. The assessments are due every five years beginning July 1, 2010.”

The assessment should provide a description of the networks and the relative value of each monitor and station with consideration of the data users. Annual monitoring network plans are to provide for actual proposed changes to the networks that are consistent with the findings of the five-year assessment.

The rest of this document provides the information requested in §58.10 (d) for the North Carolina Division of Air Quality and the Western North Carolina Regional Air Quality Agency in the following order:

- Chapter 2 Status of Network Monitoring Objectives Defined in Appendix D
- Chapter 3 Need for New Sites
- Chapter 4 Existing Sites That Are No Longer Needed and Can Be Terminated
- Chapter 5 Evaluation of New Technologies to Benefit the Ambient Air Monitoring Network
- Chapter 6 Ability of Existing and Proposed Sites to Support Air Quality Characterization of Areas with Relatively High Populations of Susceptible Individuals, e.g., Children with Asthma
- Chapter 7 Effect on Data Users for Any Sites That Are Being Proposed For Discontinuance
- Chapter 8 Needed Changes to PM_{2.5} Population-Oriented Sites
- Chapter 9 Monitoring Network Infrastructure Needs

Forsyth County and MCAQ have submitted separate 5-year assessments for their networks.

Chapter 2 Status of Network Monitoring Objectives Defined in Appendix D

This chapter provides the network monitoring objectives defined in Appendix D to 40 CFR Part 58 and states whether the 2020 North Carolina Monitoring Network meets those objectives. This chapter is organized as follows:

- 2.1 Design Criteria for National Core, NCore, Monitoring Sites,
- 2.2 Pollutant-Specific Design Criteria for State and Local Air Monitoring Station, SLAMS, Sites and
- 2.3 Network Design for Photochemical Assessment Monitoring Stations, PAMS

North Carolina is meeting the network monitoring objectives defined in appendix D for all networks with these exceptions:

- Currently the Myrtle Beach area requires two O₃ monitors based on the current O₃ design value and DAQ has a monitoring agreement with the South Carolina Department of Health and Environmental Control or DHEC, which operates one monitor near Myrtle Beach and DAQ does not operate any; further evaluation and waiver request are in process and
- DAQ has a waiver for a second required PM₁₀ monitor in the Raleigh MSA.

2.1 Design Criteria for National Core, NCore, Monitoring Sites

The State of North Carolina is required to operate two National Core, NCore, monitoring sites. Figure 1 shows the locations of these two sites. The North Carolina Division of Air Quality, DAQ, operates one of those NCore sites and MCAQ operates the other. Chapter IX of the 2020-2021 Annual Monitoring Network Plan for The North Carolina Division of Air Quality Volume 1 Network Descriptions provides the status of the NCore site operated by DAQ. Currently, DAQ and MCAQ are meeting the design criteria for NCore sites.



Figure 1. North Carolina national core, NCore, monitoring stations

2.2 Pollutant-Specific Design Criteria for State and Local Air Monitoring Station, SLAMS, Sites

This subsection describes the network monitoring objectives for each of the criteria pollutants and is organized as follows:

- 2.2.1 Ozone, O₃, Design Criteria
- 2.2.2 Carbon Monoxide, CO, Design Criteria
- 2.2.3 Nitrogen Dioxide, NO₂, Design Criteria
- 2.2.4 Reactive Oxides of Nitrogen, NO_y, Design Criteria
- 2.2.5 Sulfur Dioxide, SO₂ Design Criteria
- 2.2.6 Lead, Pb, Design Criteria
- 2.2.7 Particulate Matter, PM₁₀, Design Criteria
- 2.2.8 Fine Particulate Matter, PM_{2.5}, Design Criteria
- 2.2.9 Coarse Particulate Matter, PM_{10-2.5}, Design Criteria

2.2.1 Ozone, O₃, Design Criteria

State and, where appropriate, local agencies must operate O₃ sites for various locations depending upon area size, in terms of population and geographic characteristics and typical peak concentrations, expressed in percentages below or near the O₃ standard. Specific SLAMS O₃ site minimum requirements are included in Table D–2 of 40 CFR Part 58, Appendix D. The EPA expects the NCore sites to complement the O₃ data collection that takes place at single pollutant SLAMS sites and agencies can use both types of sites to meet the network minimum requirements. The total number of O₃ sites needed to support the basic monitoring objectives of public data reporting, air quality mapping, compliance and understanding O₃-related atmospheric processes will include more sites than these minimum numbers required in Table D–2. The EPA regional administrator and the responsible state or local air monitoring agency must work together to design and/or maintain the most appropriate O₃ network to service the variety of data needs in an area. Within an O₃ network, at least one O₃ site for each MSA or combined statistical area, if multiple MSAs are involved, must be designed to record the maximum concentration for that particular metropolitan area. More than one maximum concentration site may be necessary in some areas.

Currently DAQ is required to operate 21 monitors in 12 MSAs. DAQ meets or exceeds those requirements in all but two MSAs. DAQ does not operate any monitors in the Virginia Beach-Norfolk-Newport News MSA because we have an agreement with the Virginia Department of Environmental Quality, or VA DEQ, that they will maintain the required number of monitors for the MSA, fulfilling our appendix D monitoring requirements. DAQ does not operate any O₃ monitors in the Myrtle Beach-Conway-North Myrtle Beach MSA. However, the Division has a monitoring agreement with the South Carolina Department of Health and Environmental Control. Figure 2 shows the 2020 ozone monitoring network. Chapter V of the 2020-2021 Annual Monitoring Network Plan for The North Carolina Division of Air Quality Volume 1 Network Descriptions provides more information on the ozone monitoring network.

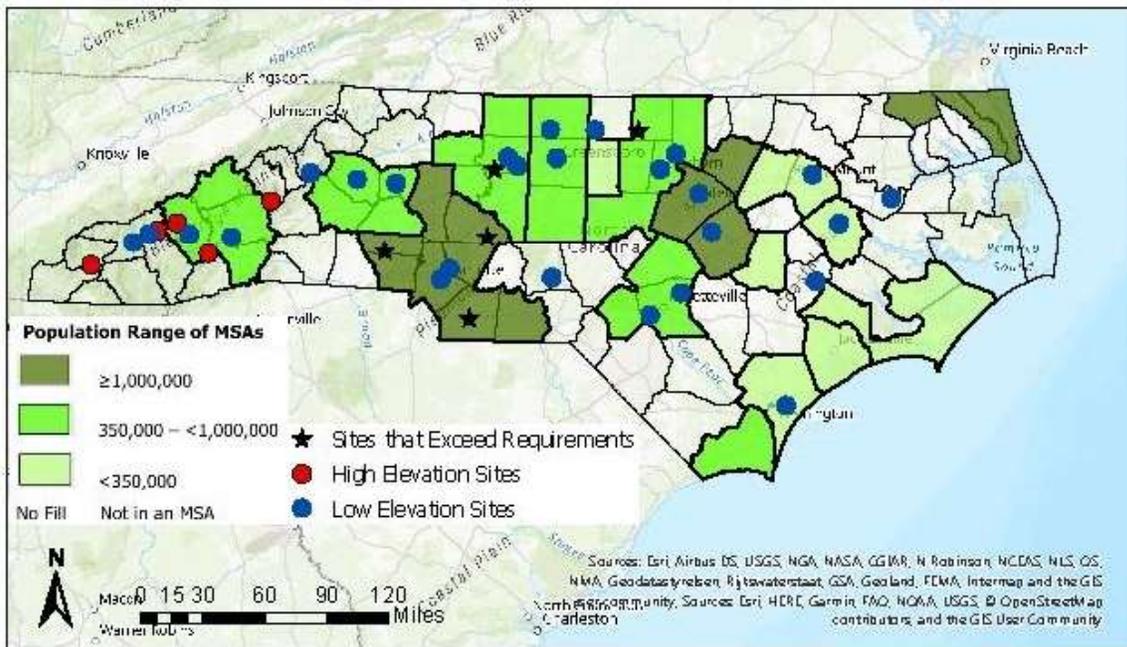


Figure 2. 2020 Ozone monitoring network

2.2.2 Carbon Monoxide, CO, Design Criteria

The minimum monitoring requirements in 40 CFR Part 58 Appendix D for CO monitoring sites are stated as follows:

“4.2.1 General Requirements. (a) Except as provided in subsection (b), one CO monitor is required to operate collocated with one required near-road NO₂ monitor, as required in Section 4.3.2 of this part, in CBSAs having a population of 1,000,000 or more persons.”

These near-road monitors were required to start on Jan. 1, 2017. In addition to these required near-road CO monitors, the regional administrators can require additional CO monitoring:

“4.2.2 Regional Administrator Required Monitoring. (a) The Regional Administrators, in collaboration with states, may require additional CO monitors above the minimum number of monitors required in 4.2.1 of this part, where the minimum monitoring requirements are not sufficient to meet monitoring objectives. The Regional Administrator may require, at his/her discretion, additional monitors in situations where data or other information suggest that CO concentrations may be approaching or exceeding the NAAQS. Such situations include, but are not limited to, (1) characterizing impacts on ground-level concentrations due to stationary CO sources, (2) characterizing CO concentrations in downtown areas or urban street canyons and (3) characterizing CO concentrations in areas that are subject to high ground level CO concentrations particularly due to or enhanced by topographical and meteorological impacts.”

Additionally, continued operation of existing SLAMS CO sites using FRM or FEM monitors is required until the EPA regional administrator approves discontinuation. Where SLAMS CO monitoring is ongoing, at least one site must be a maximum concentration site for the area under investigation. Currently, in North Carolina there are no additional

SLAMS CO sites. A maximum concentration site, located in Forsyth County, shut down at the end of 2015, after receiving EPA approval.

Chapter III of the 2020-2021 Annual Monitoring Network Plan for The North Carolina Division of Air Quality Volume 1 Network Descriptions provides more information on the carbon monoxide monitoring network.

2.2.3 Nitrogen Dioxide, NO₂, Design Criteria

The subsections below provide specific details about the design criteria in Appendix D to 40 CFR Part 58 and how the North Carolina network measures up.

2.2.3.1 Requirement for Near-road NO₂ Monitors

Within the NO₂ network, there must be one micro-scale near-road NO₂ monitoring station in each core-based statistical area, or CBSA, with a population of 1,000,000 or more persons to monitor a location of expected maximum hourly concentrations sited near a major road with high average annual daily traffic, or AADT, counts. An additional near-road NO₂ monitoring station is required for any CBSA with a population of 2,500,000 persons or more, or in any CBSA with a population of 1,000,000 or more persons that has one or more roadway segments with 250,000 or greater AADT counts to monitor a second location of expected maximum hourly concentrations. The CBSA populations shall be based on the latest available census figures.

The near-road NO₂ monitoring sites shall be selected by ranking all road segments within a CBSA by AADT and then identifying a location or locations adjacent to those highest ranked road segments, considering fleet mix, roadway design, congestion patterns, terrain and meteorology, where maximum hourly NO₂ concentrations are expected to occur and siting criteria can be met in accordance with Appendix E of 40 CFR Part 58. Where a state or local air monitoring agency identifies multiple acceptable candidate sites where maximum hourly NO₂ concentrations are expected to occur, the monitoring agency shall consider the potential for population exposure in the criteria utilized to select the final site location. Where one CBSA is required to have two near-road NO₂ monitoring stations, the sites shall be differentiated from each other by one or more of the following factors: fleet mix; congestion patterns; terrain; geographic area within the CBSA; or different route, interstate or freeway designation.

There is one MSA in North Carolina with over 2.5 million people – Charlotte-Concord-Gastonia – and two MSAs in North Carolina with over one million people – Raleigh and Virginia Beach-Norfolk-Newport News. Thus, North Carolina is required to have four near-road monitoring sites. Table 1 provides the status of these four near-road monitoring stations. Currently, two monitoring stations in North Carolina are up and operational. The original location for the Virginia Beach-Norfolk-Newport News near-road station fell through and a replacement site has not yet been identified. The second site in the Charlotte-Concord-Gastonia MSA will be established when the EPA provides funding for it.

2.2.3.2 Requirement for Area-wide NO₂ Monitoring

Within the NO₂ network, there must be one monitoring station in each CBSA with a population of 1,000,000 or more persons to monitor a location of expected highest NO₂ concentrations representing the neighborhood or larger spatial scales. Agencies should use

Table 1. Required Near-Road Monitoring Stations for North Carolina MSAs

CBSA Full Name	Charlotte-Concord-Gastonia, NC-SC		Raleigh, NC	Virginia Beach-Norfolk-Newport News, VA-NC
EPA Regional Office	4		3	3
State	NC		NC	VA
County	Mecklenburg	Mecklenburg	Wake	Virginia Beach City
City	Charlotte	Charlotte	Raleigh	TBD
Site Name	Remount Road	TBD	Triple Oak	TBD
AQS ID	37-119-0045	TBD	37-183-0021	TBD
Latitude	35.213082	TBD	35.865155	TBD
Longitude	-80.874169	TBD	-78.819673	TBD
Target Road	I-77	TBD	I-40	TBD
AADT	154,000	TBD	158,000	TBD
AADT Rank in CBSA	11	TBD	3	TBD
FE-AADT	262,535	TBD	227,789	TBD
FE-AADT Rank in CBSA	6	TBD	3	TBD
Distance to Road, meters	36.0	TBD	19.0	TBD
NO ₂ Probe Height, meters	4.5	TBD	4.3	TBD
Operational	YES	No	YES	NO
NO ₂ Start Date	7/17/14	TBD	1/8/2014	TBD
CO Start Date	1/1/2017	Not required	12/1/2016	TBD
PM _{2.5} Start Date	1/1/2017	Not required	1/4/2017	TBD
PM _{2.5} Method	Met One BAM 1022 (as of 04/01/2018)	Not applicable	Met One BAM 1022	TBD
Meteorology Start Date	1/1/2015	Not required	Not required	TBD

Data from <http://www.epa.gov/tn/amtic/nearroad.html>, accessed June 2, 2020, supplemented with AQS data.

emission inventories and meteorological analysis to identify the appropriate locations within a CBSA for locating required area-wide NO₂ monitoring stations. CBSA populations shall be based on the latest available census figures. These monitoring sites were required to be operational by Jan. 1, 2013. Both area-wide NO₂ monitoring stations in North Carolina are located at the NCore sites in Wake and Mecklenburg Counties. As shown in Table 2, these counties had the highest emissions of nitrogen oxides in 2017.

Table 2. County-wide 2017 Nitrogen Oxides Emissions from all Sources

County Name	State USPS Code	Nitrogen Oxides Emissions ^a	Units of Measure
Raleigh Metropolitan Statistical Area:			
Franklin	NC	1,189.83	Ton
Johnston	NC	4,015.44	Ton
Wake	NC	11,804.53	Ton
Charlotte-Gastonia-Concord Metropolitan Statistical Area			
Anson	NC	1,124.23	Ton
Cabarrus	NC	3,632.19	Ton
Gaston	NC	5,183.09	Ton
Iredell	NC	4,273.31	Ton
Lincoln	NC	1,632.09	Ton
Mecklenburg	NC	16,330.16	Ton
Rowan	NC	4,359.37	Ton
Union	NC	3,740.81	Ton
Chester	SC	3,407.97	Ton
Lancaster	SC	1,840.42	Ton
York	SC	6,007.58	Ton

^a Data from the 2017 National Emission Inventory available at <https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data>, accessed June 13, 2020.

2.2.3.3 Regional Administrator Required Monitoring

The regional administrators, in collaboration with states, must require a minimum of 40 additional NO₂ monitoring stations nationwide in any area, inside or outside of CBSAs, above the minimum monitoring requirements, with a primary focus on siting these monitors in locations to protect susceptible and vulnerable populations. The regional administrators, working with states, may also consider additional factors to require monitors to be sited inside or outside of CBSAs in which:

- (i) The required near-road monitors do not represent all locations of expected maximum hourly NO₂ concentrations in an area and NO₂ concentrations may be approaching or exceeding the NAAQS in that area;
- (ii) Areas that are not required to have a monitor in accordance with the monitoring requirements and NO₂ concentrations may be approaching or exceeding the NAAQS; or
- (iii) The minimum monitoring requirements for area-wide monitors are not sufficient to meet monitoring objectives.

The regional administrator and the responsible state or local air monitoring agency should

work together to design and/or maintain the most appropriate NO₂ network to address the data needs for an area and include all monitors under this provision in the annual monitoring network plan.

DAQ does not operate any regional administrator required monitors. However, in 2013 the EPA designated the NO₂ monitor at Hattie Avenue, operated by Forsyth County, as a regional administrator required monitor.¹

Figure 3 shows the locations of the nitrogen dioxide monitors in North Carolina.

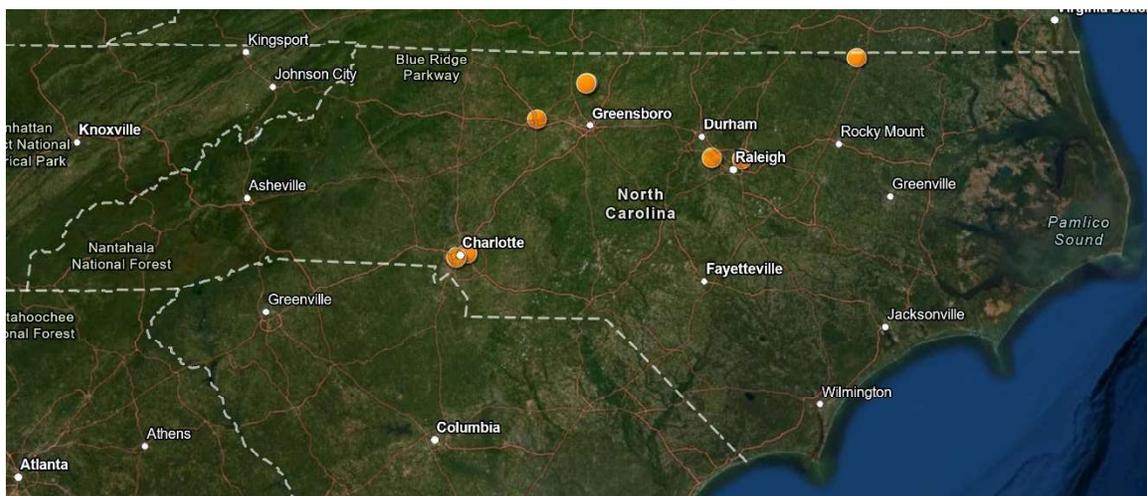


Figure 3. Location in North Carolina of nitrogen dioxide monitors.

2.2.4 Reactive Oxides of Nitrogen, NO_y, Design Criteria

Appendix D states:

NO/NO_y measurements are included within the NCore multi-pollutant site requirements and the PAMS program. These NO/NO_y measurements will produce conservative estimates for NO₂ that can be used to ensure tracking continued compliance with the NO₂ NAAQS. NO/NO_y monitors are used at these sites because it is important to collect data on total reactive nitrogen species for understanding O₃ photochemistry.

DAQ operates one NO_y monitor at East Millbrook Middle School in Raleigh and MCAQ operates one at Garinger High School in Charlotte. These monitors support ozone and fine particle precursor monitoring as well as validation of emission inventories. Figure 1 shows the locations of the NO_y monitors.

2.2.5 Sulfur Dioxide, SO₂, Design Criteria

The subsections below provide specific details about the design criteria in Appendix D to 40 CFR Part 58 and how the current North Carolina sulfur dioxide network measures up. Chapter IV of the 2020-2021 Annual Monitoring Network Plan for The North Carolina Division of Air Quality Volume 1 Network Descriptions provides more information on the network.

¹ <http://www.epa.gov/ttn/amtic/svpop.html>

2.2.5.1 Requirement for Monitoring by the Population Weighted Emissions Index

For the SO₂ monitoring network, the EPA developed the population weighted emissions index, PWEI. The PWEI is calculated for each CBSA by multiplying the population of each CBSA, using the most current census data or estimates, by the total amount of SO₂ in tons per year emitted within the CBSA area, using an aggregate of the most recent county level emissions data available in the latest national emissions inventory for each county in each CBSA. The resulting product is divided by 1,000,000, providing a PWEI value, the units of which are million persons-tons per year. For any CBSA with a calculated PWEI value equal to or greater than 1,000,000, a minimum of three SO₂ monitors are required within that CBSA. For any CBSA with a calculated PWEI value equal to or greater than 100,000, but less than 1,000,000, a minimum of two SO₂ monitors are required within that CBSA. For any CBSA with a calculated PWEI value equal to or greater than 5,000, but less than 100,000, a minimum of one SO₂ monitor is required within that CBSA.

The SO₂ monitoring sites required as a result of the calculated PWEI in each CBSA shall satisfy minimum monitoring requirements if the monitor is sited within the boundaries of the parent CBSA and is one of the following site types, as defined in section 1.1.1 of 40 CFR Part 58 Appendix D: population exposure, highest concentration, source impacts, general background, or regional transport. SO₂ monitors at NCore stations may satisfy minimum monitoring requirements if that monitor is located within a CBSA that is required to have one or more PWEI monitors.

Figure 4 maps and Table 3 provides the latest population-weighted emission indices using the 2017 National Emission Inventory² and 2019 population estimates³ for every CBSA in North Carolina. According to these calculations, North Carolina is required to operate 3 PWEI monitors in 3 CBSAs: Virginia Beach-Norfolk-Newport News, Charlotte-Gastonia-Concord and Durham-Chapel Hill. DAQ has an agreement with the VA DEQ that they will maintain the required number of monitors for the Virginia Beach-Norfolk-Newport News MSA so DAQ did not consider adding PWEI SO₂ monitors in Camden, Currituck or Gates County. Figure 4 also shows the locations of the required PWEI monitors for 2020 in North Carolina. The sites in Charlotte and Durham are already operating.

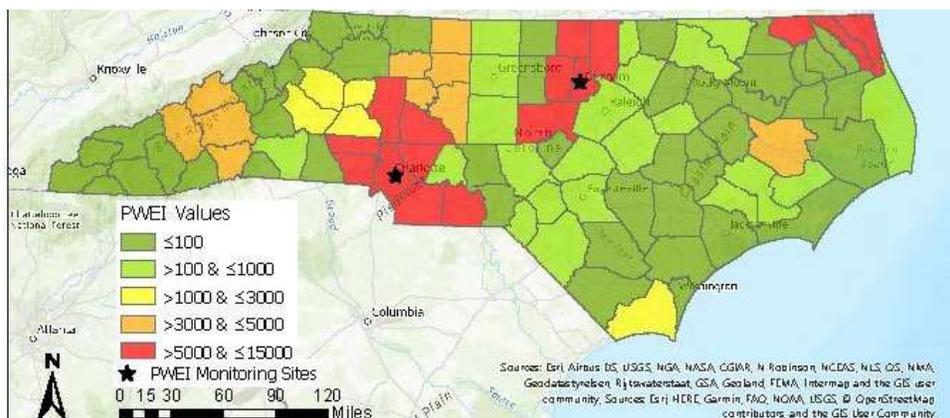


Figure 4. Map showing PWEI values for North Carolina and the location of the PWEI monitors

² The 2017 National Emission Inventory is available at <https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data>, accessed June 13, 2020.

³ <http://www.census.gov/popest/data/counties/totals/2014/CO-EST2014-01.html>

Table 3. Population-Weighted Emission Indices Using the 2017 National Emissions Inventory and 2019 Population Estimates

Core-based Statistical Area	SO₂ Emissions, tons	Estimated Population, July 1, 2019	Population Weighted Emission Index	Number of SO₂ Monitors Required
Asheville MSA	6,841.30	462,680	3,165.33	0
Burlington MSA	40.91	169,509	6.93	0
Charlotte-Gastonia-Concord MSA	5,648.80	2,636,883	14,895.23	1
Durham Chapel Hill MSA	7,909.54	644,367	5,096.65	1
Fayetteville MSA	318.12	526,719	167.56	0
Goldsboro MSA	98.73	123,131	12.16	0
Greensboro MSA	216.08	771,851	166.78	0
Greenville MSA	85.66	180,742	15.48	0
Hickory MSA	4,819.90	369,711	1,781.97	0
Jacksonville MSA	325.07	197,938	64.34	0
Myrtle Beach-Conway-North Myrtle Beach MSA	3,937.13	496,901	1,956.36	0
New Bern MSA	869.63	124,284	108.08	0
Raleigh MSA	445.57	1,390,785	619.70	0
Rocky Mounty MSA	91.21	145,770	13.30	0
Virginia Beach-Norfolk-Newport News MSA	3,084.61	1,768,901	5,456.37	1
Wilmington MSA	289.08	297,533	86.01	0
Winston-Salem MSA	5,242.06	676,008	3,543.68	0
Albemarle MiSA	259.27	62,806	16.28	0
Boone MiSA	19.47	56,177	1.09	0
Brevard MiSA	11.98	34,385	0.41	0
Cullowhee MiSA	68.16	58,209	3.97	0
Elizabeth City MiSA	73.17	53,287	3.90	0
Forest City MiSA	900.11	67,029	60.33	0
Henderson MiSA	159.93	44,535	7.12	0
Kill Devil Hills MiSA	116.36	37,009	4.31	0
Kinston MiSA	34.26	55,949	1.92	0
Laurinburg MiSA	429.11	34,823	14.94	0
Lumberton MiSA	190.69	130,625	24.91	0
Marion MiSA	50.50	45,756	2.31	0
Morehead City MiSA	62.89	69,473	4.37	0
Mount Airy MiSA	37.46	71,783	2.69	0
North Wilkesboro MiSA	58.49	68,412	4.00	0
Pinehurst-Southern Pines MiSA	116.02	100,880	11.70	0
Roanoke Rapids MiSA	432.47	69,493	30.05	0

Table 3. Population-Weighted Emission Indices Using the 2017 National Emissions Inventory and 2019 Population Estimates

Core-based Statistical Area	SO₂ Emissions, tons	Estimated Population, July 1, 2019	Population Weighted Emission Index	Number of SO₂ Monitors Required
Rockingham MiSA	85.52	44,829	3.83	0
Sanford MiSA	26.70	61,779	1.65	0
Shelby MiSA	88.85	97,947	8.70	0
Washington MiSA	3,172.23	46,994	149.08	0
Wilson MiSA	152.19	81,801	12.45	0
Alleghany County	4.29	11,137	0.05	0
Ashe County	21.23	27,203	0.58	0
Avery County	7.95	17,557	0.14	0
Bertie County	34.59	18,947	0.66	0
Bladen County	42.68	32,722	1.40	0
Caswell County	16.58	22,604	0.37	0
Cherokee County	10.86	28,612	0.31	0
Chowan County	3.68	13,943	0.05	0
Clay County	9.20	11,231	0.10	0
Columbus County	1,326.38	55,508	73.62	0
Duplin County	45.55	58,741	2.68	0
Graham County	6.76	8,441	0.06	0
Greene County	5.25	21,069	0.11	0
Hertford County	113.84	23,677	2.70	0
Hyde County	20.36	4,937	0.10	0
Macon County	23.89	35,858	0.86	0
Martin County	786.89	22,440	17.66	0
Mitchell County	7.20	14,964	0.11	0
Montgomery County	69.77	27,173	1.90	0
Polk County	11.48	20,724	0.24	0
Sampson County	84.75	63,531	5.38	0
Tyrrell County	42.56	4,016	0.17	0
Warren County	9.17	19,731	0.18	0
Washington County	8.67	11,580	0.10	0
Yancey County	10.77	18,069	0.19	0

2.2.5.2 Regional Administrator Required Monitoring

The regional administrator may require additional SO₂ monitoring stations above the minimum number of PWEI monitors required, where the minimum monitoring requirements are not sufficient to meet monitoring objectives. The regional administrator may require, at his/her discretion, additional monitors in situations where an area has the potential to have concentrations that may violate or contribute to the violation of the NAAQS, in areas impacted by sources which are not conducive to modeling, or in locations with susceptible and vulnerable populations, which are not monitored under the minimum

PWEI monitoring provisions. The regional administrator and the responsible state or local air monitoring agency shall work together to design and/or maintain the most appropriate SO₂ network to provide sufficient data to meet monitoring objectives. At this time, DAQ anticipates there is not a need for regional administrator required SO₂ monitoring in North Carolina. The minimum required PWEI monitors and the existing DAQ network currently meet the needs for SO₂ monitoring in North Carolina especially with the significant decrease in SO₂ emissions from coal-fired power plants resulting from implementation of the Clean Smoke Stacks Act.

Figure 5 shows the locations of SO₂ monitoring in North Carolina.

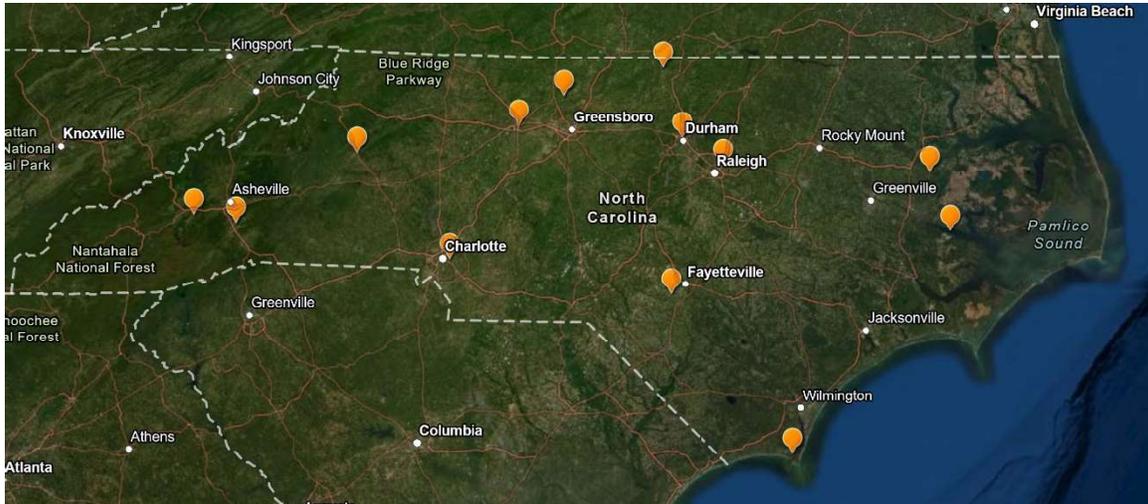


Figure 5. North Carolina SO₂ monitoring sites for 2020

2.2.6 Lead, Pb, Design Criteria

State and, where appropriate, local agencies are required to conduct ambient air Pb monitoring taking into account Pb sources which are expected to or have been shown to contribute to a maximum Pb concentration in ambient air in excess of the NAAQS and the potential for population exposure. The current requirements in 40 CFR Part 58 Appendix D are for at least one source-oriented SLAMS site located to measure the maximum Pb concentration in ambient air resulting from each Pb source that emits 0.5 or more tons per year based on either the most recent national emission inventory available at <https://www.epa.gov/air-emissions-inventories> or other scientifically justifiable methods and data, such as improved emissions factors or site-specific data, taking into account logistics and the potential for population exposure. Currently DAQ is required to operate a source-oriented SLAMS site at a Federal military installation that emits various amounts of lead depending on the level of activity occurring at the site. DAQ has requested a waiver from doing source-oriented lead monitoring at this facility. The 2020-2021 Annual Monitoring Network Plan for The North Carolina Division of Air Quality Volume 1 Network Descriptions provides more information on the waiver request and lead monitoring in North Carolina.

In 2016, the EPA removed the requirement from Appendix D for a certain number of population-oriented monitors at NCore sites. As a result, lead monitoring at both of the NCore sites in North Carolina ended at the end of April 2016.

2.2.7 Particulate Matter, PM₁₀, Design Criteria

Table D-4 of Appendix D to 40 CFR Part 58 indicates the approximate number of permanent stations required in MSAs to characterize national and regional PM₁₀ air quality trends and geographical patterns. The number of PM₁₀ stations in areas where MSA populations exceed 1,000,000 must be in the range from 2 to 10 stations, while in low population urban areas no more than two stations are required. Table D-4 specifies a range of monitoring stations because sources of pollutants and local control efforts can vary from one part of the country to another and therefore, the EPA allows some flexibility in selecting the actual number of stations in any one locale. The regional administrator must approve modifications from these PM₁₀ monitoring requirements.

Currently Table D-4 requires North Carolina to operate between 10 and 24 PM₁₀ analyzers in 11 MSAs. The Virginia Beach-Norfolk-Newport News, Charlotte-Gastonia-Concord and Raleigh-Cary MSAs are each required to have between two and four PM₁₀ analyzers. DAQ has an agreement with the VA DEQ that they will maintain the required number of monitors for the Virginia Beach-Norfolk-Newport News MSA. Currently, the VA DEQ operates two PM₁₀ monitors in the Virginia Beach-Norfolk-Newport News MSA, meeting the appendix D requirements.

MCAQ operates two PM₁₀ monitors in the Charlotte-Gastonia-Concord MSA in compliance with the appendix D requirements. DAQ operates one PM₁₀ monitor in the Raleigh MSA and received a waiver from the regional administrator for the second required monitor. The Division is requesting that the regional administrator renew this waiver because the PM₁₀ levels in Raleigh continue to remain low. DAQ is required to operate one to two PM₁₀ monitors in the Fayetteville, Greensboro-High Point and Durham-Chapel Hill MSAs. Currently, DAQ operates one PM₁₀ monitor in each of those MSAs. Forsyth County is required to operate one to two PM₁₀ monitors in the Winston-Salem MSA. They currently operate one, meeting the appendix D requirements. Four MSAs have requirements for between zero and one PM₁₀ monitors: Asheville, Hickory, Wilmington and Myrtle Beach-Conway-North Myrtle Beach. DAQ operates rotating PM₁₀ monitors in Hickory and Wilmington. Currently the Asheville and Myrtle Beach-Conway-North Myrtle Beach MSAs do not have any PM₁₀ monitoring. Figure 6 shows the 2020 PM₁₀ network.

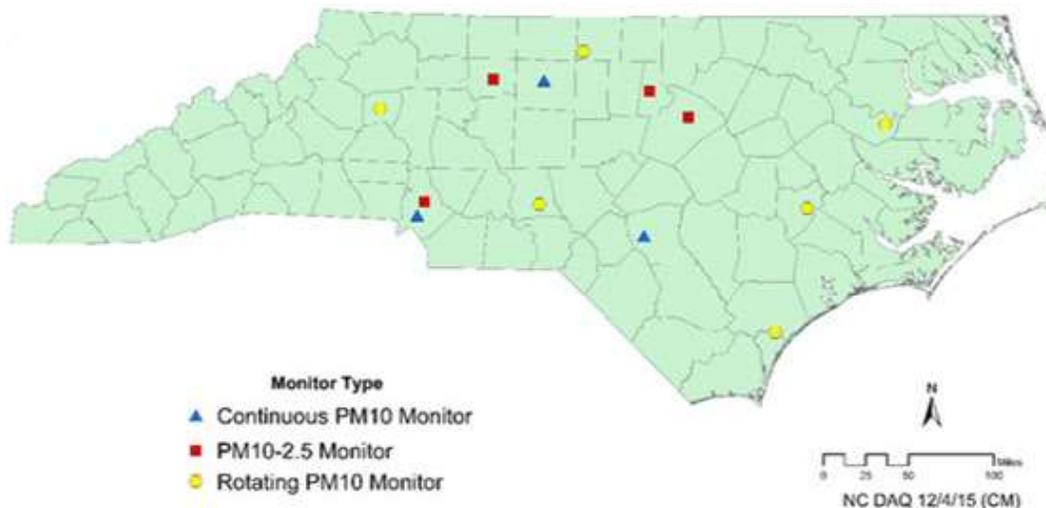


Figure 6. 2020 North Carolina PM₁₀ network

Chapter VI of the 2020-2021 Annual Monitoring Network Plan for The North Carolina Division of Air Quality Volume 1 Network Descriptions provides more information on these sites.

2.2.8 Fine Particulate Matter, PM_{2.5}, Design Criteria

The subsections below provide specific details about the design criteria in Appendix D to 40 CFR Part 58 and how the North Carolina network measures up. Chapter VII of the 2020-2021 Annual Monitoring Network Plan for The North Carolina Division of Air Quality Volume 1 Network Descriptions provides more information on the fine particulate matter network.

2.2.8.1 General Requirements

State, and where applicable local, agencies must operate the minimum number of required PM_{2.5} SLAMS sites listed in Table D-5 of Appendix D to 40 CFR Part 58. The EPA expects NCore sites to complement the PM_{2.5} data collection that takes place at non-NCore SLAMS sites and agencies can use both types of sites to meet the minimum PM_{2.5} network requirements. Agencies must site the required monitoring stations or sites to represent area-wide air quality. These monitoring stations will typically be at neighborhood or urban scale. Agencies are to site at least one monitoring station at neighborhood or larger scale in an area of expected maximum concentration. For CBSAs with a population of 1,000,000 or more persons, at least one PM_{2.5} monitor is to be collocated at a near-road NO₂ station required in section 4.3.2(a) of appendix D. For areas with additional required SLAMS, agencies are to site a monitoring station in an area of poor air quality.

Table D-5 requires North Carolina to operate two PM_{2.5} analyzers in the Virginia Beach-Norfolk-Newport News, Raleigh and Charlotte-Gastonia-Concord MSAs and one in the Greensboro-High Point, Fayetteville, Winston-Salem and Durham-Chapel Hill MSAs. DAQ has an agreement with the VA DEQ that VA DEQ will maintain the required number of monitors for the Virginia Beach-Norfolk-Newport News MSA. Currently, the VA DEQ operates three PM_{2.5} monitors in the Virginia Beach-Norfolk-Newport News MSA, exceeding the appendix D requirements. Currently MCAQ operates three PM_{2.5} analyzers in the Charlotte-Gastonia-Concord MSA and DAQ operates one, exceeding the requirements of appendix D. DAQ operates three PM_{2.5} analyzers in the Raleigh-Cary MSA and one in the Greensboro-High Point, Fayetteville and Durham-Chapel Hill MSAs. Forsyth County operates two PM_{2.5} monitors in the Winston-Salem MSA and DAQ operates one, exceeding the appendix D requirements.

2.2.8.2 Requirement for Continuous PM_{2.5} Monitoring

The State, or where appropriate, local agencies must operate continuous PM_{2.5} analyzers equal to at least one-half (round up) the minimum required sites listed in Table D-5 of Appendix D to 40 CFR Part 58. At least one required continuous analyzer in each MSA must be collocated with one of the required FRM/FEM/approved regional method, ARM, monitors, unless at least one of the required FRM/FEM/ARM monitors is itself a continuous FEM or ARM monitor in which case no collocation requirement applies.

State and local air monitoring agencies must use methodologies and quality assurance/quality control, QA/QC, procedures approved by the EPA regional administrator for these required continuous analyzers.

Currently Table D-5 requires North Carolina to operate one continuous PM_{2.5} analyzer in each of the following seven MSAs:

- Virginia Beach-Norfolk-Newport News,
- Charlotte-Gastonia-Concord,
- Raleigh,
- Winston-Salem,
- Greensboro-High Point,
- Fayetteville and
- Durham-Chapel Hill.

DAQ has an agreement with the VA DEQ that Virginia will maintain the required number of monitors for the Virginia Beach-Norfolk-Newport News MSA. Currently, the VA DEQ operates one continuous monitor in the Virginia Beach-Norfolk-Newport News MSA, meeting the appendix D requirements.

Currently MCAQ operates three continuous PM_{2.5} analyzers in the Charlotte-Gastonia-Concord MSA, Forsyth County operates two continuous PM_{2.5} analyzers in the Winston-Salem MSA and DAQ operates one continuous PM_{2.5} analyzer in the Charlotte-Gastonia-Concord, Greensboro-High Point, Winston-Salem, Fayetteville and Durham-Chapel Hill MSAs. DAQ operates three continuous PM_{2.5} analyzers in the Raleigh MSA.

2.2.8.3 Requirement for PM_{2.5} Background and Transport Sites

Each state shall install and operate at least one PM_{2.5} site to monitor for regional background and at least one PM_{2.5} site to monitor regional transport. These monitoring sites may be at community-oriented sites and agencies may satisfy this requirement by a corresponding monitor in an area having similar air quality in another State. State and local air monitoring agencies must use methodologies and QA/QC procedures approved by the EPA regional administrator for these sites. Methods used at these sites may include non-federal reference method samplers such as Interagency Monitoring of Protected Visual Environments, IMPROVE, or continuous PM_{2.5} monitors.

DAQ currently operates one regional background and one regional transport monitor. These monitors are located at Candor, regional background and Bryson City, regional transport. Thus, the Division meets the appendix D requirements.

2.2.8.4 PM_{2.5} Chemical Speciation Site Requirements

Each state shall continue to conduct chemical speciation monitoring and analyses at sites designated to be part of the PM_{2.5} Speciation Trends Network, STN. The regional administrator must approve the selection and modification of these STN sites. The PM_{2.5} chemical speciation urban trends sites shall include analysis for elements, selected anions and cations and carbon. States must collect samples using the monitoring methods and the sampling schedules approved by the administrator. Chemical speciation is encouraged at additional sites where the chemically resolved data would be useful in developing state implementation plans and supporting atmospheric or health effects related studies.

MCAQ currently operates a PM_{2.5} STN at the NCore Station in Mecklenburg County, meeting the appendix D requirements. In addition to this STN site, DAQ operates a PM_{2.5} chemical speciation site at the Millbrook NCore site. Forsyth County operates a PM_{2.5}

Chemical Speciation site at Hattie Avenue in Winston-Salem for health effects related studies.

2.2.9 Coarse Particulate Matter, PM_{10-2.5}, Design Criteria

The only required monitors for PM_{10-2.5} are those required at NCore Stations. DAQ and MCAQ are currently operating PM_{10-2.5} at both of the NCore Stations in North Carolina, meeting the appendix D requirements. In addition, DAQ operates a PM_{10-2.5} monitor in Durham.

2.3 Network Design for Photochemical Assessment Monitoring Stations, PAMS and Enhanced Ozone Monitoring

State and local monitoring agencies are required to collect and report PAMS measurements at each NCore site required under paragraph 3(a) of 40 CFR Part 58, Appendix D located in a CBSA with a population of 1,000,000 or more, based on the latest available census figures. States with moderate and above 8-hour O₃ nonattainment areas and states in the Ozone Transport Region as defined in 40 CFR 51.900 shall develop and implement an Enhanced Monitoring Plan, EMP, detailing enhanced O₃ and O₃ precursor monitoring activities to be performed. The PAMS program includes measurements for O₃, oxides of nitrogen, volatile organic compounds and meteorology.

Currently, North Carolina has two NCore sites in CBSAs with a population of 1,000,000 or more; thus, North Carolina must have two PAMS sites up and operational by June 1, 2021. Currently, North Carolina does not have any O₃ nonattainment areas and is not part of the Ozone Transport Region, so North Carolina is not required to have an EMP. Chapter XII of the 2020-2021 Annual Monitoring Network Plan for The North Carolina Division of Air Quality Volume 1 Network Descriptions provides more information on the North Carolina PAMS network. Figure 1 shows the locations of the required PAMS sites.

Chapter 3 Need for New Sites

This chapter describes the need for new sites in North Carolina over the next five years. DAQ determined the need for sites based on requirements listed in 40 CFR Part 58, Appendix D, estimated changes in population and air quality and projected needs of the state over the next five years. Currently DAQ does not expect any proposed changes to appendix D or possible changes to the NAAQS to occur in the next five years.

DAQ obtained North Carolina county population projections from the North Carolina Office of State Budget and Management,⁴ South Carolina county population projections from the South Carolina Revenue and Fiscal Affairs Office,⁵ and Virginia population projections from the Weldon Cooper Center for Public Service.⁶ Figure 7 through Figure 10 graph these projections for the next 10 years for all 17 MSAs in North Carolina. The projections indicate two MSAs will cross a monitoring threshold requiring additional

⁴ North Carolina Office of State Budget and Management, available online at https://files.nc.gov/ncosbm/demog/countytotals_2020_2029.html, accessed June 14, 2020.

⁵ S.C. Department of Health and Environmental Control - Vital Records Department, available online at http://www.sccommunityprofiles.org/census/projections_2010.html, accessed June 14, 2020.

⁶ University of Virginia Weldon Cooper Center, Demographics Research Group. (2019). Virginia Population Projections. Retrieved from <https://demographics.coopercenter.org/virginia-population-projections> June 14, 2020.

monitoring during the next 10 years. The monitoring thresholds are at 350,000 for ozone monitoring, 500,000 for particle monitoring, 1,000,000 for particle and near-road monitoring and 2,500,000 for near-road monitoring. The Myrtle Beach-Conway-North Myrtle Beach MSA will cross the 500,000 population threshold in 2020, requiring the addition of PM₁₀ and PM_{2.5} monitoring. The Asheville MSA is projected to cross the 500,000 population threshold in 2026, requiring the addition of PM₁₀ monitoring. Table 4 lists the new sites North Carolina may need in the next five years as a result of changes in population and air quality and projected needs of the state.

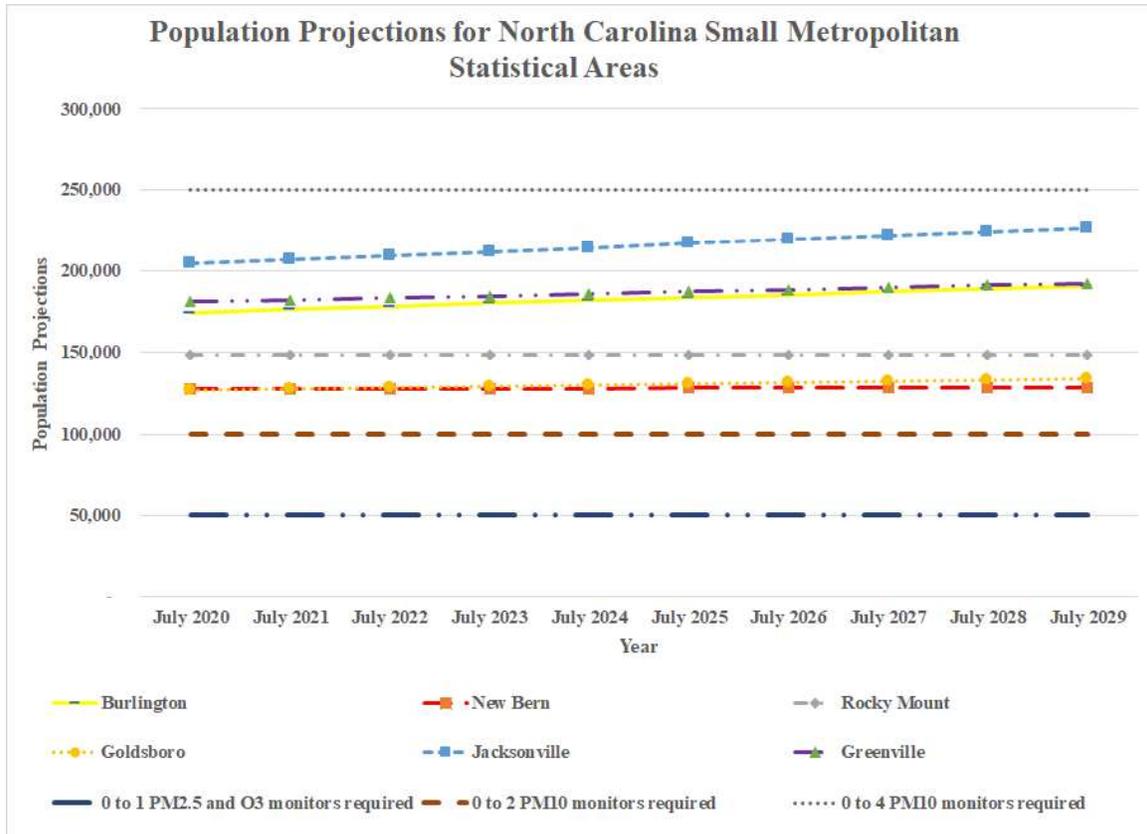


Figure 7. Population projections for small North Carolina MSAs

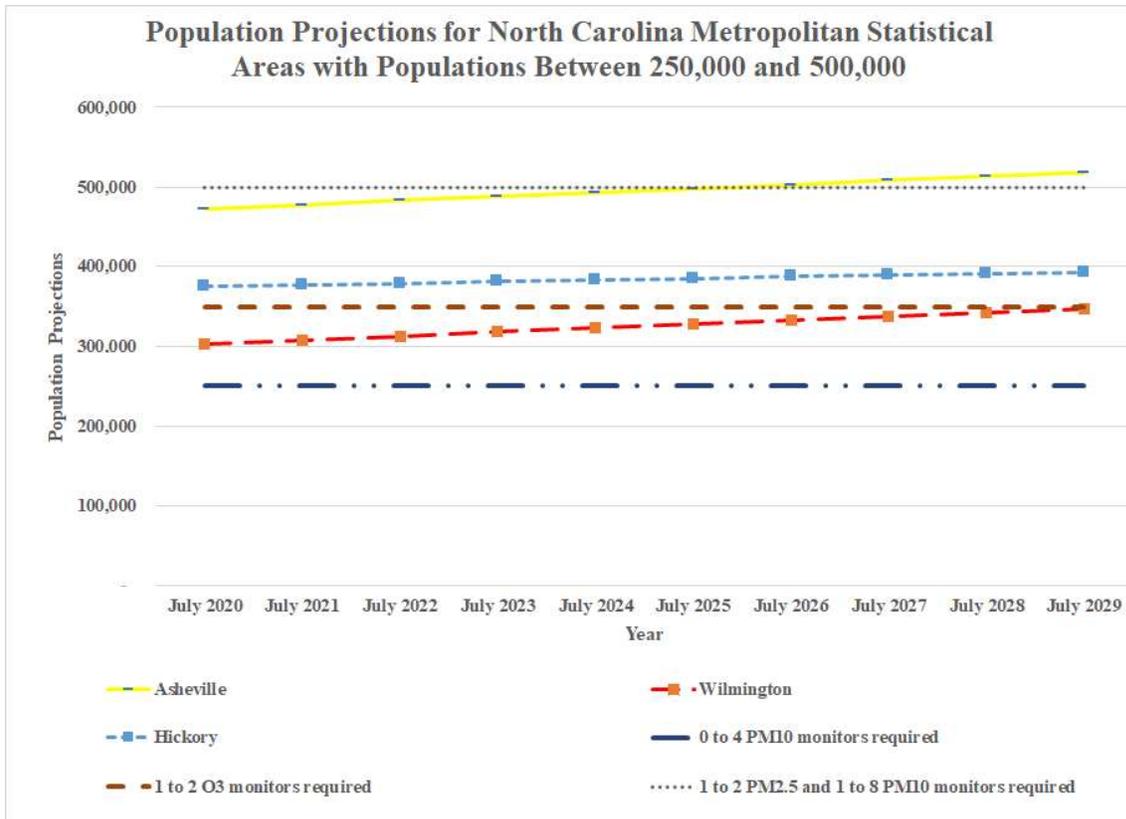


Figure 8. Population projections for North Carolina MSAs between 250,000 and 500,000

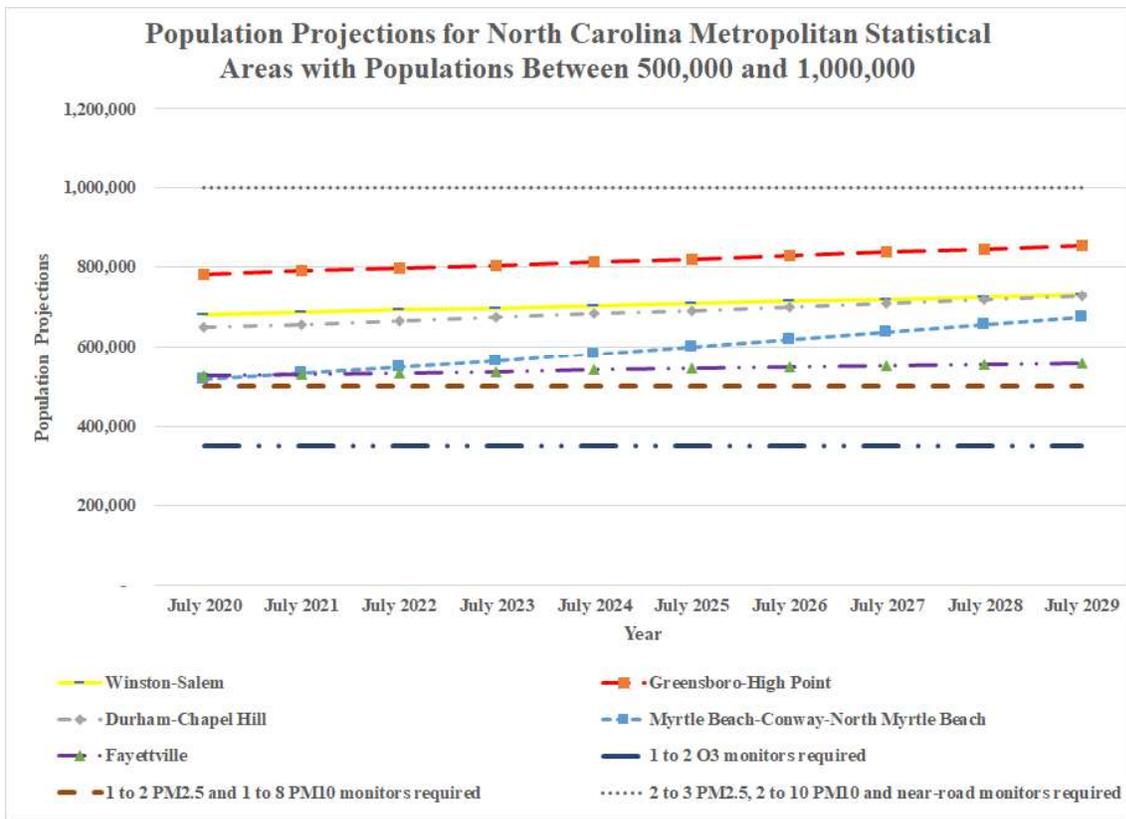


Figure 9. Population projections for North Carolina MSAs between 500,000 and 1,000,000

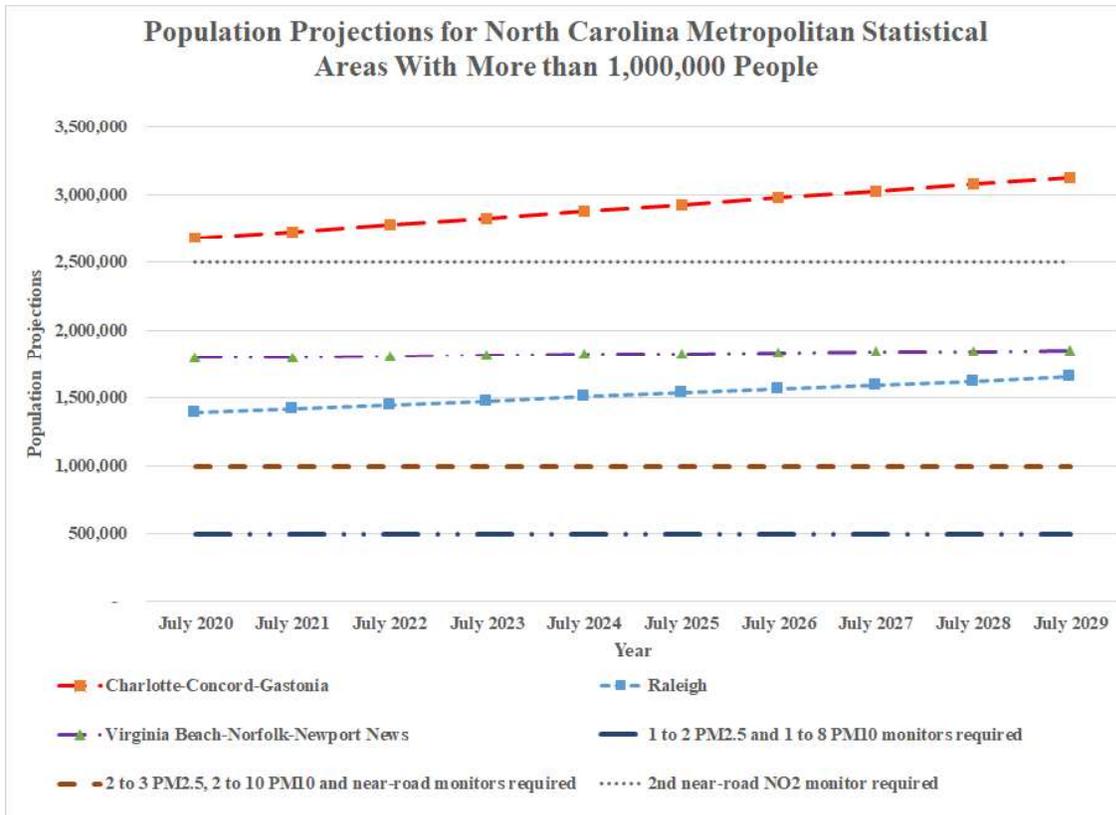


Figure 10. Population projections for North Carolina MSAs with over 1,000,000 People

Table 4. Possible Future Sites and Site Upgrades in the Next Five Years

OZONE SITES

AQS Site Id Number	Site Name	Monitor Type	Proposed Changes	Time Frame
TBD	TBD	SLAMS	DAQ is working with DHEC and the EPA to determine if additional ozone monitoring is needed in the Myrtle Beach-Conway-North Myrtle Beach MSA due to the design value being above 85 percent of the NAAQS	3/1/2022
TBD	TBD	Special Purpose	DAQ was looking into placing some ozone sensors around the Charlotte area to evaluate the spatial variability of ozone and confirm the network adequately captures the maximum ozone concentration. The COVID-19 pandemic has delayed this study indefinitely.	TBD
37-179-0003	Monroe	Special Purpose	DAQ proposes to add a solar radiation sensor	3/1/2021

CARBON MONOXIDE SITES

AQS Site Id Number	Site Name	Monitor Type	Proposed Changes	Time Frame
No new sites proposed				

NITROGEN DIOXIDE SITES

AQS Site Id Number	Site Name	Monitor Type	Proposed Changes	Time Frame
37119XXXX	TBD	SLAMS	Second near-road monitoring site in Charlotte	TBD
371590021	Rockwell	Special Purpose	A background monitor will be added to the site for PSD modeling	10/1/2020

SULFUR DIOXIDE SITES

AQS Site Id Number	Site Name	Monitor Type	Proposed Changes	Time Frame
No new sites proposed				

LEAD SITES

AQS Site Id Number	Site Name	Monitor Type	Proposed Changes	Time Frame
37xxxxxxx	Fort Bragg	SLAMS	May need a source oriented lead monitor on or near Fort Bragg if the EPA does not approve a waiver	2021 or 2022

PM₁₀ SITES

AQS Site Id Number	Site Name	Monitor Type	Proposed Changes	Time Frame
370210034	Board of Education	SLAMS	Population projections indicate monitoring will be required in this MSA	1/1/2026-1/1/2028
TBD	TBD	SLAMS	DAQ will work with DHEC and the EPA to determine where to place a PM10 monitor when needed in the Myrtle Beach-Conway-North Myrtle Beach MSA due to population increases	1/1/2022

FINE PARTICULATE MATTER SITES

AQS Site Id Number	Site Name	Monitor Type	Proposed Changes	Time Frame
37-179-0003	Monroe	Special Purpose	Add continuous monitor to study effect of smoke on ozone	3/1/2021
TBD	TBD	SLAMS	DAQ will work with DHEC and the EPA to determine where to place a PM _{2.5} monitor when needed in the Myrtle Beach-Conway-North Myrtle Beach MSA due to population increases	1/1/2022

PAMS SITES

AQS Site Id Number	Site Name	Monitor Type	Proposed Changes	Time Frame
371190041	Garinger	PAMS	PAMS monitoring will start to meet 40 CFR Part 58, Appendix D requirements	6/1/2021
371830014	Millbrook	PAMS	PAMS monitoring will start to meet 40 CFR Part 58, Appendix D requirements	6/1/2021

3.1 NCore Sites

DAQ has no plans to add any NCore sites within the next five years.

3.2 Pollutant-Specific SLAMS Sites

3.2.1 Ozone, O₃, Sites

DAQ does not meet 40 CFR Part 58 Appendix D minimum ozone monitoring requirements for the Myrtle Beach-Conway-North Myrtle Beach MSA because the ozone design value is greater than 85 percent of the NAAQS. Consequently, DAQ is working with the DHEC and the EPA to determine the best course of action for this MSA. DAQ has requested a waiver for this second required ozone monitor so that it can obtain additional design values for the MSA. Additional design values will allow DAQ to determine whether the ozone concentrations are trending downward or have plateaued.

DAQ was also investigating placing ozone sensors around the edges of Mecklenburg County. These sensors would measure the spatial variability of the ozone concentrations, enabling DAQ to evaluate the current ozone network to ensure it captures the maximum ozone concentrations in the area. The Division had anticipated this study would last for several months during the 2020 ozone season. However, because of the 2020 COVID-19 pandemic, DAQ has not been able to implement this study. This study is likely to be delayed indefinitely.

DAQ also plans to add a solar radiation sensor at Monroe to help investigate why the ozone concentrations seem to be trending upward there. DAQ will place the solar radiation sensor at Monroe whenever it is safe to do so.

3.2.2 Carbon Monoxide, CO, Sites

DAQ does not plan to add any additional CO monitors to its network. Chapter III of the 2020-2021 Annual Monitoring Network Plan for The North Carolina Division of Air Quality Volume 1 Network Descriptions provides information on the current CO monitoring stations.

3.2.3 Nitrogen Dioxide, NO₂, Sites

The subsections below provide specific details about any proposed sites in the next five years.

3.2.3.1 Requirement for Near-road NO₂ Monitors

Currently, North Carolina is required to have three near-road monitors, not counting the near-road monitor required for the Virginia Beach-Norfolk-Newport News MSA. DAQ operates one near-road monitor in Raleigh and MCAQ operates one near-road monitor in

Charlotte. MCAQ anticipates adding a second near-road monitor in Charlotte sometime in the future when the EPA provides sufficient funding to accomplish that goal. Figure 2 shows the approximate location of these three near-road NO₂ monitors.



Figure 2. Locations and proposed locations of near-road NO₂ monitors.

3.2.3.2 Requirement for Area-wide NO₂ Monitoring

North Carolina has two CBSAs with a population of 1,000,000 or more persons, excluding Camden, Currituck and Gates County which are in the Virginia Beach-Norfolk-Newport News MSA. Thus, two area-wide NO₂ monitors were required in North Carolina, one in Mecklenburg County and one in Wake County, to monitor a location of expected highest NO₂ concentrations representing the neighborhood or larger spatial scales. These monitors were placed at the Garinger and Millbrook NCore sites shown in Figure 1. No additional area-wide NO₂ monitors are required at this time or projected to be needed in the next five years.

3.2.3.3 Regional Administrator Required Monitoring

DAQ is not subject to any current requirement to add any regional administrator required NO₂ monitoring sites in North Carolina during the next five years.

3.2.4 Reactive Oxides of Nitrogen, NO_y Sites

DAQ has no current plans to add any NO_y sites during the next five years.

3.2.5 Sulfur Dioxide, SO₂, Sites

DAQ does not plan to add any additional SO₂ monitors to its network in the next five years. Chapter IV of the 2020-2021 Annual Monitoring Network Plan for the North Carolina Division of Air Quality Volume 1 Network Descriptions provides more information on the SO₂ network. The subsections below provide specific details about each type of SO₂ site that DAQ operates.

3.2.5.1 Population Weighted Emissions Index Sites

Based on the PWEI values for every CBSA in Table 3, DAQ is not required to operate any additional PWEI SO₂ monitors. Figure 4 shows the required PWEI sites using the 2019 population estimates and the 2017 national emissions inventory.

3.2.5.2 Regional Administrator Required Monitoring Sites

DAQ has no current requirement to add any regional administrator required SO₂ monitoring sites in North Carolina during the next five years.

3.2.5.3 Background PSD Industrial Expansion Monitoring Sites

DAQ operates a background PSD Industrial Expansion SO₂ Monitoring Network. Currently, the Division does not expect to add any sites to this network. However, DAQ continues to evaluate areas where permit modelers may need future background SO₂ monitoring, such as Class 1 areas and the corridor between Greensboro and Fayetteville.

3.2.5.4 Source-oriented Monitoring Sites

DAQ operates a Source-Oriented SO₂ Monitoring Network. These include sites added to comply with the Data Requirements Rule as well as sites operated to satisfy requirements in Special Orders of Consent. Currently, the DAQ does not expect to add any sites to this network.

3.2.6 Lead, Pb, Sites

DAQ and MCAQ ended lead monitoring at the NCore sites shown in Figure 1 at the end of April 2016. The DAQ has no plans to add any community or area wide monitors in the next five years.

DAQ may place one source-level monitor at the fence-line of Fort Bragg in Hoke or Cumberland County. This site emits various amounts of lead depending on the level of training activity occurring at the site. In 2018, the site emitted more than the 0.5 tons of the lead monitoring threshold. The Division has requested a waiver for lead monitoring at Fort Bragg. Chapter II of the 2020-2021 Annual Monitoring Network Plan for the North Carolina Division of Air Quality Volume 1 Network Descriptions provides the waiver request.

3.2.7 Particulate Matter, PM₁₀, Sites

DAQ does not plan to add any SLAMS PM₁₀ monitors to the network during the next five years. The Division meets the minimum monitoring requirements in Table D-4 of Appendix D to 40 CFR Part 58 in all areas except for the Raleigh MSA. DAQ has a waiver for the second required PM₁₀ monitor and is requesting that the EPA renew this waiver. Chapter II of the 2020-2021 Annual Monitoring Network Plan for the North Carolina Division of Air Quality Volume 1 Network Descriptions provides the waiver renewal request. Sometime within the next 10 years, DAQ anticipates that PM₁₀ monitoring will be required in the Asheville MSA. DAQ will work with WNC to determine how to best meet this requirement. The Division does not plan to make any changes to the special purpose background PM₁₀ monitoring network during the next five years. Chapter VI of the 2020-2021 Annual Monitoring Network Plan for the North Carolina Division of Air Quality Volume 1 Network Descriptions provides more information on these sites.

3.2.8 Fine Particulate Matter, PM_{2.5}

The subsections below provide specific details about any sites DAQ will add to the network in the next five years. Chapter VII of the 2020-2021 Annual Monitoring Network Plan for the North Carolina Division of Air Quality Volume 1 Network Descriptions provides more information on these sites.

3.2.8.1 General PM_{2.5} Sites

DAQ does not have any plans during the next five years to add additional SLAMS PM_{2.5} monitoring stations anywhere in North Carolina unless the standard is lowered or the monitoring requirements in 40 CFR Part 58 Appendix D change.

The Myrtle Beach-Conway-North Myrtle Beach MSA will be required to add PM_{2.5} monitoring in 2021 or 2022. DAQ will work with DHEC and EPA to determine the best location for that monitor once it becomes required.

3.2.8.2 Requirement for continuous PM_{2.5} monitoring

DAQ does not plan to add any SLAMS PM_{2.5} continuous monitors in the next five years. The Division does plan to add a special purpose continuous PM_{2.5} monitor to the Monroe site, 37-179-0003, in Union County to study the effect of smoke on the ozone monitor.

3.2.8.3 PM_{2.5} background and transport sites

DAQ does not plan to add any PM_{2.5} regional background or PM_{2.5} regional transport sites in the next five years.

3.2.8.4 PM_{2.5} chemical speciation sites

DAQ does not plan to add any PM_{2.5} chemical speciation urban trends sites in the next five years.

3.2.9 Coarse Particulate Matter, PM_{10-2.5}

DAQ does not propose any additional PM_{10-2.5} monitoring stations at this time, although, the Division may measure PM_{10-2.5} for a 12-month period at Castle Hayne, 37-129-0002, in New Hanover County during 2020 to 2021.

3.3 Photochemical Assessment Monitoring Stations, PAMS

Currently DAQ does not have any PAMS sites. However, MCAQ and DAQ are required to establish PAMS monitoring at the NCore sites in the Charlotte and Raleigh areas. These sites are required to begin operating on June 1, 2021.

Chapter 4 Existing Sites That Are No Longer Needed and Can Be Terminated

This chapter describes the monitors and sites in North Carolina that DAQ does not need or will no longer need and will shut down over the next five years. Table 5 summarizes these monitors and any sites that DAQ will shut down.

Table 5. Monitors and Sites to be Shut Down in the Next Five Years

OZONE SITES				
AQS Site Id Number	Site Name	Monitor Type	Proposed Changes	Time Frame
37-051-0008	Wade	SLAMS	Site will shut down and move	10/31/2020
37-145-0003	Bushy Fork	SLAMS	Site is not required. DAQ will determine if DAQ needs the site for other purposes; if not, DAQ will shut down the monitor and site.	10/31/2021

CARBON MONOXIDE SITES

AQS Site Id Number	Site Name	Monitor Type	Proposed Changes	Time Frame
All sites are required, none are proposed to be shut down				

NITROGEN DIOXIDE SITES

AQS Site Id Number	Site Name	Monitor Type	Proposed Changes	Time Frame
37-131-0003	Northampton County	Special Purpose	This monitor and site will shut down when the background study ends	TBD

SULFUR DIOXIDE SITES

AQS Site Id Number	Site Name	Monitor Type	Proposed Changes	Time Frame
37-019-0005	Southport SOC	Industrial	Monitor and site will shut down	When three complete years of data are obtained
37-021-0037	Skyland DRR	Industrial	Monitor and site will shut down	When EPA approval is obtained
37-063-0015	Durham Armory	SLAMS	If the PWEI drops below 5,000 the monitor will shut down	12/31/2023
37-145-0004	Semora DRR	Industrial	Monitor and site will shut down	When EPA approval is obtained

LEAD SITES

AQS Site Id Number	Site Name	Monitor Type	Proposed Changes	Time Frame
There are no lead sites operating in North Carolina				

PM₁₀ SITES

AQS Site Id Number	Site Name	Monitor Type	Proposed Changes	Time Frame
None are proposed to be shut down				

FINE PARTICULATE MATTER GENERAL SITES

AQS Site Id Number	Site Name	Monitor Type	Proposed Changes	Time Frame
37-063-0015	Durham Armory	SLAMS	The collocated manual monitors will shut down; the continuous monitor at the site will become the primary monitor	9/30/2020

FINE PARTICULATE MATTER CONTINUOUS SITES

AQS Site Id Number	Site Name	Monitor Type	Proposed Changes	Time Frame
37-131-0003	Northampton County	Special Purpose	This monitor and site will shut down when the background study ends	TBD
37-179-0003	Monroe	Special Purpose	This monitor will shut down when the study ends	10/31/2023

FINE PARTICULATE MATTER BACKGROUND AND TRANSPORT SITES

AQS Site Id Number	Site Name	Monitor Type	Proposed Changes	Time Frame
			None are proposed to be shut down	

FINE PARTICULATE MATTER SPECIATION SITES

AQS Site Id Number	Site Name	Monitor Type	Proposed Changes	Time Frame
			None are proposed to be shut down	

PAMS SITES

AQS Site Id Number	Site Name	Monitor Type	Proposed Changes	Time Frame
			No monitors or sites to shut down	

4.1 NCORE Sites

DAQ does not plan to terminate any NCore sites in the next five years. Chapter IX of the 2020-2021 Annual Monitoring Network Plan for the North Carolina Division of Air Quality Volume 1 Network Descriptions provides more information on the NCore site operated by the DAQ.

4.2 Pollutant-Specific Slams Sites

4.2.1 Ozone, O₃, Sites

DAQ plans to shut down one ozone site at the end of 2020: Wade, 37-051-0008, in the Fayetteville MSA. The Division will shut down this site because trees that are obstructing air flow have grown up around the site.

Table 6 provides a relative ranking of all of the ozone sites operated in North Carolina. DAQ based the ranking on how long the site was in operation, concentrations measured at the site based on design values, number of other pollutants and meteorological conditions measured at the site, Appendix D and G requirements and the estimated susceptible population and area served. Monitors in operation longer with higher design values and collocated monitors or meteorological towers received higher rankings. Monitors required by Appendix D and G and that served a larger susceptible population or area also received higher rankings. Chapter V of the 2020-2021 Annual Monitoring Network Plan for the North Carolina Division of Air Quality Volume 1 Network Descriptions provides additional information on the ozone network. Figure 2 shows the 2020 ozone network.

As shown in Table 6, the Bushy Fork ozone monitor is no longer required and ranks 27, in the bottom half of monitors. As a result, the DAQ plans to do a more indepth evaluation of this monitor and its value to the overall DAQ ozone network. Depending on the results of the study, DAQ may decide to shut down this monitor at the end of the 2021 ozone season. At this time, DAQ does not plan to shut down any other ozone monitors in the next five years unless:

Table 6. Ranking of Relative Value of Ozone Sites Based on Site Longevity, Measured Concentrations and Other Considerations

Overall I Rank	AQS Site Id Number	Site Name	Date Established	2017-2019 Design Value	Required by Appendix:		Total Parameters Measured at Site	Ozone Exceedance Probability	Area Served (Km ²)	Population Density (People per Km ²)	Susceptible Population Served	Percent not Caucasian	MSA, CSA or CBSA represented
					D	G							
1	371190041	Garinger High School	July 30, 1999	0.070	Yes	Yes	166	25%-50%	964	695	115,531	47%	Charlotte-Concord-Gastonia
2	371830014	Millbrook School	April 17, 1989	0.064	Yes	Yes	204	<10%	3,024	253	124,937	35%	Raleigh
3	370810013	Mendenhall School	December 14, 2001	0.065	Yes	Yes	4	<10%	2,213	205	85,669	40%	Greensboro-High Point
4	370670022	Hattie Avenue	January 01, 1999	0.065	Yes	Yes	159	<10%	2,178	114	50,904	38%	Winston-Salem
5	370510010	Honeycutt School	May 09, 2015	0.062	Yes	Yes	2	<10%	6,058	97	109,890	52%	Fayetteville
6	370671008	Union Cross	April 01, 1988	0.064	Yes	No	6	<10%	1,232	224	54,606	28%	Winston-Salem
7	370270003	Lenoir (city)	January 01, 1981	0.062	Yes	Yes	2	<10%	3,412	64	45,411	11%	Hickory-Lenoir-Morganton
8	371190046	University Meadows	April 01, 2016	0.069	Yes	No	1	25%-50%	1,380	322	72,565	29%	Charlotte-Concord-Gastonia
9	370630015	Durham Armory	April 01, 2007	0.061	Yes	No	12	<10%	2,844	190	88,515	40%	Durham-Chapel Hill
10	370510008	Wade	May 08, 1990	0.062	Yes	Yes	1	<10%	4,054	45	36,055	36%	Fayetteville
11	370210030	Bent Creek	April 01, 1989	0.061	Yes	Yes	1	<10%	2,182	144	74,235	13%	Asheville
12	370030005	Taylorsville Liledoun	August 02, 2013	0.062	Yes	Yes	2	<10%	3,987	71	61,213	17%	Hickory-Lenoir-Morganton
13	370650099	Leggett	January 01, 1983	0.061	No	No	2	<10%	7,105	41	62,186	54%	Rocky Mount
13	370770001	Butner	January 01, 1979	0.064	Yes	Yes	1	<10%	3,252	45	28,969	43%	Durham-Chapel Hill
15	371570099	Bethany School	July 07, 1993	0.063	Yes	No	2	<10%	3,278	55	41,162	23%	Greensboro-High Point

Table 6. Ranking of Relative Value of Ozone Sites Based on Site Longevity, Measured Concentrations and Other Considerations

Overall I Rank	AQS Site Id Number	Site Name	Date Established	2017-2019 Design Value	Required by Appendix:		Total Parameters Measured at Site	Ozone Exceedance Probability	Area Served (Km ²)	Population Density (People per Km ²)	Susceptible Population Served	Percent not Caucasian	MSA, CSA or CBSA represented
					D	G							
16	3710100 02	West Johnston County	January 01, 2009	0.061	Yes	No	2	<10%	3,813	87	59,137	27%	Raleigh
17	3710900 04	Crouse	July 01, 1993	0.064	No	No	1	<10%	3,144	121	76,891	20%	Charlotte-Concord-Gastonia
17	3717900 03	Monroe School	April 07, 1999	0.068	No	No	1	10%-25%	2,150	82	31,139	24%	Charlotte-Concord-Gastonia
19	3706700 30	Clemmons Middle	April 27, 2005	0.064	No	No	12	<10%	2,714	96	55,112	18%	Winston-Salem
20	3710700 04	Lenoir Co. Comm. College	April 01, 1998	0.062	No	No	1	<10%	6,514	56	76,129	40%	Kinston
21	3715900 21	Rockwell	April 01, 1993	0.062	No	No	3	<10%	2,766	81	46,565	20%	Charlotte-Concord-Gastonia
22	3711700 01	Jamesville School	April 01, 1995	0.061	No	No	3	<10%	9,211	15	32,994	41%	None
23	3712900 02	Castle Hayne	July 01, 2002	0.059	No	No	2	<10%	8,156	51	84,404	24%	Wilmington
23	3714700 06	Pitt Ag. Center	April 01, 2008	0.062	No	No	5	<10%	2,558	73	31,525	41%	Greenville
25	3703300 01	Cherry Grove	April 01, 1993	0.060	No	No	1	<10%	3,600	78	60,530	33%	None
26	3712399 91	Candor	January 01, 2011	0.059	No	No	93	<10%	6,050	34	47,931	27%	None
27	3714500 03	Bushy Fork	April 01, 1998	0.062	No	No	1	<10%	4,117	25	22,897	33%	Durham-Chapel Hill
28	3708700 35	Frying Pan Mountain	July 01, 1994	0.062	No	No	45	<10%	1,230	37	12,890	7%	Asheville
29	3701100 02	Linville Falls	August 01, 1999	0.060	No	No	45	<10%	2,192	29	13,700	10%	None
30	3709900 05	Barnett's Knob	April 01, 1999	0.066	No	No	1	<10%	118	80	2,190	9%	Cullowhee

Table 6. Ranking of Relative Value of Ozone Sites Based on Site Longevity, Measured Concentrations and Other Considerations

Overall Rank	AQS Site Id Number	Site Name	Date Established	2017-2019 Design Value	Required by Appendix:		Total Parameters Measured at Site	Ozone Exceedance Probability	Area Served (Km ²)	Population Density (People per Km ²)	Susceptible Population Served	Percent not Caucasian	MSA, CSA or CBSA represented
					D	G							
31	370319991	Beaufort	January 01, 2011	0.059	No	No	1	<10%	3,521	47	36,613	18%	Morehead City
32	370119991	Cranberry	January 01, 2011	0.061	No	No	4	<10%	2,964	34	23,406	4%	None
33	371990004	Mt. Mitchell	June 02, 2006	0.062	No	No	1	<10%	3,147	32	23,775	7%	None
34	370870036	Purchase Knob	June 06, 1995	0.063	No	No	1	<10%	2,319	23	12,516	4%	Asheville
35	471550102	Cling-man's Dome	April 01, 1993	0.062	No	No	9	<10%	481	0	-	0%	Sevierville, TN
36	371730002	Bryson City	April 01, 1995	0.058	No	No	9	<10%	525	23	3,052	8%	Cullowhee
37	370750001	Joanna Bald	April 03, 2003	0.062	No	No	1	<10%	2,867	22	17,728	6%	None
38	370870008	Waynesville School	April 01, 2011	0.059	Yes	No	1	<10%	1,072	45	12,075	5%	Asheville
39	371730007	Acquoni	April 01, 2012	0.057	No	No	1	<10%	514	52	4,601	34%	Cullowhee
40	371139991	Coweeta	January 01, 2011	0.060	No	No	1	<10%	2,529	21	16,040	6%	None

(1) The owner of the property evicts the monitor from the site and DAQ cannot find a suitable place to relocate the monitor or

(2) DAQ is required to add additional monitors to other MSAs and does not have the resources to do so without discontinuing existing monitors that are not required by 40 CFR Part 58 Appendix D.

4.2.2 Carbon Monoxide, CO, Sites

Currently, DAQ does not plan to shut down any CO monitors. All of the CO monitors operated by DAQ are required by 40 CFR Part 58 Appendix D. More information on the CO sites operated by the Division is provided in Chapter III of the 2020-2021 Annual Monitoring Network Plan for The North Carolina Division of Air Quality Volume 1 Network Descriptions.

4.2.3 Nitrogen dioxide, NO₂, sites

DAQ currently operates three NO₂ sites. The Northampton County site will shut down when the background study there ends. The local programs in Forsyth County and Mecklenburg County do not plan to make any changes to their existing NO₂ sites. As a result, the only NO₂ site in North Carolina that DAQ may discontinue in the next five years is the Northampton County site.

4.2.4 Reactive Oxides of Nitrogen, NO_y

DAQ has no plans to shut down any NO_y sites in the next five years.

4.2.5 Sulfur dioxide, SO₂, sites

The subsections below provide specific details about sites that are proposed for discontinuation in the next five years. Table 7 provides a relative ranking of the sulfur dioxide sites operated by DAQ and the local programs. The ranking was based on how long the site was in operation, concentrations measured at the site based on design values, number of other pollutants and meteorological conditions measured at the site, whether the monitor was required by Appendix D or some other requirement, the estimated population density, number of susceptible people, percent of population who are not Caucasian and area served. Monitors in operation longer with higher design values and collocated monitors or meteorological towers received higher ranks. Monitors required by Appendix D or some other requirement and that served a larger susceptible population or area also received higher ranks. More information on these sites is provided in Chapter IV of the 2020-2021 Annual Monitoring Network Plan for the North Carolina Division of Air Quality Volume 1 Network Descriptions.

4.2.5.1 Population-weighted emissions index sites

Currently, all of the PWEI sites in North Carolina are required. The PWEI for the Durham-Chapel Hill MSA is nearing the 5,000 threshold. DAQ anticipates that this PWEI value may drop below 5,000 with the 2020 NEI. If this occurs, the DAQ may shut down the PWEI monitor at the Durham Armory at the end of 2023.

Table 7. Ranking of Sulfur Dioxide Monitoring Stations

Overall Rank	AQS Site Id Number	Site Name	Date Established	2017-2019 Hourly Design Value	Total Parameters Measured at Site	Required by Appendix D, DRR or SOC	Population Density (People per Square Km)	Area Served	Susceptible Population Served	Percent of Population that is not Caucasian	MSA, CSA or CBSA represented
1	371830014	Millbrook School	January 01, 1999	2	204	Yes	113	13,247	266,451	37%	Raleigh
2	371190041	Garinger High School	July 30, 1999	4	166	Yes	167	10,808	317,317	33%	Charlotte-Concord-Gastonia
3	370630015	Durham Armory	September 15, 2007	4	12	Yes	138	5,008	118,223	38%	Durham-Chapel Hill
4	370670022	Hattie Avenue	January 01, 1999	5	159	No	99	9,960	204,682	26%	Winston-Salem
5	370190005	Southport DRR	October 18, 2016	66	4	Yes	62	10,386	140,118	22%	Myrtle Beach-Conway-North Myrtle Beach
6	370130151	Bayview Ferry	January 01, 1980	16	4	No	35	12,066	89,045	28%	Washington
7	370510010	Honeycutt	May 09, 2015	2	2	No	51	21,482	216,790	47%	Fayetteville
8	371570099	Bethany	January 01, 2011	13	2	No	106	6,655	141,729	34%	Greensboro-High Point
9	371170001	Jamesville School	December 01, 1994	2	3	No	33	12,645	83,014	47%	None
10	370270003	Lenoir (city)	January 01, 2013	5	2	No	48	13,955	144,679	12%	Hickory-Lenoir-Morganton
11	371450004	Semora DRR	April 01, 2016	32	4	No	24	11,938	65,219	37%	Durham-Chapel Hill
12	370870013	Canton	January 01, 2017	152	1	Yes	37	6,301	53,669	9%	Asheville
12	370210037	Skyland DRR	January 06, 2017	12	4	No	79	5,434	105,041	12%	Asheville

4.2.5.2 Regional Administrator Required Monitoring Sites

Currently there are no Regional Administrator Required SO₂ monitoring sites in North Carolina. DAQ anticipates that these sites will not be required in the state at this time.

4.2.5.3 Background PSD Industrial Expansion Monitoring Sites

DAQ does not plan to shut down any rotating SO₂ monitors. The background monitoring sites are still required for PSD modeling.

4.2.5.4 Source-oriented Monitoring Sites

DAQ operates a Source-Oriented SO₂ Monitoring Network. This network includes sites that were added to comply with the Data Requirements Rule as well as sites that are operated to satisfy requirements in Special Orders of Consent. DAQ plans to shut down two of the DRR sites at Skyland and Semora in 2020. The Southport SOC site is only scheduled to operate until the end of 2020 when the SOC expires; however, the DAQ may continue operating the site until the end of 2021 to obtain a valid design value for the area.

4.2.5.5 Other SLAMS SO₂ monitoring sites

DAQ does not plan to discontinue any of the other SLAMS SO₂ monitoring sites unless DAQ gets evicted.

4.2.5.6 Wind Speed and Direction Sensors at SO₂ Sites

When the source-oriented SO₂ sites shut down, the associated wind speed and direction sensors at those sites will also shut down. The affected wind speed and direction sensors are at the following SO₂ sites:

- Southport DRR in Brunswick County, 37-019-0005,
- Skyland DRR in Buncombe County, 37-021-0037, and
- Semora DRR in Person County, 37-145-0004.

DAQ does not plan to discontinue any additional wind speed and direction sensors collocated at SO₂ monitoring sites in the next five years.

4.2.6 Lead, Pb, sites

Currently there are no lead monitoring sites in North Carolina. More information on the lead monitoring network is provided in Chapter VIII of the 2020-2021 Annual Monitoring Network Plan for the North Carolina Division of Air Quality Volume 1 Network Descriptions.

4.2.7 Particulate matter, PM₁₀, sites

DAQ has no plans to shut down any PM₁₀ sites in the next five years.

More information on the PM₁₀ monitoring network is provided in Chapter VI of the 2020-2021 Annual Monitoring Network Plan for the North Carolina Division of Air Quality Volume 1 Network Descriptions.

4.2.8 Fine particulate matter, PM_{2.5}

The subsections below provide specific details about sites that DAQ proposes for discontinuation in the next five years as well as proposed technology at various sites.

Table 8 provides a relative ranking of the fine particle sites operated by DAQ and the local programs. The ranking was based on how long the site was in operation, concentrations measured at the site based on design values, number of other pollutants and meteorological conditions measured at the site, Appendix D and G requirements, the population density, susceptible population, percent of population that is not Caucasian and area served. Monitors in operation longer with higher design values and collocated monitors or meteorological towers received higher ranks. Monitors required by Appendix D and G and that served a larger susceptible population or area also received higher ranks. Chapter VII of the 2020-2021 Annual Monitoring Network Plan for the North Carolina Division of Air Quality Volume 1 Network Descriptions provides more information on these sites.

4.2.8.1 General PM_{2.5} Sites

DAQ does not plan to shut down any PM_{2.5} monitoring sites.

As can be seen in Table 8, the higher ranked sites are located in the larger MSAs and have higher design values. Generally, Appendix D to 40 CFR Part 58 requires the agency to operate these monitors.

The Division will also change the technology used at one of the PM_{2.5} sites to reduce the number of manual FRM monitors in use throughout the network. At the Durham Armory, 37-063-0015, in Durham County, DAQ will discontinue the manual collocated FRM monitors and replace them with a continuous FEM monitor on October 1, 2020.

On October 1, 2020, DAQ will also make the continuous monitor the primary monitor at the Millbrook Middle School site, 37-183-0014, in Wake County to eliminate the need for collocated PM_{2.5} FRM analyzers.

4.2.8.2 Continuous PM_{2.5} Monitoring Sites

DAQ does not plan to shut down any continuous PM_{2.5} analyzers during the next five years. Figure 11 shows the PM_{2.5} continuous network for 2020.

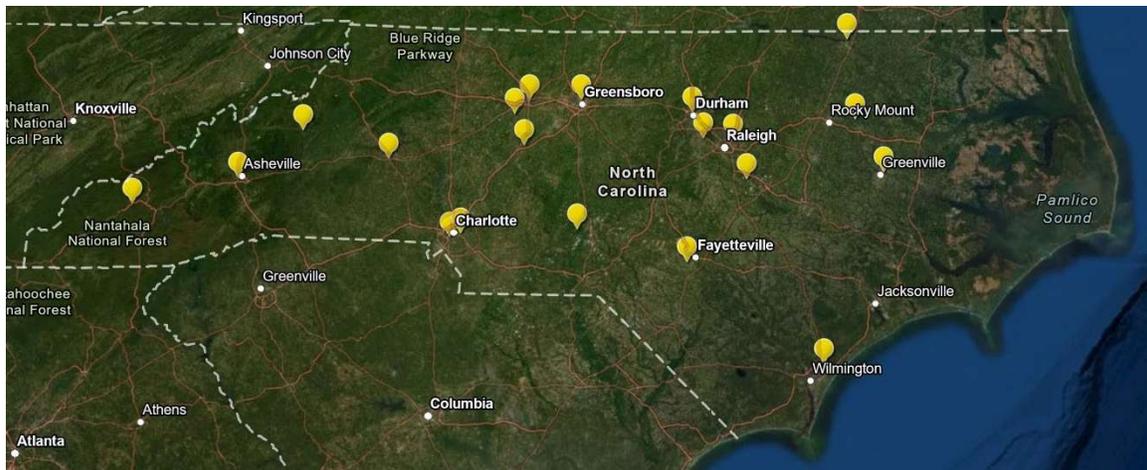


Figure 11. 2020 Continuous Fine Particle Network

Table 8. Ranking of Relative Value of Fine Particle Sites Based on Site Longevity, Measured Concentrations and Other Considerations

Overall rank	AQS Site Id Number	Site Name	Date Established	2017-2019 Daily Design Value	2017-2019 Annual Design Value	Total Parameters Measured at Site	Required by Appendix:		Population Density (People per Square Km)	Area Served in Square Kms	Percent of Population that is not Caucasian	Susceptible Population Served	MSA, CSA or CBSA represented
							D	G					
1	37-119-0041	Garinger	July 30, 1999	17	8.1	166	Yes	Yes	362	1,528	40%	91,956	Charlotte-Concord-Gastonia
2	37-183-0014	Millbrook	January 01, 1999	14	7.7	204	Yes	Yes	173	3,521	41%	104,922	Raleigh
3	37-063-0015	Durham Armory	September 15, 2007	16	8.2	12	Yes	Yes	80	6,483	41%	92,261	Durham-Chapel Hill
4	37-051-0009	William Owen	January 01, 1999	11	7.4	8	Yes	Yes	76	9,562	49%	137,914	Fayetteville
5	37-081-0013	Mendenhall	December 14, 2001	15	7.3	4	Yes	Yes	141	6,227	37%	175,725	Greensboro-High Point
6	37-067-0022	Hattie Ave.	January 01, 1999	19	7.8	159	No	Yes	106	3,641	32%	80,171	Winston-Salem
7	37-035-0004	Hickory Water Tower	January 01, 1999	18	8.3	5	No	Yes	69	8,645	15%	127,689	Hickory-Lenoir-Morganton
8	37-119-0045	Remount Road	January 01, 2017	18	9	14	Yes	No	344	1,385	33%	85,779	Charlotte-Concord-Gastonia
9	37-067-0030	Clemmons	August 01, 2004	23	9.3	12	Yes	No	65	4,602	15%	65,035	Winston-Salem
10	37-123-9991	Candor	July 16, 1999	14	6.8	92	Yes	No	33	6,593	29%	51,290	None
11	37-147-0006	Pitt County	April 3, 2008	13	6.5	5	No	No	37	18,450	41%	143,875	Greenville
11	37-183-0021	Triple Oak	January 04, 2017	16	8.1	5	Yes	No	202	2,287	28%	73,447	Raleigh
11	37-159-0021	Rockwell	January 01, 2005	23	9	3	No	No	109	2,47	24%	56,223	Charlotte-Concord-Gastonia

Table 8. Ranking of Relative Value of Fine Particle Sites Based on Site Longevity, Measured Concentrations and Other Considerations

Over-all rank	AQS Site Id Number	Site Name	Date Established	2017-2019 Daily Design Value	2017-2019 Annual Design Value	Total Parameters Measured at Site	Required by Appendix:		Population Density (People per Square Km)	Area Served in Square Kms	Percent of Population that is not Caucasian	Susceptible Population Served	MSA, CSA or CBSA represented
							D	G					
14	37-057-0002	Lexington Water Tower	January 01, 1999	19	8.8	4	No	No	100	1,537	17%	31,348	Winston-Salem
15	37-101-0002	West Johnston	January 01, 2009	15	7.9	2	No	No	78	6,291	33%	92,613	Raleigh
16	37-021-0034	Board of Ed	January 01, 1999	13	6.3	4	No	Yes	74	5,727	11%	101,852	Asheville
16	37-131-0003	Northampton Co	July 24, 2019	16	8.1	5	No	No	21	11,415	54%	52,966	Roanoke Rapids
18	37-173-0002	Bryson City	January 01, 1999	16	7.6	9	Yes	No	22	3,106	8%	17,898	Cullowhee
18	37-119-0048	Friendship Park	January 06, 2020	18	8.1	1	No	No	265	1,511	33%	66,930	Charlotte-Concord-Gastonia
20	37-129-0002	Castle Hayne	July 01, 2002	12	4.5	2	No	No	56	11,938	24%	142,677	Wilmington
21	37-099-0006	Cherokee	April 01, 2000	14	6.6	2	No	No	37	3,362	11%	28,540	Cullowhee
22	37-121-0004	Spruce Pine	January 09, 2014	13	6.1	1	No	No	35	5,662	8%	41,624	None

4.2.8.3 PM_{2.5} Background and Transport Sites

DAQ does not plan to shut down any PM_{2.5} regional background or PM_{2.5} regional transport monitors in the next five years.

4.2.8.4 PM_{2.5} Chemical Speciation Site

DAQ does not have any plans to discontinue any PM_{2.5} chemical speciation monitors in the next five years.

4.2.9 Coarse Particulate Matter, PM_{10-2.5}

DAQ does not have any plans to discontinue any PM_{10-2.5} monitoring stations in the next five years.

4.3 Photochemical Assessment Monitoring Stations, PAMS

DAQ currently does not have any PAMS to discontinue.

Chapter 5 Evaluation of New Technologies to Benefit the Ambient Air Monitoring Network

DAQ is considering an array of new technologies as a means to meet increasing demands in a time of decreasing resources. EPA has revised a number of ambient standards and related monitoring requirements in a short period of time, increasing the burden on state and local programs with no assurance of full funding.

In the meantime, we are evaluating new technologies that would allow us to do more with less. These new technologies are discussed more fully below, but include:

- Telemetry,
- Automated monitors,
- Data acquisition systems,
- Electronic logbooks,
- Handheld devices
- Air Sensor Technologies, and
- New monitors

Each of these technologies must be carefully evaluated to ensure it provides more benefit than cost, especially since near-term cash flow is problematic.

5.1 Telemetry

DAQ is working to ensure telemetric access to all of its remote monitors, especially the PM_{2.5} FRM machines. A history of filter exchange problems, with associated missed samples, has led field staff to not trust the FRM machines. As a result, they often make special trips to the FRM sites to ensure that the sample collection occurred. These trips take several hours per week from the technicians' schedules. DAQ has acquired several communications boards to install in the more remote machines so that technicians can check an FRM unit from their office. Although there is an added cost to put these units "online", the cost is offset by freeing up the technician to perform higher priority tasks. It also improves technician morale and satisfaction by being able to determine whether the FRM sampled without making a special trip. By the end of 2020, DAQ will only be operating FRMs at the NCore site and to meet collocation requirements.

5.2 Automated monitors

Today's society has grown to expect real-time information, whether it is news, personal communications, or air quality forecasts, including monitoring data. Because FRMs do not satisfy this demand, the national trend is moving toward continuous monitors since they provide more data much more quickly. Additionally, DAQ currently operates several BAMs and is starting to acquire more T640X monitors. The need for continuous monitors also drives our switch from manual monitors to new automated ones. DAQ is required to operate a certain number of continuous monitors and switching to the new automated monitors will allow us to replace two monitors with one. The division will not be purchasing any more FRMs. We expect to continue operating the existing ones for a few more years, but as they retire, we will replace them with continuous monitors.

5.3 Data acquisition systems

Not long after DAQ's previous network assessment in 2015, the former Ambient Monitoring Section Chief decided that AirVision would not be able to meet long term data acquisition and handling needs. As a consequence, DAQ purchased and installed Envista/Envidas in mid-2017, as our new data acquisition system. Reasons given for the change to a new DAS system were that the DAQ reorganization changed validation processes and created new needs for greater flexibility and more remote access. Another reason for the change-over was that newer monitoring equipment is better accessed using digital technology and is more Windows and personal computer based. Due to the immensity of the DAQ monitoring network the transition to the new DAS has been a monumental effort and DAQ continues to work with the vendor to implement exactly what is needed.

5.4 Electronic logbooks

DAQ has developed a series of electronic logbooks, eLogs, to help document the various activities that occur in the field and to communicate them to the central office. The field offices and central office have embraced the change and have fine-tuned the details. The Division is investigating software for creating manual maintenance logs and site logs that could be accessed via the internet from anywhere. Such electronic logs would make DAQ operations more efficient because information could be recorded once instead of in multiple paper logbooks. As one might expect, the major hurdle to this conversion will be the substantial budgetary expense.

5.5 Handheld devices

In the past, DAQ computers and laptops that were deemed obsolete for office work were transferred to ambient monitoring sites just prior to being discarded. Although these machines did not have the capacity for running the latest office software, they were deemed adequate for ambient monitoring operations. As the price of a desktop PC has decreased, the older PCs have been upgraded to more modern PCs than previously used. Also, DAQ has been purchasing relatively inexpensive, lightweight, handheld electronic devices for field work and has been testing and evaluating these devices as well.

5.6 Air Sensor Technologies

Since the publication of the 2015 Network Assessment, there has been rapid expansion in the field of air sensors. Air sensors are devices that are typically smaller, lower-cost and less accurate than federally certified monitoring equipment. While DAQ does not anticipate

that air sensor technologies will become sufficiently sophisticated to utilize for regulatory purposes over the next five years, many state, local, and federal agencies are already employing networks of air sensors for research, screening, outreach and education. DAQ is committed to exploring the potential uses of air sensors and engaging with regulators and communities to provide feedback and answer questions on their use.

5.7 New monitors

DAQ understands that new generation monitors are web-based. One of our local programs is pioneering the effort with web-based monitors and we expect to learn from their experience. As we purchase new monitors we will consider going with web-based machines. However, we must consider the fact that it may be more of a challenge to switch over a large statewide network than a small local network.

Chapter 6 Ability of Existing and Proposed Sites to Support Air Quality Characterization of Areas with Relatively High Populations of Susceptible Individuals, e.g., Children with Asthma

One way DAQ ensures that populations of susceptible children are represented by ambient monitors is by locating monitoring sites on school grounds, especially elementary and middle schools. Nine of 40 ozone and six of 22 particle monitors in the North Carolina network are on school property. There are a number of other advantages to locating monitoring sites on school property:

- In urban areas, schools are typically the place with enough open area for adequate siting.
- Schools do not charge us rent or other fees.
- It is easy to defend a monitor located on school property. While there have been instances of opposition or criticism of a monitor located near a major roadway or industrial facility, concerns seem to decrease when noted that the monitor is on a school campus.
- Monitors on school property provide teaching opportunities. Field staff report that science teachers often include the school's monitor in a lesson plan and schedule DAQ for "show and tell" with the students. This reinforces other DAQ programs at schools, such as anti-idling and school bus retrofits, and additional air quality lessons that children often take home to their families.

Chapter 7 Effect on Data Users for Any Sites That Are Being Proposed For Discontinuation

DAQ does not expect any of the sites proposed for discontinuation will impact data users. Some sites collect data that few external customers use. In some cases, the impact may be small because other monitors will exist in the MSA or the region that can be used to estimate O₃ or fine particle values at the location where the monitor was shut down.

Chapter 8 Needed Changes to PM_{2.5} Population-Oriented Sites

Locations of PM_{2.5} monitoring sites were determined in the late 1990s based on the data from the 1990 census. Figure 12 through Figure 18 show the PM_{2.5} monitoring sites and the O₃ monitoring sites existing in 2020 overlaid on maps showing the population density based on the 2010 Census. These maps show that the PM_{2.5} monitoring sites are still located in

highly populated areas based on the 2010 census data. Thus, at this time DAQ does not recommend any changes to the PM_{2.5} population-oriented sites.

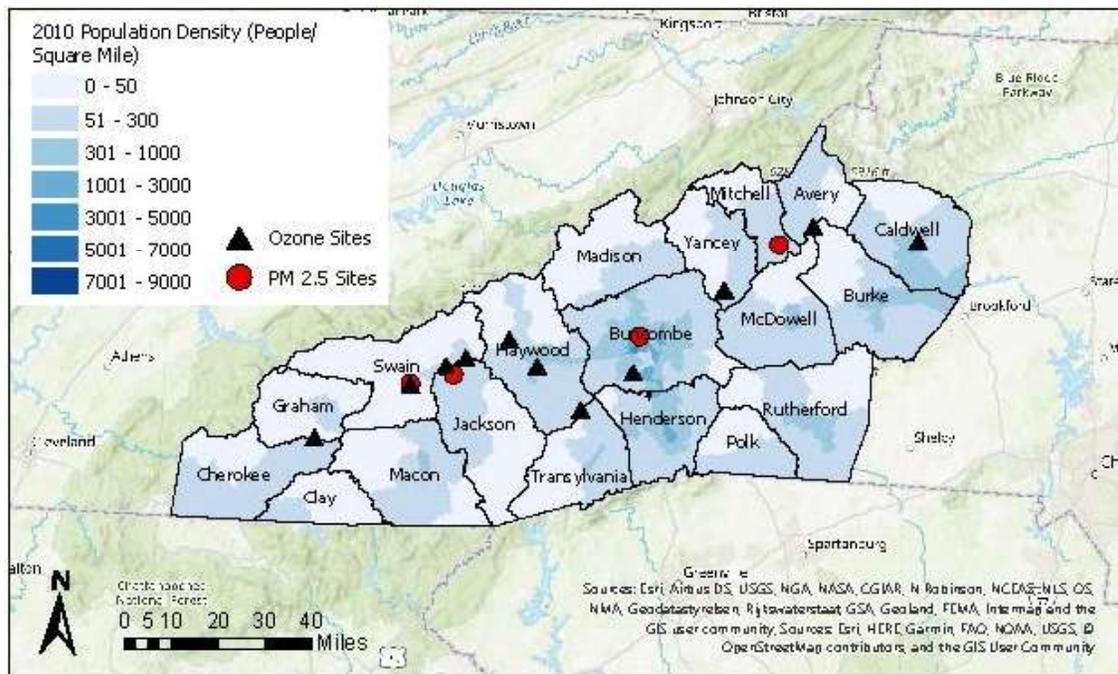


Figure 12. Location of PM_{2.5} and O₃ monitors compared to 2010 population density in the Asheville monitoring region

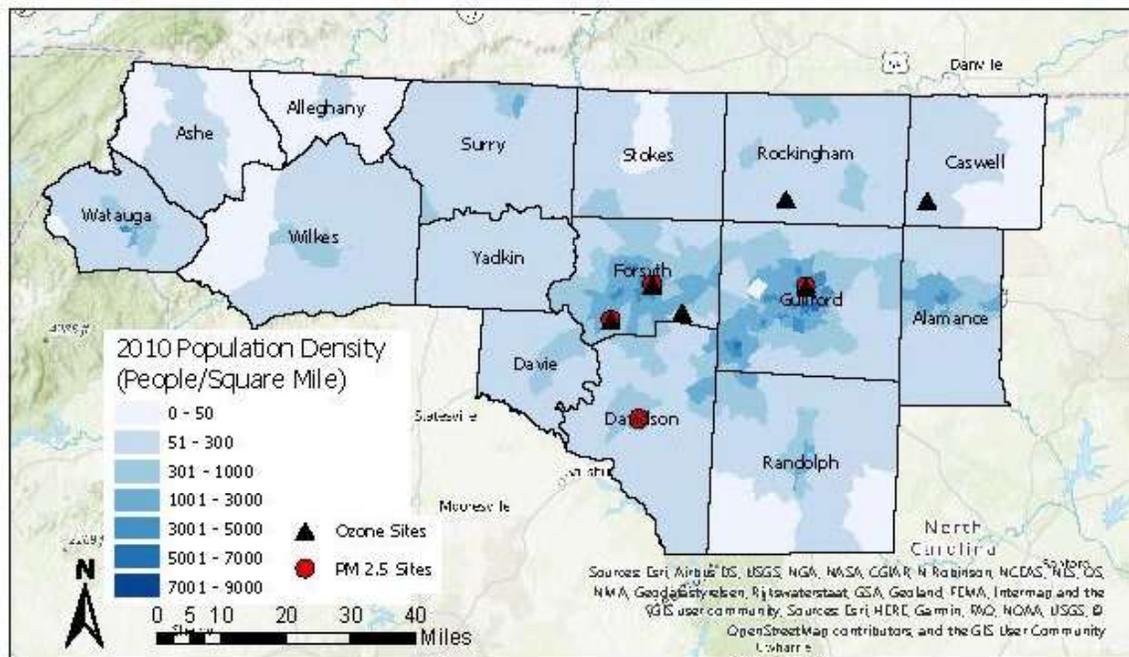


Figure 13. Location of PM_{2.5} and O₃ monitors compared to 2010 population density in the Winston-Salem monitoring region

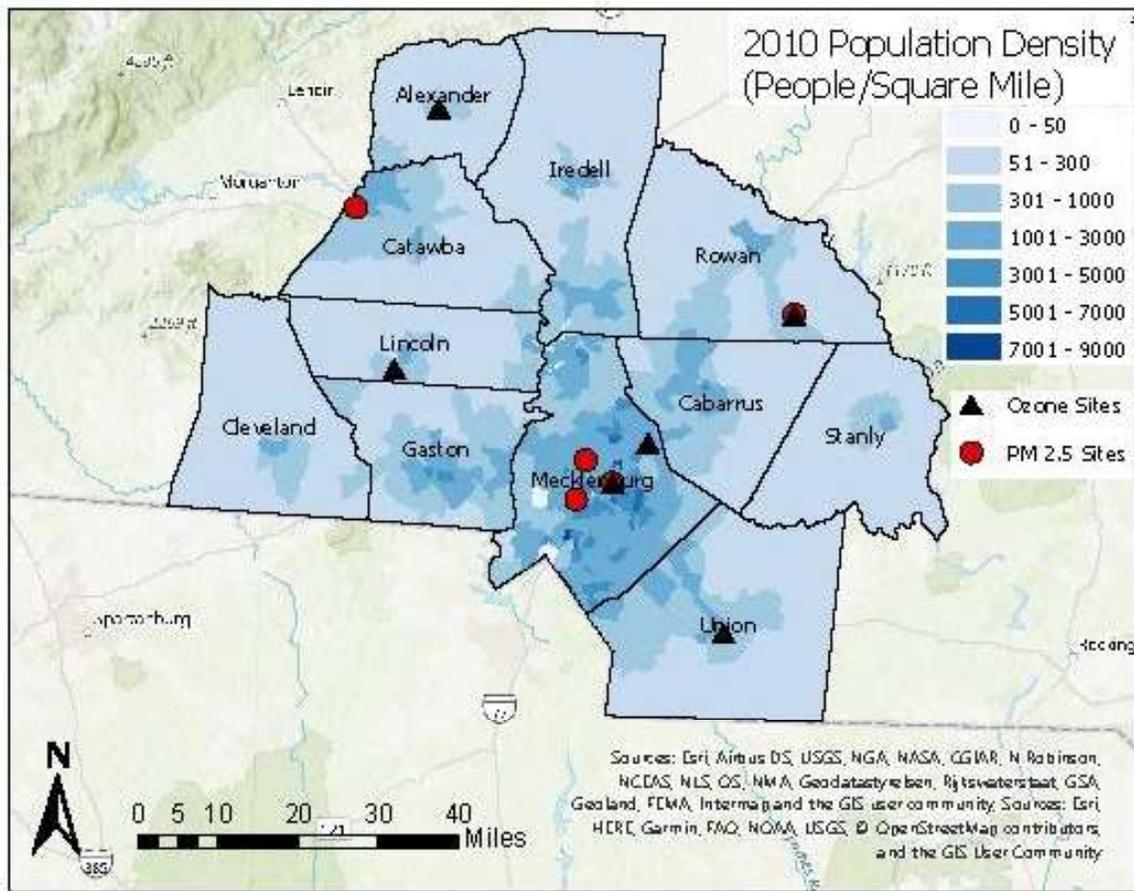


Figure 14. Location of PM_{2.5} and O₃ monitors compared to 2010 population density in the Mooresville monitoring region

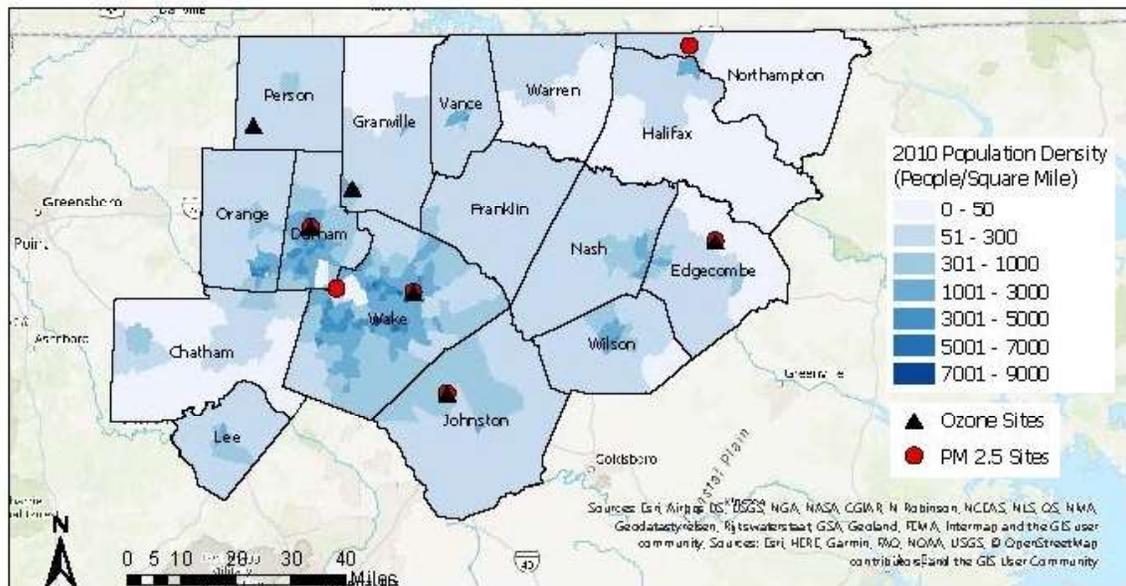


Figure 15. Location of PM_{2.5} and O₃ monitors compared to 2010 population density in the Raleigh monitoring region

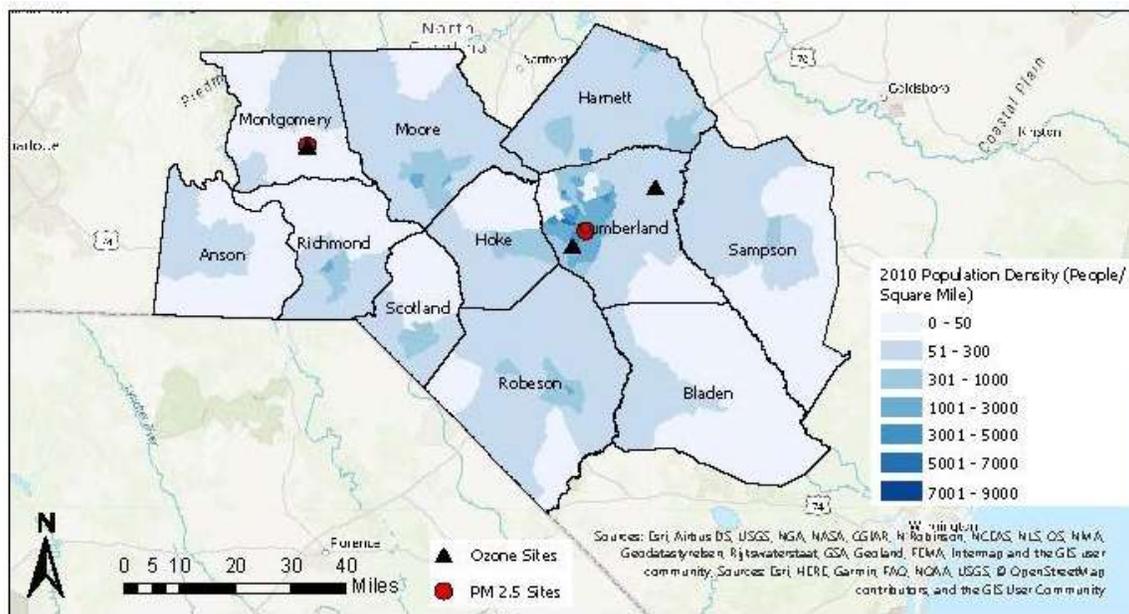


Figure 16. Location of PM_{2.5} and O₃ monitors compared to 2010 population density in the Fayetteville monitoring region

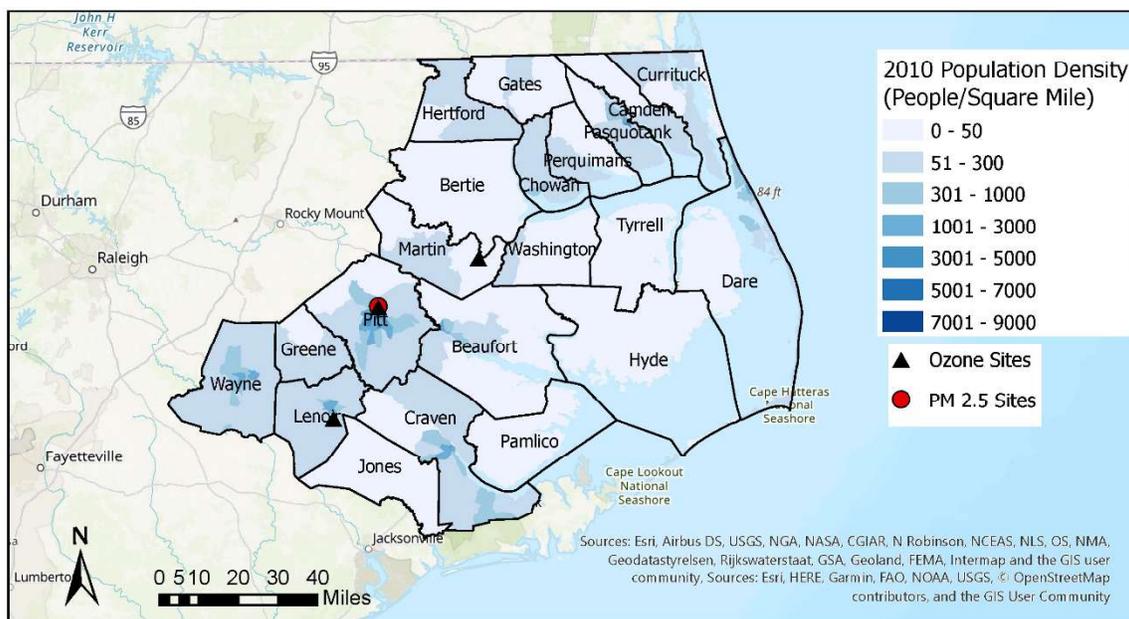


Figure 17. Location of PM_{2.5} and O₃ monitors compared to 2010 population density in the Washington monitoring region

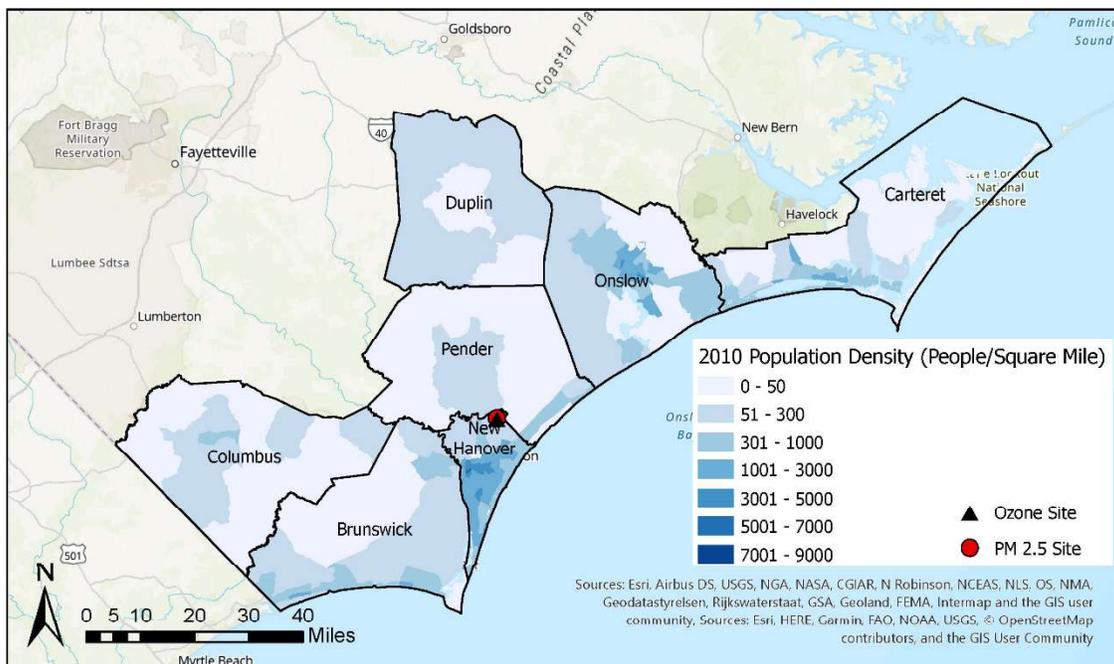


Figure 18. Location of PM_{2.5} and O₃ monitors compared to 2010 population density in the Wilmington monitoring region

Chapter 9 Monitoring Network Infrastructure Needs

For the most part this document has addressed expanding portions of the ambient monitoring network, mostly to meet new EPA requirements. But the rest of network is aging. Much of the network equipment is more than 10 years old and many of its shelters are more than 20 years old. DAQ has been notified by at least one vendor that they will discontinue supporting our equipment in a couple of years. Although this does not affect the current operation of the network, DAQ sees making capital investments to update the network as a priority which is a constant struggle with looming budgetary issues.

Most of the monitoring shelters are 8'x8' buildings constructed by a low bidder. Many of the shelters are well over twenty years old with some even built in the 1980s. Although still functional, their physical condition is as you would expect for nearly 30-year-old low-cost structures. DAQ developed specifications and identified funding to replace these shelters with a new generation of more energy-efficient, modern shelters.

In 2013 and 2014, DAQ replaced 4 of the 8'x8' shelters with aluminum faced buildings constructed with structural foam and vacuum epoxy laminated shelter panels. In 2015 and 2016, 15 aluminum shelters were purchased from a different vendor and 5 were installed. The remaining 10 buildings were scheduled to be installed at a rate of one per quarter over the next few years. While preparing the remaining shelters for installation a noticeable degree of rot and water leaks were detected. After many months of investigation and working with the shelter vendor it was determined that the 15 shelters were non-repairable and had to be disposed of. The 5 shelters that were installed in the field had similar signs of failure and became a priority for replacement. The original vendor from 2013 was contacted and designed 8'x12' aluminum shelters that would allow for future site expansions and flexibility for multiple types of equipment installations. In 2019 and 2020, two of the failing shelters were replaced with the new 8'x12' shelters. Two more failing

shelters are on schedule to be replaced in 2020. DAQ has made replacing the failing shelters and old 8'x8' wooden shelters a priority and currently plans on replacing 2 per year until all have been replaced with the new 8'x12' aluminum shelters.

Likewise, the older monitoring equipment is still fully functional, but it is no longer state-of-the-art. The equipment is in better condition than the shelters, however, we realize that the equipment has a limited useful life and we must plan for its eventual replacement.

As a result, DAQ invested in new O₃ monitors and O₃ calibrators. Most of the old O₃ equipment was swapped out for the 2014 O₃ season and all of the old O₃ equipment was replaced for the 2015 O₃ season. This O₃ equipment will no longer be supported by the manufacturer in 2024 and the DAQ has begun initial planning on replacing this equipment and will begin testing new models in 2020 for compatibility with our data acquisition software. The timing of these replacements will be based on available funding once the equipment model has been determined. DAQ has also replaced all old Tapered Element Oscillating Microbalance (TEOM) monitors with BAM 1020 monitors. The Division has replaced three 2025 sequential PM_{2.5} monitors with BAM 1020 monitors and is on track to replace all of the 2025 sequential monitors within the next few years. Several BAM 1022s were installed in the field to replace older equipment and they seem to operate at a high level of dependability. One Teledyne T640x has been installed and others will be installed in the future to meet monitoring requirements and DAQ will continue testing the new technology.

Full federal funding of all new monitoring requirements is essential for DAQ to maintain the existing infrastructure. Otherwise, DAQ will be forced to ration its limited resources and make decisions about whether to fully implement new monitoring requirements or to short-change existing ones.

List of Acronyms and Glossary

AADT	Average Annual Daily Traffic
ARM	Approved Regional Method
BAM	Beta Attenuation Monitor
CBSA	Core-Based Statistical Area
CFR	Code of Federal Regulations
CO	Carbon Monoxide: A colorless, odorless, highly poisonous gas, formed by the incomplete combustion of carbon or a carbonaceous material, such as gasoline.
DAQ	North Carolina Division of Air Quality: The Division of Air Quality, part of the N.C. Department of Environmental Quality, works with the state's citizens to protect and improve outdoor, or ambient, air quality in North Carolina for the health and benefit of all and enforces state and federal air pollution regulations.
DHEC	South Carolina Department of Health and Environmental Control
EPA	The United States Environmental Protection Agency: The EPA works to protect human health and to safeguard the natural environment -- air, water and land -- upon which life depends.
FEM	Federal equivalent method
FRM	Federal reference method
IMPROVE	Interagency Monitoring of Protected Visual Environments
Km	Kilometers
MCAQ	Mecklenburg County Air Quality
MSA	Metropolitan Statistical Area: Metropolitan Statistical Areas have at least one urbanized area of 50,000 or more population, plus adjacent territory, that has a high degree of social and economic integration with the core as measured by commuting ties.
NAAQS	National Ambient Air Quality Standards
NCORE	National Core or National Community Representative: Describes monitoring stations where multiple pollutants are measured to evaluate long term trends.
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen Oxides
O ₃	Ozone
PAMS	Photochemical Assessment Monitoring Stations
Pb	Lead
PM	Particulate Matter

PM ₁₀	Particles with an aerodynamic diameter of 10 micrometers or less
PM _{10-2.5}	Particles with an aerodynamic diameter between 2.5 and 10 micrometers
PM _{2.5}	Fine particles: Particles with an aerodynamic diameter of 2.5 micrometers or less
PWEI	Population Weighted Emission Index
QA/QC	Quality Assurance/Quality Control
SLAMS	State and Local Air Monitoring Stations. Describes single or multiple pollutant monitoring stations required by 40 CFR Appendix D that are not NCore Stations or that operate for longer than two years.
SO ₂	Sulfur Dioxide
TEOM	Tapered Element Oscillating Microbalance
VA DEQ	Virginia Department of Environmental Quality
WNC	Western North Carolina Regional Air Quality Agency

2020 NCDAQ_5-Yr_Assessment

Final Audit Report

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